THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN

EDITED BY

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VOL. LXXII.

LONDON
TAYLOR AND FRANCIS
RED LION COURT, FLEET STREET
1934.

CONTENTS.

ARTICLES :— Page

Some Remarks on the Kinabalu Collection of Chaplain and Mrs. Clemens, 1931–32. By C. G. G. J. VAN STEENIS 1

Miscellanea Bryologica.—XII. By H. N. DIXON 12

Bryophyta new to Co. Waterford. By ELEONORA ARMITAGE.... 18

Novitates Africanæ (*continued*) 20

Notes on *Selaginella*.—V. The *Selaginellae* of Trinidad and Tobago. By A. H. G. ALSTON 33

Notes from the British Museum Herbarium 40, 279

Abnormal Flowers in *Cephalanthera grandiflora* (L.) Bab. and other Orchids. By PATRICK M. HALL..... 49

Some Dispersal Notes. By H. N. RIDLEY, C.M.G., F.R.S..... 52

The Irish Forms of *Neotinea intacta* Reichb. fil. By H. W. PUGSLEY. 54

British Bryological Society. Annual Meeting and Excursion. By ELEONORA ARMITAGE 56

Antithamnion Spirographidis Schiffner. By M. A. WESTBROOK.. 65

The Standing of certain Plants in Ireland. By R. LLOYD PRAEGER 68

Synopsis of the European Species of *Pogonatum* and *Polytrichum*. By J. H. ALBRECHT. (With Illustrations by W. R. SHERRIN.) 75, 104

New Moss Records. 1. New Vice-County Records for Sphagna, mostly North Country. By A. THOMPSON..... 81

2. New Moss Records for Moray and Inverness. By H. B. GILLILAND 82

Orchis latifolia L. By P. VERMEULEN. (Plate 603.)..... 97

The Identity of *Lassonia* Buc'hoz. By J. E. DANDY..... 101

Astragalus (Sect. *Platyglottis*): Revision of Palestinian Species. By A. EIG. (Plates 604 & 605.) 121

Notes on Hydrocharitaceae.—I. By J. E. DANDY..... 132

Thalictrum minus L. sensu latissimo in Britain. By R. W. BUTCHER 153

An External Leaf-Character of the Cricket-bat and other Willows. By HELEN BANCROFT 165

Rosa perthensis Rouy and its History as a British Plant. By J. R. MATTHEWS 167

Two Interesting Hybrids in the British Flora. By J. EDWARD LOUSLEY 171

ARTICLES (*continued*) :— Page

Propagation from Aerial Shoots in *Equisetum*. By R. LLOYD PRAEGER 175
On the Morphology, Ecology, and Distribution of *Ranunculus Lenormandi* F. Schultz and *R. hederaceus* L. By E. J. SALISBURY, F.R.S. 185
The Flora of Akpatok Island, Hudson Strait. By NICHOLAS POLUNIN 197
Notes on Tropical African Umbelliferae. By C. NORMAN 205
South-Western Naturalists' Union. Twelfth Annual Conference. By IDA M. ROPER 209
Letters from John Ray to Peter Courthope. By R. T. GUNTHER. (Plate 606.) 217
Notes on *Selaginella*.—VI. The *Selaginellae* collected by Thaddeus Haenke and described by Borewog Presl.—VII. New Species. VIII. Nomenclatural Notes. By A. H. G. ALSTON 223
Rubus "*latifolius*" of Cornwall. By W. C. BARTON and H. J. RIDDELSDELL 230
South-Eastern Union of Scientific Societies. Thirty-ninth Annual Congress 232
Regeneration in *Polysiphonia nigrescens* Grev. By MARGARET T. MARTIN 241
Varieties of *Galium Mollugo* Linn. in Britain. By C. E. BRITTON. 243
New Malayan Rubiaceae. By H. N. RIDLEY, C.M.G., F.R.S. 251, 271
Mycological Notes.—VII. By W. B. GROVE 265
Revision of the South African Species of *Barleria*. Addenda and Corrigenda. By A. A. OBERMEIJER 275
New Variety of *Verbascum nigrum* L. By H. W. PUGSLEY 278
The British Association. Annual Meeting. By A. B. RENDLE. 282, 297
New Species from British Guiana, Cambridge University Expedition, 1933. By T. G. TUTIN 306, 333
Three New Species of *Grewia* from Tanganyika Territory. By A. W. EXELL 314
Linnæan Species of *Spermacoce*. By A. B. RENDLE. (Plates 607 & 608.) 329
Notes on *Colchicum*. By WILLIAM T. STEARN 341
Some Observations on the Saprolegniaceae of the Soils of Wales. By W. R. IVIMEY-COOK and E. MORGAN 345

SHORT NOTES :—

Re-introduction of *Cypripedium Calceolus* L., Matlock District, Derbyshire. By C. S. GARNETT 58
Zostera nana Roth in Carmarthenshire. By H. A. HYDE 58
Sorbus porrigens Hedlund in Ireland. By H. W. PUGSLEY 58
Flora of Lundy Island. By H. W. PUGSLEY 58
Riccia Beyrichiana in Arctic Europe. By C. V. B. MARQUAND .. 59
Viola lepida Jord. By W. H. PEARSALL 113
Jean Louis Berlandier 115
Cambridge University Herbarium 177

SHORT NOTES (*continued*) :— Page

Isoëtes echinospora Dur. in Cornwall. By CHAS. OLDHAM 177
Bromus interruptus Druce in Holland. By I. A. WILLIAMS 178
Utricularia ochroleuca Hartm. in Kerry. By R. W. SCULLY 210
Lathræa squamaria, Exudation of Water. By R. LLOYD PRAEGER. 210
Isoëtes in Devon. By F. A. BROKENSHIRE 259
Abnormality in *Heliopsis helianthoides* (L.) Sweet. By A. W. EXELL 260
Publication of the Generic Name *Vitaliana*. By A. BECHERER .. 292
Mistletoe on Holly. By ELEONORA ARMITAGE 293
Convolvulus arvensis L. with Quinquepartite Corolla. By ELEONORA ARMITAGE 319
Myosotis sylvatica Hoffm. in North Somerset. By H. S. THOMPSON 320
Lemna minor L. flowering in Cheshire. By W. G. TRAVIS 321
Dorycnium gracile Jord. in Kent. By H. N. RIDLEY 349
Sisymbrium thalianum flowering in November. By W. WATSON. 350
Introduced Plants in Somerset. By W. WATSON 350
Trichomanes radicans Sw. in the South of Spain. By P. W. RICHARDS 351

BIBLIOGRAPHICAL NOTES :—

C. 'Catalogue of Trees, Shrubs [&c.] in the Gardens near London,' 1730. By J. ARDAGH 110

ABSTRACTS OF PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA. By E. G. BAKER and H. W. PUGSLEY. 22, 142

OBITUARIES 83, 111, 139, 176, 207, 233, 257, 292, 316

REVIEWS 23, 60, 88, 115, 146, 178, 211, 235, 260, 293, 321, 351

BOOK-NOTES, NEWS, ETC. 30, 63, 94, 118, 151, 183, 216, 240, 296, 328, 359

SUPPLEMENTS :—

1. International Rules of Botanical Nomenclature adopted by the Fifth International Botanical Congress, Cambridge, 1930. By A. B. RENDLE.
2. Mr. John Gossweiler's Plants from Angola and Portuguese Congo.—Pteridophyta. By A. H. G. ALSTON.

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LIST OF PLATES.

603. *Orchis latifolia* var. *majalis* Kittel ..... *Facing* p. 97

604, 605. Palestinian Species of *Astragalus* ..... ,, p. 121

606. Letter from Ray to Timothy Burrell, Esq., dated 7 May, 1701 ..... ,, p. 217

607, 608. Linnæan Species of *Spermacoce* ..... ,, p. 329

CORRIGENDA AND ADDENDA.

P. 142. In line 2 from bottom, for *angustiloba* read *angustifolia*.
In bottom line, add after *umbellatum* L. "as subsp. *maritimum* (F. J. Hanbury) Zahn."

P. 320, line 25, *for* "a shoot of *M. sylvestris*" *read* "a sheet of *M. sylvatica*."

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SOME REMARKS ON THE KINABALU COLLECTION OF CHAPLAIN AND MRS. CLEMENS, 1931–32.

By C. G. G. J. van Steenis.

At the suggestion of Mr. J. Ramsbottom, Keeper of Botany, British Museum, Chaplain J. and Mrs. M. S. Clemens made further extensive collections on Mt. Kinabalu, British Borneo, principally in three stations, namely, Dallas, 3000 ft. alt., Tenompok, ca. 5000 ft., and in the high regions of the lofty granite dome up to ca. 13,500 ft. The study-set is in the British Museum, and the other sets will be distributed to the large herbaria in Europe, America, and Malaysia. The present collection amounts to about 3500 numbers. The preliminary identifications were made at Buitenzorg by the present writer. As only a few months were available, the provisional names can be trusted only so far as his knowledge and experience of Malaysian botany goes. It should be remarked that Mrs. Clemens supplied the field-identifications, and that some families have been more thoroughly studied than others, as is the case with the *Sapotaceae* and *Burseraceae* (Dr. H. J. Lam), *Combretaceae*, *Flacourtiaceae*, and *Gramineae* (Dr. D. F. van Slooten), *Ebenaceae*, *Verbenaceae*, and *Bombacaceae* (Mr. R. C. Bakhuizen van den Brink), and *Bignoniaceae* by the author. A numbered list of all identifications will accompany each set; in this way new identifications can be easily added later, when the material has been studied more thoroughly by specialists. The *Palmae*, *Araceae*, and *Pteridophytes* are to be identified by the staff of the Singapore Botanic Gardens and the *Fungi* by Mr. Ramsbottom of the British Museum. The numbering and putting into sets was largely done by the Clemens themselves.

The Clemens plan to continue their work in the Malaysian region, and will first collect still more in the vast and rich jungle of the Kinabalu region.

Of the large families abundantly represented in the present collection—such as *Annonaceae*, *Apocynaceae*, *Araliaceae*, *Ericaceae*, *Fagaceae*, *Lauraceae*, *Melastomataceae*, *Meliaceae*, *Myrtaceae*, *Moraceae*, *Orchidaceae*, and *Rubiaceae*, which for the greater part were collected at medium altitudes—we cannot give particulars which would demonstrate the relative richness of the collection. It may be stated, however, that the collection includes several genera which are recorded for Borneo for the first time, or at least have not been mentioned by Merrill in his 'Bibliographic Enumeration.' We cannot estimate the number of new species, or species new to Borneo; this will appear after the working up by specialists. Of many rare and interesting species ample material has been collected.

Among the *Burseraceae*, Dr. Lam discovered a representative of the genus *Haplolobus*, which is treated fully in his recent monograph*. The genus is distributed in New Guinea with ten species, in the northern part of the Moluccas with one, and *Haplolobus borneensis* H. J. L., sp. nov., occurs in Borneo. It is noteworthy that the new Bornean species is more closely allied to the Papuan ones than to that of the Moluccas.

With regard to the most fascinating part of the flora of the mountain, that of the high peaks, several collections have already been made, such as those by Low, Burbidge, Haviland, Miss Gibbs, J. C. Moulton, and Mrs. Clemens herself, but it is evident from the present collection that there was still important work to be done. Several interesting mountain plants hitherto not recorded from Borneo have been discovered by Mrs. Clemens; these are important from a plant geographical point of view. Of these the following may be mentioned: *Galium rotundifolium* L., *Astilbe* sp., *Uncinia* sp., *Aulacolepis* sp. (probably new) †, *Hierochloe Horsfieldii* R. Br., *Carex* sp. (probably new), *Bromus* sp. (probably new), *Monostachya centrolepidioides* Merr., *Poa* sp. (perhaps new), *Deschampsia* sp. (probably new), *Vernonia* sp. (perhaps new), *Cynoglossum* sp., *Gunnera macrophylla* Bl. aff. *humilis* Merr., and *Pogostemon menthoides* Bl.

The occurrence of *Monostachya* is of considerable interest, the more so as much material was procured. This small tussock-forming highland grass was for the first time described by Merrill from Mt. Pulog (Luzon, Benguet Prov.) as an endemic monotypic genus. In 1929 Dr. G. Kjellberg, who in that year made extensive collections in South and Central Celebes, collected it in the highlands of Central Celebes, where it grew together with *Centrolepis*. Dr. H. J. Lam informs me that the genus probably was also found by him in Central New Guinea. Thus it appears to be more widely spread than was supposed. Also the occurrence of *Bromus* sp., *Aulacolepis* sp., *Uncinia* sp., *Deschampsia* sp., and

* Bull. Jard. Bot. Buitenzorg, sér. iii. 12 (1932).
† Hitchcock, *in litt.*, 1932.

Poa sp. proves that formerly little attention was paid to a thorough exploration of the highland sedge- and grass-flora of Mt. Kinabalu, although these families are of much importance to the plant geography of the higher regions of Malaysia. On the whole, the alpine and subalpine flora of the Malaysian region is still rather obscurely known. Even in Java I have been able to trace some interesting species*, not to speak of the much less explored regions in the other great islands. For instance, Dr. G. Kjellberg has secured many interesting highland plants in Central Celebes, several of which are of importance for the proper understanding of the distribution of some Kinabalu plants which formerly were supposed to be confined to that mountain. For instance, *Myriactis* aff. *humilis* Merr., *Ranunculus* aff. *Lowii* Stapf, *Carex* sp., *Gentiana* aff. *lycopodioides* Stapf, *Potentilla* aff. *parvula* Stapf, *Potentilla leuconota* D. Don var., *Lithospermum* aff. *borneense* (Stapf) Boerl., *Pilea* aff. *Johniana* Stapf, and *Lactuca retrorsidens* Merr. are all either identical or very nearly allied with Bornean species. We therefore await with interest the working up of this important Celebes collection.

Very important, it appears to me, is the agreement in floral elements of the non-eruptive mountains of Borneo and New Guinea, on the one hand, and, on the other, of the volcanoes of Sumatra, Java, Celebes, and the Philippines. There seems to be little accordance between their different geological origin, antiquity and soil, and the composition of their flora; it seems rather that high altitude alone is sufficient for the development of the subalpine and alpine flora in the tropical region.

For the knowledge of the Bornean mountain flora the botanical exploration of the other high peaks in British North Borneo and Brunai is urgently needed. These are botanically scarcely known, though their high altitudes, reaching the 3000 m. line or even beyond, suggest the existence of an interesting mountain flora.

A few species of the present Kinabalu collection are treated of below. One of these I have the pleasure to dedicate to Mrs. Clemens, who, though not a botanist by profession, has devoted the greater part of her life to the promotion of the botanic exploration of Eastern Asia and the Malaysian region, and has gained an extensive field-knowledge, accompanied and assisted by her husband, Chaplain J. Clemens.

Weinmannia Clemensiae van Steenis, sp. nov. Foliolis sessilibus coriaceis conspicue bullatis subtus costa (ut rachibus, foliis, stipulis, ramorum apicibus, inflorescentiisque) dense fulvo-tomentoso-velutinis,. ab omnibus speciebus malayensibus et papuanis differt.

Small *tree*, with terete twigs, internodes slightly compressed

* "Eenige belangrijke plantengeographische vondsten op den Papandajan. I.–II." (De Trop. Natuur, xix. (1930) 73–91, xxi. (1932) 101–108).

and broadened towards their apex, defoliate part glabrescent, the foliate densely light brown velvety-tomentose, as are the rachises of the leaves and of the inflorescence; internodes 1–3 cm. l., 2–3 mm. diam. *Stipules* entire, caducous, apparently free from the beginning, broadly rounded at apex, base short and abruptly cuneately narrowed, tomentose above, sericeo-velutinous below, erect, first flat, later the apex slightly or distinctly recurved, 7–12 by 8–12 mm. *Leaves* 6–13·5 cm. l. including the petiole, with 7–15 pairs of leaflets, the upper sometimes with only 3 pairs; petiole terete, 7–17 mm. l.; rachis terete, slightly sulcate above. *Leaflets* sessile, the terminal on a stalk 3–5 mm. l., the pairs at distances of ·5–1 cm., coriaceous, brittle, conspicuously bullate, with recurved distinctly crenate margin, the parenchyma prominent between the primary nerves, when juvenile flat; blade oblong, apex rather blunt, base rounded, 13–22 by 7–10 mm., when juvenile tomentose below and pubescent above, when adult glabrous or sparsely puberulous above, and below with tomentose midrib, pubescent primary nerves and sparsely pubescent parenchyma; nerves 4–5 on either side, prominent below, slightly so above, veins visible below, rather wide-netted, crenate teeth 3–6 on each side, provided with a tuft of hairs. *Racemes* densely flowered, 2, opposite, in the axils of two upper leaves below the juvenile parts of the shoot, as long as the lower adult leaves and extending above the juvenile parts, one of the pair sometimes only 2 cm. l., including peduncle 1 cm. l. Peduncle 5–12 mm. l. *Flowers* on tomentose pedicels 1–2 mm. l., fasciculated in the axils of recurved, tomentose, spathulate-oblong bracts 1·5–2 mm. l. *Calyx* campanulate, apparently red, tomentose at base, lobes 4–5, imbricate, pubescent, ovate, more or less concave, blunt, 1·5–1·75 mm. l. *Petals* 4–5, entire or emarginate, 1·75–2 by 1 mm., obovate with rounded apex, extending about ·75 mm. beyond the sepals. *Stamens* 8–10, in adult flowers about twice as long as petals, incurved in bud; filaments terete, filiform, slightly thickened in the middle (in boiled flowers); anthers medifixed, cells 1·5 mm. l., more or less reniform, twice as long as broad, free in lower half, slightly diverging at base; connective minutely produced above. *Disc* of 8–10 blunt lobes about ·3 mm. l., alternating with the stamens. *Ovary* apparently rudimentary, densely tomentose; stigmas 2, small rudimentary, depressed ovate. [*Fruit* unknown.]

British North Borneo: Mt. Kinabalu, in low jungle near Kamborangah, 2400 m. alt., *Clemens* 27,880, flowers cream-pink.

This aberrant and well-characterized species stands rather isolated among the Malaysian members of the genus; its nearest ally perhaps is *W. urdanetensis* Elm. Its leaf-habit and tomentum recall some remote New Guinea members of the family, viz., *Spiracanthemum bullatum* Gibbs and *Sp. Pulleanum* Schltr., and the New Caledonian *Cunonia bullata* Brongn. & Griseb. and

Pancheria insignis Schltr. In *Weinmannia* the same tendency occurs in *W. bullatum* Rusby, judging from the specific name (*cf.* also Schlechter, Engl. Bot. Jahrb. lii. (1914) 139–140).

The specimens seem to be male with a rudimentary ovary, which suggests diœcism or at least polygamy. This also occurs in the Javan species *W. Blumei* Planch. as mentioned by Koorders and Valeton (Bijdr. Booms. Java, v. (1900) 398, 401) and by C. A. Backer (Schoolfl. Java (1911) 471–2), which I can confirm from abundant living material from Mt. Salak near Buitenzorg. Engler in his recent treatment of the family in the 'Pflanzenfamilien' (ed. 2, xviii. *a* (1930) 250) still accepts monœcious flowers for the genus.

Radermachera ramiflora van Steenis, sp. nov. Racemis in ramis defoliatis fasciculatis, corolla tubulosa longa leviter falcata, basi non constricta, ab omnibus speciebus malayensibus differt.

Tree, glabrous throughout, to 20 m. tall or more, stem diameter 30 cm. or more. *Leaves* incompletely 3- sub-4-pinnate, fasciculated at the end of the twigs, polished and sticky above when young, the older dull on both surfaces, up to 1 m. l. Adult leaves: petiole stout, terete, slightly striate, sulcate above as are the stout rachises, about 20 cm. l.; primary pinnæ 4–6, at distances of 17, 12, 9, and 7 cm. respectively; leaflets chartaceous, elliptic-lanceolate, acuminate, base cuneately decurrent along the short sulcate petiolule, terminal leaflet long-stalked: lowest leaflets of the secondary pinnæ sometimes 3-foliolate (in this case the leaves sub-4-pinnate); primary nerves 6–8 on each side, connected at about 3–4 mm. from the margin, prominent below, veins few, scarcely prominent; blade below fine-punctate, near base and apex with small shallow spot-like glands, those of adult leaves 5·5–8·5 by 1·5–2·75 cm., including the petiolule 3–5 mm. l., acumen about 10 mm. l. *Racemes* hanging, originating laterally from finger-thick to arm-thick branches, scattered along the younger branches and fasciculated on the thicker ones on knobs of the rough bark, unbranched, flowering from the base, elongating during flowering; rachis angular or with decussately flattened nodes, densely set with scars over the whole length, up to 32 cm. l., sticky and polished by secreted resin towards the apex, as are the pedicels and calyces. *Buds* erect, closed, pear-shaped, the calyx far more rapidly adult than the corolla. *Flowers* erect on curved pedicels, with yellow tube and bright red limb, opposite or in whorls of three or scattered along the rachis; lower part of the pedicels of the opened flowers spreading at an angle of 45°, straight, 5–14 mm. l., articulated at the apex and there with 3 minute bracteoles, upper portion curved, 4–8 mm. l., gradually enlarged into the calyx-tube. *Calyx* green to purple, tubular, slightly or distinctly widened towards the apex, including the cuneate base 1·5–3 cm. l.

8–10 diam. at the throat; lobes 2, broadly triangular, 4–6 mm. l., each lobe at last split into two smaller acute lobes 2·5–4 mm. l. *Corolla* tubular, the tube slightly falcate and widened towards the apex, 6–7 cm. l., the lower portion neither constricted near the insertion of the stamens nor abruptly enlarged where it emerges from the calyx, 3–4 mm. wide at the ultimate base, the mouth 1·5–2 cm. diam.; lobes rounded, about 1 cm. diam., subequal, slightly papillose inside. *Stamens* and *style* reaching the mouth of the corolla, the former subequal, curved, connivent in pairs, connate with the tube up to about half its length; cells linear-oblong, about 4 mm. l., connective slightly protruding. *Capsule* green, terete, twisted, straight or falcate, acute, 50–70 cm. l., about 5 mm. diam., valves 5–6 mm. broad, dissepiment 2·5 mm. diam. *Seed*: germ 4–5 mm. broad, 2·5 mm. high, wings oblong, 6–7 mm. l.

British North Borneo: Mt. Kinabalu; Tenompok, E. of lodge, opening below trail, 1500 m. alt., *Clemens* 28,672, 4.3.32, tree 50 ft. tall, tube yellow, bell red, *type-specimen*. E. Dallas, 900 m. alt., *Clemens* 27,392, 4.12.31, 2 specimens not far apart on forest-hill, tree 21 m. or more tall, fruit green. Tenompok, 1500 m. alt., *Clemens*, without number, 18.2.32, jungle-tree, 18 m. tall, diameter at breast-height 30 cm., petals orange purple tips, calyx green to purple.

So far as I know, this characteristic species is the only cauliflorous one in the genus. It occupies a rather isolated position among the other Malaysian species on account of the unbranched inflorescence and structure of the corolla. As appears from the description the length of the calyx is rather variable.

Rhamnus borneensis van Steenis, sp. nov. Foliis subtus indumento glauco munitis, floribus 2–4 in axillis fasciculatis vel interdum cymis 3-floris brevipedunculatis, ab omnibus speciebus malayensibus differt.

Small *tree* with glabrescent angular branches, young parts densely fulvous-tomentose except the upper surface of the leaves, tomentum of densely set stellate hairs. *Stipules* linear-lanceolate, half-terete, outside convex, inside flat, 4–7·5 mm. l. *Petioles* tomentose, sulcate, 5–10 mm. l.; blade chartaceous, obovate to obovate-oblong, base more or less distinctly cuneate, apex rounded, rather abruptly short-acuminate, rarely acute, acumen blunt or broadly triangular, to 4 mm. l.; upper side of leaf glabrous with sulcate midrib, nerves, and veins; underside tomentose, midrib and nerves at first fulvous, later glaucous as is the parenchyma; nerves 7–8 pairs, parallel, connected along the entire recurved margin into a submarginal slightly looped line, strongly prominent as is the stout midrib, veins distinctly prominent, forming a dense net of cross-bar veins. *Buds* erect. *Flowers* drooping, light brown (*teste* coll.), 2–4 fasciculated in the axils of normal leaves or forming a 3-flowered cyme on an axillary peduncle 4–10 mm. l. and then rarely with two reduced leaves 8–20 by 3–12 mm. at the tip of the peduncle; bracteoles small, acute; pedicels 5–8 mm. l., terete, fulvous-tomentose. *Calyx* fulvous-tomentose outside, 4·5–5 mm. l., split halfway down; lobes 5, triangular, acute, rather thick, carinate inside over their whole length, 3 mm. l., 2 mm. wide at base. *Disc* thin, connate to the calyx-tube, about 2 mm. high. *Petals* cap-shaped, 2 mm. l., embracing the glabrous *stamens*, which are shorter the than petals, 1·75 mm. long; filaments distinctly flattened and broadened towards base, narrow-triangular in outline, inserted with ·75 mm. broad base on the margin of the glabrous disc; anthers oval, ·5 mm. l., medifixed, glabrous. *Ovary* glabrous, globular, about 1 mm. high; style 2 mm. l., split halfway down into 3 terete arms with a punctiform stigma at tip. [*Fruit* unknown.]

British North Borneo: Mt. Kinabalu, in low jungle near Kamborangah, *Clemens* 27,876, 7.1.32, flowers light brown.

The nearest ally seems to be the Philippine *Rh. mollis* Merr., which differs according to the description in the rounded leaf-base, scandent habit, minutely crenate leaf-margin, longer petioles, and paniculate inflorescence.

There is yet another undescribed species which comes very near and is known from Sumatra only, which I will call **Rhamnus lancifolius** v. St.*. It differs from *Rh. borneensis* in the oblong, larger, minutely crenate leaves 8·5–16 by 3·5–8·5 cm., with 8–11 pairs of nerves, and sharply acuminate or subcaudate leaf-apex, the narrow acute acumen 5–15 mm. l., the smaller flowers (petals 1·5 mm., sepals 2 mm. l.), the filiform terete filaments not or scarcely broadened towards the base. It occurs in the mountain forests of Central Sumatra at 900–1300 m. alt.

A third allied species was collected in Sarawak on the summit of Mt. Poi by Mrs. Clemens in 1929 (no. 20,055). It might be new, as it differs in the venation of the leaves, the tomentum being much thinner. In leaf-shape it approaches *Rh. lancifolius*, to which it may belong. But there are no flowers in our specimen.

According to the description *Rhamnus sumatrensis* Ridl. (Journ. Roy. As. Soc. Mal. Br. i. (1923) 57) differs in the absence of an indumentum and is allied to *Rhamnus nepalensis*.

The occurrence of stellate hairs needs comment, as Weberbauer accepts this character as of primary importance in the *Rhamneae* ('Pflanzenfamilien,' ed. 1, iii. 5 (1896) 407). The form of the hairs agrees well with those of *Styrax Benzoin*; the arms spread in various directions. Also in the other two above-named species of *Rhamnus*, which have an indumentum, stellate hairs were observed.

* sp. nov., foliis oblongis minute crenatis apice acuminato vel subcaudato, floribus minoribus, filamentis basi vix quam supra latioribus a *Rh. borneense* differt.

Paratrophis glabra (Merr.) van Steenis, comb. nov. *Gironniera glabra* Merr. in Philipp. J. Sc. i. (1906) Suppl. 42; Enum. Philipp. Flow. Pl. ii. (1923) 35. *Aphananthe negrosensis* Elm. Leafl. Philipp. Bot. ii. (1909) 575. *Pseudostreblus caudata* Ridl. Journ. Feder. Mal. Stat. Mus. vi. (1915) 54; Fl. Mal. Pen. iii. (1924) 324.

MALAY PENINSULA: Selangor; Gunong Mengkuang, 1500 m. alt., *H. C. Robinson*, without number, coll. 14.1.1913 (duplicate in Herb. Bog.); G. Kerbau, 4500 fr., *H. C. Robinson* (Kew, fragment in Herb. Bog.), 14.3.1913, *type-specimen* of *Pseudostreblus caudata* Ridl.

BORNEO: Sarawak: Mount Poi, ca. 1400 m. alt., *Clemens* 20,039, Sept. 1929, tree 9 m. tall, in forest. British North Borneo; Mount Kinabalu, Tenompok, 1500 m. alt., *Clemens* 29,321, 19.4.1932, tree 9 m. tall, end of jungle-ridge. *Idem*, Tenompok, trail to Tomis, 1700 m. alt., *Clemens* 29,532, 3.5.1923, tree 9–12 m. tall, summit of jungle-ridge, flowers cream with pinkish perianth. *Idem*, above Dallas trail, jungle-ridge trail to Tomis, 1700 m. alt., *Clemens* 28,809, tree 12–13 m. tall, stem diam. 15 cm., wood very hard, so hard as to turn edge of parang (knife), flower cream with pink tinge. Dutch Borneo: Central eastern part, near G. Kemoel, 1200 m. alt., *Endert* 3838, 10.10.1925, on mountain ridge, tree ±15 m. tall, trunk 35 cm. diam., distinctly angular, soft-wood 2 cm. thick, whitish, heart-wood dark red-brown, bud reddish.

PHILIPPINES: Luzon: Tayabas, Rizal, Bataan and Sorsogon provinces, *Merrill* 5185 (dupl. in H. B.), *Whithord* 1205, B. S. 3297, *Ramos* 19,518, *Elmer* 15,574 (dupl. in H. B.). Negros: *Elmer* 9514, 9801, and 10,156 (of all a dupl. in H. B.); in mountain forests up to 1200 m. alt. (Merr. Enum. ii. (1923) 35).

CELEBES: Northernmost province, Manado, subdistrict Parigi, Bt. Towoewoe, 1100 m. alt., coll. Forest Exper. Station Neth. Ind. no. b.b.15,024, 28.1.1931, tree 14 m. tall, trunk 15 cm. diam., bark with plenty of milky juice, vernac. *laudji*.

This species, which was very aberrant in habit in the genus *Gironniera*, proved to belong to the *Moraceae* by the stamens strongly incurved in bud and the occurrence of latex. In the female flowers the small calyx does not increase in size, and supports the drupaceous fruit, thus differing from *Pseudotrophis* Warb., while it cannot be inserted in *Taxotrophis* Bl. owing to its distinctly imbricate perianth. Either it must belong to *Paratrophis* Bl. or to *Pseudomorus* Bur. In the latter, however, the cotyledons are unequal in size and shape, the outer being large and embracing the globular inner one, whilst those in *Paratrophis* are equal in size and shape. Though I had no ripe fruit of *Pseudomorus* at my disposal, I was able to examine the structure in *Paratrophis philippinensis* (Bur.) F.-Vill. (*C. A. Wenzel* 2657 or 3657?), which exactly agreed with the generic character. In *Gironniera glabra* Merr. (*Elmer* 10,156) I find that the cotyledons are both of the same size and shape; the radicle is lateral and not included between them. Thus it appears that the species must be included in *Paratrophis*, in which it does not seem hitherto to have been described. No further description is needed, as those of Merrill and Elmer give sufficient particulars. The distribution appears to be a rather wide one. It may be expected to occur also in Sumatra.

Mr. H. N. Ridley kindly compared the type-specimen of *Pseudostreblus caudata* Ridl. with Merrill's *Gironniera glabra* at Kew, and he is of the opinion that they are identical. The type-specimen of *Pseudostreblus caudata* was from G. Kerbau, 14.3.1913, which seems a miscopy from the specimen preserved in the Buitenzorg Herbarium, which was collected in January on Gunong Mengkuang (*Ridley*). The Director of the Royal Botanic Gardens, Kew, generously sent a flowering fragment which confirms our opinion.

COPTOSAPELTA MONTANA Korth. MS. ex Val. in Rec. Trav. Bot. Néerl. xix. (1922) 285, 290–292; Versl. Gew. Verg. Wis- & Natuur. Afd. Kon. Akad. Wetensch. Amsterdam, xxxii. (1923) 439, fig. 4, 440.

Mrs. Clemens has secured ample flowering and scarce fruiting material which could easily be determined with Valeton's key, and comparison with the co-type in Herb. Bog. left no doubt as to its identity. As hitherto only Korthals's fruiting specimen was known, an emended description is given.

Ornamental hanging *vine*, about 12 m. tall, twigs terete or obscurely quadrangular; flower-bearing twigs non-branched, lateral on the spirally twisted older branches, 3–5 mm. diam., 20–40 cm. l., the upper half flower-bearing, with 7–12 pairs of leaves, the lowest reduced to small blades 1·5–2 cm. l. *Leaves* ovate to ovate-lanceolate, 5–8 cm. l. (including the acumen) and 2–3·5 cm. wide. *Racemes* lax, 2–19-flowered, with or without reduced lanceolate leaves 1·5–3·5 by ·5–1·5 cm., sometimes subpaniculate if the lower pedicels bear 2–3-flowered cymes, up to 14 cm. l.; racemes forming a lax leafy panicle. *Flowers* creamy, very fragrant. Buds terete, acute, 1·5–2 cm. l. Bract at the base of the pedicel leafy, spathulate, or the uppermost subulate. Pedicel golden brown, appressed tomentose as are the ovary, sepals, and corolla; bracteoles subopposite or opposite, inserted below or above the middle of the pedicel. *Calyx-tube* (ovary) campanulate, costate when dry, densely tomentose, 2–2·5 mm. high and wide, upper limb free, somewhat swollen, 3–4 mm. high; lobes 5, erect, persistent, narrow-triangular, outside appressed-hirsute, inside glabrous, 2·5–3 by hardly 1 mm., in fruit forming a slightly enlarged crown about 5 mm. high. *Corolla*-tube about 5 mm. l., densely appressed whitish-hairy, below the lobes with a line of yellowish hairs,

campanulate-cylindric; throat densely white-bearded, hairs on the base of the petals more or less erect and twisted, the bearded part entirely filling the upper half of the tube and consisting of reflexed hairs 2 mm. l.; lobes 5, inside glabrous, outside densely appressed-yellowish hairy, glabrous on one margin, linear to subspathulate, acute, sulcate inside, 13–15 mm. l., 2–2·5 mm. broad, patent, at last reflexed. *Stamens* at last reflexed, inserted at the margin of the tube between the petals; filaments flattened towards the base, on the inner side long-bearded, the hairs gradually decreasing in size towards the tip, the outer side glabrous, basifixed, 4 mm. l.; anthers linear, connective flattened, densely set with long appressed hairs directed towards the apex, the tip mucronate and glabrous; cells glabrous 1 cm. l., the lower 1 mm. fertile and free so as to form a sagittate anther. *Style* 15–18 mm. l., green, when dry the upper half black, the lower whitish.

British North Borneo: Mt. Kinabalu, near Tenompok, E. of lodge, 1500 m. alt., *Clemens* 28,166, 30.1.32, vine 40 ft. tall, flower cream, pistil green, a very fragrant and ornamental hanger.

Valeton described the inflorescence as glabrous, whereas that of the co-type is distinctly hairy, even on the remains of the calyx-lobes.

Pegia sarmentosa (H. Lecomte) van Steenis, comb. nov. Merrill (Pl. Elmer. Born. in Univ. Calif. Publ. Bot. xv. (1929) 168) first recorded this genus for Borneo. Mrs. Clemens has collected ample material of a second species which entirely fits Lecomte's description of *Phlebochiton sarmentosum*. The petals in this genus are valvate, which causes without doubt the difficulty in determining it with the aid of the first edition of the 'Pflanzenfamilien.' Also Lecomte described valvate æstivation (Bull. Soc. Bot. Fr. liv. (1907), 528), but later discarded it (Fl. Gén. Indo-China, ii. (1908) 32), and noted in the generic description imbricate æstivation. I believe he was right in his first examination, though I have not seen any Indo-Chinese specimens. In *P. nitida* the petals are also valvate. Elmer (Leafl. Philipp. Bot. viii. (1919) 3101) does not mention the æstivation in *P. philippinensis*, and I had no flowers of this species for examination. As to the generic name *Pegia* I see no reason to discard the validity of the full description of Colebrooke (Trans. Linn. Soc. Lond. xv. (1827) 364), which has priority over and was based on the same species as Wallich's *Phlebochiton* (Trans. Med. & Phys. Soc. Calc. vii. (1835) 230).

Indo-China: no specimens examined, *Lecomte*, l. c.

British North Borneo: Dallas, Tenompok trail, 900 m. alt., ♂, *Clemens* 26,652, Sept., Oct. 1931, long scandent vine with costate-striped stem, prostrate, with cream flowers, leaves with a strong odour; same locality, *Clemens* 30,352, fruiting, young

leaves with a distinctive odour; same locality, bridle-trail, ? ☿, *Clemens* 26,068, 13.8.31, tall climber, fruit green.

Some remarks on the variability of characters may be made. The insertion of the inflorescence (terminal or lateral) I believe to be of little taxonomic importance. Both modes occur in *P. nitida*. In the present material only lateral ones are present, but no twig-ends are available. The genus has a subscandent habit and is more or less a straggling shrub, and so different parts of the plant may have different habits. Length of leaves and leaflets is of hardly any importance in furnishing characters of specific rank. Plentiful material of *P. nitida* gave the following results: leaves from 10–45 cm. l., leaflets 2–9·5 by 1–4 cm. The number of leaflets is also rather variable; in *P. nitida* mostly (5)–6–7 pairs occur, but near the ends of the twigs where the inflorescences are still lateral there are sometimes only 1–3 pairs and near the leaf-tops on the youngest shoots the leaves are even simple (*cf.* the material of the cultivated specimen in Herb. Bog. sub no. xi. B xx. 5). The form of the leaflets and the presence of a tomentum, however, seems to be rather constant, though the principal characters of specific rank will be found in the fruit and flower. A key for the three known species of *Pegia* is appended:—

1. Plant villous, stem eventually more or less glabrescent. Leaflets not oblique, mostly distinctly crenate. Petiolules 3–5 mm. long. (*Robergia hirsuta* Roxb., nomen nudum; *Phlebochiton extensum* Wall.; *Tapiria extensa* Hook. f.; *T. hirsuta* Hook. f.). Br. India	*Pegia nitida* Colebr.
Plant subglabrous. Leaflets subentire or entire	2.
2. Fruits ovate, very oblique, 12–15 by 8–9 mm. Seed subreniform-ovate, 11–13 by 6–7 mm. Leaflets with or without domatia, oblique, the leaf-margin inserted at the same height at both sides on the slender petiolule 4–16 mm. long. Panicles 15–35 cm. long. Calyx-lobes glabrous. Petals 2 by 1 mm., non-ligulate (*Phlebochiton sarmentosum* H. Lec.). Indo-China, Borneo	*P. sarmentosa* (Lec.) v. St.
Fruits obovoid-oblong, more or less pear-shaped, straight, 8–9 by 4–5 mm. Seed subreniform, 7 by 3·5 mm. Leaflets without domatia, very oblique at the base, the lateral petiolules 3 mm. long, the leaf-margin of the anterior side inserted higher than on the posterior side. Panicles 10–15 cm. long. Calyx-lobes sparsely ciliate. Petals ligulate, 3 by 1 mm. (*Phlebochiton philippinense* Merr.). Borneo, Philippines	*P. philippinensis* Elmer.

The genus seems to occur in Sumatra also (*cf.* Merrill, Enum. Philippine Flow. Pl. iv. (1923) 472), but I could not find any

specimen from that island in Herb. Bog. to determine the species; according to Hallier f. the specimen belonged to *P. philippinensis* Elm.

It is still somewhat doubtful whether the plant is diœcious or polygamous. I suspect the latter is the case, as the nos. *Clemens* 26,652 and 26,068 are not quite the same, the former is male, the ovary being very reduced and merged into the disc, the latter has much more developed ovaries. The stems are hardly twisted, but the material cited has leaves which have certainly climbed by means of the petiolules, which are strongly curved for 360° and are much thickened. In *P. nitida*, however, I could not trace such petiolules. Petals and sepals vary from 4 to 5, stamens from 8 to 10. The rudimentary ovary is more or less 4- or 5-lobed with 4–5 small styles and stigmas, which are more or less stellately expanded.

The Herbarium,
Botanic Gardens, Buitenzorg (Java).

MISCELLANEA BRYOLOGICA.—XII.

By H. N. Dixon.

(Concluded from *Journal of Botany*, 1928, 354.)

Some Japanese Ulotas.

I have received several specimens of *Ulota* from Japan under the name of *U. nipponensis* Besch., but until lately I have had no occasion to examine them critically. Recently, however, I was desirous of getting a clearer idea of the characters, and I examined Bescherelle's Herbarium at the British Museum. To my surprise I found that the name on the only two specimens in the collection, the type and a second packet, had been corrected by Bescherelle himself from *U. nipponensis* to *U. Drummondii*, both on the labels and on the species-cover. Bescherelle had evidently arrived at the conclusion that his plants belonged to *U. Drummondii*, and that *U. nipponensis* must disappear.

There are two specimens, both collected by Faurie, numbered 10 and 11 *b* respectively. The latter, marked "Type," of the habit of *U. crispa*, with leaves well curled when dry and the calyptra naked or at the most with two or three sparse hairs. The other has the creeping habit of *U. Drummondii*, with a very hairy calyptra and the leaves only slightly curled when dry.

Bescherelle in his diagnosis (Ann. Sci. Nat., Bot. xvii, 339) has clearly mixed up these two plants. The description of the calyptra, "globosa pilis rectis copiosis vel subnullis," shows this to be the case, while the description of the plant as having the habit of *U. Drummondii*, but the leaves more crisped, is equally incorrect, and indicates that it was drawn up from the two plants.

No. 10, "Akkeshi, arbres, 1893," may, I think, safely be referred to *U. Drummondii*; it is not *U. reptans* Mitt., which has much smaller and shorter capsules, which are wide-mouthed when dry, with broader regular peristome teeth, distinctly arranged in pairs.

On examining my Japanese specimens named *U. nipponensis*, I found that in one case at least the reference there was incorrect, since the calyptras are strongly hairy. This is certainly *U. crispa* Brid. Bescherelle's plant, No. 11 *b*, must be considered the type of *U. nipponensis*, which is a good species, but the description must be amended; the leaves are curled when dry, the habit is not creeping, and the calyptra is naked or almost so.

U. crispa has not been recorded from Japan, but Prof. Malta tells me that he has seen it from there. It may be well to give the localities from which I have it. Mt. Daisen, Japan, 25 Oct., 1913. Herb. Nakajianum Universitatis Imperialis Tôkyôensis. Nisiyama, Prov. Rikutyu, 8 May, 1927; coll. G. Toba, comm., H. Sasaoka (3385). Mt. Oodaigahara, Prov. Yamato, on tree, Aug. 1929; coll. H. Sasaoka (5381). This last a robust form, with stouter capsules, cylindric and more abruptly tapering into the neck, not contracted below the orifice, but this is probably due to their not being over-ripe; I find no structural differences.

The leaves in *U. nipponensis* are much curled when dry, but I find a distinct difference in the leaf-base from those of *U. crispa*; there they are normally Ulotoid, with a broad, short, very concave, often orange base, the broad band of marginal, lax, hyaline cells clearly defined from the small, very narrow, very incrassate, often orange inner cells. In *U. nipponensis*, so far as I have examined it, the base is narrower, more gradually tapering, and less clearly defined, and the median cells are comparatively wide and thin-walled, hence much less clearly differentiated from the marginal ones. The stomata in both are numerous in about two rows around the base of the spore-sac, but there seems a slight difference in size and form, those of *U. nipponensis* which I have observed being narrower in proportion to their length, *i. e.*, distinctly elliptic and slightly larger, 40–55 μ long. In *U. crispa* they are only slightly elliptic, and about 40 μ long.

The question arises as to what is *U. japonica* (Sull. & Lesq.) Mitt., but unfortunately I have not been able to see a specimen. The brief description states that the calyptra is "epilosa," which removes it at once from *U. crispa*. Is *U. nipponensis* distinct from this? Bescherelle makes no reference to it. There appears to be ground for considering it distinct. Sullivant, in writing of *U. Barclayi* Mitt. ('Icones Muscorum,' Suppl. 75) says:—"This species is very near *O*[*rthotrichum*]. *japonicum* of Sull. & Lesq., . . . if indeed both forms do not represent varieties of the same species." Now in *U. Barclayi* the leaves when dry are appressed, hardly curled, and the inference is that this is the same with *U. japonica*.

Byssophora Duthiei C. M. (gen. et sp. nov.), ined.

This was issued by Levier as *Byssophora Duthiei* C. Müll., sp. nov., genus novum (adhuc dubium); Distr. Mussoorie (N.W. Himalaya); Landour, Garhwal Road, on rocks in shade, 7000 ft., det. cl. Brotherus, No. 3711. Bryothec. E. Levier, M. Ind. Or., curante cl. W. Gollan lecti.

This is therefore not the actual plant determined by C. Müller, but there is no reason to doubt its identity with that plant.

I have examined the specimen at Kew. It is in poor condition, and consists almost entirely of a greyish felt of extremely delicate filaments, resembling a filamentous alga. It has practically no stem or leaves giving a clue to its relationship, but I recognized it at once as identical with a specimen I had received from Landour, Mussooree, on overhanging rocks, c. 6800 ft., collected by Winfield Dudgeon, in 1923; probably from the same station, where, he wrote, it is very common.

This is a state of *Anoectangium Stracheyanum* Mitt. (leaves and fruit are present) almost entirely overrun, and in some cases quite smothered, by a dense growth of greenish protonemal threads, cauline in origin, and branched and re-branched so as to form the dense felt-like mass of which the Kew specimen almost entirely consists. It is a remarkable plant, but it has no claim to be considered a new genus, or even species. The name may well be allowed to sink into oblivion, but as Levier's 'Exsiccata' have been distributed and are in many collections it is as well to put the facts on record.

Clastobryum tenuirameum (Mitt.) Dix., comb. nov.

Mitten in the Musc. Ind. Or. 94 (1858) published his *Stereodon tenuirameus*, giving as a synonym "*Pylacesia tenella* Wils. *in sched.*" He compares it with *Pylaisia polyantha* and *P. subdenticulata*. Naturally, therefore, Paris places it under *Pylaisia*, but unfortunately, as in so many cases, he adopts Wilson's specific epithet—which is unpublished and unavailable—as *Pylaisia tenella* Wils.

Jaeger adopts the same classification, but rightly names it *Pylaisia tenuiramea* (Mitt.). Brotherus (Musci, ed. i.) refers to it under *Pylaisia* as a species which he had not seen, but which from the description he would be inclined to place under *Clastobryum*. From the second edition of the 'Musci' it appears to have disappeared altogether.

The authors of the 'Bryologia Javanica' (ii. 228) have cited Wilson's MS. name, *Pylaisia tenella*, for a Javanese moss, but Fleischer considered this to be a distinct species, and described it as *Clastobryella tenella*, citing as "Synonym; *Pylaisia tenella* (non Wils.) Bryol. jav. ii. 228 (1870)." This is surely incorrect. The fact that the authors referred their moss to Wilson's plant

erroneously, without even giving a description, cannot involve them in having (unintentionally) created a new specific name. The name *tenella* as applied to *Clastobryella* is perfectly valid, but it should appear as *C. tenella* Fleisch., not *C. tenella* (Lac.) Fleisch. As a matter of fact, by a happy misprint it does so appear in the text (Musci . . . von Buitenzorg, iv, 1199), but in the index it appears as Fleischer no doubt intended it, though as I think incorrectly, *C. tenella* (Lac.) Flsch.

I have examined Mitten's Indian plant, and there is no doubt that it is, as Brotherus suspected, a *Clastobryum*. I have given some notes on this in an article in 'Annales Bryologici,' vi. 35 (1933).

Publication of Hooker's 'Musci Exotici.'

This work is generally known in two volumes, dated 1818 and 1820 respectively, and there is nothing to indicate that they were issued in a different form, beyond the fact that there is no pagination of the text; the Plates are numbered consecutively, each with a page of description accompanying it. The dates of publication of the various species are inconsistently given by Paris in the Index, those which appeared in Vol. I being given as "(1818)" while those which appeared in Vol. II are given as "(1818–20)."

The work was isued in 22 parts, in paper wrappers, in two forms, a small paper and a large paper edition, all, however, printed from the same plates; there was one edition with plain, another with coloured plates; I believe that the large paper edition had them coloured, the small paper one plain. Copies with the wrappers present are extremely rare, and I have not been able to see a complete set of these. I have, however, seen sufficient to enable the dates of all the parts to be ascertained with scarcely any doubt. A number (11) of the parts of the small paper edition were recently acquired by the British Museum (Nat. Hist.), and I had the opportunity of collating these; while by the courtesy of Messrs. Bernard Quaritch I have been able to see and to take notes of some of the parts of the large paper edition.

The wrappers of the large paper edition are misleading, as they were evidently all printed at once, with the date "1818," and price "[Price 8*s*.]" printed on all, while a space is left after "No. . . ." to be filled in for each part in writing.

Much more information is given on the wrappers of the small paper edition. On p. 4 of all the wrappers is a note as to the plan of the work, which is worth reproducing, as it does not appear in the completed volumes. At any rate, it does not occur in my copy, which should be a perfect one, as it bears the rather interesting inscriptions in the two volumes as follows:—In Vol. I, "Joseph Dalton Hooker K.C.S.I. With best wishes

from C. H. Symonds. Christmas 1889." And in Vol. II, "for Papa with best Christmas wishes from his affectionate children Gracie and Reggie. Dec^ber 25, 1889."

The note is as follows :—" This work is intended to comprise such Exotic Cryptogamic subjects, exclusive of the Ferns, as have not been noticed, or are imperfectly described, by preceding Naturalists. In those cases where the Author has been favoured by collections of considerable extent made by any individual Botanist, they will be distinguished from the miscellaneous collections by an additional running title, as 'Humboldtiani,' 'Menziesiani,' and with a distinct Index; so that they may be bound separately, or incorporated with the rest of the work, according to the option of the possessor."

This indexing does not appear to have been carried out.

Separate wrappers were printed for each of these small paper parts, giving no., date, title, etc.

From these wrappers it is clear that Vol. I was issued in twelve monthly parts, most of them, but not all, including eight Plates. No. 1 could only have contained Tabs. I–IV, since No. 2 commences with Tab. V and ends with Tab. XII. Nos. 3 and 4 were missing from the parts which I examined, so that there is no evidence as to which number made good these parts, but they must have been in either the March or April parts or in both, since the May number commences with Tab. XXXIII. Presumably the remaining parts came out as arranged, and containing their due Plates; the last part, Dec. 1818, including the Title, Index to Vol. I, and the Dedication to James Brodie.

Of Vol. II, Part 15 was issued in Mar. 1819, and presumably Parts 13 and 14 had been duly issued in Jan. and Feb. Part 21 was issued on Dec. 1, 1819, and Part 22 on May 1, 1820. All species contained in Vol. II, therefore, up to Tab. CLXVIII, were actually published in 1819, while those of the later Plates were published in 1820.

The following list gives the dates of the parts actually known, while I have given in square brackets the data of the missing parts, so far as these are ascertainable :—

Vol. I.

[No. 1.	1818, Jan. 1	Tabs.	I–IV.]
2.	,, Feb. 1	,,	V–XII.
[3 & 4.	,, Mar. and April	,,	XIII–XXXII.]
5.	,, May 1	,,	XXXIII–XL.
6.	,, June 1	,,	XLI–XLVIII.
12.	,, Dec. 1	,,	LXXXIX–XCVI (with Title &c.).

Vol. II.

[No. 13.	1819, Jan. 1	Tabs.	XCVII–CIV.]
[14.	,, Feb. 1	,,	CV–CXII.]
15.	,, Mar. 1	,,	CXIII–CXX.
16.	,, Apr. 1	,,	CXXI–CXXVIII.
17.	,, May 1	,,	CXXIX–CXXXVI.
18.	,, July 1	,,	CXXXVII–CXLIV.
20.	,, Nov. 1	,,	CLIII–CLX.
21.	,, Dec. 1	,,	CLXI–CLXVIII.
22.	1820, May 1	,,	CLXIX–CLXXVI.

Index to "Miscellanea Bryologica."

I have been asked by some correspondents to give, for more easy reference, an index to the notes in the series of papers under this title, which have appeared in the *Journal of Botany* at intervals over a period of twenty years. The different parts appeared as follows :—

Part I, Aug. 1913.
,, II, Nov. 1913.
,, III, May 1914.
,, IV, Jan. 1915.
,, V, Dec. 1916.
,, VI, Apr. 1919.
Part VII, May 1921.
,, VIII, Oct. 1922.
,, IX, Aug. 1924.
,, X, Jan. 1927.
,, XI, Dec. 1928.

Index to Notes.

Aërobryum lanosum Mitt., 1916, 352.
Anoectangium scabrum Broth., 1919, 75.
Anomobryum robustum, 1927, 7.
Arthrocormus Schimperi Doz. & Molk., 1924, 235.
Astomum Levieri Limpr., 1913, 330.

Barbella Levieri (Ren. & Card.), 1919, 79.
Barbula albicuspis Mitt., 1927, 6.
B. apoclada Par., 1921, 136.
B. rubella, 1916, 355.
B. torquescens Schimp., 1924, 234.
Beddomiella Dix., 1927, 5.
Bibliography :
'Bryologia Javanica,' Dates of publication, 1928, 352.
Duby, 'Choix de Cryptogames,' Dates of publication, 1922, 284.
Harvey, 'Thesaurus Capensis,' 1927, 7.
Hooker, 'Musci Exotici,' Dates of publication, 1934, 15.
Brachythecium decurvans, 1922, 286.
B. trachypodium Bry. eur., 1914, 123.
Breutelia, Some Australasian species, 1915, 16.
Bryum Bescherellei Jaeg., 1919, 78.
B. crassum H. f. & W., 1928, 351.
B. erythrocarpoides Schimp., 1919, 78.

Campylopus brevipilus, c.fr. 1928, 349.
Ceylonese Mosses, 1919, 77.
Chaetomitrium Deplanchei Duby and its allies, 1919, 73.
Cheilothela chilensis (Mont.), 1924, 231.
Cryphidium, Some Australasian species of, 1916, 357.
C. dilatatum, 1916, 358.
C. ovalifolium, 1916, 359.
Cyrtopus setosus, 1922, 290.

Daltonia novae-zelandiae Mitt., 1914, 123.
Dicranoloma dichotomum, 1916, 356.
Dicranum fuscescens forma, 1921, 135.
Didymodon recurvus (Mitt.), 1922, 283.
D. riparius (Aust.) Kindb., 1921, 134.
D. rufescens (Hook.), 1922, 283.

Discelium nudum Brid., 1921, 134.
Ditrichum brachycarpum Hampe, 1913, 235.
D. flexifolium Hook., 1913, 324.
Drepanocladus secundifolius, 1921, 138.

Ectropothecium australe Jaeg., 1921, 135.
Ephemeropsis tjibodensis in New Zealand, 1928, 347.
Eurhynchium meridionale, 1921, 133.
E. remotifolium, 1927, 7.
E. scabrisetum, 1927, 9.

Fissidens humilis Dix. & Watts, 1924, 234.
F. linearis and *linealis*, 1924, 232.
F. sylvaticus Griff., 1922, 284.
F. Zippelianus Doz. & Molk., 1922, 284.

High Altitudes, Some mosses from, 1924, 228.
Hookeriopsis sumatrana, 1916, 355.
Hypnum microcladum, 1927, 6.
H. replicatum Hampe, 1921, 132.
H. scabrellum Lac., vide *Sematophyllum decipiens*.
H. secundifolium C. M., 1921, 137.
Hypopterygium atrotheca Dix., 1928, 350.

Isopterygium limatum (H. f. & W.), 1921, 136.

Leptodontium squarrosum, 1927, 5.
Leskea longirostris Schwaegr., 1927, 11.
L. remotifolia Hook., 1927, 9.

Microthamnium, 1922, 281.
Microthamnium, S. African species of, 1915, 20.
M. cavifolium, 1915, 21.
Myurium Foxworthyi, 1921, 136.

Neckera glossophylla Mitt., 1921, 138.
N. Hoehnelii and *N. Hoehneliana*, 1915, 22.
New Zealand Mosses, 1916, 354.

Orthotrichum, S. American species, 1924, 228.
O. firmum Vent., 1922, 286.
O. leptocarpum Br. & Schimp., 1922, 285.

Philonotis afro-uncinata, 1924, 235.
Pilopogon umbellatus, 1922, 287.
Pinnatella elegantissima (Mitt.), 1921, 138.

Renauldia Hoehnelii, 1915, 23.
Rhynchostegiella convolutifolia (Hampe), 1924, 234.
R. cucullata (Mitt.), 1924, 234.
Rigodium dentatum Dix., 1921, 133; 1928, 350.

Schwetschkea, papillosity in, 1921, 136.
Sematophyllum (*Acroporium*) *acutirameum* (Mitt.), 1914, 119.
S. decipiens Dix., 1919, 77.
Stereophylla, Some W. African, 1924, 235.
Syrrhopodon rufescens, 1922, 287.

Taxithelium Gottscheanum, 1919, 76.
Tetraphidopsis, 1913, 244.
Thiemea, 1927, 5.
Thuidia, Some Australasian species, 1913, 326.
Thuidium orientale Mitt., 1913, 329.
Thysanomitrium Richardii, 1922, 287.
Tortula inermis (Brid.), 1921, 133.
Trichostomum aequatoriale (Spr.), 1924, 134.
T. quitense, 1924, 232.
T. Warnstorfii, 1921, 134.

Weisia Welwitschii, 1913, 246.

BRYOPHYTA NEW TO CO. WATERFORD.

By Eleonora Armitage.

During a visit last July to Cappagh, near Dungarvan, Co. Waterford, I took every opportunity to collect the local Bryophyta, especially as I soon found there were many gaps among the commoner species for v.c. I. 6.

As a result, I found that of over seventy True Mosses collected eighteen were new records; thirty-four gatherings of *Sphagna* were made, including seventeen forms of which thirteen were

previously unrecorded; while of the small number of twenty-seven species of Hepatics eight were new records.

The country is not very interesting bryophytically; it is largely open and cultivated or grass-land, rising by dry moorland to the mountains. On the Comeraghs I had the opportunity of meeting some Dublin naturalists under the leadership of Dr. Lloyd Praeger, and we explored the high glacial lake of Coomshingaun where *Saxifraga umbrosa* is at home; here the rock is a hard grey conglomerate. Another day, visiting the fine range of the Knockmealdowns I was able to examine a boggy hillside watered by a small stream, and then came down through the beautiful valley of the Unishad to Lismore. Rambles on the Cappagh demesne included one to a lonely lakelet on a high moorland, Poolvona, where grew several *Sphagna*, while the lakes and gardens yielded more records. Here and there among the prevailing Old Red Sandstone are some outcrops of Carboniferous Limestone, low cliffs, with caves, at Kilgreany and Knock Maun—these added some finds for v.c. I. 6.

As bryologists do not seem often to visit this district, it may be worth while to publish the following notes; no plants previously recorded for Co. Waterford are mentioned.

My thanks are due to Messrs. W. R. Sherrin, J. B. Duncan, and H. H. Knight for refereeing the Sphagna, Mosses, and Hepatics respectively.

Sphagna.—*Sphagnum acutifolium* Ehrh. var. *rubrum* Brid., conspicuous in deep red cushions on a slope of the Knockmealdowns; *S. compactum* DC. in three varieties, *squarrosum* Russ., *subsquarrosum* W., and *imbricatum* W., at Poolvona; *subsquarrosum* W. on Bally Mona Hill; *imbricatum* W. in the Knockmealdowns. *S. recurvum* Beauv. var. *majus* Ångstr. p.p., in three colourings (green, yellow, and orange). *S. cuspidatum* Ehrh. var. *falcatum* Russ., Poolvona and Knockmealdowns; also, at the last locality, a lax green submerged form, scarcely identifiable; *S. inundatum* R. & W., Knockmealdowns; *S. auriculatum* Schimp., Knockmealdowns and Poolvona, with the variety *ovatum* W. at the latter spot. *S. papillosum* Lindb. var. *normale* W., Knockmealdowns; *S. cymbifolium* Ehrh. var. *pallescens* W., Knockmealdowns; var. *flavescens* W., Poolvona; var. *rubescens* W. with pretty pink capitula on the Knockmealdowns.

True Mosses.—*Leucobryum glaucum* Schimp., sparingly on the Knockmealdowns and at Poolvona.

Rhacomitrium protensum Braun, Coomshingaun. *Barbula rigidula* Mitt. and *B. revoluta* Brid., Cappagh Lime Caves.

Trichostomum crispulum Bruch, Kilgreany Caves and Bally Mona Hill.

Ulota Bruchii Hornsch. on willow, Knockmealdowns.

Orthotrichum saxatile Milde, on lime rocks, Cappagh, and on Knock Maun. *O. leiocarpum* B. & S. and *O. Lyellii* Hook. & Tayl., Cappagh.

Funaria hygrometrica Sibth., Knockmealdowns, unrecorded in the 'Census Catalogue.'

Cryphaea heteromalla Mohr, on a fallen pine-tree by the Upper Lake, Cappagh.

Anomodon viticulosus Hook. & Tayl., on walls, Kilgreany.

Eurhynchium tenellum Milde, c.fr., Knock Maun and Kilgreany.

Amblystegium serpens B. & S., Kilgreany.

Hypnum exannulatum Gümb. near var. *brachydictyon* Ren., Poolvona. *H. cupressiforme* L. var. *ericetorum* B. & S., Coomshingaun; var. *tectorum* Brid., Knock Maun.

Hylocomium brevirostre B. & S., in the valley of the Unishad, near Lismore.

HEPATICS.—*Marchantia polymorpha* L., with archegonia, Knockmealdowns.

Pellia Fabbroniana Raddi, Kilgreany.

Gymnocolea inflata (Huds.) Dum., Poolvona.

Lophozia incisa (Schrad.) Dum., Poolvona.

Lophocolea cuspidata Limpr., Poolvona and Kilgreany.

Cephaloziella Starkii (Funck) Schiffn., Poolvona.

Scapania gracilis (Lindb.) Kaal., Coomshingaun.

S. nemorosa (L.) Dum., Strancally Castle, on the Blackwater.

NOVITATES AFRICANÆ.

(Continued from vol. lxxi. 1933, p. 125.)

Lachnea elegans Compton (*Thymelaeaceae*). *Fruticulus* gracilis, virgatus. *Caules* erecti, parum ramosi, rubidi, teretes, cicatricibus foliorum prominentibus, glabri vel juventute parce pilosi. *Folia* semi-imbricata, erecto-patentia, alterna, sessilia, anguste elliptica, glabra, 6–8 mm. long., 2–3 mm. lat., nervis infra prominentibus, marginibus parum inflexis; suprema parum majora, 8–10 mm. long., 3–4 mm. lat., marginibus capillis crispis ciliatis, coriacea, papillis minutis rubidis inspersis, internodiis brevioribus separata sed non involucrum formantia. *Inflorescentia* subcorymbosa, ad 4 cm. diam. Capitula 1–7 in ramulis brevibus terminalia, ad 1·2 cm. diam., floribus c. 12 sessilibus, confertis. Receptaculum villosum. *Perianthii tubus* ovoideus, glaber, 2 mm. long., infra lobos constrictus; lobi late elliptici, basi conjuncti, anteriores maximi, purpurati vel pallide rosei, exteriore dense pilosi, 6 mm. long., 4 mm. lat. *Squamæ* lineares, obtusæ, ·7 mm. long. *Stamina* 4 longiora 4 mm. long., 4 breviora, filamentis angustis, antheris exsertis ·5 mm. long. *Ovarium* ovoideum, glabrum, stylo subterminale, filiforme, supra incrassato et piloso, 3 mm. long., stigmate exserto, capitato, piloso.

Hab. Cape Province; Ceres Div., exact locality unknown. Exhibited at the Ceres Wild Flower Show, October 1932, *Compton* 4157.

Apparently nearest *L. striata* Meisn., but differing therefrom in many respects.

Lachnea naviculaefolia Compton (*Thymelaeaceae*). *Fruticulus* erectus, virgatus, parum ramosus, subdichotomus. *Caules* graciles, teretes, rigidi, rubidi vel fusci, glabri, cicatricibus haud prominentibus. *Folia* 2-nata, decussata, internodiis duplo longiora vel ultra, erecta vel erecto-patentia, imbricata, utrinque glabra, sessilia, elliptica, naviculæformia, marginibus inflexis, coriacea, supra glauca, apice obtuso, corneo, nervis haud manifestis, ·8–1·4 cm. long., 3–4 mm. lat., superiora in bracteas involucri transeuntia, alata. *Inflorescentia* solitaria, terminalis, ad 3 cm. diam. *Bracteæ* involucrales 3–4-jugæ, intimæ maximæ, late orbiculares, coriaceæ, in marginibus scariosæ, intra et infra glabræ, exteriore in marginibus parum pubescentes, virides roseo-tinctæ. *Flores* numerosi, brevissime pedicellati, pedicellis villis longis undulatis dense tectis. *Perianthii tubus* parte basale c. 2 mm. long. pubescente, constrictione divisa a parte distale 6–8 mm. long., angusta, patenti-villosa: segmenta subæqualia elliptica obtusa, utrinque appresso-villosa, lacticolorata, 6–8 mm. long., 2 mm. lat., ore dense villosa, squamis subulatis, 1·7 mm. long. *Stamina* longe exserta, antheris ovoideis, 1 mm. long. *Stylus* villosus, præsertim in parte exserta, 1 cm. long., stigmate clavato, penicillato.

Hab. Cape Province; Ceres Div., precise locality unknown. Exhibited at the Ceres Wild Flower Show, October 1932, *Compton* 4158.

Allied to *L. purpurea* Andr.

Podalyria chrysantha R. S. Adamson (*Leguminosae*). *Frutex* usque ad 2 m. alta. *Caules* teretes, juvenes dense tomentosi, maturi calvescentes. *Folia* breviter petiolata, orbiculata vel late obovata, c. 3 cm. longa, basi rotundata vel subcuneata, apice rotundata, brevissime mucronata, pallida, dense tomentosa pilis perbrevibus albis numquam sericeis, inferne reticulata, venis lutescentibus. *Inflorescentia* terminalis vel axillaris, 2–5-fl. *Flores* folia æquantes vel paullo superantes, lutei, 12–16 mm. longi. *Bracteæ* dense tomentosæ, concavæ. *Sepala* inæqualia, dense tomentosa. *Ovarium* dense tomentosum.

Hab. Ladismith Div.; by stream at foot of Swartberg at Seven Weeks Poort, Sept. 1928, *M. A. Pocock* 1016 (type). Same locality, *Levyns* 2514. Near Ladismith, *Levyns* 2767.

Allied to *P. cordata* and *P. canescens*, but differs in the colour of the flowers, the shape of the leaves, and the tomentum.

Podalyria Tayloriana L. Bolus. *Rami* visi 30–40 cm. longi, ad 4 mm. diam., internodiis 0·5–1 cm. longis. *Stipulæ* lanceolatæ vel deltoideæ, 2–3 mm. longæ; petiolus 5–6 mm. longus; lamina obovate orbicularis, basi subcuneata, utrinque adpresse breviterque sericeo pubescens, inferne nervis reticulatis bene visis, glabrescentibus, 2·5–3·5 cm. longa, 2–3 cm. lata. *Racemi* 2–3-fl., in axillis foliorum superiorum dispositi, vel 7–8 vel ultra apice ramorum aggregati, pedunculo ad 5 mm. longo; pedicelli prope apicem articulati, 4–5 mm. longi. *Bracteæ* basi amplectentes, subquadratæ, 3 mm. longæ, 4 mm. latæ. *Calyx* intrusus, albide subsericeus, 8 mm. longus, segmentis anterioribus fere, vel omnino, ad apicem coalitis, ceteris acutis, 4 mm. longis. *Corolla* læte lutea, vexillo 1·1 cm. longo, ad 1·4 cm. lato, alis ad 0·6 cm., carina ad 0·5 cm., latis. *Ovarium* sericeo-tomentosum, 7 mm. longum.

Hab. Oudtshoorn Div.; Swartberg, among many other living plants collected for exhibition in London, September 1933.

A *Podalyria chrysantha* Adamson, indumento subsericeo, floribus minoribus, bracteis basin calycis vix attingentibus, calyce valde intruso, præcipue differt.

Named in honour of Mr. W. Taylor of Oudtshoorn, who has maintained a keen interest in the native flora and its preservation throughout a long life and contributed many plants to the Bolus Herbarium.

(To be continued.)

ABSTRACTS OF PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA.

Additions to the Flora of Orkney.—Col. H. H. Johnston has published his sixteenth paper (Neill & Co., Edinburgh, March 1933) on additions to this Flora as recorded in Watson's 'Topographical Botany,' ed. 2, 1883. The author gives a list of his previous papers, most of which appeared in the 'Transactions of the Edinburgh Botanical Society,' and the place and date of their publication. Six of the seven plants here included are presumed new records for Orkney, four are native, and three are aliens introduced by man. The records include two new species of *Hieracium* (*H. subexpallescens* and *H. polyphyllum*), both of Dr. Hugo Dahlstedt, who has supplied descriptions and remarks; a modification of *H. saxifragum* Fries; *Mentha longifolia*×*rotundifolia* Hudson, *Plantago indica* L., and *Catapodium loliaceum* Link.

Brambles of Kent and Surrey.—William Watson ('London Naturalist,' 1932, pp. 60–66) continues his comments on Brambles observed within easy reach of London. Putney Heath and Wimbledon Common have supplied many of the specimens quoted. These include a few novelties—*Rubus rectiramus*, sp. nov., near *R. linguifolius* Genev., frequent on Putney Heath and occurring on several other London commons; *R. Griffithianus* subsp. nov. *tardus*; and *R. coronatus* var. nov. *cinerascens*, Putney Heath, also from Horsham and Chester. The novelties are described and the communication includes critical notes on others of the plants recorded.

Records of the London Area.—The same Journal contains a continuation of "Botanical Records" (pp. 51–66) from *Scandix* to *Campanula*. H. J. Burkill contributes a list of Plant-Gall Records for 1932.

Danish Species of Crataegus.—C. Raunkiaer (De danske Crataegus Arten; Bot. Tidsskr. xlii. Heft iii. pp. 232–250) gives the results of his study. He recognises six species: *C. Oxyacantha*, s. str., *C. monogyna*, s. str., *C. Palmstruchii* Lindm., *C. Schumacheri* Raunk., *C. erimitagensis* Raunk., and *C. raavadensis* Raunk. The characters on which he mainly relies are the side nerves of the leaves and whether the ovary is glabrous or hairy. He gives the following diagnoses:—

C. Palmstruchii Lindm. Folia intermedia (in ramulis elongatis) nervis lateralibus infimis sursum arcuatis; ovaria villosa.

C. Schumacheri Raunk., sp. nov. Folia intermedia (in ramulis elongatis) nervis lateralibus infimis rectis vel singulis sursum deorsumve arcuatis; ovaria glabra.

C. eremitagensis Raunk., sp. nov. Folia intermedia (in ramulis elongatis) nervis lateralibus infimis rectis vel singulis deorsumve arcuatis; ovaria villosa.

C. raavadensis Raunk., sp. nov. Folia intermedia (in ramulis elongatis) nervis lateralibus infimis deorsum arcuatis; ovaria glabra.—E. G. B.

REVIEWS.

Zur Organogenie und Phylogenie der Koniferen-Zapfen. By O. Hagerup. Kgl. Danske Vidensk. Selsk. Biol. Meddels. x. 7 (pp. 82, figs. 146), 1933.

This is a valuable contribution to the historical discussion as to the morphological nature of the female cone of Coniferae. The author's line of investigation is practically a new one, for no one has hitherto made so thorough a study of the ontogenetic development of the structures concerned. By means of microtome-sections he traces every stage in the early growth of the cone in all the main groups of Coniferae, and his conclusions appear to be of great importance. It is round the nature of the structures situated between the bract and the cone-axis that

controversy has raged, and upon the solution of this riddle depends the main view-point, namely, whether the cone is an inflorescence or a flower. The matter is soon settled by the author. In every case (except Taxineae and Juniperoideae) he finds that in the axil of the bract arises a minute secondary axis whose development always begins by the formation of a pair of transverse foliar organs, this being in accordance with the facts of development in the vegetative long-shoot; this is followed by one or more members in the median plane.

In *Cryptomeria japonica*, type of the Taxodineae, both the transverse and median pair of "leaves" develop as integuments (throughout his thesis the author regards these in all groups as the equivalent of sporophylls, enclosing the nucellus or macrospore in the same way as obtains in *Selaginella*). In *Cryptomeria*, further, 3–6 sterile "leaves" arise which soon become united to form the "ovuliferous scale" ("Zapfenschuppe"). It is thus clear that ovules and ovuliferous scale have an independent origin, as distant foliar organs, on the axillary shoot.

In the Pinaceae, of which the genera *Pinus*, *Larix*, *Picea*, *Tsuga*, and *Pseudotsuga* were investigated, it is also made clear that a rudimentary axillary shoot arises bearing three "leaves," viz., a pair transversely placed developing as integuments, and a third sterile scale in the median posterior position which soon occupies a completely terminal position on the axillary axis, increases greatly in size, and becomes the well-known ovuliferous scale of this group. That this is the correct interpretation of the developmental data is shown by the fact that in virescent cones the pair of transversely-placed ovules are replaced by scale- or needle-shaped leaves, with a third scale in the median position.

As a type of Podocarpaceae, the female parts of *Dacrydium elatum* were chosen for study—a difficult one, the structures being so greatly reduced and modified. But even here essentially the same ground-plan of structure was traced. The bract contains in its axil a much reduced secondary axis which becomes bent over away from the bract into a nodding position and bears four "leaves," a first pair of transverse and a single median posterior one, the three eventually forming by their fusion the "epimatium" of the ovule; the fourth "leaf" develops as an integument enclosing the nucellus and comes to occupy a terminal position on the secondary axis.

The extreme form of reduction and modification has been reached in the Araucariaceae, of which the author investigated *Araucaria angustifolia*. He was able to show, by careful manipulation, that essentially the same structure exists as in *Dacrydium*, but the anterior median scale, instead of uniting with the two transverse scales to form an "epimatium," lies flat on the bract; it is this scale which, by other authors, has been held to be a ligule. The case of *Araucaria* affords a striking instance of the

danger of accepting the mere face-value of a structure without taking account of the possibility of its extreme modification.

The Cupressineae reveal points of considerable interest. In *Cupressus macrocarpa* a pair of transverse "leaves" are the first formed on the axillary shoot of the cone, and they develop as integuments, followed by rows of integuments on the posterior and anterior sides, *Cupressus* having a large number of ovules. There are no sterile "leaves," hence there is no ovuliferous scale and, therefore, no handle for those who hold the ligular theory of this scale in other groups. Another difference is that the secondary axillary axis maintains throughout its connection with the cone-axis, never becoming pushed out on to the surface of the bract, as is the case in the Taxodineae, Pinaceae, etc. In this respect the Cupressineae exhibit a primitive character. *Thuia orientalis* revealed essentially the same structure, but the number of ovules is much less. *Juniperus* is in line with other genera in its essential structure, but a remarkable feature is that the cone, in certain species, has a terminal flower, *i. e.*, the various "leaves" are not situated on secondary axillary axes, but on the main axis of the cone. In this genus the "false carpels" forming the fleshy portion of the fruit develop from a whorl of sterile "leaves" situated below the ovules (integuments).

Finally, in *Taxus* the integument arises terminally to a short-shoot. The fleshy aril arises much later between the integument and the highest sterile leaves of the shoot; it is therefore to be regarded as a new structure, not found in any other group of Coniferae and, in actuality, springs from the base of the integument and not on the shoot-axis. It is only biologically the equivalent of the fleshy envelope of *Juniperus*. Apart from the presence of the aril, the female apparatus in *Taxus* is essentially similar to that of *Juniperus*.

The general conclusions are very important and are as follows:—

1. The female cone of Coniferae, whatever its form, is (except in *Taxus* and Juniperoideae) an inflorescence and not a single flower. This is in agreement with the views of Alex. Braun, Čelakovsky, and others, and with the conclusions arrived at from teratological data by the last-named author and others. The secondary structure in the axil of the bract arises in the first instance on the main axis and not on the bract; and the vascular supply is received directly from the main axis and, further, the secondary axis possesses a radially constructed stele. There is, therefore, no question of a ligule being present on the bract, the ligule-like structure being due to the subsequent displacement on to the bract of the extremely modified axillary structure.

Investigators in the past have been misled by the appearance presented by the mature structure; hence the great value of these

minute researches into the ontogeny. The cone has, therefore, the same essential structure as a vegetative long-shoot.

2. The integuments are macrosporophylls, enclosing the macrosporangium or nucellus (which is identical with Celakovsky's view that the ovules are reduced carpels). The author's comparison of this sporophyll with that in Lycopodiales has induced him to place the Coniferae in the direct line of descent from that group.

3. *Juniperus* is the genus standing nearest to the Angiosperms, for it may have a terminal hermaphrodite flower and a closed "ovary."

4. The so-called "ovuliferous scale" ("Zapfenschuppe") is clearly shown to be a sterile "leaf" arising on the secondary axillary axis, from a single posterior one in Pinaceae, and from several anterior ones in Taxodineae; it therefore, cannot be a ligule, and its origin as an independent "leaf" would seem to throw doubt on the correctness of Celakovsky's view that it is a vegetatively-developed outer integument of the ovule, or that this organ consists of the two first leaves of an axillary bud—a view founded on abnormalities. It becomes extremely modified to subserve a special function.

The volume is a suggestive contribution towards a solution of one of the most vexed questions of morphological interpretation.—W. C. WORSDELL.

Kirchner-Loew-Schröter, Lebensgeschichte der Blütenpflanzen Mitteleuropas. Lieferung 44: *Moraceae.* Von Dr. HANS WALTER. Band II. Abt. 1. 8vo, pp. 765–860, 41 text-figs. Eugen Ulmer: Stuttgart, 1933. Price R.M. 6.

THE only native representative of the Moraceae in Central Europe is the Hop (*Humulus Lupulus*), but the white and the black Mulberry (*Morus alba* and *nigra*) and the Fig (*Ficus Carica*) are so frequent in cultivation as to merit inclusion in Dr. Walter's account of the family in this series of monographs of the life-histories of Central European Flowering Plants. In each case the author has given an account of the morphology, from the seedling stage upwards, anatomy, ecology, and biological relations of the species, with notes on pathology and cultivation where these are called for. The text is well illustrated by a number of clear text-figures, most of which are original. A list of the relevant literature includes 148 titles.

The part finishes abruptly in the description of the flower of the Hop which will presumably be completed in the next part, where we may expect to find also an account of the Hemp (*Cannabis*).

Bibliotheca Botanica. Edited by Prof. Dr. L. DIELS. Heft 107: *Ueber die Coniferen-Gattungen* Cheirolepis *Schimper und* Hirmeriella, *nov. gen., aus dem Rhät-Lias von Franken.* By LUDWIG HÖRHAMMER. 4to, pp. i, 34, 7 pls., 11 text-figs. E. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, 1933. Price 22 Marks.

THE greater part (pp. 1–28) of this publication deals with an exhaustive description of *Cheirolepis Münsteri* Schenk, hitherto known only from female cone-scales, based on material recently found by Prof. Hernier and the author in the plant-bearing strata of the Rhætian Lias near Nuremburg. Vegetative and male and female reproductive organs were found, and an examination of the cutinised layer of the epidermis and the stomatal apparatus showed characters in common between leaves and cones and indicated their specific identity. *Cheirolepis* had hitherto been compared with *Cryptomeria,* but the detailed examination suggests no certain affinity with any recent Conifer. Leaf-characters show a resemblance with *Widdringtonia* and *Athrotaxis,* but the male inflorescence strikingly recalls that of *Taxus.*

With the material of *Cheirolepis* were found remains of vegetative shoots and female cones of another conifer, resembling somewhat *Cheirolepis,* but with different epidermal structure. This is described as *Hirmeriella rhätoliassica,* gen. et sp. nov.

The plates, photographic reproductions of the fossils, well depict the form and structure of the two species.

BRITISH FLORAS.

The Flora of Leicestershire and Rutland. By ARTHUR REGINALD HORWOOD, F.L.S., and the late CHARLES WILLIAM FRANCIS NOEL, third Earl of Gainsborough. Crown 8vo, pp. ccxcvii, 687, 32 pls., 2 folding maps. Oxford University Press, Milford: London. 1933. Price 35*s.*

IN his preface Mr. Horwood, who is for all practical purposes the author of this compendious volume, recounts the story of its conception and elaboration. The idea originated with the late Rev. T. A. Preston, who during his thirty years' sojourn in Leicestershire worked for the revision of the original 'Flora of Leicestershire,' published in 1886. Preston died in 1905, and in 1912 a Flora Committee was formed by the Leicester Literary and Philosophical Society, with Mr. Horwood as Editor, with the help of Sectional Editors; later a Rutland Committee was formed under Lord Gainsborough. But in the end the lamented decease of his co-workers threw the burden of compilation on

Mr. Horwood, and the fulfilment of the request, made in 1931, for the Flora to be completed by the date of the meeting of the British Association at Leicester in 1933 called for an heroic effort on the part of the Editor to complete the work.

The bulky, somewhat ungainly volume is a monument to Mr. Horwood's tremendous energy and enthusiasm. But the suggestion arises as to whether too much has not been attempted (for a one-volume work) in the effort to supply a Flora "conducted upon geological and ecological lines." The author refers to the necessity for omitting much matter, severe cutting down and rigid summarizing of the Introduction, and the reservation of the non-vascular plants and ecological details for a later volume. A concise description of the vegetation of the area in its ecological aspects is a desirable companion to the systematic list of genera and species, and bibliographical or biographical details are also useful or interesting; but when these bulk so largely as in the volume before us the question arises as to the advisability of an issue in two parts, the one for preparatory study or reference, the other for use in the field. Moreover, as the compilation had to be done *de novo*, the two counties might well have been treated as one—a county after all is not of necessity a botanical area,—thus avoiding some repetition, especially in the introductory portion. And the section on the history of botanical research would have lost nothing of real value by considerable compression. Here Mr. Horwood pays a tribute to the work and interest of Lord Gainsborough in the Rutland flora; unfortunately, his illness and death prevented him taking an active part after 1918. Some preparatory work was done by Mr. A. B. Jackson, who went through Preston's herbarium and published some additions to the Leicester flora in this Journal in 1904; and Mr. Horwood also acknowledges the help of numerous specialists.

The Introduction (pp. xv–cclxxxi) comprises accounts of the Soils, Geology, Botanical Districts, Climate and Meteorology, Natural types of vegetation, and History of botanical research with biographies, in the two counties treated separately. Special sections are devoted to the Charnwood Forest area—the most interesting district botanically—and the Woodland areas of the two counties. The plan of the Flora, notes on the herbaria etc. consulted, a bibliography of the relevant literature, and a list of helpers complete the Introduction.

The Flora proper occupies the second portion of the volume, pp. 1–687. The arrangement of the genera follows the system of Bentham and Hooker's 'Genera Plantarum,' the species that of the 'London Catalogue.' The genera are, "so far as possible, cited in accordance with the law of priority": it is regrettable that the Editor should have rejected the "Nomina Conservanda," using, for instance, *Cammarum* for *Eranthis* and *Capnoides* for *Corydalis*—this is not helpful to the student. He is over-

generous in the insertion of aliens; it seems unnecessary to burden a Flora with obvious garden escapes such as species of *Tropaeolum*, or the occurrence of *Ficus Carica* and other species at the Belgrave Pumping Station. On the other hand, the notes on occurrence and nature of habitat etc. and the occasional critical notes are valuable. In dealing with critical genera Mr. Horwood follows recent workers, for example, Pugsley for *Euphrasia*, Drabble for *Viola*. He adds a new species of Elm to our flora by describing as *Ulmus elegantissima*, sp. nov., "the other component of Goodyer's Elm realized as distinct from the Cornish Elm by Ley, Moss & Druce"; Mr. Atkinson supplies a good figure.

The frontispiece is appropriately a reproduction of the Linnean Society's portrait of Dr. Pulteney, "the pioneer of Leicestershire botany." The maps and the plates, illustrating aspects of vegetation, are a useful addition.—A. B. R.

The Flora of the Liverpool District. Illustrated by Drawings and Photographs. Edited by C. THEODORE GREEN, F.L.S. 8vo, pp. xi, 163. Buncle: Arbroath, 1933. Price 12*s.* 6*d.*

IN his Introduction to this, the fifth edition, of the Liverpool Flora, the Editor, who also bears the cost of publication, gives a detailed account of its history. The first 'Flora of Liverpool,' the work of T. B. Hall, appeared in 1839. The second edition, by J. Dickenson, 1851, was published in the 'Transactions' of the local Literary and Philosophical Society, and was followed by a Supplement in 1855. In 1872 the Liverpool Naturalists' Field Club, formed in 1860, produced a third edition, to which three Appendixes were added in 1873, 1875, and 1887. The Club continued its work on the flora with the help of an *ad hoc* Committee, but, as no funds for publication were available, the present editor was authorised to publish a new edition at his own charges. This, which appeared in 1902, was practically a new work, the value of which was greatly enhanced by the addition of some 800 small line figures of species drawn by Miss E. M. Wood, at the expense of Mr. Charles Gatehouse; chapters on the Geology, by J. J. Fitzpatrick, and on the Meteorology, by the Rev. J. C. Mitchell, were also added; and Dr. J. W. Ellis supplied photographs illustrating the nature of the countryside.

The present revision maintains the form of the fourth edition with a useful innovation, namely, brief accounts by the Editor of the character and vegetation of special areas in the district—the Sand dunes, the Lancashire Mosses, the Estuaries of the Mersey and Dee, the Upland Heaths of Wirral, Bidston Moss and the Langfields, Submarine forest beds at Leasowe, and Inland Marshes and Ponds.

The District comprises an area of fifteen miles' radius from the Liverpool Town Hall, together with two miles around Southport,

covering together about 500 square miles, with a coast-line of 75 miles. In the thirty years since the previous edition, building on both sides of the Mersey, deposition of sewage in the estuaries, drainage, reclamation and better cultivation of land, and depredation by individuals, has resulted in the diminution or extension of some species. On the other hand, the vast overseas shipping and canal traffic to the Port of Liverpool continually brings numerous aliens, the claims of which to insertion require consideration.

In the list of species there is a little inconsistency in the occasional addition of a second name, which in some cases, e. g., "*Alopecurus myosuroides* Huds. = *agrestis* L." is a synonym, but in others is the result of a segregation, when "*pro parte*" should have been added to the "synonym." *Galeopsis intermedia* Vill. = *Ladanum* L. conveys a false impression; *G. intermedia* is the broad-leaved form of *G. Ladanum*, which latter seems to be the plant represented in the figure (506).

The text concludes with a short bibliography and a list of contributors of plants and their stations. We are glad to note that Col. Green will make over the copyright of this edition to the Liverpool Museum, so that the material will be available for revision of this useful Flora at any future time.—A. B. R.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on November 23, Prof. F. E. Weiss, F.R.S., President, in the Chair, Miss May Rathbone exhibited and gave an account of some specimens of the moss, *Leucobryum glaucum* Schimp., which were in "balls," similar to those of *Cladophora*, shown at the previous meeting.

Dr. A. B. Rendle gave an account of a pentandrous teratological flower of *Orchis mascula* *, illustrated with lantern-slides and a dried specimen of the plant sent by Mr. Ronald Burn from West Suffolk. A discussion followed, in which Mr. W. C. Worsdell emphasised the importance of the exhibit as bearing on the origin of the Orchid flower.

A discussion on quantitative methods in the analysis of vegetation was opened by Dr. Eric Ashby, who spoke on "Quantitative Methods in the Study of Vegetation." In recent years there has been a gradual substitution of quantitative for qualitative methods in ecology, but in Britain plant communities are still studied and classified on a morphological basis; there has been no attempt to give quantitative expression to such

* An account was published in the December number of this Journal, p. 352.

concepts as heath, moor, wood, etc. The purpose of the discussion was to consider critically some of the "statistical" methods of studying communities in use in Switzerland and Scandinavia, and to discuss whether any progress would be made by the application of such methods to plant communities in this country.

Some of the problems which may be solved by quantitative methods were introduced, with examples of the application of some "statistical" methods to British vegetation.

Mr. G. E. Blackman (Visitor) followed with "A Statistical Study of the Distribution of Species in Grassland Associations." Although many papers have been published on the inter-relationship between species in an association, no detailed investigation has been made of the manner in which such species are distributed.

Investigations were undertaken to determine how species are distributed in grassland associations. The technique consisted in throwing down a quadrat a large number of times at random, and noting the species present at each throw. The number of individuals of each species in the quadrat was also counted, but with species where it was impossible to define an individual plant "tiller counts" or estimates of the percentage area covered by the species were made. It was shown that the frequency distribution curves were similar in the great majority of species. Usually where individual plants were counted the distribution was at random, since the distribution curves were of the "Poisson" type. With the "tiller count" and "area covered" data it was found that distribution curves of the binomial type gave good fits, the form of these curves approximating closely to the Poisson form. If species in an association are distributed at random and the distribution is of the Poisson type then it is possible to calculate from a known percentage frequency the percentage frequency in any sized quadrat. The percentage frequency has also a quantitative value, since the form of the Poisson distribution curve depends on the percentage number of quadrats containing no individuals of the species. It is therefore possible from changes in percentage frequency to estimate the fluctuation in the population of the species.

Dr. H. Godwin, Dr. A. R. Clapham, Dr. O. W. Richards, and Dr. F. G. Gregory (Visitors) also took part in the discussion.

At the General Meeting on December 7, the President in the Chair, Mr. John Parkin and Dr. W. A. Sledge showed that the species described by Cheeseman in 1885, from a fruiting specimen, as *Ranunculus tenuicaulis* is really an *Anemone*. The corolla, subsequently described by Kirk, is a simple perianth and the achene contains a pendulous ovule. The species represents a new series of the section *Rivularidium* Jancz., and affords an interesting extension of the range of this section, previously only known in Australasia in the Tasmanian species *Anemone crassifolia* Hook.

Dr. Margaret J. Benson brought forward new evidence of the nature of the reproductive bodies and habit of the Lower Carboniferous Pteridosperms, from a study of material from the fossiliferous limestone of the Teilia Quarry in North Wales. The speaker concluded that the Lower Carboniferous Pteridosperms are a very homogeneous group of Seed Plants; that all *Calathiops* bodies are their seed fructifications; and that *Heterotheca Grievii* and the other form species are their characteristic pollen apparatus.

THE JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY, lviii. pt. 2 (September 1933), edited by F. J. Chittenden, contains a report of the Masters Lectures, 1932, given by Sir Frederick Keeble, F.R.S., on "Garden Fertility: its Origin and Maintenance." An interesting account of progress and extension in the Society's Gardens at Wisley, for the twenty-five years since their acquisition in 1904, is given by Mr. F. J. Chittenden, the late Director. The account is illustrated by a long series of excellent photographs. Contributions from the Wisley Laboratory comprise notes on pollination of pears by A. N. Raines and a study on the germination and seedlings of the Gentians by Prof. F. E. Weiss, who finds that the presence of a mycorrhizal fungus is not necessary for germination nor for a continued healthy growth. He also concludes that while exposure to frost may help germination of seeds when sown in the open, the experience of Wisley shows that the seeds of a large number of species of Gentian germinate readily at 45°–50° F. The report of F. W. Sansome's lecture, "How new Plants are brought about," is a readable account of the part played by chromosomes in plant-breeding, and stresses the importance of collaboration between breeder and geneticist. Other articles of botanical interest are Jessie Ferguson's "Botanical Study of Rose Stocks," Mrs. Frank Tracey's "Flower Hunting in Cyprus," and T. A. Lofthouse's "Further Notes on Plants seen in the Sierra Nevada of Spain." Of bibliographical interest are Miss E. S. Rhode's account of "The Nymans Garden Library," a sketch of the life of the Rev. Alexander Cleeve, B.A., first Secretary of the Royal Horticultural Society, and some notes on the work of Samuel Curtis (1779–1860), editor of the Botanical Magazine, 1827–1846. A notable feature is the number and excellence of the illustrations which accompany the various articles.

'GENTES HERBARUM,' vol. iii. fasc. 3 (August 1933).—In this fascicle—Eubati Australes—Prof. L. H. Bailey returns to the study of the *Rubi* native in an area beyond the highlands of Georgia and Alabama. Fifty years' study of the *Rubi* have demonstrated the futility of earlier work, and botanists interested in the genus will find helpful suggestions in the author's notes and criticisms.

NOTES ON *SELAGINELLA*.

V. THE *SELAGINELLAE* OF TRINIDAD AND TOBAGO.

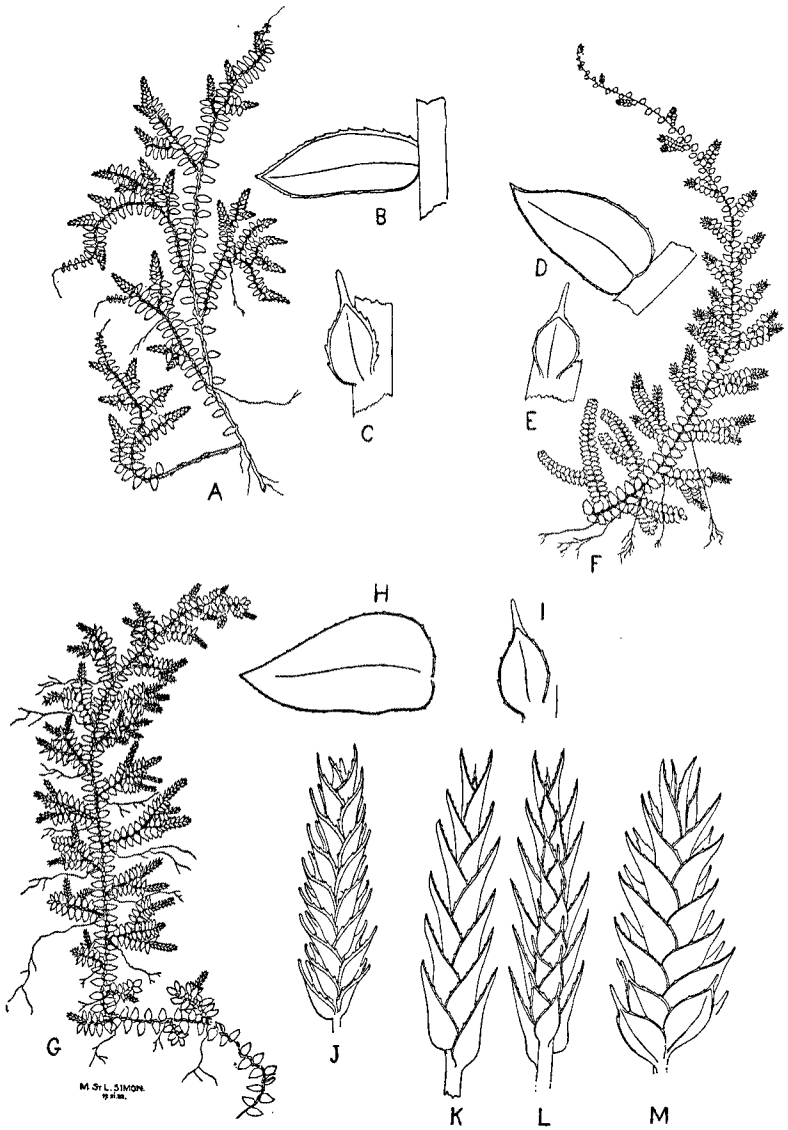
BY A. H. G. ALSTON.

THE British Museum has recently received several collections of *Selaginellae* from these islands from the following persons and loans from the institutions; to these I wish to acknowledge my indebtedness:—The Ven. Archdeacon Hombersley; Mr. W. E. Broadway; The Royal Botanic Gardens, Trinidad; The Royal Botanic Gardens, Kew. This accession of material has made possible the publication of a tentative revision of the species. Almost all the material seen was from the St. George County in the north-east corner of Trinidad. Of the nine species enumerated, one, *S. Lemairei* Hieron., though widely distributed, appears to be found in Tobago, but not in Trinidad.

Among the abbreviations after the numbers cited:—B=British Museum (Natural History); K=Herbarium, Royal Botanic Gardens, Kew; T=Herbarium, Royal Botanic Gardens, Trinidad.

Key to the Species.

Stems red, erect; lower part of stem simple, with subequal leaves ..... 1. *S. Lemairei.*
Stems straw-coloured.
  Leaves subequal in the lower part of the stem.
    Lateral leaves denticulate, contiguous ..... 2. *S. Hartii.*
    Lateral leaves closely ciliolate, overlapping.. 3. *S. viticulosa.*
  Leaves strongly dimorphous throughout.
    Lateral leaves ciliate.
      Lateral leaves auriculate; stem jointed, up to 1 foot long, rooting throughout.. 4. *S. mnioides.*
      Lateral leaves exauriculate, stem not jointed, up to 5 cm. long, rooting at base ..... 5. *S. Cruegeri.*
    Lateral leaves entire or denticulate; stem not jointed, up to 20 cm. long.
      Median leaves acuminate; plants usually under 2·5 cm. high; bracts strongly dimorphous ..... 6. *S. Broadwayi.*
    Median leaves aristate.
      Lateral leaves oblong-lanceolate, more than twice as long as broad; plants usually 5–10 cm. high; lateral branches occasionally flagelliform at apex ..... 7. *S. cladorrhizans.*
      Lateral leaves ovate-lanceolate or ovate-rhomboid, less than twice as long as broad.
        Bracts dimorphous.
          Median leaves long-aristate; bracts narrow; main stem filiform, often flagelliform at apex; plants usually 7·5–10 cm. high ..... 8. *S. flagellata.*



A–C. *Selaginella cladorrhizans* A. Br.—A, habit; B, lateral, C, median leaf.
D–F. *S. flagellata* Spring.—D, lateral leaf; E, median leaf; F, habit.
G–I. *S. trifurcata* Baker.—G, habit; H, lateral leaf; I, median leaf.
J. Strobilus of *S. cladorrhizans* A. Br.
K, L. Strobilus of *S. flagellata* Spring: K, from above; L, from below.
M. Strobilus of *S. trifurcata* Baker.

A, G, × 7/10; other figs. × 10.

(I am indebted to Col. M. St. L. Simon for the drawing.)

Median leaves shortly aristate; bracts broad; main stems robust, not flagelliform ..... 9. *S. porelloides*.
Bracts uniform; stems not flagelliform.
Stems rooting at intervals almost to apex.
Lateral leaves ovate-lanceolate; stems filiform, usually 5–10 cm. long; lateral branches very short, often simple, usually fertile ..... 10. *S. trifurcata*.
Lateral leaves ovate-rhomboid; stem more robust, 5–20 cm. long; lateral branches about 2·5 cm. long, sparingly pinnate ..... 11. *S. platybasis*.
Stems rooting in the lower half only, usually 7·5–15 cm. high; lateral leaves ovate-lanceolate . 12. *S. substipitata*.

1. S. Lemairei Hieron. in Hedw. lviii. 287 (1917). *S. umbrosa* (Lemaire) Hieron. in Engl. u. Prantl, Nat. Pfl. i. pt. 4, 683, no. 134 (1901), non Linden? *Lycopodium umbrosum* Lemaire ex Kunze in Linnæa, xxiii. 292 (1850), in syn.; Regel in Gartenfl. iv. 314 (1855), non Willd. *S. erythropus* var. *major* Spring, Monogr. ii. 156 (1850). *S. erythropus* "Spring"; Krug in Engl. Bot. Jahrb. xxiv. 151 (1897).

Tobago: without exact locality, *Bevis* 98 (K); Inverra Waterfall, Queen's River, *Meyer* 25 (K); Bacolet River, *Eggers* 5070 (K); Mason Hall, growing on the ground, near the river, *Broadway* 4228 (B); Great Courland River, *Freeman* 10,662 (T); Forest Reserve above Caledonia, *Broadway* 3077 (B).

Distr. Barbados (Jenman!) and Central America.

The name *umbrosa* was based on a misinterpretation of *Lycopodium umbrosum* Willd. by Lemaire. Hieronymus (Hedw. *loc. cit.*) states that *L. umbrosum* Willd. is the same as *S. obtusa* (Bonav.) Spring, a Mauritian species. It is possible that this species is only an escape in Tobago, as its main distribution seems to be in Central America.

2. S. Hartii Hieron. in Urban Symb. Antill. iii. 525 (1903); in Hedw. lviii. 289, no. 7 (1917). *S. flabellata* "(Linn.) Spring"; D. C. Eat. in Bot. Gaz. v. 122 (1880); Krug in Engl. Bot. Jahrb. xxiv. 150 (1897), p.p.; Hart, Herb. List, 87 (1908). *S. mnioides* (Blob.) Spring"; Hart, *l. c.* p.p.

Without exact locality, *Fendler* 146 (B); *Prestoe* 1172 (T).

Trinidad: St. George Co. Heights of Aripo in rocky wet soil, mouth of the Guacharo Cave, *Broadway* 7086 (B). Heights of Aripo, *Britton and Freeman* 2346 (T), *Broadway* 9971 (T). Mt. Tucuche, *Crueger* 181 (T); *J. Dannouse* 6825 (T); Las Cuevas, *Crueger* 180 (T); Maracas, *J. Dannouse* 6303 (T); Morne Bleue,

R. H. S. Rodger 1, 2 (B); Blanchisseuse Road, *Hombersley* A 6 (B), A 15 (B); road to Tucuche, on wet rocks, *Broadway* 8942 (B).

ST. ANDREW CO.: Tamana, *Hombersley* (B).

This species has not yet been found outside Trinidad.

3. S. VITICULOSA Klotzsch in Linnæa, xviii. 524 (1844). ? *S. flabellata* Hieron. in Hedw. lviii. 289, no. 8 (1917), p.p.

TRINIDAD: ST. GEORGE CO.: Maracas, on a bank, *Broadway* 7807 (B); Diego Martin, *Broadway* (T).

Distr. Venezuela (*Funck* 344, *Moritz* 70), Colombia (*Karsten*), Panama (*Seeman*).

This species has been cultivated in the Trinidad Botanic Gardens since 1897, and may not be native in all its stations.

4. S. MNIOIDES (Sieber) Spring in Bull. Ac. Brux. x. 228 (1843), emend. A. Br. Ind. Sem. Hort. Berol. 1860, 23; Hart, Herb. List, 87 (1908), p.p. *Lycopodium mnioides* Sieber ex Hook. & Grev. in Hk. Bot. Misc. ii. 394, no. 148 (1831). *S. ciliauricula* Spring ex Kl. in Linnæa, xx. 436 (1847), nomen; in Mém. Ac. Belg. xxiv. 219, no. 157 (1850); Griseb. Fl. Brit. W. Indies, 646 (1864); D. C. Eat. in Bot. Gaz. v. 121 (1880). *S. mnioides* var. *ciliata* Spring, Monogr. ii. 224 (1850). *S. portoricensis* "A. Br."; Hart, *l. c.*

TRINIDAD: without locality, *Sieber* 325 (type, K & B), *Fendler* 56 (B); *Day* 375 (K); ST. GEORGE CO.: Maracas, near the waterfall, *Broadway* 6974 (B), Maracas, *Sherring* 3 (K); Blanchisseuse road, growing up a perpendicular bank, forests, near 11th mile post, *Broadway* 7409 (B); Las Lapas Road, in shaded damp ground, *Broadway* 5915 (B); Morne Bleu, *Britton* 2275 (K), *Freeman* 9607 (T); Tucuche, *Broadway* 5214 (T); Maracas Bay, *Hart* 6321 (T); Tucuche, *Hombersley* A 14 (B). ST. ANDREW CO.: Quare River Valley, *Totton* (B); Iropuche, *Broadway* 7509 (B). ST. PATRICK CO.: Cedros woods, *Crueger* 183 (T).

Sieber's locality was stated by Hooker and Grenville to be Mauritius, but the specimens were, no doubt, from Trinidad as stated by A. Braun (Ind. Sem. Hort. Berol. 1860, 23).

Var. MINOR A. Br. in Ann. Sc. Nat. sér. 5, iii. 301 (1865).

TRINIDAD: ST. GEORGE CO.: Maracas, shaded banks, road to waterfall, *Broadway* 5359 (K), *Hombersley* (B), *Broadway* 5360 (B).

Distr. Venezuela (*Moritz* 380).

According to Urban (Symb. Antill. iii. 126), Sieber did not, himself, collect in the West Indies, but employed F. Kohaut to collect for him in Martinique and F. Wrbna in Trinidad. Spring confused the species with the South African *S. Kraussiana* (Kze.) A. Br. and even described the typical *S. mnioides* as a variety, var. *ciliata* Spring.

5. S. CRUEGERI Jenm. in Gard. Chron. ser. 3, 22, 378 (1897); Ferns, B. W. Indies, 388, no. 1 (1909) (*Crugeri*).

TRINIDAD: ST. GEORGE CO.: Arouca, *Crueger* 194 (T).

This is still an imperfectly known species, and may have to be reduced to the Andine *S. novae-hollandiae* (Sw.) Spring (*S. radiata* auct.). *S. mollis* A. Br. (Ocaña, *Schlim* 1029) and *S. minima* Spring (near Cayenne, *Leprieur*) are also allied.

6. S. BROADWAYI Hieron. in Hedw. lviii. 317, no. 17 (1917).

TRINIDAD: ST. GEORGE CO.: Government Botanic Gardens, wild, in exposed grass-land, Oct. 1921, *Broadway* 1934 *bis* (B); in the grounds of "Government House," in the ground among short grass in the old orchard, November 1907, *Broadway* 1934 (f. Hieron., type); Maracas, on a bank, bottom part of road to the waterfall, *Broadway* 6581 (B).

This species resembles *S. minima* Spring and *S. simplex* Bak. in habit, but the former has ciliate and the latter ovate leaves. *Broadway* 6581 is more compound than no. 1934, but it is probably a form of this species.

7. S. CLADORRHIZANS A. Br. in Ann. Sc. Nat. sér. 5, iii. 282, no. 21 (1865). *S. humilis* Jenm. in Gard. Chron. ser. 3, xxii. 210 (1897), "*humile*"; Hieron. *l. c.* 319, no. 18, p.p. *S. albonitens* "Spring"; Krug in Engl. Bot. Jahrb. xxiv. 151 (1897), p.p.; Hart. *l. c.*, p.p. *S. ambigua* var. *minor* Hieron. *l. c.* 317 (1917), p.p.!

TRINIDAD: without exact locality, 187, *Fendler* 108 (B), *Sherring* 2 (K). ST. GEORGE CO.: St. Ann's Cascade, on banks of main road, *Broadway* 5069, p.p. (B); Blue Basin, *Day* 376 (K); Las Lapas Rd., *Hombersley* (B); Chancellor Road, St. Ann's, in side of damp shaded hole, *Broadway* 7426 B (B); St. Ann's, *Crueger* 187 (T), *Broadway* 4999 (T); Diego Martin, *McLean* 6522, 6519, 6518 (T); Tacarigua, *Hart* 6106 (T); Blue Basin, *McLean* 7692 (T); Aripo, *Alexander* 6107 (T). ST. ANDREW CO.: Quare River, on a boulder near the reservoir, *Broadway* 6845 (B); Santa Cruz, river banks, *Broadway* 7718 (B). ST. PATRICK CO.: St. Francis Valley, *Broadway* 2768 (B).

Distr. Venezuela (*Fendler* 324) and Panama (*Standley* 26,164).

S. albonitens Spring is distinguished by the absence of flagelliform branches and the more strongly ciliolate lateral leaves, but I am not sure that these differences are constant.

8. S. FLAGELLATA Spring in Bull. Ac. Brux. x. 228, no. 119 (1843). *S. rhizophora* Bak. in Journ. Bot. xxii. 244, no. 140 (1884). *S. Purdiei* Hieron. in Hedw. lviii. 322, no. 19 (1917). *S. Othmeri* Hieron. *l. c.*, no. 20. *S. ambigua* varr. *minor* and *fallax* Hieron. *l. c.*, p.p. *S. patula* "Spring"; D. C. Eaton in Bot. Gaz. iii. 90 (1878). *S. humilis* "Jenm."; Hieron. *l. c.* lviii. 310, no. 18 (1917), p.p. *S. albo-nitens* "Spring"; Krug in Engl.

Bot. Jahrb. xxiv. 151 (1897), p.p.; Hart, *l. c.*, p.p. *S. ambigua* "A. Br."; Hart, *l. c.*, *S. cordifolia* Hart, *l. c.*, *S. radiata* "Bak."; Hart, *l. c.*, p.p. *S. Lychnuchus* "Spring"; Hart, *l. c.*, p.p.

TRINIDAD: without exact locality, *Hart* 3456, 193, 192 (T), *Jenman* 6330 (T), *Fendler* 42 (*fide* Hieron.), *Jenman* 6314 (K); ST. GEORGE CO.: Maracas, at the foot of the hill, south to the bay, *Broadway* 6747 (B); Maracas, road to the Falls, on banks, *Broadway* 6700 (B); Maracas, *Hart* 6322 (K); bottom of hill to Blue Basin, Diego Martin, on stones in the stream, *Broadway* 5871 (K), 1919 (B); Aripo, *Hart* 6381 (T); Blue Basin, *Hombersley* (B), *McLean* 7680 (T); Maracas, *Hart* 4128 (T), 6322 (T), 4115 (T), *Dannouse* 6524 (T), *Hombersley* (B); Diego Martin, *McLean* 6489 (T); Las Lapas Road, *Hombersley* (B); Maraval, *Broadway* 7045 (B); Santa Cruz, *Broadway* 7719 (B), *Dannouse* 6855 (T); Santa Cruz, on banks, *Broadway* 1988 (Paris). VICTORIA CO.: Moruga, *Crueger* 186 (T).

TOBAGO: Big River Bridge, Mason Hall, on banks, *Broadway* 3036 (B); Bacolet River, *Eggers* 5679 (K).

Distr. Guiana (*Le Prieur*), Costa Rica (*Tonduz* 13,761 B), Panama (*Standley* 26,850).

This species was compared with *S. leptostachya* A. Br. by Hieronymus. *S. regularis* is also closely allied. It is distinguished from the other small species by its rooting apices, narrow dimorphous bracts, and ovate-lanceolate-acute leaves.

9. S. PORELLOIDES (Lamk.) Spring in Bull. Ac. Brux. x. 141, no. 42 (1843), emend. Hieron. in Hedw. lviii. 298 (1917). *Lycopodium porelloides* Lamk. Encycl. iii. 652 (1791). *Stachygynandrum? porelloides* (Lamk.) Beauv. Prodr. 110 (1805). *Lycopodium anomalum* Hook. & Grev. in Hook. Bot. Misc. ii. 400, no. 180 (1831). *Selaginella anomala* (Hook. & Grev.) Spring in Bull. Ac. Brux. x. 232, no. 148 (1843). *S. substipitata* "Spring"; Hart. Herb. List, 87 (1908).

TRINIDAD: ST. GEORGE CO.: Aripo, *Crueger* 182 (T). ST. ANDREW CO.: Quare River Valley, *Totton* (B); Cumuto, in shaded ground, near 5½ mile post, *Broadway* 7395 (B); Valencia Road, *Broadway* 7730 (B). CARONI CO.: Aripo, *Alexander* 6106, p.p. (T).

Distr. B. Guiana (*Ankers*!).

The Hispaniola species (*Fuertes* no. 955) called *Selaginella porelloides* in Herbaria is *S. Mayerhoffii* Hieron.

10. S. TRIFURCATA Bak. in Journ. Bot. xxi. 98 (1883). *S. humilis* Hieron. *l. c.* 319, no. 18 (1917), p.p. *S. Lychnuchus* "Spring"; Hart, Herb. List 87 (1908), p.p. *S. cordifolia* "Spring"; Hart, *l. c.*, p.p.

TRINIDAD: ST. GEORGE CO.: Blanchisseuse, on a bank near the sea, *Broadway* 2255 (B); Santa Cruz Mountains, *Broadway* 7030 (B); Blanchisseuse, *Hombersley* (B); Maracas, *Hombersley* (B); Maracas road to the bay, north near the top at "Geteau," on a wet bank, *Broadway* 7281 (B); Blanchisseuse Road, Verdant Vale bathing-pool on wet ground, *Broadway* 6224 (B); Five Rivers (Laurel Hill), Arouca, in shaded ground, *Broadway* 5851 (B); Maraval, *Broadway* 7055 (B); Caura, *Broadway* 7046 (B). CARONI CO.: Machapoone, forest-bank, *Britton* 2232 (K); Arena, *Crueger* 190 (T), Aripo, *Broadway* 6800 (B). ST. ANDREW CO.: Oropuche Road, *viâ* Valencia, on a shaded bank, *Broadway* 5581 (K); Tamana forests, on damp ground, *Broadway* 7795 (T); Quare River valley, *Totton* (B).

TOBAGO: The Widow, near Easterfield, growing on a bank along the main road, *Broadway* 3514 (B); Campbleton woods, Charlotteville, along shaded banks of the main road, *Broadway* 3633 (B).

Distr. Brazil (*Spruce* 2532).

11. S. PLATYBASIS Bak. in Journ. Bot. xxi. 242, no. 73 (1883). *S. producta* Bak. *l. c.* 243, no. 79 (1883); Hart, Herb. List, 87. *S. tobagensis* Hieron. in Urban Symb. Antill. iii. 524 (1903). *S. serpens* "Spring"; D. C. Eaton in Bot. Gaz. iii. 89 (1878). *S. radiata* "Baker"; Hart, *l. c.*, p.p.

TRINIDAD: without exact locality, *Fendler* 29 (B); ST. GEORGE CO.: Blanchisseuse road, 10½ mile post, on a bank, *Broadway* 6824 (B); Blanchisseuse road, near 10½ mile post, on banks, *Broadway* 5632, 5870 (K); Tucuche, *Hombersley* A 14 (B), *Crueger* 185 (T); Maracas, *Hombersley* A 2 (B); Las Lapas Road, *Broadway* 5934 (B); Maracas, *Dannouse* 6488 (T); Las Lapas, *Broadway* 7537 (B). ST. ANDREW CO.: Quare River forests, on wet shaded bank, near the reservoir, *Broadway* 6839 (B). CARONI CO.: Savonetta woods, *Crueger* 191 (T). ST. PATRICK CO.: Irois forest, in dense shade, *Broadway* 6715 (B), *Williams* 11,927 (T).

TOBAGO: Gilpin Road, Parlatuvier, in the heart of the forests, on banks, *Broadway* 4597 (B); Morne d'Or, 1200 ft., *Eggers* 5815 (duplicate of type of *S. tobagensis*, K); Menna, on the ground, along the roadside, *Broadway* 4838 (B).

Distr. British Guiana (*Jenman* 4212, 2325; *Richards* 196, 268), Brazil (*Spruce* 2502), Venezuela (*Rusby & Squires* 438, 439).

12. S. SUBSTIPITATA Spring in Bull. Ac. Brux. x. 227, no. 110 (1843). *S. Karsteniana* A. Br. in Ann. Sc. Nat. sér. 5, iii. 288, no. 25 (1865), ex descr. *S. portoricensis* A. Br. *l. c.*

TRINIDAD: without exact locality, *Prestoe* 1171 (T). ST. GEORGE CO.: Mt. Tucuche, 10–12 mile posts, on banks, plentiful, *Broadway* 7056 (B); Mt. Tucuche, near the top, on shaded banks, *Broadway* 5654 (K).

Distr. Colombia (*Karsten*); Porto Rico (*Sintenis* 4321, 4104); Guadeloupe and Dominica (*Husnot, L'Herminier*).

The unnumbered Karsten specimen in Herb. Mus. Brit. may be a duplicate of A. Braun's type. Spring's type was collected in Guadeloupe by Beaupertuis. This species has recently been collected in Nevis and St. Kitts by Lt.-Com. R. H. Rodger. *S. Sherringii* Hieron. (Grenada, *Sherring* 160), *S. Nashii* Hieron. (Haiti, *Leonard* 15,158), and *S. rigidula* Bak. (Colombia, *Kalbreyer* 972) may be the same species, but more material is required from these localities.

Species dubiæ.

S. PLANA (Desv.) Hieron., a native of the Sunda Is., is found as an escape; there is a cultivated specimen, Hart 5549, dated 1894, in the Trinidad Herbarium. It is separated by its entire and auriculate median leaves. It is represented by *Broadway* 7047, 7529, 7720, etc.

S. MARACASENSIS O. C. Schmidt in Fedde, Repert. xxix. 10 (1931).

TRINIDAD: ST. GEORGE CO.: Marcas Falls, on rocks where the water falls down from the cliff above, *Broadway* 6701 (f. Schmidt). Schmidt states that this species is allied to *S. Cruegeri* Jenm.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

SOME ADDITIONS TO THE GENUS *BUBBIA* (WINTERACEAE).

THE genus *Bubbia* Tiegh. (in Journ. de Bot. xiv. 278 in obs., 293 (1900)) was founded on a group composed of the following seven species:—*B. howeana* (F. Muell.) Tiegh., *B. Muelleri* Tiegh., *B. Balansae* (Baill.) Tiegh., *B. Deplanchei* Tiegh., *B. auriculata* Tiegh., *B. heteroneura* Tiegh., and *B. isoneura* Tiegh. Of these the first two are known only from Lord Howe Island, off the east coast of Australia, whilst the other five are restricted to New Caledonia. Up to the present no addition has been made to the genus, but among the numerous species which have been described under *Drimys* J. R. & G. Forst. since 1900 are several that belong to *Bubbia*. These latter include *D. Comptonii* Bak. f., *D. odorata* Bak. f., *D. pauciflora* Bak. f., and *D. umbellata* Ridl., which are here transferred to *Bubbia* along with *D. amplexicaulis* Vieill. ex P. Parment., which is identical with *B. auriculata* but was published four years earlier. *D. Comptonii*, *D. odorata*, and *D. pauciflora* are New Caledonian species, but *D. umbellata* is from New Guinea and its transference to *Bubbia* extends the known geographical range of the genus north-westwards to that island.

Bubbia amplexicaulis (Vieill.) Dandy, comb. nov.

Drimys amplexicaulis Vieill., ex P. Parment., in Bull. Sci. Franc. & Belg. xxvii. 231 in obs., 308, t. 10, fig. 34 (1896); Bak. f. in Journ. Linn. Soc., Bot. xlv. 267 (1921).

Bubbia auriculata Tiegh. in Journ. de Bot. xiv. 293 in obs. (1900).

Hab. NEW CALEDONIA: mountains near Wagap, in moist forests, 1861–67, *Vieillard* 2280. Ignambi, forest 3000 ft., gneiss, 1 Aug. 1914, *Compton* 1581.

Bubbia Comptonii (Bak. f.) Dandy, comb. nov.

Drimys Comptonii Bak. f. in Journ. Linn. Soc., Bot. xlv. 267 (1921).

Hab. NEW CALEDONIA: Mt. Panié, frequent in forest 2500–4000 ft., gneiss, 28 Aug. 1914, *Compton* 1815 (type in Herb. Brit. Mus.).

Bubbia odorata (Bak. f.) Dandy, comb. nov.

Drimys odorata Bak. f. in Journ. Linn. Soc., Bot. xlv. 268 (1921).

Hab. NEW CALEDONIA: Tonine, abundant in forest above 2500 ft., 3 Oct. 1914, *Compton* 1983 (type in Herb. Brit. Mus.).

Bubbia pauciflora (Bak. f.) Dandy, comb. nov.

Drimys pauciflora Bak. f. in Journ. Linn. Soc., Bot. xlv. 268 (1921).

Hab. NEW CALEDONIA: Mt. Panié, moist forest 1500 ft., gneiss, 24 Aug. 1914, *Compton* 1768 (type in Herb. Brit. Mus.).

Bubbia umbellata (Ridl.) Dandy, comb. nov.

Drimys umbellata Ridl. in Trans. Linn. Soc., Bot. ser. 2, ix. 11 (1916).

Hab. DUTCH NEW GUINEA: Camp VI *b* [Wollaston Exped. 1912–13], 3900 ft., Jan. 1913, *Kloss* (type in Herb. Brit. Mus.).—J. E. DANDY.

Vigna occidentalis Bak. f., sp. nov. (*Vigna racemosa* Hutch. & Dalz. forma *glabrescens* Bak. f. Leguminosae Trop. Afr. ii. 409 (1929), *pro parte*). *Caulis* volubilis filiformis gracilis sparse pubescens. *Stipulæ* lanceolatæ basi sagittatæ ±4 mm. longæ. *Folia* trifoliolata; foliolis terminalibus æquilateralibus ovatis vel ovato-triangularibus, apice acutis, 2–4 cm. longis, 10–20 mm. latis, petiolulis terminalibus 4–6 mm. longis, foliolis lateralibus inæquilateralibus 18–30 mm. longis, 8–20 mm. latis, petiolulis lateralibus ±2 mm. longis, petiolo communi 2–4 cm. longo. *Flores* cyanei in racemos paucifloros pedunculatos dispositi. *Calyx* ±3 mm. longus, lobis ±2 mm. longis mucronatis. *Vexillum* suborbiculare 12–13 mm. longum, 15 mm. latum, apice emarginatum. *Alæ* cum unguibus 11–12 mm. longæ. *Carina* dorso rotundata 10–12 mm. longa. *Legumen* lineare.

PRINCE'S ISLAND: Esperança, *A. W. Exell* 730 (Herb. Mus. Brit., type). Flowers bright blue. LIBERIA: *R. H. Bunting* 60. Flowers bright blue to pinkish purple. SIERRA LEONE, SHERBRO IS.: *Mrs. Hunter*. Flowers opening a brilliant blue turning mauve later. SIERRA LEONE: *F. C. Deighton* 237, 1520. CAMEROONS: Bitye, *G. L. Bates* 632, 1527.

Vigna occidentalis differs from *V. racemosa* Hutch. & Dalz. by being much less hairy and having larger flowers.—E. G. BAKER.

Combretum Youngii Exell, sp. nov. *Frutex* scandens, ramulis rufo-tomentosis. *Folia* opposita vel fere opposita petiolata, petiolo 5–8 mm. longo tomentoso, lamina oblonga elliptico-oblonga vel ovato-oblonga, apice obtusa vel rotundata vel emarginata vel nonnunquam leviter acuminata, basi cordata, 4–13×2–6 cm., supra primo rufo-tomentella demum, costa media excepta, glabrescenti, subtus primo rufo-tomentella demum pubescenti, costa media supra pubescenti subtus prominente rufo-tomentosa, costis lateralibus utrinque 7–10. *Flores* tetrameri sessiles in spicas paniculatas vel simplices rufo-tomentosas axillares et terminales dispositi. *Receptaculum* superiore breviter cupuliforme tomentosum, 4·5×2 mm., inferiore fusiforme tomentosum 2–2·5 mm. longum. *Calycis lobi* latissime deltoidei ·5 mm. longi. *Discus* patelliformis margine pilosus ceteroque glaber, 2·5–3 mm. diam. *Petala* obovata, 2·5×1·8 mm., pubescentia. *Staminum filamenta* brevissima incurva, ·3 mm. longa. *Stylus* brevissimus circa ·5 mm. longus glaber, stigmate capitato. [*Fructus* ignotus.]

Hab. Belgian Congo: River Mangoa, Dilolo, Lulua, fl. July, *R. G. N. Young* 196 (type in Herb. Mus. Brit.).

"Scrambling on shrubs."

This species belongs to Sect. *Tomentosae* Engl. & Diels, a section hitherto containing only two species—*C. tomentosum* Don, from Senegal and Sierra Leone, and *C. pecoense* Exell, from Portuguese Congo. The new species is easily distinguished from *C. pecoense*, which has much smaller, nearly glabrous leaves, deeply cordate at the base. *C. Youngii* can be distinguished from *C. tomentosum*, which it much more closely resembles, by its distinctly larger flowers and leaves more definitely cordate at the base (only rarely so in *C. tomentosum*).—A. W. Exell.

Adenopus guineensis (Don) Exell, comb. nov.

Bryonia guineensis Don, Gen. Syst. iii. 32 (1834).

Adenopus longiflorus Benth. in Hook. Niger Fl. 372 (1849); Cogn. & Harms in Engl. Pflanzenr. iv. 275, pt. ii. 225 (1924); Hutch. & Dalz. Fl. W. Trop. Afr. i. 176 (1927).

Sierra Leone: *Don* (Herb. Mus. Brit., type).—A. W. E.

Blyxa senegalensis Dandy, sp. nov. (subgen. *Saivala*) (Hydrocharitaceae). *Planta* acaulis dioica omnino glabra. *Folia* rosulata submersa lanceolata ad lanceolato-linearia, in apicem acutam vel subacuminatam sæpe subcaudiformem sensim angustata, margine minute denticulata, usque ad c. 4 cm. longa et 0·8 cm. lata. *Spathæ* pedunculatæ, apice breviter 2-fidæ, læves, floriferæ c. 18–23 mm. longæ et 1·5–4 mm. latæ, fructiferæ plus minusve auctæ interdum usque ad c. 37 mm. longæ et 6 mm. latæ, masculæ multifloræ, femineæ 1-floræ; pedunculus abbreviatus vel plus minusve elongatus, infra filiformis sed apicem versus incrassatus. *Flores masculi* per anthesin ex spatha singillatim in ordine exserti, sepalis oblanceolato-oblongis c. 4 mm. longis et 1·5 mm. latis viridulis, petalis albis, staminibus 6 inæqualibus, gynœcii rudimentis 3 in processum filiformem apice (? an fortuito) antheriferum attenuatis. *Flos femineus* per anthesin ex spatha longe prominens, sepalis oblanceolato-linearibus c. 6–7 mm. longis et 1 mm. latis viridulis, petalis albis. *Semina* oblique fusiformia vel pyriformi-fusiformia, leviter compressa, basi apiceque spinulo-caudata, marginibus 2 oppositis pectinato-alata, alibi lævia, c. 3–4 mm. longa.

Hab. Senegal: Tambawunda, 22 Nov. 1929, *A. Chevalier* 34,005 (Herb. Paris, type, with male fl. and fr.). Pools on lateritious plateau 7 km. north of Tambawunda, 21–23 Nov. 1929, *A. Chevalier* 34,016 (Herb. Paris, with female fl.); 21–22 Nov. 1929, *A. Chevalier* 34,018 (Herb. Paris, with male fl. and fr.).

This is the first species of *Blyxa* to be described from Africa north of the Equator. It is easily distinguished from all the other known diœcious members of the genus by the seeds, which have two opposite longitudinal pectinate wings running from one spinulous-caudate end to the other, but are otherwise quite smooth. *B. senegalensis* is notable also for its comparatively short lanceolate to linear-lanceolate leaves, which give the plant a facies distinctive among acaulous species of *Blyxa*.—J. E. Dandy.

NOVITATES AFRICANÆ.

(Continued from p. 22.)

Virgilia divaricata R. S. Adamson (*Leguminosae*). *Arbor* vel *arbuscula* usque ad 5 m. alta. Affinis *V. capensi* sed differt ramis divaricatis, horizontalibus non adscendentibus; stipulis foliorum subulatis apice glabro, subpersistentibus; foliolis obtusis vel etiam retusis, superne nitidis, glabris vel in vena media pilis paucissimis, subtus pallidis, pilis in venis dispositis; inflorescentiis in apice ramulorum aggregatis; ovario stipitato; disco nectarifero glabro.

Hab. Ladismith Div.; by stream in Seven Weeks Poort, Sept. 1928, *M. A. Pocock* 1018 (type); same locality, *Levyns* 2416, *Phillips* 9165, *Barker* in Hb. Bolus 20,608.

Flowers produced in spring, September and October, and flowering season quite definite and short; petals less caducous than in *V. capensis*.

Erica (§ *Pseuderemia*) **Acockii** Compton (*Ericaceae-Ericoideae*). *Fruticulus* gracilis, erectus vel decumbens. *Caules* fusci, subflexuosi, juventute parce puberuli, internodiis 2–4 mm. long. *Folia* 4-nata, squarrosa, elliptica, obtusa, sulcata, aspecto incrassata, 1·5–2 mm. long., ·5–·7 mm. lat., setis paucis, submarginalibus, longis, basi bulbosis, apice glandulosis. *Flores* 1-nati vel aggregati, terminales, subcernui. *Pedicelli*, bracteæ

et calyx pilis longis albis expansis glandulosis tecti. *Pedicelli* c. 1·7 mm. long. *Bracteæ* approximatæ, lineares, 1·2 mm. long. *Sepala* lanceolata basi late membranacea, concava, apicem versus sulcato-carinata, subacuta, arcte appressa, 2 mm. long., ·5 mm. lat. *Corolla* urceolata, sub ore parum constricta, purpurea, viscida, glabra, 3 mm. long., 2 mm. diam., segmentis late deltoideis, subundulatis, obtusis, expansis, 1 mm. long. *Filamenta* alba, 1·5 mm. long. *Antheræ* inclusæ, basifixæ, fuscæ, minute rugosæ, acutæ, 1 mm. long., poris ·7 mm. long., ample cristatæ, cristis margine exteriore acute lobatis. *Ovarium* sessile, dense villosum. *Stylus* teres, rubidus, 2 mm. long., stigmate exserto, capitato.

Hab. Cape Province; Stellenbosch Div., Brackenfel, in a small marsh, April 1933, *J. P. H. Acock* 1319.

Most nearly allied to *E. clavisepala* Guthrie & Bolus, a species apparently confined to the southern Cape Peninsula, where it has recently been re-discovered by Captain T. Salter after an interval of twenty-five years since Guthrie's original collection, during which time several botanists have looked for it in vain. *E. Acockii* is somewhat less robust, however, has smaller leaves, flowers in clusters of either 4, 6, or 8, differently shaped petals and anther-crests, and a conspicuously villous ovary. Its season of flowering and its habitat are similar to those of *E. clavisepala*, whereas most of the species of the section *Pseuderemia* are montane forms.

Erica (§*Pachysa*) **Andreaei** Compton (*Ericaceae-Ericoideae*). *Frutex* erectus, 3–6 dm. alt. *Rami* graciles, erecti vel patentes, puberuli. Folia 3-nata, juventute suberecta, postea erecto-patentia, oblonga, obtusa, sulcata, glabra nitentia, 2–3 mm. long. *Flores* terminales, 3-nati. *Pedicelli* viscidi puberuli, 2–3 mm. long. *Bracteæ* approximatæ, ovatæ, glabræ, viscidæ, coriaceæ, apice sulcato, breviter foliaceæ, 2 mm. long. *Sepala* erecta, ovata, glabra, 2 mm. long., bracteis similia. *Corolla* globoso-urceolata, ore non contracto, glabra, viscida, alba (?), 3 mm. long., ad dimidium partita, segmentis late triangulatis, erectis vel expansis. *Filamenta* 1·5 mm. long. *Antheræ* inclusæ, basi dorsifixæ, oblongæ, obtusæ, 1 mm. long., marginibus ciliatis, cristis partim decurrentibus, ciliatis, ·5 mm. long. *Ovarium* sessile, dense villosum, stylo 2 mm. long., stigmate simplice, manifesto.

Hab. Cape Province; Willowmore Div., in *Protea* scrub, east side of Aasvogelberg, near Willowmore, 1300 met. alt., Sept. 1923, *H. Andreæ* 972 and 997. Described from specimens in the Bolus Herbarium presented by Dr. R. Marloth.

Closely related to *E. formosa* Thunb., it differs thereform in the wider mouth of its corolla and the smaller size of its floral parts. Its locality is on one of the "islands" of Cape flora in the Karoo, and is rather widely separated from that of *E. formosa*, which is apparently confined to the coastal Langeberg and Outeniqua ranges.

Erica (§*Evanthe*) **octonaria** L. Bolus. *Rami* visi ad 40 cm. longi, juniores pubescentes, pilis patentibus. *Folia* 4-nata, fere erecta, imbricata linearia acuta, ciliata vel demum cartilagineo-ciliolata, aliter glabra, sulco angustissimo, sæpius 6 mm. longa, petiolo 1·5 mm. *Flores* sessiles, ramulos breves terminantes. *Bracteæ* ciliolatæ, 3·5 mm. longæ. *Sepala* ovata, apicem versus foliacea, acuminata, 4·5 mm. longa. *Corolla* pilosa, pilis patentibus, rosea, 1·2 cm. longa; tubo e dimidio superne globose ampliato, ad 6–7 mm. diam., segmentis erecto-patentibus, apice rotundatis, 3·5 mm. longis. *Filamenta* prope apicem utrinque 1-denticulata, 7 mm. longa; antheræ subovatæ, basi haud obliquæ, muticæ, saturate brunneæ, 1·25 mm. longæ, poro dimidium lobi æquante vel minus. *Ovarium* depresse globosum, glabrum 8-loculare; stigma capitellatum, demum apicem corollæ fere attingens.

Hab. Caledon Div., exact locality uncertain, among many other living specimens of *Ericae* sent by Mr. W. Paterson from Hermanus, Sept. 1933 (Bolus Herbarium 20,849).

Erica (§ *Leptodendron*) **elimensis** var. **parvibracteata** L. Bolus. A forma typica pedunculis longioribus, ad 8 mm. longis, bracteis multo minoribus, 0·75–1·5 mm. longis, corolla alba, 8 mm. longa, antheris pallide brunneis, dorsaliter infra porum anguste et pallide alatis.

Hab. Caledon Div.; exact locality uncertain, among many other living specimens of *Ericae* sent by Mr. W. Paterson from Hermanus, Sept. 1933 (Bolus Herbarium 20,850).

Erica (§*Ephebus*) **hippurus** Compton. *Frutex* erectus, virgatus, ad 1 m. alt. *Caules* teretes, hirsuti, pilis inaequilongis, maturi glabrescentes, primarii elongati, laterales breves dense foliati. *Folia* dispersa, erecto-patentia, filiformia, c. 4 mm. long., c. 3 mm. diam., parum incurvata, petiolis non appressis, sulcata, hirsuta pilis paucis longis albis patentibus, basi tuberculatis. *Inflorescentia* cylindrica, dense pseudo-spicata. *Flores* plerumque solitarii ad apices ramulorum axillarium brevissimorum, horizontaliter patentes. *Pedicelli* curvati, rubidi, hirsuti, 1 mm. long. *Bracteæ* remotæ, angustæ, hirsutæ, ·7 mm. long. *Sepala* filiformia, erecta, rubida, hirsuta, sulcata, 3 mm. long. *Corolla* rosea, ovoidea, 5 mm. long., ore contracto, segmentis erectis vel patentibus, 1 mm. long. *Filamenta* angusta, geniculata, 3·5 mm. long. *Antheræ* inclusæ, dorsifixæ, triangulatæ, ·7 mm. long., minute scaberulæ, castaneæ, subulato-aristatæ. *Ovarium* puberulum, stylo 4 mm. long., stigmate exserto, capitato. *Semina* ovoidea, ·7 mm. long.

Hab. Cape Province; Malmesbury Div., uncommon among bushes, side of upper part of Hoorn Kloof Stream, south slopes of the Paardeberg, July 1931, *Pillans* 6312.

Closely allied to *E. Alopecurus* Harv., which was placed by Guthrie and Bolus in the section *Ephebus* on account of floral characters, although in general aspect it bears a great similarity to the pseudo-spicate species of the section *Hermes*. From *E. Alopecurus* it differs in the less dense clothing of leaves, stems, bracts, calyx, and ovary, and in the larger size of its corolla and anthers. The leaves are irregularly scattered and only occasionally whorled: and in this respect also they agree with *E. Alopecurus*, though Guthrie and Bolus ('Flora Capensis') state the leaves of the latter to be 3-nate.

From the geographical point of view *E. hippurus* is of interest, occurring as it does in the winter-rainfall region of the south-west Province, whereas *E. Alopecurus* has a wide distribution in summer-rainfall areas, being recorded from the midland and eastern Cape Province, the Transkei, Natal, Transvaal, and Basutoland. The locality in which *E. hippurus* was found is over 500 miles distant from the nearest locality from which *E. Alopecurus* has been recorded.

The specific name is given as a parallel to *E. Alopecurus*, and on account of the caudate shoots, and it also alludes to the locality from which the type-specimens were collected (Paardeberg, *i. e.*, Horse Mountain).

Erica Jeppei L. Bolus (*Ceramia*) [*Ericaceae-Ericoideae*]. *Planta* sat gracilis, 9–23 cm. alta. *Rami* ad 1·5 mm. diam., juniores, in nodis præsertim, patente pubescentes, pilis inæquilongis. *Folia* adscendentia vel suberecta, 3-nata, dense imbricata, linearia acuta, apiculata vel aristata, sat longe ciliata, sulco angustissimo, ad 2·5 mm. longa, petiolo 0·5 mm., vix ad 0·5 mm. lata. *Flores* erecti 3-nati. *Pedunculi* longe pubescentes, 1·5–2 mm. longi. *Bracteæ* remotæ obtusæ subæquilongæ, 0·75 mm. longæ. *Sepala* erecta obtusa, apicem versus subfoliacea, 1 mm. longa. *Corolla* subcyathiformis glabra, "pallide rosea," 2 mm. longa, lobis erectis, ad antheras adpressis, obtusis, 0·75 mm. longis. *Antheræ* subexsertæ vel demum exsertæ, subterminales oblongæ acutæ, saturate brunneæ, marginibus minute scaberulis, circa 1 mm. longæ, poro dimidium lobi fere æquante, aristis pallidioribus vix 0·25 mm. longis, filamentis 2 mm. longis. *Stylus* in siccis interdum subunilateralis leviterque curvatus, 3 mm. longus, stigmate capitato, ovario subcylindrico, apicem versus piloso, pilis erectis.

Hab. Cape Province; Humansdorp Div., hills south of Assegai Bosch, alt. 1800 ft., in rock-crevices, May 1933, *Dr. T. Jeppe* (*Fourcade* 5017). Described from three dried specimens.

Anomalanthus Lesliei Compton (*Ericaceae-Ericoideae*). *Fruticulus* erectus ramosissimus. *Caules* juvenes erecti teretes, minute griseo-puberuli, internodiis ad 6 mm. long. *Ramuli* axillares quasi-fasciculati, numerosi, inflorescentiis terminati. *Folia* 3-nata, erecto-patentia, parum incurvata, 2–3 mm. long., petiolo puberulo, lamina glabra, lineari-lanceolata, sulcata. *Flores* numerosissimi, dense aggregati, sessiles, in foliorum axillis ramulorum lateralium. *Bracteæ* 3, appressæ, ·5–·7 mm. long., ovatæ, minute puberulæ. *Calyx* campanulatus, non angulatus, 1 mm. long., 1 mm. diam., textura firma, minute velutino-puberulus, rubidus, lobis 4 brevibus, latis, obtusis, apicibus callosis. *Corolla* 2 mm. long., tubularis, parte distale 1·7 mm. diam., parte intra calycem angustiore, roseo-purpurea, glabra, subvelutina, lobis 4 brevibus erectis, late deltoideis, obtusis. *Stamina* 4; filamenta angusta, alba, 3–3·5 mm. long. *Antheræ* longe exsertæ, ·7 mm. long., apice obtuso, basi angustiore, basifixæ, fuscæ, aristis minutis, subulatis. *Ovarium* globosum, minute puberulum, disco breve lobato, fusco. *Stylus* 5 mm. long., filiformis, glaber, stigmate haud incrassato. *Ovulum* 1, ovoideum, pendulum.

Hab. Cape Province; Ceres Div., exact locality unknown. Exhibited at the Ceres Wild Flower Show, October 1932, *Compton* 4156.

I dedicate this new species of *Anomalanthus*, perhaps the most attractive of the genus, to Mr. J. B. Leslie of Ceres, whose work for many years in connection with the classification of the exhibits at the annual Ceres Wild Flower Shows has added greatly to their interest and educational value.

Kleinia Archeri Compton (*Compositae-Senecionideae*). *Planta* perennis herbacea, succulenta, omnino glabra, resinosa, aromatica. *Caulis* erectus vel obliquus, teres, uncialis, 4 mm. diam., parum vel non ramosus, læte virens, internodiis brevibus. *Folia* 10–12, erecto-patentia, magnitudine formaque variabilia, succulenta, lateraliter compressa, a latere visa oblanceolata ad obovata, sensim arctantia ad petiolum basi leviter dilatantem decurrentem, acuta vel subapiculata, læte virentia, superficie furfuraceo-reticulata, nervis longitudinalibus translucentibus, ad 3·5 mm. long., 5 mm. lat., 1–1·2 cm. crass., petiolo vix 2 mm. lat. *Pedunculus* terminalis, erectus, teres, viridis, simplex vel supra medium 1–2-ramosus, 2·5–3 cm. alt., 2 mm. diam., in parte superiore bracteis paucis 4–6 mm. long. sparsis. *Involucrum* cylindricum, 6–8 mm. diam., basi subtruncatum, calyculatum, squamis linearibus 3–4: bracteæ c. 16, 8 mm. long., 1·7 mm. lat., viridos, oblongæ, acutæ, marginibus scariosis. *Flores* c. 45. *Corolla* alba, 8 mm. long., parte tertia inferiore angustiore. *Achænia* pubescentia. *Pappus* copiosus, simplex, albus, 6 mm. long.

Hab. Cape Province; Worcester Div., Constable, alt. 3500 ft., *Archer* 618. Described from specimens grown in the Karoo Garden, Whitehill, April 21, 1933.

Well distinguished from all other known species (except *K. ficoides* Haw., which is a tall shrub) by its laterally compressed leaves. Its closest affinity seems to be with *K. ovoidea* Compton, from which, however, it is distinguished by characters of the capitulum as well as by the leaves.

Kleinia ovoidea Compton. *Planta* humilis, resinosa, aromatica, omnino glabra. *Caulis* uncialis, erectus, subsucculentus, parce ramosus, teres, 4–6 mm. diam. *Radices* laterales crassæ, fusiformes. *Folia* pauca, erecta, carnosa, basi in petiolum c. 2 mm. long. angustata, lamina subdifforme, plusminusve ovoidea sed interdum in latera 1–4 complanata, glabra, matura furfuracea, obtusa vel aliquando subapiculata, læte virente, longitudine parum striata, 1·2–2·4 cm. long., 0·8–1 cm. lat. *Inflorescentia* terminalis, erecta, angusta, parce ramosa, c. 1·8 cm. long., capitulis paucis. *Pedunculus* gracilis, teres, rigidus, glaber, læte virens, basi c. 1–1·7 mm. diam. *Pedunculi* ultimi c. 2·5 cm. long., bracteis 2 vel 3 parvis, pallidis, subulatis. *Capitula* e basi obconica oblongum, 1–1·2 cm. long. *Involucrum* viride, glabrum, subglaucum, bracteis c. 8, æqualibus, oblongis, striatis, apicibus triangularibus, marginibus angustis, scariosis. *Flores* c. 30. *Corolla* alba, c. 6 mm. long., infra cylindrica, supra parum expansa, lobis recurvatis. *Achænia* puberula. *Pappus* albus.

Hab. Cape Province; Ladismith Div., Little Karoo, *J. Archer* 570. Described from specimens grown in the Karoo Garden, Whitehill, March 6, 1933.

Senecio addoensis Compton (§ *Kleinoidei*) (*Compositae-Senecionideae*). *Planta* perennis, herbacea. *Folia* subradicalia, molliter succulenta, 6·5–9 cm. long., basi c. 10 mm. lat., lineari-oblonga vel anguste spathulata, apice ovato-triangulare obtusa, utrinque lobis triangularibus obtusis mollibus succulentis 0, 1 vel 2 ad partem distalem tertiam, crass. c. 6 mm., ad 2·4 cm. lat., infra convexa, supra plana, nervis non apertis, omnino lanis coactis albis obtecta. *Inflorescentia* c. 3–3·5 dm. long., erecta. *Pedunculus* 2–2·5 mm. diam., teres vel parum complanatus, striatus, laxe lanatus, in parte distali ramosus, bracteis subulatis succulentis 6–8 mm. long. *Pedunculi* ultimi erecti, infimi longissimi, 1·8–6·2 cm. long., griseo-lanati, bracteis paucis subulatis. *Capitulum* 1·2 cm. long., 8 mm. diam., basi turbinata calyculata, bracteis c. 13 oblongis mollibus lanatis. *Flores* radiales c. 13, corolla ligulata flava 1 cm. long. *Flores* disci numerosi, corolla flava 6 mm. long. *Pappus* albus flexuosus barbellatus 6 mm. long. *Achænia* puberula.

Hab. Cape Province; Uitenhage Div., Addo, collected by *C. Moller* and grown in the Karoo Garden, Whitehill (W. 746), March 13, 1933.

Related to *S. scaposus* DC., but well distinguished by the peculiar lobing of the leaves, the smaller capitula with a turbinate base, and the shorter ray and disc florets. The leaves have a thin felting of hairs, which strips off readily.

Senecio subcanescens (DC., pro var.) Compton (*Compositae-Senecionideae*). *S. variifolius* var. *subcanescens* DC. Prodr. vi. 393. *S. lyratus* Linn. f. var. *subcanescens* (DC.) Harv. in Fl. Cap. iii. 385. Frequent in swampy ground in the south-west Cape Province, flowering in spring (August to October). Much confused in herbaria with *S. rigidus* L. and other species. The following specimens in the Bolus Herbarium, *inter alia*, belong here:—*Compton* 3358, Kirstenbosch, moist places, August 28, 1926. *Compton* 3967, Witsands, Cape Peninsula, freshwater swamp, Sept. 5, 1926. *Compton* 3968, Kirstenbosch, marshy places, August 17, 1924. *Bolus* 4292, in humidis prope Groene Kloof (Mamre), 300 ft., October 1878. On this specimen Dr. N. E. Brown wrote, "Not in Kew Herbarium. I think it is not *S. lyratus*." *Bolus* 5082, in valle humida ad pedem montium French Hoek prope Villiersdorp, 1300 ft., Nov. 1879. This specimen is inscribed, "Sent to Kew in 1888 and compared by N. E. Brown who could only conjecture it to be a var. of *S. lyratus*." *Wolley-Dod* 1828, Slangkop, west slopes, Oct. 4, 1896.

ABNORMAL FLOWERS IN *CEPHALANTHERA GRANDIFLORA* (L.) BAB. AND OTHER ORCHIDS.

By Patrick M. Hall.

In May 1933, in company with Mr. W. H. Pearsall, I examined a large colony of *Cephalanthera grandiflora* (L.) Bab. growing in a plantation near Wye, E. Kent. The colony consisted of some hundreds of plants in full flower; a large number were examined, and in three cases a flower was found, which at first glance appeared to be double, but on closer examination it was seen that there were three different types of abnormality, as follows:—

A. Flower normal in all respects, except that there were three labella, which were properly developed and of equal size. The two extra labella represent the two obsolete anthers of the outer whorl, *a*, *a* (see Godfery's 'Monograph,' p. 50). A similar flower was described by F. I. Warner in Journ. Bot. 1873, 236.

[Reproduction of the diagram from my note in Journ. Bot. 1933, 354, will serve to illustrate Mr. Hall's notes and also to

correct a misplacement of the lettering in the legend, which should read as here given :—

A

P *a′* *a′* *P*

a *a′* *a*
P

Diagram of relative position of petals and stamens in the monandrous Orchid flower. *P*, petals, the median one is the lip; *A*, *a*, stamens of the outer whorl; *A*, fertile; *a*, *a*, normally absent; *a′*, stamens of inner whorl, the two upper represented by staminodial auricles in *O. mascula*, the lower one normally absent.—A. B. RENDLE.]

B. Flower double in all its parts, having six sepals, four petals, two labella, and a column broader than the normal carrying two anthers. This may best be regarded simply as a case of duplication.

C. Flower with nine perianth segments, two labella, and a very broad column carrying three anthers. The perianth segments apparently consisted of five sepals and four petals: one of these segments subsequently fell off and was lost; and it is possible that another segment had already fallen off before examination. In that case there would have been six sepals and four petals as in case B. One labellum was normal, the other abnormal and more petaloid in outline. There were also two bracts, side by side and of equal size, subtending this flower: this I believe to be a most unusual circumstance. The development of three anthers upon the column is referred to in Godfery's 'Monograph,' p. 6, and the column and anthers of this flower when fresh exactly matched the case illustrated in Godfery, plate 2, fig. 8. The two lateral anthers represent the obsolete upper anthers of the inner whorl, *a′*, *a′*, present normally at the base of the column in *Cephalanthera* as staminodes. The irregularity of the two labella suggests that here also there may be manifestation of an obsolete anther or anthers; it is possible that the two labella represent the development of anthers *a*, *a*, with the normal labellum suppressed, or one of the labella may be normal and the other the development of one of the *a* anthers only. It is more probable, however, in view of the doubling of the sepals and upper petals and the duplicate bract, that this is a case of a triandrous flower with duplication of the perianth segments, as in example B.

These three flowers were found on three different spikes; in each case only one flower of the spike was abnormal, and the position of the abnormal flower was the same in each case, namely, lowest but one. This would appear to be a very remarkable coincidence, but if it is more than coincidence I am not able to suggest any explanation. The three specimens in question have been placed in the British Museum Herbarium.

In the last two or three years I have met with two other cases of abnormality in the flowers of orchids. In one case there

is near Winchester a colony of *Gymnadenia conopsea* R. Br. containing a number of plants with imperfect flowers. The extreme abnormality in this case consists of a flower carrying three sepals and two upper petals, the labellum undeveloped and petaloid, and three anthers surmounting the column. Partially abnormal flowers occur, and normal, abnormal, and intermediate flowers may occur on the same spike; in some cases all the flowers are abnormal.

The second case refers to a group of plants which are hybrids of *O. incarnata* L., either with *O. maculata* L. or *O. latifolia* L. (*teste* Godfery). In this case many of the flowers have imperfect anthers developed on the lower margins of the lateral petals: this is accompanied by malformation of the labellum, which consists in some cases of a simple strap-shaped petal (see Godfery, plate G, fig. 4, but the titles of that figure and fig. 6 have been interchanged by error).

The first of these cases is clearly a development of the upper anthers, *a′*, *a′*, of the inner whorl; the second case is, presumably, one of development of the lower anthers, *a*, *a*, of the outer whorl. This, however, implies the conclusion that this pair of anthers may develop in more than one way :—

(1) as additional labella,
(2) as imperfect anthers,
  (*a*) on the lower margins of the lateral petals,
  (*b*) on the upper margins of the labellum (see Rendle, "Note on Pentandrous Form of *Orchis mascula* L." in Journ. Bot., December 1933, 352–4).

In an earlier note "Three Hybrid Orchids, 1931," published in the 'Report of the Winchester College Natural History Society for 1927–1931,' and reprinted in the 'B. E. C. Report for 1932,' I referred both these abnormalities to the development of the same pair of anthers, *a′*, *a′*: this, I think now, was a mistake, as it implies that the same pair of anthers of the inner whorl could develop alternatively on the column or on the lateral petals. It is more natural to conclude that the pair of anthers, *a*, *a*, of the outer whorl are connected in one way or another with the petals, either with the lateral petals or with the median petal, the labellum, or with the development of additional petals formed as labella.

It is noteworthy that these abnormalities recur in both these groups year after year: also, in both cases, the abnormality, though apparently due to the development of different pairs of anthers, is accompanied by reduction of the labellum.

SOME DISPERSAL NOTES.

By H. N. Ridley, C.M.G., F.R.S.

I propose to give here some additional notes on the dispersal of seeds observed and recorded since my work on the subject was published* :—

By Mammals.—In September of this year I observed on Holmwood Common in Surrey a number of excreta which were obviously those of the fox which is abundant there. These consisted almost entirely of blackberry seeds and pulp. In one I saw the bones of a small bird, in another fragments of a dung-beetle (*Geotrupes*). The weather at the time was excessively dry and all the water on the common had dried up. As usual with wild animals the excreta were deposited on paths and were scattered along the tracks leading to the thick woods where these animals live, and far away from any blackberry bushes.

In the "Biology of Plants and Animals on the Higher Parts of the Pangerango Mountains of West Java" (Verhand. Koninkl. Akad. Amsterdam, sect. ii. pt. xxi. 73) Van Leeuwen records a rat, *Rattus lepturus*, as eating the pulpy fruit of *Vaccinium varingiaefolium* and passing the seeds uninjured. This is the first case I know recorded where these rodents actually transport the seeds of juicy fruits in their viscera.

Glyceria fluitans Br.: I had long been puzzled by the constant appearance of this grass on the edges of remote ponds and lakes where ducks which transport the seeds on their feet do not come, till, in July 1931, I found two plants in a dew-pond on Ballard Down, near Old Harry, Swanage. The pond was much used by the sheep whose foot-prints were crowded at the margin, and in these grew the grass. The nearest pond or stream was very far away. I saw the plant again in a roadside puddle, also frequented by travelling sheep, at Church Knowle, and I have seen it also in many ponds, but only where sheep or deer go. In herbaria it is frequently located "in ponds in pastures." Besides Europe it is found in the Azores, Morocco, Palestine, and Amurland to Japan. It had reached Australia by 1803 and Tasmania in 1837. Common in North America, it is widely spread also all over temperate South America, abundant enough to form thatch in Buenos Ayres, and is the only species of the genus in South America, and clearly here also associated with sheep. The grain is very small, smooth, and black, the glumes are longitudinally ribbed, and might possibly be entangled in the wool, but as the grain falls out very readily I judge that it is practically always transported in mud on the sheep's feet.

Birds.—Van Leeuwen gives a long account of fruit-eating birds on Pangerango in the above-quoted work. I find a record

* 'The Dispersal of Plants throughout the World,' 1930.

in D. A. Bannerman's 'Birds of West Tropical Africa,' i. 273 (1930), of a fish-eagle, *Gypohierax angolensis*, whose favourite food is the fruit of the Oil-palm, *Elaeis guineensis*, which it devours greedily. Very few of this group of birds play any part in dispersal.

Water dispersal.—*Ranunculus Lingua* L.: I have recorded that the achenes of this plant, which Guppy says float twelve hours only, sank at once when I put them in water. I recently tested them again, putting about a dozen in water October 4, 1932, all floated except one that sank the first day; on October 7 three sank, and on October 16 all were at the bottom; March 27 (1933) a number, nearly all, had germinated and all were floating. Thus it appears that the achenes sink in autumn and the seedlings float in the first warm weather.

Lobelia sessilifolia Lamb. did much the same. The seeds were put in water on October 4, but were still floating on November 2. Most of them sank during the winter, but began to germinate at the bottom in March, and on March 27 three seedlings were floating, and later many more. The seeds are very small and might also be transported on the feet of wading birds. The plant is a native of marshy meadows and ditches in Amurland and Manchuria to China and Japan.

Insect transport.—It has often been suggested by Guppy and others that minute seeds such as those of orchids might be transported for long distances by adhesion to far-flying insects, but no evidence of this was forthcoming till Dr. van Steenis discovered on Mount Papandayan, in Java, a dragon-fly, *Procordula sumbawana*, bearing on its wings several of the tiny achenes of the Composite *Myriactis javanica* DC. (*M. nepalensis* Less.), and recorded the fact in 'Tropische Natuur,' xxi. 10 (1932), 191. This dragon-fly occurs in Java, Celebes, Sumbawa, Flores, and Timor. The plant, a low weedy Composite with small flower-heads, is found in the first three mentioned islands and also in India. The achenes are 2 mm. in length; smooth, flat, shiny yellow, and distinctly sticky when wetted, or, *fide* Van Leeuwen, when fresh. They have no pappus, but merely an elevated ring at the apex.

Dragon-flies are known to travel very great distances across land and sea, and often in large flights. They habitually cross the sea successfully from Java to Christmas Island, 170 miles, and to Cocos Island, 700 miles, and have been met with 200 miles from land off Cape Verde Islands (R. O. Cunningham in "Voyage of the 'Nassau'"), and butterflies and moths often quite as far, and it is quite possible that this means of transport may account for the wide distribution of many minute-seeded plants, such as *Gentiana*, *Balanophora*, and *Begonia*, the story of which is still obscure. Entomologists might pay attention to this point.

THE IRISH FORMS OF *NEOTINEA INTACTA* REICHB. FIL.

By H. W. Pugsley.

When botanizing last spring in counties Clare and Galway with Dr. Lloyd Praeger my attention was drawn to this little orchid, which I then saw in life for the first time. It grows, often in small quantity, over a wide area, and the prevalent form with which Dr. Praeger was familiar is characterized by greenish-white or straw-coloured flowers, which are wholly concolorous without any markings on the perianth or the lip. The leaves of this form are clear green and unspotted. In two localities we found with this plant another form in which the leaves were glaucescent with faint purplish blotches, and the flowers of a pale pinkish-white colour, the sepals veined with dull purple and the lip marked towards the base with purplish pink. The two plants seemed quite distinct and uniform, and no intermediates were observed. We found that Mr. P. B. O'Kelly, of Ballyvaughan, was aware of the existence of both forms.

In British text-books *N. intacta* is stated to have pink or purplish flowers, and in the plate of 'English Botany,' ed. 3, they are shown as deeply coloured. The original account of this species as an Irish plant was furnished by H. G. Reichenbach in Journ. Bot. iii. 1 (1865), and the description runs:—"Leaves . . . with brown spots on the upper surface . . . the colour of the perianth is pale pink. Sepals and base of the lip are occasionally blotched with purple." The accompanying plate (tab. 25) is a good one with full dissections, but the flowers are represented as deep pink in colour and the lip of the enlarged blossom is without markings. The description was probably not based on living Irish material, and in dried specimens the colour distinctions readily vanish. Reichenbach had previously (Icones Fl. Germ. xiii.–xiv. p. 3, 1851) described the plant as with spotted or unspotted foliage and flesh-coloured or whitish flowers, and earlier authors had likewise admitted variations of these organs. The original description of the species (as *Orchis intacta*) by Link in Schrader's Journ. Bot. 322 (1799), gives "hat kleine, weise Blumen, auf der Unterlippe mit rothen Flecken." Among modern works Rouy (Fl. France, xiii. 179, 1912) describes a plant resembling the pink-tinted Irish form; in Keller and Schlechter's 'Mon. & Icon. Orchid. Europ.' 155 (1926), the flowers are depicted as "sepalen fleischfarben, rot-geadert; petalen fleischfarben. Lippe fleischfarben oder rosa"; E. G. Camus (Icon. Orchid. d'Europe, 284, 1928) gives the leaves as spotted, but allows that the species may have pink or white flowers, and two varieties, α *tridentata* and β *bifida*, based on the form of the lip, are recognized. Colonel Godfery's recent Monograph of the British Orchids says (p. 152):—"Leaves spotted . . . . sometimes unspotted . . . . sepals . . . . greenish white or pale rose . . . . petals greenish . . . . lip white or rose, with pale rose or violet markings at . . . . base." Two forms are figured, apparently intended to represent those found in Ireland, but the coloured flowers are marked with brown rather than pink or purple.

It is not known whether the *N. intacta* of southern Europe ever produces flowers more deeply coloured than those of the Irish pink-tinted form, for when dried the colour is usually lost, and comparatively few botanists have been familiar with the living plant. The species was originally described as having red-spotted flowers, and Reichenbach's account in this Journal (*l. c.*) may be held to apply to the typical and most widely known form of the species, which virtually agrees with the rarer Irish form. Although numerous authors have been aware that the foliage may be spotted or not, and that the colour of the flowers is variable, no form or variety founded on these features appears to have been accurately distinguished, and, as in Ireland the whitish-flowered plant seems perfectly distinct and uniform, no intermediates being known, and is much more widely spread than the pink-flowered type, it is proposed to segregate it as a variety thus:—

Neotinea intacta Reichb. fil. δ **straminea**, var. nov. Foliis immaculatis læte viridibus floribusque labello immaculato omnino stramineis a typo differt.

Exsicc. Pugsley no. 497 (type).

It is notable that *Antennaria dioica* Gaertn., which is abundant in the Irish stations that produce *Neotinea intacta*, is commonly white-flowered in these localities.

A curious feature of this orchid, very noticeable in the living state, is the asymmetry of the flowers in the flowering spike. The lip, instead of being uniformly anterior and deflexed owing to the torsion of the ovary, as is usual in the flowers of allied genera, points more or less horizontally to the right or left—the result of the ovary being only partially twisted. This gives an irregular but characteristic aspect to the spike. The peculiarity was known to Reichenbach, who (Journ. Bot., *l.c.*) mentions the ovary as "slightly twisted" and correctly figures the unsymmetrical flowers. The plates of Camus's 'Icones Orchid.' (no. 83) and of Godfery's Monograph (t. 31) show the ordinary deflexed lips seen in kindred genera and would not appear to have been drawn from fresh material. The true form of the flowering spikes is apparent in the stereograph (pl. F, f. 4) of the latter work, and is well seen in the drawing of this species in Mr. E. G. Bedford's fine sets of British Orchidaceae.

BRITISH BRYOLOGICAL SOCIETY.

THE Society held its Annual Meeting and Excursion at Portinscale, Cumberland, from August 29 to September 5, 1933, under the Presidency of Mr. H. H. Knight, M.A. Upwards of forty members and friends were present.

The glorious summer weather of 1933 was enjoyed to the full, though occasionally the mists rolled down from the mountain tops and caused some inconvenience to climbers. The first day was spent among the familiar surroundings of Lodore, in the rocky gorge and the steep woodland; after which the way led over Watendlath, and thence down to Rosthwaite.

The party visited Westmorland by motor coach on Thursday from Keswick by way of Thirlmere, Grasmere, and Rydal, up Great Langdale to Dungeon Gill. The Force and the rocky hillside yielded some interesting plants. Several of the party went farther to explore Crinkle Gill. On Friday Seatoller was visited, parts of the interesting woods were studied, and some rare plants were seen. On Saturday the party started to Braithwaite and thence up the long Cole Dale to the pass at the summit; but the sudden descent of mist from Grassmoor while the Hobcarton precipices were being worked caused trouble, and separated groups had to find their way down by devious tracks. Others who visited Scafell had similar trouble. On Monday some intensive work was done in the very rich and attractive rocky woods about Seatoller and Hause Gill, and also up Stonethwaite with its beck and steep wooded hillsides.

Though the bryology of the Lake District has been frequently studied, notably by the Rev. C. H. Binstead, our members were able to add a number of new records for v.c. 70 (Cumberland), and a few for v.c. 69 (Westmorland). These are starred in the list that follows, and rarer species previously known are included so far as space allows:—

SPHAGNA were numerous and many interesting forms were collected:—*Sphagnum teres* var. *subteres**; *S. pulchrum**; *S. fallax* var. *robustum**; *S. obesum* var. *luxurians** (Mickleden, 69); *S. obesum* var. *hemi-isophyllum**; *S. subsecundum* var. *tenellum**; *S. inundatum* vars. *eurycladum**, *robustum**, and *densum**; *S. auriculatum* vars. *ovatum**, *laxifolium**, *submersum**, and *plumosum**; *S. aquatile* var. *mastigocladum**; *S. contortum**; *S. subbicolor**.

TRUE MOSSES.—*Andreaea petrophila* var. *gracilis*. *Tetraphis Browniana*. *Oligotrichum hercynicum* var. *laxum**. *Archidium alternifolium**. *Ditrichum tenuifolium*. *Dicranella heteromalla* var. *interrupta**, *D. curvata*. *Campylopus subulatus*, *C. Schwarzii*, *C. flexuosus* var. *zonatus*, *C. setifolius** (69), *C. atrovirens* vars. *falcatus** (69) and *muticus** (69). *Dicranum schisti*, *D. scoparium* var. *spadiceum**. *Fissidens crassipes**. *Grimmia retracta*, *G. ovata*, *G. elongata*. *Coscinodon cribrosus*. *Pottia intermedia**. *Barbula rubella* vars. *dentata* and *ruberrima*. *B. convoluta* var. *Sardoa**. *Trichostomum tenuirostre* var. *Holtii*, *T. fragile*. *Oedipodium Griffithianum*. *Discelium nudum**: this rare plant was found on the banks of Newlands Beck near Portinscale, both male and female plants. *Philonotis caespitosa**, *P. capillaris*. *Webera annotina* var. *bulbifera**. *Bryum cyclophyllum*, *B. atropurpureum* var. *gracilentum** (also in 69*), *B. argenteum* var. *lanatum**. *Mnium affine* var. *rugicum**, *M. serratum*, *M. orthorrhynchum*, *M. stellare*. *Eurhynchium praelongum* var. *Stokesii**, *E. myosuroides* var. *tenuinerve** (Lodore). *Sematophyllum micans*. *Amblystegium varium*, *A. irriguum**. *Hypnum cupressiforme* vars. *mamillatum** and *tectorum*, *H. callichroum*, *H. cristacastrensis*. *Hylocomium umbratum*, *H. brevirostre*.

HEPATICS.—These are of considerable interest, being mainly those associated with rocky woodland, cascades, and mountains. *Riccia sorocarpa**. *Aneura multifida* and *sinuata*. *Fossombronia pusilla* and *Wondraczeki**. *Gymnomitrium concinnatum*, *G. obtusum*, *G. crenulatum*, and *G. adustum*. *Marsupella ustulata* and *aquatica*. *Alicularia compressa*, *A. scalaris* var. *procerior**. *Eucalyx obovatus* and *paroicus*. *Aplozia crenulata* var. *gracillima**, *A. pumila* var. *rivularis** (Dungeon Gill, 69). *Jamesoniella autumnalis*. *Lophozia quinquedentata*, *L. Floerkii* and var. with gemmæ, *L. attenuata*. *Sphenolobus minutus*, *S. Hellerianus**, and *S. exsectiformis**. *Anastrepta orcadensis*. *Plagiochila punctata* and *tridenticulata*. *Leptoscyphus Taylori*, c.fr. *Harpanthus scutatus*. *Saccogyna viticulosa*. *Cephalozia media*. *Odontoschisma Sphagni*. *Calypogeia Trichomanis* and *fissa*. *Bazzania trilobata* and *tricrenata*. *Lepidozia Pearsoni* and *setacea*. *Blepharostoma trichophyllum*. *Anthelia julacea*. *Herberta Hutchinsiae*. *Ptilidium ciliare* and *P. pulcherrimum**. *Trichocolea tomentella*. *Scapania compacta*, *S. subalpina*, *S. gracilis*, *S. nemorosa* var. *uliginosa**, *S. dentata*, *S. curta*, *S. umbrosa*. *Radula Lindbergiana* and *voluta*. *Colura calyptrifolia*. *Cololejeunea calcarea* (69). *Lejeunea cavifolia* and *patens*. *Microlejeunea ulicina*. *Drepanolejeunea hamatifolia*. *Harpalejeunea ovata*.

The Annual Meeting was held on September 1st, when the usual business was transacted, and it was decided to hold the next Meeting in August, 1934, at Whitby.—ELEONORA ARMITAGE.

SHORT NOTES.

RE-INTRODUCTION OF CYPRIPEDIUM CALCEOLUS L., MATLOCK DISTRICT, DERBYSHIRE.—W. R. Linton, 'Flora of Derbyshire,' 274, quotes H. Harpur Crewe and Joseph Whittaker, MS. "List of the principal Flowering Plants of Derbyshire"; 1864, "Formerly found on the Heights of Abraham, but long since extirpated." This appears to be the only recorded basis for the

belief that the species once occurred in Derbyshire, but it seems to be generally accepted as authentic.

Late in August 1933 I planted a healthy specimen in a wood adjacent to the quoted locality. The plant bore seven mature stems, and had been pot-grown from an imported rhizome of Continental origin purchased from a nurseryman about four years ago. The approximate position of the re-introduced plant is :— 53° 6′ N. lat., 1° 37′ W. long.—C. S. GARNETT.

ZOSTERA NANA Roth IN CARMARTHENSHIRE.—A specimen collected at Ferryside, Carms., by Lieut.-Commander E. K. Crockett, R.N., has been sent to me by Lieut. L. H. Milne, R.N.V.R., District Inspector of Fisheries, who states that it occurs in abundance on both sides of the Towy estuary and threatens by its increase to harm the cockle fisheries. *Zostera nana* has been previously recorded for only one other station in South Wales, namely, Llanmorlais, Glam. (Rep. B. E. C. v. 404, 1919).—H. A. HYDE, National Museum of Wales.

SORBUS PORRIGENS Hedlund IN IRELAND.—In May last, while botanizing at Garryland, near Gort, Co. Clare, with Dr. Lloyd Praeger, I found a small tree of *Sorbus porrigens* Hedlund flowering profusely, and with several young bushes in its vicinity. The species, which is characterized by small foliage somewhat intermediate in form and veining between that of *Sorbus Aria* (L.) Crantz and *S. rupicola* (Syme) Hedlund, has not hitherto been recorded for Ireland, but it may possibly prove to have been confused by Irish botanists with *S. rupicola*. Mr. Wilmott has seen the specimens and concurs in the determination.—H. W. PUGSLEY.

FLORA OF LUNDY ISLAND.—In perusing the 'Contribution to the Flora of Lundy Island' by Dr. F. R. Elliston Wright, which appeared last November in this Journal, I was reminded of a day's botanising on the island in the summer of 1899. It was not in the hope of any interesting discoveries that I made the trip, for I knew that botanically the ground had already been well explored, and I had provided myself with a list of the rarer species that I wished to see, taken chiefly from Ravenshaw's 'Flora of North Devon.' The best plants that I found were *Scrophularia Scorodonia* and *Lastraea aemula*, the former of special interest as having been originally noticed by Charles Kingsley, who recorded it as *S. vernalis*, a misidentification corrected by Moyle Rogers in this Journal in 1877. A number of interesting plants recorded by Ravenshaw or Rogers do not appear in Dr. Wright's list ; some of these, such as *Ranunculus Lingua* and *Dianthus Armeria*, are decreasing species which may have become extinct.

Dr. Wright criticises the latest list of Lundy plants, printed in Loyd's 'Lundy,' as wholly unreliable, but, in spite of a certain number of obvious errors and the inclusion of some aliens, its 300 names cover nearly all the known species, excepting sedges and grasses, and it is the most complete existing flora.

In the new Contribution several records seem to need confirmation. *Ranunculus hederaceus* may well be *R. Lenormandi*, given by Ravenshaw. *Fumaria Bastardii* is likely to be the prevalent species of Devonshire, *F. Boraei*. *Brassica Cheiranthus*, stated emphatically to be native, is a good addition to the flora if correct, but as the species is unknown in Great Britain as a wild plant, a voucher specimen is desirable, especially as *B. campestris*, *B. nigra*, and *B. oleracea* have all been recorded for Lundy, and Dr. Wright's allusion to the lyrate-dentate leaves seems to point to one of these. *Carex arenaria* is shown as "abundant on whole island"—a remarkable fact to have escaped previous observers. *Polystichum aculeatum* is said to be "frequent" and *Lastraea spinulosa* "very common," while *P. angulare* and *L. dilatata* are not mentioned. The last-named are common ferns of North Devon, while the rarity of the other two in the district was remarked both by Ravenshaw and Moyle Rogers ; it seems strange that they should occur in Lundy, albeit there is suitable ground in the island for *L. spinulosa*. I saw *L. dilatata* in 1899, but not *L. spinulosa*.

Dr. Wright's strictures on the "faulty descriptions" of *Rubi* are regrettable, for the accounts of the species and varieties in Moyle Rogers's admirable 'Handbook' are among the best ever written by a British botanist on any group of plants.—H. W. PUGSLEY.

RICCIA BEYRICHIANA IN ARCTIC EUROPE.—In an interesting paper by Th. Arwidsson, recently published* in Swedish, *Riccia Beyrichiana* Hampe (*R. Lescuriana* Aust.) is recorded from the Henriksfjäll in the neighbourhood of Dikasjön and Borkajaure in Swedish Lapland (lat. c. 55° 30′ N.). In the same paper a sketch-map records the known localities for this species in Scandinavia. The most northerly of these marked is in the Lofoten Islands on the west coast of Norway, where the species was found by Jörgenssen at Trondenes in Tromsøamt. During the excursion of the British Bryological Society to Norway in August 1932, I was fortunate enough to discover this species in a small clearing of the Birch woods (*Betula odorata*) near Hamnes, at an altitude of less than 100 m. (300 ft.) on the south side of Ulø, an island in Tromsøamt, in nearly 70° N. lat., or more than 1° N., and some 5° E. of the most northerly previously known locality. The plants were quite typical and bore young

* "*Riccia Beyrichiana* funnen i Åsele lappmark," Botaniska Notiser, 1932, 373.

sporogonia. They were growing in considerable quantity in one spot on bare mud on a sloping bank, below which was *Climacium dendroides*. Only a small number were collected, and it was not seen elsewhere during our travels in Lapland. It is well known that owing to the influence of the Atlantic the climate of these islands situated at the seaward end of the fjords, is very much milder than would be expected from their latitude, more than 200 miles north of the Arctic circle, where snow remained throughout the summer in places right down to sea-level on the opposite side of the Lyngen Fjord; but it was thought worth while placing on record this considerable extension of the known range of a typically southern genus.—C. V. B. MARQUAND.

REVIEWS.

Trees and Shrubs hardy in the British Isles. By W. J. BEAN, I.S.O., V.M.H., late Curator Royal Botanic Gardens, Kew. Vol. III. Pp. xiv, 517, with 64 pls. John Murray: London, 1933. Price 36*s*.

IT is nearly twenty years since the publication of Mr. Bean's authoritative work, 'Trees and Shrubs hardy in the British Isles' (1914). In the meantime many new species have been introduced; many others were then so new to cultivation, or even unidentified, that little or nothing was known about them. The present volume deals with these. But in addition the scope of the work has been extended to include consideration of many species which require a comparatively mild climate, and can be cultivated only in the maritime counties of the South and West of Britain, and in Ireland, where an equable climate and a generous rainfall render possible the growth of a great variety of trees and shrubs, especially evergreens, from such regions as the Himalayas, South-West China, New Zealand, and Chile.

In a brief Introduction the author gives biographical notes on the principal collectors to whom we are indebted for additions to our list of trees and shrubs during the last three decades, the majority of whom, notably Wilson and Forrest, are no longer with us. Outstanding figures such as those of Charles Sprague Sargent, Maurice de Vilmorin, H. J. Elwes, and Augustine Henry have also gone.

As in the two volumes of the original work the genera are arranged alphabetically, and references are given to the earlier volumes where other species of the genus are described. Illustrations in the 'Botanical Magazine' and other works are also quoted and, where likely to be helpful, synonyms are cited. No distinction is indicated in the nomenclature between true species and hybrids, by the addition of the recognised mark, ×, before

the names of the latter, though full information is given in the text. The plates, reproductions of photographs by Messrs. Malby, are excellent; the addition of an indicating number would have facilitated reference. It is also worthy of note that the author appreciates the value of page-headings.

Under each species notes of origin and of features which commend the plant to the gardener are included, in addition to a description of the plant. The notes on cultivation indicate what a surprisingly large number of tender species will thrive in the south-west corner of our island.

Nearly a hundred pages are devoted to *Rhododendron*; "an astonishing development" in the cultivation of the species has occurred since the two first volumes of the work were finished early in 1913. E. H. Wilson was the pioneer in this development, which, however, is mainly due to the "amazing industry of the late George Forrest," and his organisation of native collectors. The work has been successfully continued by Kingdon Ward. The careful description and classification of the species is owed to the late Sir Isaac Bailey Balfour, which, though to some extent tentative, "has brought a good deal of order and definiteness into what would otherwise have been chaos." Mr. Bean, however, suggests that "as with other botanists who have become absorbed in one group of plants, he attached too much importance to minute differences," and as the plants become better known in cultivation many of his species will be reduced to synonyms or subspecies. To the thousand or so of "so-called species" of American *Crataegus* Mr. Bean gives short shrift. Of the 150 species in cultivation at Kew "a monotonous proportion" would in the old days have been lumped under *coccinea* or *mollis*. "Certainly they have brought no increase of beauty into the genus anything like commensurate with their number."

But exigencies of space forbid further comment on this new instalment of Mr. Bean's classic work, and we must conclude with hearty congratulations to the author on its continuance.—A. B. R.

British Economic Grasses: their Identification by the Leaf Anatomy. By SYDNEY BURR, M.Sc., Lecturer, and DOROTHY M. TURNER, B.Sc., Assistant Lecturer in Agricultural Botany, University of Leeds. 4to, pp. 94, 34 pls. Edward Arnold: London, 1933. Price 10*s*. 6*d*.

IN his Foreword Prof. R. G. Stapledon emphasises the importance of laboratory research and technique in the study of grassland, the management and improvement of which is demanding critical attention. It is essential to be able to identify the various grasses in all stages of growth and wherever they may be growing, and the object of the authors of the present book is to make this possible with a high degree of precision and certainty. The

anatomy of the leaf as seen in transverse section supplies a means of diagnosis, and a key based on these characters has been elaborated as alternative and supplementary to one based on vegetative characters. An introductory chapter gives a brief general account of these characters with directions for the selection of material for examination. Freehand sections of fresh material are generally preferable to microtome sections.

The main portion of the book consists of descriptions of the vegetative characters and of the microscopic characters as presented by the accompanying full-page plate, of about sixty species and varieties. The plates are excellent photographic reproductions of transverse sections of the leaf and shoot, and incidentally an indication of the possibilities of the hand section. This attractive volume supplies an excellent guide to the determination of the grasses during the long period when flowers are not available.

The Woodlands and Marshlands of England. By H. A. Wilcox, M.A. (Mrs. G. S. Treleaven), with Foreword by Prof. P. M. Roxby. Sm. 8vo, pp. 55, 2 maps. Hodder & Stoughton : London, 1933. Price 6*s*.

A reconstruction of the primitive conditions of the vegetation of England was, as explained by Prof. Roxby in his Foreword, the subject of the author's thesis for the M.A. degree in Geography at Liverpool University. At the suggestion of the examiners, and on the advice of a subcommittee of the British Association, it has been published, with the aid of a small grant from the Association. The data which were originally distributed over two sets of maps for six areas have been transferred in condensed form on to two 1 : 1,000,000 base maps issued by the Ordnance Survey.

Map A has been compiled from geological, topographical, and climatic evidence, and purports to depict the distribution before the process of clearing the woodlands began and after the establishment of physical and climatic conditions approximating to those of the present day, presumably at some period in the Bronze Age. Map B "historical" is based mainly on evidence from existing maps depending on historical evidence or which are surveys of woodland existing at the time when the map was prepared ; it is of special value for the light it may throw on the extent to which woodlands have been cleared and marshes drained.

A discussion of the general problems involved in the work of compilation is followed by a "Regional discussion" on each of the six areas represented in the original series—S.W. England, S.E. England, East Anglia and the Counties East of the Limestone Escarpment, The Western Midlands, The Counties East and West of the Central and Southern Pennines, and The Four Northern Counties. While the author emphasises the tentative

character of the map based on physical considerations, she is justified in her suggestion as to its value in connection with the study of early man and his works in Britain. Its special interest for students of the British flora is obvious.

Systematic Botany. By B. Hayata. Vol. I. Gymnospermae. 886 pages. Tokio, 1933. Price 15 yen.

As this work is published entirely in Japanese a detailed review is unfortunately impossible. It is the first of five volumes in which Professor Hayata intends to publish a systematic account of the Plant World, and includes the whole of the Gymnosperms. From the numerous illustrations, which are for the most part excellent, it appears that the author deals largely with the cytology as well as the pure taxonomy and fossil record of the seven classes comprising the Gymnospermae. This will undoubtedly be the standard textbook on the subject for Japanese students for many years. The *format* of the work is attractive. There are a short bibliography and full indexes.—C. V. B. M.

BOOK-NOTES, NEWS, etc.

Linnean Society of London.—At the General Meeting on January 4, the President, Prof. F. E. Weiss, F.R.S., exhibited a photograph of a spruce forty years old rooted on a willow growing in Vorarlberg.

Dr. F. W. Sansome gave an account of "Character Expressions in the Tomato" ; vegetative production of tetraploids afforded a ready means of studying the differences between these and diploid plants.

Dr. W. Watson read a paper on "Flowering Time and its Evolutionary Significance." It was suggested that those plant-groups which have been regarded as more primitive flowered more abundantly earlier in the year than those considered to be later in evolution. The method of expressing this was as follows :—Records of the dates of first flowering in the plants of West Somerset had been kept for many years. The average time of first flowering during ten years was obtained for each species, then the mean time of first flowering for a particular group was calculated. For example, there were sufficient data for the time of first flowering for thirteen species of Ranunculaceae. The sum of these times was divided by 13 and the mean time for the family was April 28. For fifty-five species of Compositae the mean time was June 29. In a similar way other families, subfamilies, and even genera were treated, and a general correspondence with evolutionary views was obtained. This recapitulation could be expressed as follows :—When a sufficient number of species are taken to obtain the mean time of first flowering for a group those groups with the earlier flowering times are the earlier evolutionary.

Dr. Stanley Kemp, F.R.S., showed lantern-slides of soundings taken in the Antarctic and a record illustrating a new automatic method of recording echo-soundings.

'THE ORCHID REVIEW' (November, December) contains accounts of the thrilling experiences associated with the discovery of two Cypripediums, *C. Stonei* var. *platytaenium* from near Sarawak and *C. Spicerianum* from Bhutan. The stories are excerpts from Mr. F. Boyle's 'The Woodlands Orchids.' Also a sketch of the life of Francis Bauer, the Austrian botanical draughtsman whom Sir Joseph Banks appointed, at his own cost, botanical painter to the Royal Gardens, Kew, where he died in 1840. His beautiful and wonderfully detailed drawings of British Orchids and of new and rare plants are preserved with Banks's herbarium in the Department of Botany, British Museum.

'SUNYATSENIA.'—Vol. I. nos. 2–3 (July 1933) of this Journal of the Botanical Institute, College of Agriculture, Sun Yatsen University, Canton, contains several important papers. A. W. Exell (British Museum, Natural History) supplies a review of the Combretaceae of China, including six species of *Combretum* (one new) and four of *Terminalia*; and a revision of *Rhodoleia* (Hamamelidaceae), with seven species (two new). H. H. Hu's revision of the genus *Carpinus* in China, 23 species, contains descriptions of several novelties. In each case keys to the species are included. New species from Kwangtung are described by several authors, including a number of additions to the Orchid flora by C. L. Tso. W. Y. Chun reprints the additions to the floras of Hongkong and Kwangtung originally published by Tutcher in the Reports of the Botanical and Forestry Departments of Hongkong, 1913–18. The papers are illustrated by somewhat crudely reproduced photographs of herbarium specimens.

GERMINATION OF VICIA FABA.—A. Nelson and J. C. Macsween (Trans. & Proc. Bot. Soc. Edinburgh, xxxi. 247) find that in the germination of the broad bean the passage of water through apertures such as the micropyle or hilar slit is insignificant or non-existent. The mechanism consists in hydration of the colloids of the testa followed by an osmotic intake of water through its semipermeable membrane, the active substance being a reducing sugar formed from the carbohydrate not in the embryo itself.

'SOUTH AFRICAN GARDENING AND COUNTRY LIFE' for October 1933 (xxiii. 231) contains a coloured plate and description of *Hoodiopsis Triebneri*, the type of a new genus of *Stapelieae*, by Carl Luckhoff. The plant is extremely rare, having been found in Great Namaland in localities 100 miles apart. The genus differs from *Hoodia* in its deeply lobed corolla, which is 10·5 cm. in diameter, and comparatively few-angled stems with angles much deeper.

ANTITHAMNION SPIROGRAPHIDIS SCHIFFNER.

BY M. A. WESTBROOK, M.SC.

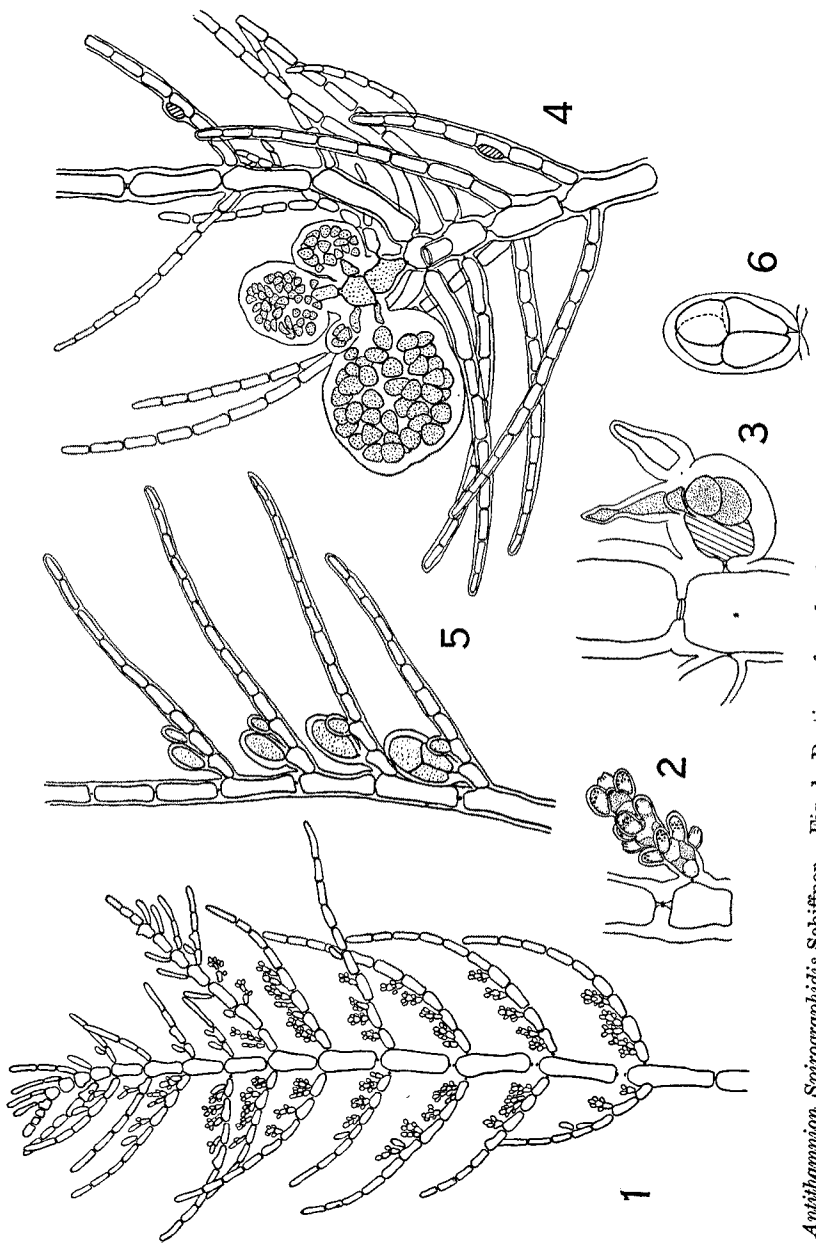
A RED alga agreeing with the description and figures of *Antithamnion Spirographidis* Schiffner has been found at Plymouth. A short account of it is here given, as it is new to Britain, while female plants were previously unknown.

It was first found (Schiffner, 1916) at Trieste, growing on tubes of *Spirographis* in 0·5–3 m., and later (Funk, 1923) in the Gulf of Naples from autumn to spring, on algæ, tube-worms, and ascidians from sea-level down to 40 m. It was noted here in material collected by Mr. F. S. Russell and Mr. D. P. Wilson from a basin in Devonport Dockyard (December 22, 1931). The water there is relatively warm as it circulates through a cooling plant, and is only occasionally in communication with the sea. Figures kindly supplied by Mr. Russell show that on January 12, 1932, the average surface-temperature of the water ranged from 14°·25 C. at the intake of the cooling plant to 17°·25 C. at the outflow. The air temperature then was 10°·65 C. The only plant found was *A. Spirographidis*, which was growing on *Ciona intestinalis* and on the sides of the basin, forming a zone about a foot wide just below the surface. On June 10, 1932, it was very abundant on the sides, the average surface-temperature then being 24°·75 C. Finally, the writer (August 9, 1932) found it on *Alcyonidium gelatinosum* dredged from Plymouth Sound in 4–6 fathoms.

The deep red plants were very delicate and usually not more than 1 cm. high. Most of those collected in June were taller (up to 3·5 cm.); Schiffner only found small plants, but thought that they might grow larger. The bigger ones were either brick-red or straw-coloured with red-brown tips. There is a central axis of uncorticated cells with two opposite, unbranched pinnæ emerging just below the upper end of each cell, all in the same plane. Towards the apex a few pinnæ grow out to shoots repeating the structure of the axis. It is characteristic that at intervals a sequence of three or four axile cells bears pinnæ on one side only. In this it resembles *A. tenuissimum* Gardner*. Near the base of the plant a rhizoid frequently arises from the lowermost cell of each pinna.

In this material the axile cells varied in size from $45 \times 310\ \mu$ at the base to about $20 \times 60\ \mu$ in the central region, gradually becoming narrower and proportionately shorter towards the apex. The apical cell of the main shoot is about $7 \times 12\ \mu$, of uniform diameter with an obtuse tip. As in other species of

* Gardner (1927) has named this Pacific plant without reference to the fact that Schiffner (1916) had previously given the same specific name to *A. cruciatum* f. *tenuissima* Hauck, which he clearly showed to be a distinct species.



Antithamnion Spirographidis Schiffner.—Fig. 1. Portion of male plant with antheridial groups, ×285. Fig. 2. Single antheridial group, ×1160. Fig. 3. Young procarp; bearing-cell hatched, carpogonial branch-cells dotted, ×1160. Fig. 4. Cystocarp; gland-cells hatched, ×285. Fig. 5. Shoot with tetrasporangia, ×285. Fig. 6. Cruciately divided sporangium, ×495.

Antithamnion, gland-cells (fig. 4) with yellowish refractive contents occur, but only sparsely. They are most abundant on tetrasporic plants. Each is roughly hemispherical, about 15 μ in diameter, and is seated on one of the lower pinna-cells (usually not the basal one). Hyaline hairs of the Floridean type were sometimes found at the tips of the shoots; they were about 25–175 μ long. The cells throughout are uninucleate and have numerous parietal plastids, at first irregularly discoid, later elongated. In the larger June plants they formed long, very thin ribbons, which were almost colourless; the cells, however, contained many grains of Floridean starch.

Male plants were found in December. The antheridial branchlets are mostly secund on the adaxial face of the pinnæ, one to three developing from each of the lower cells (fig. 1). They are very small, about 20 μ long, with two to five axile cells, each of which may produce two to four antheridia (fig. 2). The contents of the latter escape through an apical split in the wall. No secondary antheridia were seen.

Female plants were found in August and December. The procarps develop near the apex of the branches (fig. 3). The bearing-cell corresponds to the basal cell of a pinna and has a four-celled carpogonial branch curving up round its side. Usually it also bears an apical hair-like cell or else a few pinna-cells. The trichogyne is short, often with a bulge at its base. The stages after fertilization were not seen, but the final result is as in other species (Kylin, 1923; Capt, 1930). The cystocarp (fig. 4) shows several globular gonimolobes in different stages of development, each attached by a sterile cell to a large central cell. The cells are not pigmented until the gonimolobe is nearly ripe. It then measures about 85–125 μ across. The cystocarp has no involucre, but several axile cells below it bear ternate pinnæ, which may curve round it.

Tetrasporangia were found in June and December. They are sessile and secund along the inner face of the lower pinna-cells, rarely more than five in sequence and often borne singly (fig. 5). Sometimes a single cell bears two sporangia in different stages of development. When ripe they are about $30 \times 50\ \mu$. The method of division may be tetrahedral or show variations towards the cruciate type (fig. 6). The spores are discharged through an apical longitudinal split in the wall. The same dehiscence is seen in *A. Plumula* Thur. and may be contrasted with the opening by a "hinged lid" in *Callithamnion*.

Höfler (1930) examined the resistance of red algæ to hypotonic sea-water and found that *A. cruciatum* Naeg. (from Naples) alone could endure prolonged immersion in fresh water. Plants of *A. Spirographidis* were therefore tested (June). In fresh water the cells swelled and burst in 10–15 minutes, but plants appeared quite unharmed after two days in sea-water diluted to a quarter

normal concentration and after four days in half concentration. They are therefore unusually resistant to hypotonic sea-water.

The alga was at first thought to be a variety of *A. cruciatum*, which is also found at Plymouth. Apart from the quaternate pinnæ, densely clustered round the apices, the stouter filament-cells and tapering apical cells distinguishing *A. cruciatum*, the two can always be separated by the gland-cells, borne on a single cell in *A. Spirographidis*, but partially encircled by several pinna-cells in the former (Nestler, 1900). Schiffner places *A. Spirographidis* near to the boreal *A. floccosum* Kleen, a much larger plant with pedicellate sporangia, but with similar branching and gland cells.

Like the nearly related *Antithamnionella sarniensis* Lyle (Westbrook, 1930) this alga is probably a fairly recent arrival at Plymouth. It is possible that it was brought to the dockyard on the hull of a vessel from the Mediterranean and flourished on account of the favourable temperature in the basin. The authorities desire to remove plant and animal life from the latter, but as the alga has also been found in the Sound it may persist there.

The writer's thanks are due to Miss C. M. Dickinson (Kew Herbarium) for obtaining herbarium specimens of *A. Spirographidis* (kindly loaned by Professor Schiffner) and to Mr. G. Tandy (British Museum) for confirming the identification. Special thanks are due to Dr. E. J. Allen for his permission to work at the Plymouth Laboratory.

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THE STANDING OF CERTAIN PLANTS IN IRELAND.

By R. Lloyd Praeger, D.Sc.

In the light of our present knowledge, a revision of the standing (as native or alien) hitherto accorded to certain members of the Irish flora is worth considering. One is inclined in this difficult matter to accept the judgment of those masters of Irish plant-

geography, David Moore and A. G. More. But in the seventy years which have elapsed since the compilation of 'Cybele Hibernica,' knowledge of the distribution and habitats of our plants has advanced far. Intensive work as published in several local floras, notably by Stewart, Colgan, and Scully, has resulted in many cases in a change in the status which was awarded in 'Cybele' to various plants, and the standing of some others now invites comment. I dealt recently with such a case in the matter of *Tamus* at Lough Gill*. The species selected below stand in the same category as *Tamus*, inasmuch as present knowledge suggests a partial or complete lifting of the ban which has hitherto excluded them from the rank of indigenous—truly native—plants.

Rosa stylosa Desv.

This rose is in Ireland known only in the form *systyla* Baker. It was first recorded in Mackay's 'Flora Hibernica,' 1836—"hedges near Cork; Mr. J. Drummond." Power's 'Botanist's Guide,' 1845, adds further Cork stations. The first note of doubt as to its being native was struck by Isaac Carroll in 'Cybele,' 1866—"on rocks at Myrtle-hill, near Cork! perhaps planted; I. C." After that the plant appears to have been lost sight of, and, apparently in the absence of fresh information, the editors of the second edition of 'Cybele' (1898) not only classed it as introduced, but relegated it along with a couple of undoubtedly alien roses to the Appendix as "not fully naturalized," with the comment "perhaps semi-naturalized about Cork." Having myself at that time no knowledge of the plant other than what is quoted above, I omitted it from 'Irish Topographical Botany' as apparently neither native nor naturalized; but in view of reports by R. A. Phillips on habitats in Limerick I inserted it in the Second Supplement (1929) with a ‡, and the comment "appears to be thoroughly naturalized." I now think that this does not fairly represent its standing. Miss Knowles, in her exploration of the Barony of Shanid, Co. Limerick, found it both along the shore of the Shannon and inland "in absolutely native surroundings" in a number of places. "In all of these," she writes (Irish Nat. 1907, 191), "it looks as native as the plants among which it is growing.... It is difficult to see why this rose should have been planted. To the uninitiated it looks just like any other ordinary Dog Rose; there is nothing remarkable about the flower, and it has nothing exceptional in the way of perfume or anything else to recommend it to gardeners." On asking Mr. Phillips for his opinion he wrote:—"With reference to *Rosa systyla* (*stylosa*), I am not well acquainted with that plant and have seen it only in a few places, including Foynes, Co.

* Proc. R. I. Acad. xli. B, 117–9 (1932).

Limerick, and between Bray and Enniskerry, never in Co. Cork, but I feel certain that it was not planted in any of those places. It seems always to occur in small quantity under circumstances and in habitats similar to those in which native species such as *R. sepium* and *R. rubiginosa* occur in their outlying stations. I am not aware that it (*stylosa*) is ever cultivated, even for budding or grafting purposes like some of the other species." The plant has been found also at Newcastle in S. Tipperary. Its range remains to be determined.

The opinion of these two excellent observers is to my mind quite convincing, and I feel no doubt that this rose should be reckoned as indigenous in Southern Ireland. Its British range (England south of the Wash–Severn line) and likewise its continental range (Germany and France) suggest that this western species should be native in Ireland.

Sedum dasyphyllum L.

As long ago as 1750, when the number of garden plants introduced into Ireland must have been small, Charles Smith * recorded this Stonecrop from "an old wall near Blarney Castle"—a record accepted by Wade (1804). Power's 'Flora,' 1845, added "walls at Sunday's Well, Cork: Mr. J. Drummond. On limestone rocks and walls at Broomfield, Midleton: Dr. Power." This mention of a rock habitat is of importance. In 'Recent Additions,' 1872, More adds "At Carrickshean, near Midleton, where it covers a range of limestone hills and appears quite wild; Rev. T. Allin"; and in 'Cybele,' ed. 2, R. A. Phillips adds "abundant and looking native on the Carrickshean hills." There are also some additional stations on walls in the same area. Interest centres in this Carrickshean station, and in the question as to whether the plant has spread to its several wall-stations from a native station here, or whether it reached both its wall and rock stations from gardens. In these days of rock-gardening, *Sedum dasyphyllum* is occasionally seen in cultivation, but one doubts if it offered attractions to earlier generations of gardeners. It has no medicinal reputation. On the other hand, we know how widely certain native plants of limestone rocks or of calcicole tastes have spread on lime-built walls—*Ceterach*, *Asplenium Ruta-muraria*, *Cystopteris fragilis*, *Parietaria*, for instance.

Sedum dasyphyllum is a plant of "Mediterranean" type, found in Central, S. and W. Europe, and in N. Africa, on rocks and walls. In Britain it is spread over England and southern Scotland, usually on walls, and its standing is regarded as doubtful. H. C. Watson is cautious about the plant: its recorded hill and rock stations, he says, are not satisfactory: if native, it is, as such, of restricted range. Many more recent English writers set it down definitely as alien.

* 'Ancient and Present State of the County and City of Cork,' ii. 355.

R. A. Phillips, whose opinion is especially valuable on account of his unrivalled knowledge of the Cork flora, looks on it as native on Carrickshean, whence it has migrated to walls—not *vice versa*; and I am inclined to agree with him. In that case it no doubt passed from the Continent across England, and in the latter region survives now mostly on walls.

The only other Irish locality where the plant is established is Ballinasloe in Galway, where R. A. Phillips reports it as "abundant on old walls and cottage roofs" (Irish Nat. 1924, 35). The fact that it appears to be here confined to the town and the absence of natural rock-habitats from which it might have spread leave no doubt that here it is an introduction.

Lysimachia nummularia L.

The Moneywort has long been a favourite garden-plant, but in Great Britain it is generally accepted as being native, though occurrence as an escape is naturally frequent. In Ireland, where also it is common in gardens, its treatment at the hands of the compilers of floras has been different. Moore and More, in 'Cybele Hibernica' (1866) attached to it the mark signifying "possibly introduced," and wrote "Hedgebanks and borders of streams and ponds, very rare, and often in suspicious situations." Most of the earlier-recorded stations quite justified suspicion as to the plant's standing. The editors of the 2nd edition (1898) marked it as certainly introduced. They say "River banks, lake shores, marshes, etc.; rare and nowhere native.... Nowhere thoroughly naturalized except in District XII" [N.E. Ireland]. The more correct description here given of the plant's prevailing habitat militates against its altered status, for lake shores and marshes are habitats where the alien element in the flora is at a minimum. Much field-work has been done since 1898. The range of the Moneywort has been greatly extended (to 25 out of the 40 Divisions) and, more important, many of the new stations lie about the larger lakes and rivers, where the plant often grows over wide areas among a strictly native vegetation. The central and west-central regions of Ireland prove to be its head-quarters (not the North-east), and there no one, unaware that the plant had been labelled as alien, would think of treating it otherwise than as indigenous. I may cite as typical habitats the shores of Lough Corrib, Lough Gill, Lough Ree, Lough Erne, Lough Neagh, and the banks of the rivers Suck, Barrow, Nore, Boyne, Bann, etc. In all these places it has a wide range, and often occurs in abundance in the wilder parts, and in most of these areas gardens are few. The plant would have to be capable of spreading at a phenomenal rate to have colonized all this ground from occasional introduction or escape since the uncertain, but not very distant, date when it might have been first brought as an ornamental plant to this

country. As to its power of spreading, this would not appear to be high. It is stated to produce seed but seldom—I have never seen such in Ireland,—and its habit of mostly growing interwoven among a mat of other plants, not in open or bare places, renders it less likely to be propagated by pieces broken off and floated to new habitats. I think the present evidence for its being native is much stronger than the evidence against, and I treat it as indigenous here as in Great Britain.

Cuscuta Epithymum Murr. and C. Trifolii Bab.

The Dodders are generally set down in Ireland as introduced with the seeds of some of the plants on which they prey, such as clover: but they are by no means always found in the farm-land, as would then be expected, many of their habitats being on sand-dunes or in sandy pastures near the sea, often remote from cultivation or houses, and where no seed is introduced; this applies particularly to *C. Epithymum*, of which indeed all the recorded Irish stations are on quite wild ground. A comparison of the two editions of 'Cybele Hibernica' would seem to confirm the remark appended to *C. Trifolii* in the second edition—"appears to have spread considerably in East Ireland" (which might be held to suggest recent introduction); but, as in the case of many other plants, this apparent spread may be due to more complete field-work. The Dodders are quite inconspicuous until late summer, and even then are easily passed over unless abundant. *C. Trifolii* appears to be distinctly commoner in Ireland than its ally; some of the older records are indefinite as to which form they refer. The range of the two as at present known appears to be: *C. Epithymum*—Mid Cork, Waterford, W. Donegal, Down. *C. Trifolii*—S. and N. Kerry, W. Cork, Limerick, Clare, Wexford, Wicklow, Dublin, Sligo, Louth—an entirely marginal distribution, it will be observed. Our two most critical local Floras (those of Scully and of Colgan) uncompromisingly set down the Dodder (in both cases *C. Trifolii*) as "alien"—a more emphatic judgment than the ‡ signifying "probably introduced," which the same writers used in the second edition of 'Cybele.'

Much the oldest record for Dodder in Ireland is that for "*Cuscuta major*" in Threlkeld's 'Synopsis,' 1726:—"This herb groweth in great Plenty on the dry sandy Banks near Mayden tower near Drogheda and grows like red Threads on the Tops of the low Grass." I do not know of any recent record from Mayden tower, but *C. Trifolii* flourishes on similar sandy ground close by at Baltray, on the opposite side of the Boyne-mouth. That the seeds are an occasional impurity of imported clover seed, etc., there is no reason to doubt; Barrington's Fassaroe record (see 'Cybele,' ed. 2) from clover fields and Hart's (*ibid.*) from vetches at Sutton point strongly to such an origin for the

plant so far as these stations are concerned; but it seems to me that the sand-hill and the sandy pasture records are in a different category, and represent the appearances of a somewhat sporadic native.

The trend of English Floras is to regard *C. Epithymum* as native there and *C. Trifolii* as alien. The plants are rather southern in their British range, as they are on the Continent.

Iris foetidissima L.

This is a plant which, even were it a quite widely spread native, would have its Irish standing much confused by the fact that, like many actual natives—e. g. *Meconopsis*, *Lavatera*, *Epilobium angustifolium*,—it is grown in gardens and shrubberies, whence it escapes to "wild looking" stations. The bulk of the widespread Irish stations for this *Iris* are without question of this type, but there are a few near Dublin which merit discussion. Walter Wade recorded it ('Plantæ Rariores,' 1804) from Ireland's Eye and Howth (as well as from Fassaroe and Ennis churchyard, very suspicious localities); and Hart found it on Lambay in 1881–2 on cliffs covered with vegetation, and in no other situation: it still grows on these cliffs, where Hart believed it to be native. On Howth, Hart found it very abundant on the Sutton side "looking native": it occurs also by cottages there. On Ireland's Eye it still flourishes on sandy banks: this island has an almost purely native flora, and the only buildings upon it are the medieval ruined church and a martello tower erected in Napoleonic times. It is these Lambay and Ireland's Eye stations that give one pause as to the plant's being an introduction into Ireland. Bird-sowing is, of course, a possibility in these cases, but that explanation is purely hypothetical; I am not even aware whether birds eat the scarlet seeds—they never did so in my garden, and I presume that the fruit is as poisonous as the other parts of the plant. *Iris foetidissima* is admitted as a native in England, and just across the Irish Sea, in Anglesea, Carnarvonshire, Cornwall, it occupies stations identical in character with these Irish ones—bushy cliffs and sand-hills. Its occurrence in eastern Ireland would be a quite natural extension of its West European range.

A very similar case is found in *Ligustrum*. The Privet occurs throughout this country, but the only present stations which appear above suspicion are cliffs and sands on the eastern side of Ireland, as on Howth and in Co. Waterford. In these stations there can be no doubt that it is indigenous. In Great Britain H. C. Watson considered it a naturalized plant save in chalk districts and on sea-cliffs.

Iris foetidissima is not even admitted to naturalized rank by Colgan ('Fl. Dublin') or by the editors of the second edition of 'Cybele Hibernica,' and is correspondingly treated by Stewart

for the N.E., and by Hart for Donegal, though they admit that in some places the plant "looks native"; and, while some of these local condemnatory judgments may be correct, I am inclined to think that the Dublin stations at least may well represent the last strongholds of an indigenous species.

In Europe the plant has a western range, and in Britain it is southern, as are most of the plants which in Ireland are characteristic of the eastern coast.

Allium Babingtonii Borr.

This plant differs from those discussed above in that it has no British or foreign reservoir from which it may have come as an introduction: its headquarters are in Ireland itself, along the west coast from Donegal (L. Swilly) to the Aran Islands. In Britain it is found only in Cornwall, where it is widespread, and is awarded native rank in Davey's 'Flora' (1909). Elsewhere it appears to be unknown. If human influence has had anything to do with its present range, it is more likely to have been brought from Ireland to Cornwall than from Cornwall to Ireland, where it is found on coasts and islands for a length of 150 miles. It might be suggested that it is a form derived in gardens from *A. Ampeloprasum*, to which it is allied, and of which some botanists consider it a variety: but I think there is little likelihood of a vigorous and permanent form like this, distinct enough to be ranked as a species, having been produced in cultivation. Unless we can discover an origin for it other than a natural one, the plant must rank as indigenous. In Ireland it has hitherto generally been set down as probably introduced.

In the case of all the plants discussed above, the problem involved is the disentangling of the aboriginal flora of the low grounds from the adventive flora. It is on the low grounds with their rich soils that human influence is at its maximum, and it is there also that the native flora was formerly at its maximum. The native species have had their range in most cases greatly curtailed, though some compensating advantages such as the abundance of mortar-built walls have been introduced. The adventive flora—weeds, casuals, garden-plants, etc.—is on the lower grounds particularly abundant and aggressive. But one general law, as true in the Antipodes* as it is here, stands out—the introduced flora, of whatever kind, finds great difficulty is assimilating with the native flora. Adventive plants are, almost without exception, confined to ground interfered with by man. When we find a plant growing among a purely native flora, there is a strong presumption that it is native. And if its general range offers no obstacle to this view, and if we fail to find evidence of introduction, the case is strengthened. If at

* See G. M. Thompson, 'The Naturalisation of Animals and Plants in New Zealand.' Cambridge, 1922.

the same time the plant is also found in cultivation, we have to consider alternatives—that it is an adventive species which has run wild, or that it is a native plant which has been brought into gardens, etc., or has spread to places such as hedge-rows by natural means. It is at least as reasonable to hold an accused person innocent till proved guilty, as guilty till proved innocent. In the case of doubtful plants of the lowlands it is mostly impossible to *prove* either native or adventive origin.

On the evidence (to return to the seven plants dealt with above) I think that *Rosa stylosa*, *Lysimachia Nummularia*, the Dodders, and *Allium Babingtonii* must be ranked as natives. The cases of *Sedum dasyphyllum* and *Iris foetidissima* are not so clear, and these are best marked for the present † (*i. e.*, possibly introduced)—which also of necessity signifies probably native.

I would state my belief also that the following species, marked † in 'Cybele Hibernica,' ed. 2, are certainly native in some or all of their Irish stations, and must rank as indigenous plants:—*Viola odorata*, *Trifolium subterraneum*, *T. glomeratum*, *Prunus Avium*, *Rosa rubiginosa*, *R. micrantha*, *Pyrus Malus* (*acerba*), *Sisyrinchium angustifolium*, *Juncus macer* (=*tenuis*). Also two species relegated in that work to the Appendix, according to the information available in 1898, namely *Leucojum aestivum* and *Brachypodium pinnatum*.

SYNOPSIS OF THE EUROPEAN SPECIES OF *POGONATUM* AND *POLYTRICHUM*.

By J. H. Albrecht.

(With Illustrations by W. R. Sherrin.)

This synopsis has been written with the view of inducing British bryologists to take an increased interest in these highly critical plants. It is quite likely that other European species, hitherto unrecorded for Britain, are yet to be found, especially *P. formosum* subsp. *decipiens* in the highlands of Scotland and *P. commune* subsp. *Jensenii* in the margins of ponds. Mr. W. R. Sherrin was the first to discover *P. commune* subsp. *Swartzii* on Chobham Common (Surrey) in 1923, the determination of which has been confirmed by Dr. Hj. Möller. The plant has since been found in other countries, and would appear to be not uncommon in our swamps and bogs.

My grateful thanks are due to Mr. H. N. Dixon, Dr. Hj. Möller, Mr. J. B. Duncan, and Herr L. Loeske for supplying specimens. Also to Mr. W. R. Sherrin for his useful illustrations and for several suggestions, particularly as to the best way of elucidating certain points.

Classification.—After some consideration I feel that it is unnatural to separate *Pogonatum* from *Polytrichum*; the chief

difficulty is where to draw the dividing-line. There are several characters in the sporophyte to choose from, two of which have already been used by various authors; but, as plants are thus artificially separated from their allies, I have rejected the whole system on principle. The mode I have followed is that of first placing the plants in natural groups and then looking for separating characters. This I believe is the method adopted in the

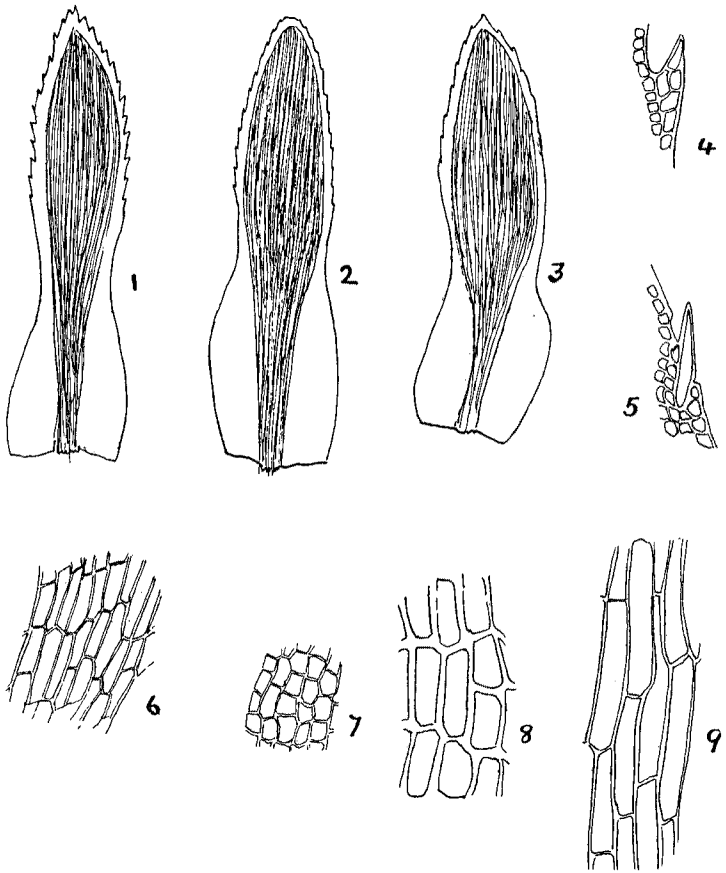


Fig. 1.—1–3, leaves: 1, *Polytrichum aloides*; 2, subsp. *Briosianum*; 3, subsp. *nanum*. 4, serrature of Section I.; 5, spine of Section II. 6–9, basal cells: 6, *P. urnigerum*; 7, subsp. *capillare*; 8, *P. gracile*; 9, *P. formosum*. All magnified.

Natural System of classification for flowering plants, as distinct from the older and more artificial Linnæan system.

I find that the combined species of *Pogonatum* and *Polytrichum* fall into three sections, according to the nature of the leaf-margin;

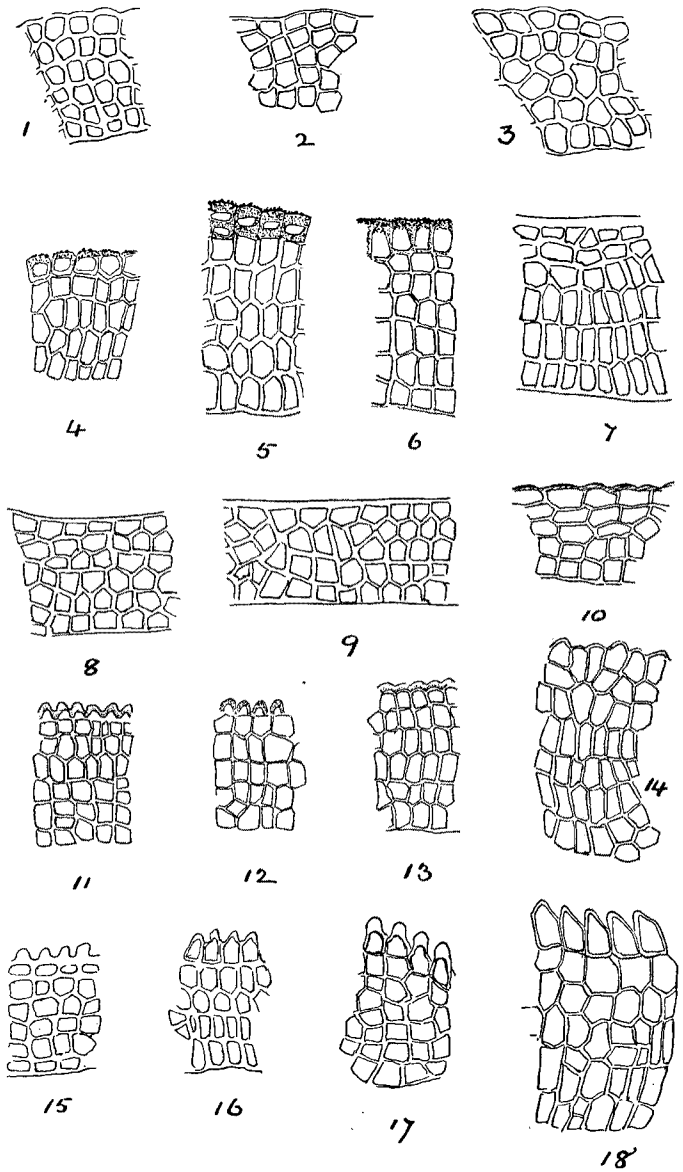


Fig. 2.—Side view of lamellæ: 1, *Polytrichum aloides*; 2, subsp. *Briosianum*; 3, subsp. *nanum*; 4, *P. urnigerum*; 5, subsp. *capillare*; 6, *P. alpinum*; 7, *P. norvegicum*; 8, *P. gracile*; 9. *P. formosum*; 10, subsp. *decipiens*; 11, *P. commune*; 12, subsp. *Jensenii*; 13, subsp. *perigoniale*; 14, subsp. *Swartzii*; 15, *P. juniperinum*; 16, subsp. *strictum*; 17, *P. piliferum*; 18, subsp. *hyperboreum*. All magnified.

and these may be divided again, so that five subsections result, each consisting of species related to one another within the subsection, but having no close allies without.

If I have paid more attention to the characters of the gametophyte than to those of the sporophyte, it is because the vegetative characters seem to ensure a more natural grouping. In this genus, at any rate, more importance has formerly been attached to the sporophyte than is justified in practice. That the old group of cleistocarpous mosses can no longer be maintained is a further case in point.

Most species may be determined by the side view of the lamellæ, after these have been scraped from the lamina. This was first noticed by Limpricht; but it was Sherrin who first published a formal key based on this character (Journ. Bot. 1918, 105). The following preliminary key is a revision and an enlargement of his system; but I have preferred to retain the species in their natural order, so that the key is actually a skeleton of the synopsis which follows it:—

Preliminary Key to the Species and Subspecies.

Section I. Margins of lamina serrate; teeth multicellular (rarely undeveloped); elamellose cells not differentiated.

Subsection A. Upper margin of lamellæ crenulate, not thickened.

a. Lamina sharply serrate from the base upwards; apex acute ..... 1 A. *P. aloides.*
b. Lamina sharply serrate from the base upwards; apex obtuse ..... 1 B. Subsp. *Briosianum.*
c. Lamina with blunt teeth, only in the upper half ..... 1 C. Subsp. *nanum.*

Subsection B. Upper margin of lamellæ straight, forming a strongly thickened roof.

Series *. Border-cells of lamellæ finely papillate, yellowish.

d. Border-cells broader than high (rounded in cross-section) ..... 2 A. *P. urnigerum.*
e. Border-cells broader than high (truncate in cross-section) ..... 2 B. Subsp. *capillare.*
f. Border-cells higher than broad..... 3. *P. alpinum.*

Series **. Border-cells of lamellæ smooth.

g. Lamina quite entire ..... 4. *P. norvegicum* [(*P. sexangulare*).

Section II. Margins of lamina spinose; spines unicellular (rarely undeveloped); elamellose cells not differentiated.

Subsection C. Sheaths on the stem dull green.

h. Lamellæ 5–7 cells high; margin straight, not thickened ..... 5. *P. gracile.*
i. Lamellæ 3–5 cells high; margin straight, not thickened ..... 6 A. *P. formosum.*
j. Lamellæ 5–6 cells high; margin crenulate and thickened ..... 6 B. Subsp. *decipiens.*

Subsection D. Sheaths on the stem whitish above to a metallic-brown below.

Series *. Upper margin of lamellæ crenate and doubled; furrow deep.

k. Lamina sharply spinose from the base upwards ..... 7 A. *P. commune.*
l. Lamina entire below, weakly spinulose above ..... 7 B. Subsp. *Jensenii.*

Series **. Upper margin of lamellæ crenulate only; furrow shallow.

m. Upper margin of lamellæ thickened as well as doubled ..... 7 C. Subsp. *perigoniale.*
n. Upper margin of lamellæ scarcely thickened or doubled ..... 7 D. Subsp. *Swartzii.*

Section III. Margins of lamina entire and broadly inflexed; elamellose cells differentiated (vermicular)—if not, see Sections I. and II.

Subsection E. Upper margin of lamellæ deeply crenate; border-cells with a cartilaginous apical thickening.

Series *. Leaf-arista short and red.

o. Lumen of the border-cells of the lamellæ well below the crenate projection ..... 8 A. *P. juniperinum.*
p. Lumen of the border-cells included in the projection ..... 8 B. Subsp. *strictum.*

Series **. Leaf-arista long and hyaline, piliform.

q. Cartilaginous thickenings tooth-like, half the height of the border-cells..... 9 A. *P. piliferum.*
r. Border-cells of the lamellæ only slightly thickened at the apex ..... 9 B. Subsp. *hyperboreum.*

Synopsis of the Genus *Polytrichum* Dill.

Leaves differentiated into lamina and sheath (without border of narrow cells); margins serrate or entire; lamellæ usually numerous, straight, on the upper surface of the lamina. Capsule round or angular in cross-section, with or without apophysis and stomata, porose or aporose. Calyptra covered with deflexed hairs.

The cells of the lamina are of two kinds: (1) quadrate lamellæ-bearing medial cells (similar in form to the dorsal cells of the nerve); (2) elamellose marginal cells (one to several rows), which in toothed leaves are similar to, but in entire leaves are (vermicular) differentiated from, the quadrate lamellæ-bearing cells. The breadth of the quadrate cells increases towards the nerve, and the areolation as a whole tends to widen as the breadth of the elamellose margins increases. The teeth in some species are serrate (really saw-like) and multicellular, in others spinose and unicellular.

The colour of the sheaths on the stem will distinguish between hygrophilous and xerophilous species. The sheaths of swamp mosses impart a marked metallic shine to the stems, whitish above to coppery brown below. In the xerophytes the sheaths on the stem are dull green. This character will be found useful in the field, as swamps often dry up during the summer months,

and woodland mosses are sometimes found on damp open ground.

The areolation of the sheath shows three differentiations: (1) at the shoulders and just above a network of small, quadrate, granulose cells; (2) bordering the shoulders a few rows of very narrow hyaline cells forming membranaceous edges; (3) elongate basal cells beginning as subquadrate medial cells, and, in creeping down, spreading to occupy the whole breadth of the sheath, becoming longer below and narrower towards the margins. The length of these basal cells is dependent upon the length of the sheath, which in some species is invariably short with consequent only shortly elongate or even subquadrate basal cells; whereas in other species the length of the sheath and with it the basal cells are subject to wide variation. The comal leaves, as too the perichætial bracts, always have longer sheaths than the stem-leaves.

The perichætial bracts are found at the apex of the female stems within the comal leaves, which they sometimes resemble though they are more usually specialized in certain ways. The sheaths are abnormally long, as long as or even longer than the lamina, which is generally reduced in length while the arista is prolonged. Two types of perichætial bracts may be distinguished: (1) *lamellose*, bearing lamellæ as in the normal leaf, though usually with subentire to entire margins; (2) *membranaceous*, without lamellæ (except for an occasional few confined to the region of the nerve), and with white membranaceous edges.

The lamellæ are unistratose plate-like structures that grow lengthwise on the lamina and assume the functions of the leaf proper; hence the cells of the lamellæ contain chlorophyll, while the elamellose marginal cells of the lamina are without it—though occasionally in forms of *P. gracile*, where the margins are sometimes very broad, one finds these cells with chloroplasts and a tendency for the differentiation into lamina and sheath to disappear. The height of the lamellæ in the different species varies within certain limits; they are always 1–2 cells higher on the nerve than towards the margins of the lamina.

Sporophyte.—The vegetative characters are really quite sufficient to distinguish the various species; but I have thought it necessary to describe the exothecium cells and the size of the spores (Limpricht's measurements, where available), as a variation in these characters will generally indicate a hybrid in the sporophyte. The exothecium cells may each be surmounted by a pore-like thinning at the apex. These pores are sometimes quite large, and were used as a separating character by Limpricht; but owing to their variability they can hardly be of much practical assistance—hence I have ignored them.

(To be continued.)

NEW MOSS RECORDS.

1. New Vice-County Records for Sphagna, mostly North Country.

By A. Thompson.

Sphagnum fimbriatum Wils. var. *robustum* Braithw.; damp ground in wood, Hodders Combe, Quantocks; v.c. 5. Var. *validius* Card. and its f. *compactum* Warnst.; same as last. Var. *tenue* Grav.; wet ground among trees, Skipwith Common; v.c. 61.

S. Girgensohnii Russ. Moel Siabod, N. Wales; v.c. 49.

S. Warnstorfii Russ.; wet ground, Skipwith Common; v.c. 61.

S. compactum DC. var. *imbricatum* Warnst.; Moel Siabod, N. Wales; v.c. 49.

S. strictum Sulliv.; Moel Siabod; v.c. 49.

S. squarrosum Pers. var. *spectabile* Russ.; marshy ground, in wood, Hodders Combe, Quantocks; v.c. 5.

S. amblyphyllum Russ. var. *mesophyllum* Warnst.; marshy moor, Yorks, side of Tees, High Force; v.c. 65. Var. *macrophyllum* Warnst.; marshy ground, head of Scandale; v.c. 69; and marsh, Skipwith Common; v.c. 61.

S. pulchrum Warnst.; marsh, Skipwith Common; v.c. 61.

S. recurvum P. Beauv. var. *majus* Ångstr.; marsh, Skipwith Common; v.c. 61.

S. fallax von Klingg. var. *laxifolium* Warnst., wet ground, Tarn Hows, Lake District; v.c. 69.

S. cuspidatum Ehrh. var. *plumulosum* Schimp.; marsh, Skipwith Common; v.c. 61.

S. obesum var. *sanguineum* Warnst.; submerged in pool, head of Hodders Combe; v.c. 5.

S. subsecundum var. *intermedium* Warnst.; pool, Skipwith Common; v.c. 61.

S. inundatum Warnst. var. **robustum** (Warnst.), comb. nov.; pool, Skipwith Common; v.c. 61; and submerged, pool, Coniston Old Man; v.c. 69. Var. **densum** (Warnst.), comb. nov.; submerged in pool, Loughrigg; v.c. 69. Var. *lancifolium* Warnst.; pool, Skipwith Common; v.c. 61.

S. auriculatum Schimp. var. *laxifolium* Warnst.; pool, Skipwith Common; v.c. 61. Var. *canovirescens*; boggy ground, Hopcott Hill, Minehead; v.c. 5. Var. *plumosum* Warnst.; pool, Skipwith Common; v.c. 61.

S. aquatile var. *remotum* Warnst.; same as last. Var. *plumosum*; same as last.

Mr. W. R. Sherrin very kindly corrected my naming of these plants. v.c. numbers:—5, S. Somerset; 49, Carnarvon; 61, South-east Yorks; 65, North-west Yorks; 69, Westmorland with N. Lancs.

2. New Moss Records for Moray and Inverness.

By H. B. Gilliland, B.Sc.

While on holiday in Morayshire the writer made a fairly comprehensive collection of the mosses in the neighbourhood of Grantown-on-Spey. Some 122 specimens were gathered comprising 68 species and varieties.

Mr. W. R. Sherrin kindly undertook the naming of these specimens, and subsequent investigation has shown that they include five new records for Moray (v.c. no. 95) and one for Easterness (v.c. no. 96), which are listed below.

With few exceptions they are fruiting specimens, this being of particular interest in the case of *Tetraphis pellucida* Hedw. and *Hylocomium splendens* Br. & Schimp., which do not fruit commonly in Britain. These bear the following notes:—Gilliland no. 24: "Under an overhanging bank in the pinewoods along the river Spey, 6. viii. 33." And no. 105: "Overhanging the edge of a shaded gully near Grantown-on-Spey, 22. viii. 33."

A specimen of *Fissidens decipiens* De Not. (Gilliland, no. 92, "In rock crevices in a damp shady gully cut by a stream in sandstone, North of Grantown-on-Spey, 22. viii. 33") was interesting, inasmuch as a Blue-green Alga (probably *Nostoc muscorum* Ag.) occurred as a commensal between the stipule and leaf proper.

Specimen no. 76. *Brachythecium plumosum* Br. & Schimp., "On a damp boulder in the spray of a small waterfall, Lord Huntley's Cave, Grantown-on-Spey, 19. viii. 33," was particularly interesting in having a smooth seta.

Polytrichum formosum Hedw. Gilliland, no. 10. "On a boulder in the shade of a birch. High up on Viewpoint Hill. Grantown-on-Spey, 2. viii. 33"; v.c. 95.

P. alpinum Hedw. Gilliland, no. 42. "Growing as a large patch at the side of a burn at the foot of the Cromdale Hills, 6. viii. 33"; v.c. 95.

Grimmia Doniana Sm. Gilliland, no. 68. "Growing on the top of a wall in a clearing in the pine forest. Grantown-on-Spey, 13. viii. 33"; v.c. 95.

Bryum bimum Schreb. Gilliland, no. 61. "In the well of the target-butt, rifle range, Grantown-on-Spey, 13. viii. 33"; v.c. 95.

Hypnum uncinatum Hedw. var. *plumulosum* Schimp. Gilliland, no. 71, "In pinewoods near Grantown-on-Spey, 18. viii. 33"; no. 72, "On a wall-top, north of Grantown-on-Spey, 18. viii. 33"; and no. 110, "On the stump of a fallen birch-tree in pine forest near the River Spey, 25. viii. 33"; v.c. 95. An unmistakable plant that is not yet recorded further north than vice-county 89.

Cynodontium Jenneri Schreb. Gilliland, no. 44. "On a bank in pine forest near Loch-an-eilan, Inverness-shire, 13. viii. 33"; v.c. 96.

The specimens have been presented to the Cryptogamic Herbarium of the British Museum of Natural History, and, so far as possible, duplicates to the Cryptogamic Herbarium of the Royal Botanic Garden, Edinburgh.

OBITUARY.

Dukinfield Henry Scott

(1854–1934).

The death of Dr. Scott on January 29 removes a very familiar figure from botanical circles, and perhaps our best-known and most eminent surviving exponent of the science. He was active to the last and still frequently attended the Linnean Society's meetings; he was present on January 4, and, as senior member, presided, in the absence of the President, at the Club dinner which followed; he was in excellent form and proudly referred to his recent entry on his 80th year. He had driven up from his home at East Oakley in Hampshire and was returning the same night.

A few years ago when commenting on the difficulty in obtaining accurate information for obituary notices, I jokingly suggested that individuals might supply material in advance. He replied "All right! I'll send you some." It came, with a characteristic note (April 28, 1928):—

"My dear Rendle, I enclose the notes you asked for, together with a copy of 'German Reminiscences,' which fills a gap. You must make what use of them you find best (when the time comes!). I have never had to write my own obituary before, so please excuse shortcomings!" His friends will like to read it, so I give it practically as he wrote it:

"I was born in London, November 28, 1854, the son of George Gilbert Scott, afterwards Sir Gilbert Scott, R.A. [the famous church-architect]. My great grandfather was the Rev. Thomas Scott, the commentator, a leader of the old Evangelical

party of those days. I was educated at home by tutors, never went to school of any kind. Was at first very keen on history and read a great deal. Took to botany in the summer of 1868, on the advice of my mother (*née* Caroline Oldrid), who had learnt it as a girl on the old Linnean System. Began with field botany; soon became interested in structure, much owing to the 'Micrographic Dictionary' of Griffith and Henfrey. This put me on the track of more original books, such as Berkeley's 'Cryptogamic Botany' and especially translations of German works. I first read Braun's 'Rejuvenescence in Nature'; then Mohl on the 'Vegetable Cell,' Nägeli's papers on the cell and cell-formation translated in the Ray Society's 'Reports and Papers on Botany,' 1845 and 1849, and last, not least, Hofmeister on the Higher Cryptogamia, translated by F. Currey. I owe much to those who made the great works of the German botanists accessible to English readers. This was all in 1869 and early 1870. At the same time I was using the microscope so far as I could without any training. Freshwater Algæ were my chief joy—I still think them the best possible introduction to scientific botany. Seaweeds were occasionally observed and some of the easier parasitic Fungi, chiefly Rusts. I was a great enthusiast at that time.

"My botanical work then suffered a long interruption. I was at Christ Church, Oxford, from 1872 to 1876, when I read for Pass 'Mods.' and Honours 'Greats.' Subsequently I spent three years as an engineering student. Neither of these periods was quite wasted. I value immensely the little I learnt of the Classics, and some knowledge of mechanical things was also useful afterwards.

"It was not till the autumn of 1879 that I began to think of returning seriously to Botany. This was at the suggestion of a great friend of mine, Thomas Stevens. I also received encouragement from some other friends, notably from Fletcher Moulton, afterwards Lord Moulton (a college friend of my eldest brother's), who gave me an introduction to Sir Joseph Hooker. Through him I met Thiselton-Dyer, who strongly advised me to go to work in Germany. This was the turning point in my career. I also consulted Vines, who proved most stimulating and helpful. I worked hard at German for about three months, and when I went out to Würzburg at the end of February 1880 was able to follow a lecture in German pretty well."

Scott's "German Reminiscences of the Early 'Eighties" in the 'New Phytologist,' March 1925, give an interesting and humerous insight into University life at Würzburg, where he worked under Sachs and his Assistant, Goebel, from February 1880 to July 1881, when he was awarded the Ph.D. The subject of his thesis was the development of articulated laticiferous vessels; it was published in the 'Arbeiten des botanischen

Institut in Würzburg,' ii. 1882 (without the figures, which Sachs cut out), and a translation (with a plate) subsequently appeared in the 'Quarterly Journal of Microscopical Science' (xxii. n.s., 1882). Scott returned to Würzburg for July and August 1882 and worked at a small physiological problem. A fellow-worker was Walter Gardiner, who was beginning his investigations into the continuity of protoplasm. Though an enthusiastic believer in the German influence on the development of English Botany in the latter half of the nineteenth century, Scott remarks "I think, perhaps, we may have been almost too German at that time; we scarcely gave enough attention to French work, for example." The chief characteristic of German university life, as he saw it, was the dominance of research over mere learning.

To continue the autobiography. "My teaching career began in May 1882, when I succeeded Bower as assistant to Prof. Daniel Oliver at University College. I acted as Demonstrator; the Professor, fully occupied at Kew as Keeper of the Herbarium, was only able to spare an early morning hour for his lecture. As a matter of fact, I never saw him at the College at all, my work not beginning before 10. I think it was in 1884 that I first gave any lectures, an advanced course. In May 1885 I was rather suddenly transferred to the Royal College of Science, South Kensington, again following in Bower's steps. My first duty was to take on the small advanced class, then meeting in the Jodrell Laboratory at Kew. Early next year I began my regular courses at South Kensington, and continued this work till the summer of 1892. I was nominally Assistant-Professor under Huxley, with sole charge of the botanical teaching. In 1892 I gave up regular teaching and became, at Thiselton-Dyer's suggestion, Honorary Keeper of the Jodrell Laboratory at Kew. I remained there for fourteen years, the most active time of my life.

"I first met Williamson in 1889, at the British Association meeting in Newcastle. Six months later I went with Bower to Manchester and we spent many hours in Williamson's 'Coal-hole,' as he called it, examining his wonderful slides of fossil plant-structure. It was a revelation to me, and I became converted to Palæobotany on the spot, and returned in a state of enthusiasm, rivalling that of my boyish days, twenty years before. Williamson's removal to London about coincided with my appointment at Kew, and in the autumn of 1892 our joint work started. Williamson used to come over to the Jodrell at intervals and we had lively discussions over the questions that arose as we examined his slides. The visits became less frequent as Williamson's health failed, but we produced three joint papers in the 'Philosophical Transactions.' After his death in June 1895, I set myself to continue his work, and have

endeavoured to do so ever since. There is no need to dwell on the details of which the published papers are a sufficient record.

" I left Kew in 1906 and settled in the country, where I have since been doing a fair amount of work. Both while at Kew and since my retirement I have occasionally given lectures or courses of lectures. The most important were my first course at University College (1896), which formed the basis of my 'Studies in Fossil Botany'; and a course at Aberystwyth in 1922, which appeared in the form of my 'Extinct Plants and Problems of Evolution.' For a good many years [1912–1921] I was one of the Editors of the 'Annals of Botany.'

" It would be ungrateful to the Societies which have honoured me not to add that I have been the fortunate recipient of four medals. From the Royal Society, a Royal Medal (1906) and the Darwin Medal (1926); the Linnean Society's Gold Medal (1921) and the Wollaston Medal of the Geological Society (1928). My membership of foreign and other Societies is sufficiently recorded in the Royal Society List. I most value the honour of being a Correspondent of the French 'Académie des Sciences.' "

Though Scott will be remembered chiefly as the architect of modern British palæobotanical study, he had a wide interest in botany, as is shown, for instance, in his able presidential addresses to Section K at the meetings of the British Association at Liverpool in 1896, "The Present Position of Morphological Botany," and at Edinburgh in 1925, "The Present Position of the Theory of Descent in relation to the Early History of Plants." Physiology had little attraction for him. The two volumes of his 'Introduction to Structural Botany' (1894 and 1896), based on the study in detail of a few selected plants, and products of his teaching period, are admirable elementary text-books and have run through many editions; these and his classic 'Studies in Fossil Botany' (1900) are models of exposition and clear easy literary style.

He did not lose his first love for field-botany. He knew the plants of his own district, and as recently as November last this *Journal* published a note by Mr. Dymes recording visits under Scott's guidance to a Hampshire locality of *Euphorbia Cyparissias*. His earlier papers, published during his time at South Kensington, continued his early anatomical work—"Laticiferous Tissue in *Manihot* and *Hevea*" (Q. J. M. S. 1884), "Laticiferous Vessels in *Hevea*" (Journ. Linn. Soc. (Bot.) 1886), "Distribution of Laticiferous Tissue in the Leaf" ('Annals of Botany' iii. 1889–90); followed by more general anatomical studies, such as "Recent Progress in our Knowledge of Plant Anatomy" (Ann. Bot. iv.), "Origin of Polystely in Dicotyledons" (Ann. Bot. v.), and "Anatomical Characters of the Cycadaceae" (Ann. Bot. xi.). He was thus unconsciously preparing himself for the more difficult work on the interpretation of the anatomy of fossil plants, initiated, as he

has told us, by his association with Williamson. The three joint papers with Williamson in the 'Philosophical Transactions of the Royal Society' (1895, 6) were entitled "Further Observations on the Organization of the Fossil Plants of the Coal Measures"—the first two dealt with *Calamites* and other genera, the third with *Lyginodendron* and *Heterangium*. These were followed by a long series of communications in the 'Annals of Botany' and in the publications of the Royal and Linnean Societies, mainly under his own name, but in part in association with younger workers whom he had inspired to explore the new avenues indicated by himself. Especially notable were the results of his joint work with F. W. Oliver on palæozoic seeds, which opened up the study of a new group of plants of the greatest interest. His paper on *Lepidocarpon* showed that certain lycopod cones of the Coal Measures bore seeds, and that on *Botrychioxylon* revealed the existence of secondary wood in a palæozoic fern. Other important publications dealt with the fertile organs of the Sphenophyllales, especially the extraordinarily complicated cone *Cheirostrobus*. In his latest independent paper, on *Archaeopitys* (1933), he returned to one of a series of well-preserved American Lower Carboniferous plants which he had described with Prof. E. C. Jeffrey some twenty years earlier.

His addresses to Scientific Societies, such as those already mentioned at the British Association meetings, included carefully prepared and suggestive reviews of present knowledge, such as those to the Royal Microscopical Society—"What were the Carboniferous Ferns?" (1905) and "Flowering Plants of the Mesozoic Age in the Light of recent Discussion" (1907).

The various offices that he held also indicate his interest in the advancement and spread of science. He was twice President of the Botany Section of the British Association, at Liverpool in 1896 and at Edinburgh in 1921, and from 1901–3 was General Secretary. From 1902–8 he served the Linnean Society (which he had joined in 1880) as Botanical Secretary and from 1908–12 as President; from 1885 onwards he had served repeatedly on the Council. He was Foreign Secretary of the Royal Society from 1912–16 (he had been elected to the Fellowship in 1894). Also President of the Royal Microscopical Society from 1904–6. The work of local Natural History Societies also claimed his interest. In 1909 he presided over the Annual Congress of the South Eastern Union of Scientific Societies at Winchester, and also attended other of the annual meetings. In 1905, with Mrs. Scott, he took part in the International Botanical Congress at Vienna, a memorable meeting, where he read a paper, on a palæobotanical subject, in German, but admitted with regret that he had quite lost the power of following a German lecture.

At the International Botanical Congress at Cambridge in 1930, when for the first time there was a palæobotanical section,

Scott, as the doyen of palæobotany in Europe, was selected as President.

Scott's collection of slides was bought by the Trustees of the British Museum in 1923 *, where, in the Department of Geology, they form an invaluable continuation of the Williamson collection purchased nearly thirty years previously.

He married in 1887 Miss Henderina Victoria Klaassen, who shared her husband's botanical interests and was often his companion at scientific meetings. At the close of the autobiographical notes quoted above, Scott writes :—" My wife has greatly helped me in my work." Mrs. Scott died on January 18, 1929 (see this *Journal*, 1929, 57). Of a large family four daughters survive ; a son was killed in the Great War. Dr. and Mrs. Scott were charming hosts, and many botanists have enjoyed the hospitality of their beautiful home and garden at East Oakley.

Scott had an engaging personality. A somewhat confiding manner in conversation gave his listener a pleasant impression of being consulted, and an infectious chuckle was prone to lighten argument. He was not a fluent speaker, but he chose his words well and made his points effectively. At scientific meetings, such as those of the Linnean Society where he will be greatly missed, his comments on papers read or his contributions to discussion were to the point and always helpful.

He died at his home at East Oakley on January 29, after a short illness. His ashes were buried on February 1 in the same grave with his wife in the churchyard of St. Leonard's, Oakley. A number of botanists representing various Societies and Institutions, and other friends, attended the service, which was in part conducted by his friend the Rev. Prof. M. C. Potter. With his passing we mourn the loss of one of the makers of modern British botany.

A. B. RENDLE.

REVIEWS.

The Greek Herbal of Dioscorides illustrated by a Byzantine, A.D. 512. Englished by JOHN GOODYER, A.D. 1655. Edited and first Printed A.D. 1933. By ROBERT T. GUNTHER, M.A., Hon. LL.D. Roy. 8vo, pp. xii. 701, with 396 illustrations. Printed by John Johnson for the Author at the University Press : Oxford, 1934. Price £3 3*s*.

" CAST thy bread upon the waters "—the remainder of the quotation does not apply, for old John Goodyer, who went " bearing forth the seed," had not the joy of returning with his sheaves.

* Mr. W. N. Edwards informs me that it contains 3185 slides, more than 3000 of which are of Carboniferous plants. Over 400 of the slides had been figured, and others have been figured since by Scott and others. The collection was accompanied by a full manuscript catalogue and also a complete card-index.

It has been left for Dr. Gunther to " find it after many days." Goodyer's manuscript translation, with his fine botanical library, came, on his death in 1664, to Magdalen College, Oxford, and there " it has remained unnoticed and unused by generations of classical tutors who, in lectures on the classics, have preached the sterile joys of reading dead languages in the original, rather than the duty of making the contained information available to their fellow-countrymen."

Fortunately Dr. Gunther has now combined in this chaste and remarkably interesting volume Goodyer's translation of the text of the ' Materia Medica ' of Dioscorides, with reproductions of the drawings by which it was illustrated in the Vienna ' Codex Aniciæ Julianæ,' a beautiful photographic facsimile of which was published at Leyden in 1906.

Dioscorides of Anazarba in Cilicia compiled his ' Medicinall Matter ' in the first century A.D. Latin, French, German, Italian, and Spanish translations have appeared from the sixteenth century onwards. But though, as Dr. Gunther points out in his Preface, the work has been the chief source whence, for fifteen centuries and more, herbalists of all nations have drawn their inspiration, yet no English translation has hitherto been published. John Goodyer, in order to make the text available for his fellow-countrymen, between the years 1652 and 1655 laboriously wrote out the entire Greek text with an interlinear English translation on 4,540 quarto pages ; a photographic reproduction of his manuscript of the first page of the fourth book (dedicated, as is the whole work, to the " best beloved Areius ") forms the frontispiece to the volume. But, perhaps because he failed to find a patron, Goodyer's work has, up to the present time, never been printed.

In his Introductory dedication to Areius, by whose advice the compilation was undertaken, Dioscorides comments on the imperfections, omissions, and inaccuracies of " many writers of modern times, as well as of antiquity," who " have composed Treatises on the preparation, power and testing of medicines." For himself " having travelled much (for you know that I led a soldier's life) " he craves attention to the industry and experience he has brought to bear in the matter ; " with very accurate diligence, knowing most herbs with mine own eyes . . . . we will endeavour both to make use of another arrangement, and also to describe the kinds and forces of every one of them." Shrewd advice is also given for the proper gathering of herbs. Nature of the locality must be noted and the plant should be studied in its various stages of growth, " the man who will observe his herbs oftentimes and in divers places will acquire the greatest knowledge of them."

The ' Medicinall Matter ' is presented in five books, respectively entitled ' Aromatics, Oils, Ointments, Trees,' ' Living

Creatures, Milk and Dairy Produce, Cereals and Sharp Herbs,' 'Roots, Juices, Herbs,' 'Herbs and Roots,' and 'Vines and Wines, Metallic Ores.' The text is practically as Goodyer left it, except for certain needful changes in punctuation and order of words to make their meaning clearer.

There is good internal evidence that the illustrations, the work of a Byzantine artist of about A.D. 512, are based upon originals that are not far removed from sketches by the famous Crateuas, the father of plant-illustration, who was body physician to Mithridates VI. Eupator (120–63 B.C.). His plant descriptions are occasionally quoted in the text, and the best of the Anician drawings are those which are associated with these quotations; eleven of the more convincing figures have been assigned to him by Dr. Singer. The figures may be classed as good, bad, indifferent, and fictitious. Many seem hopeless of determination, but Dr. Gunther has included them in the hope that field-botanists when travelling in the localities whence the Dioscoridean flora was derived may be able to recognize some which it has been impossible to identify in a herbarium. In some cases the plant described is obviously not the plant figured—for instance, *Numphaia*, p. 377, is, from the description, a Water-lily, but the figure closely resembles the *Scolopendrium* (*Pteris etera*) figured on p. 587, and there are other equally striking misplacements.

The specific names which have been assigned to the plants are quoted from the list of identifications appended by Charles Daubeny to his 'Lectures on Roman Husbandry' (1857), which is reprinted as an appendix to the volume. Others have been taken from Sprengel's edition of Dioscorides, and some help in identification has been given by the botanists at the Natural History Museum. But, as the Editor modestly suggests, "if these imperfect identifications stimulate by their falsity the production of a revised version, they will not have been printed in vain."

Apart from its importance from the point of view of the history of the English Herbal and the critical interest aroused by the identity of the figures, the book is wonderfully interesting. The beautifully quaint language, the remarkable virtues, sometimes amusing, sometimes almost startling to the modern mind, that are assigned to the plants, render it a pleasant companion for an hour's recreation.

Dr. Gunther is a master in antiquarian botanical research, which is, with him, evidently a labour of love. Botanists owe him a debt of gratitude for rendering available to English readers in so presentable a form the work of the old Greek herbalist and of his translator, one of the fathers of British botany. Thanks are also due to the Oxford Press for the excellency of its production.—A. B. R.

Wundkompensation Transplantation und Chimären bei Pflanzen. Von Prof. N. P. KRENKE, übersetz von Dr. N. BUSCH, redigiert von Dr. O. MORITZ. Roy. 8vo, pp. xvi, 934, 201 text-figs, 2 coloured plates. Springer: Berlin, 1933. Price R.M. 88.

THIS compendious volume forms no. 29 of the series 'Monographien aus dem Gesamtgebiet der Physiologie der Pflanzen und der Tiere,' issued by Messrs. Springer. It is a German edition of the work, published in 1928, by Prof. Krenke, head of the section for Phytomorphogenesis at the Timiriaseff Institute, Moscow, who writes a Foreword to the volume. The initiative for the production of the present edition is due to Prof. Tischler, to whom the book is dedicated in gratitude by the translator and editor. Prof. Krenke points out that owing to extensive rearrangement and additions the German edition is a completely new work, half as large again as the original Russian work. The increase in size is due mainly to the introduction of the results of *ad hoc* experimental investigations carried out since 1927 and published simultaneously in the German edition and the new Russian edition. The work is by no means a compilation. The importance of the new investigations is emphasized; these with the help of the extraordinarily rich material embodied in the literature have rendered possible a representation of our knowledge of the subjects treated. During the last twenty-five years there has been a great advance in views on questions of transplantation and on chimæras and to increase our knowledge especially of the phenomena associated with transplantation is an outstanding object of the work. Special attention has been paid to the study of variability, particularly to teratological forms between which and other variations it is often difficult to draw a line.

The subject-matter is divided into two sections dealing respectively with natural (pp. 1–138) and artificial or surgical (pp. 139–877) operations. At the outset a scheme of classification of the nature of the mechanical operations and their effect is suggested, by means of which the nature of the operation and its result may be expressed in a formula. For instance, a small piece of leaf-stalk of a *Nicotiana* was cut off and grafted in inverted position on a shoot of *Solanum*—the experiment is thus represented $T\text{–}A_2\text{–}B_2\text{–}C_3\text{–}D_3\text{–}E_2\text{–}F_3\text{–}G_2\text{–}H_2\text{–}I_2\text{–}K_1 \ldots$, which indicates an artificial abnormal union of plant-structures, embodying structural and physiological factors, by transplantation, resulting in heteroplastic depolarised union by contact of organs of different functions.

The greater part of the first section is given to the discussion of natural grafting—union mainly of stem-structures. In the second section problems of wounds and their healing and

regeneration are considered. Transplantation occupies about 160 pages, and the discussion of chimæras 140. A section on the introduction of foreign substances into plants deals with questions of immunity and other problems.

A closely printed bibliography of forty pages and indexes of genera and species and of persons concludes the volume, which represents a monumental contribution to our knowledge of an important phase of botanical morphology and physiology.

Annales Bryologici. A Year-book devoted to the Study of Mosses and Hepatics. Edited by FR. VERDOORN. Vol. VI. 8vo, pp. 141. M. Nijhoff: The Hague, 1933. Price 6 Guilders.

A CHARACTERISTIC portrait of Prof. V. Schiffner, the Nestor of European hepaticologists, forms the frontispiece of this volume, which is dedicated to him in commemoration of his 70th birthday. There are a number of communications of varied interest. A. Le Roy Adams, discussing the identity of the problematical *Sphagnum americanum* Warnst., suggests its relegation to the list of *nomina ambigua*, and refers also to other instances of European misunderstanding of American *Sphagnum* species. Other papers in English are by H. N. Dixon on Mosses collected on Mt. Cameroon by Miss Steele and New Species of *Clastobryeae* from Indo-Malaya, and by Y. Horikawa, who describes two new species of *Schistochila* from Formosa. Ch. Douin, from a study of the development of the archegonium in *Anthoceros*, shows that the so-called "involucre" in this genus is merely a development of the archegonium comparable to the vaginula of the mosses, and that the archegonium of *Anthoceros* differs from that of other mosses only in very secondary details. This paper is in French; the remainder are in German.

Carl Helmut describes the propagula previously indicated by Spruce on the leaves of *Plagiochila*; Th. Herzog contributes a critical examination of the characters of *Neurolejeunea*; and Edgar Knapp discusses the affinity of *Macvicaria fossombronioides* Nichols. and its relationship with the genus *Madotheca*. Fr. Verdoorn continues his taxonomic studies of the Frullaniaceae in a revision of the Lejeuneaceae-Holostipae from Java and Sumatra and the description of a new genus, *Schiffneriolejeunea*, from Celebes, and also gives notes on his Hepaticae Selectæ et Criticæ, ser. v. & vi., with some habitat photographs. Werner Dickel describes some new genera and species of Lejeuneaceae; and a decade of new Bryophyta is communicated by various authors.

NEW EDITIONS OF TEXT-BOOKS.

A Text-book of Botany for Medical, Pharmaceutical, and other Students. By JAMES SMALL, D.Sc., Professor of Botany in the Queen's University, Belfast. Third Edition. Crown 8vo, pp. x, 717, 1351 figs. J. & A. Churchill: London, 1933. Price 21*s*.

Elements of Botany. By RICHARD M. HOLMAN and WILFRED W. ROBBINS, Professors of Botany in the University of California. Second Edition, rewritten and reset. Crown 8vo, pp. v, 404, 268 figs. Chapman & Hall: London, 1933. Price 16*s*. 6*d*.

Practical Botany. By F. CAVERS, D.Sc., F.L.S. Fourth Edition. Crown 8vo, pp. xvi, 429, 115 figs. University Tutorial Press: London, 1933. Price 5*s*. 6*d*.

THE call for a third edition in the space of a few years indicates that Prof. Small's informative text-book meets the requirements of a large number of students. The two previous editions were noticed in this Journal in 1921 (p. 236) and 1927 (p. 263) respectively. We have to note again a slight increase in size, 717 pages and 1352 figures as against 686 pages and 1350 figures in the second edition. The original edition cost 25*s*., that of 1929 fell to 21*s*., the price also of the present. The increase in size of the 1933 volume is due to the inclusion in Appendix IV. "of brief summaries of the structure and biocycles" of a selection of special types of the lower plants amplifying the detailed accounts of these groups in the main text.

The author has not an attractive style, but he tells us a great deal and illustrates his statements with a profusion of, generally small, figures. The figures vary greatly in quality. Many are carried over from Bentley's and Green's Manuals, of which Professor Small's book is a development—these, though in some cases becoming worn, are good, as are some of the later blocks, often borrowed from other sources. But others are poor, figs. 1124–26 (*Cycas*, *Ginkgo*, and *Welwitschia*) are extremely crude, and here, as elsewhere, there is no indication of the magnification—*Cycas revoluta* and *Welwitschia* may be merely small pot-plants! There is also a general absence of uniformity in the method of lettering, which is sometimes neat, sometimes (*e. g.*, fig. 1124) untidy in the extreme. The appearance of the text would be improved by attention to these matters.

PROFESSORS Holman and Robbin's 'Elements of Botany' is in marked contrast with Prof. Small's 'Text-book.' It is an attractive volume with clear open text, and large, well-indexed, mainly line drawings. It is an abridgement of the author's 'Text-book of General Botany' (noticed in this Journal, 1925, p. 309) "for use in institutions in which only one semester is

devoted to the course in general botany," or in which the subject is less extensively studied; and can also be recommended as a good and readable introduction to the science. Structure and functions of the plant-body as a whole, the cell, stem, root, leaf, flower, fruit, and seed are explained in successive chapters. Chapters are devoted to the relation of the plant to the environment and the general characters of the great plant-groups, and finally there is one on evolution and heredity, with a very poor borrowed portrait of Charles Darwin. There is also a full index. Attention is directed to the binding, which is "completely waterproof and vermin-proof."

THE University Tutorial Press aims at supplying a great deal of information in a small compass at the lowest possible price, and the frequent call for new editions of its publications indicates that it is meeting a need. The fourth edition of Cavers's 'Practical Botany' differs from the previous one in some textual alterations, and the addition of a number of new diagrams; for these Mr. L. C. Fox is responsible. The book is a practical guide to the study of the histology and physiology of the Flowering Plants, followed by a short course on a few selected types of Cryptogams and Gymnosperms. Apparatus and methods are described in detail, and a special feature is the chapter on cell-contents and cell-walls—an elementary course in biochemistry. The explanatory diagrams are such as the student may be expected to draw from his own preparations. Two useful appendixes deal respectively with the reagents required in the work and hints on microtechnical method. The book will be helpful to teachers of elementary classes and to students working under guidance. It would be helpful to reviewers and bibliographers if publishers would insist on the reprinting of the original preface and those of successive editions with the dates of each added.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on January 18 the Assistant Secretary drew attention to a donation from Mr. O. R. Gurney of miniature portraits in pencil of Sir James Edward Smith's mother (Mrs. Frances Smith) and his maternal grandparents (the Rev. John and Mrs. Sarah Kinderley).

The President (Prof. F. E. Weiss, F.R.S.) exhibited on behalf of Miss E. K. Pearce, F.L.S., a fasciated stem of holly.

Dr. G. S. Carter read his paper, illustrated with lantern-slides, "Reports of the Cambridge Expedition to British Guiana, 1933. Illumination in the Rain-forest at Ground-level," and Prof. A. H. R. Buller, F.R.S., gave an account, illustrated with lantern-slides, of "Hyphal Fusions and the Translocation of Protoplasm in the Mycelia of the Higher Fungi."

At the Meeting on February 1, the Vice-President in the Chair moved the following Resolution, which was passed in silence, all standing:—

> The Fellows of the Linnean Society of London having heard with the deepest sorrow of the death of Dr. D. H. Scott, F.R.S., desire to put on record their high appreciation of the services he has rendered to the Society during the fifty-four years of his Fellowship. Elected in 1880, he served on the Council for six triennial periods and acted as Botanical Secretary from 1902–1908. He was appointed Vice-President on four occasions and held the office of President from 1908–1912. Throughout his Fellowship of the Society he showed the greatest interest in its work, both by frequent attendance at its meetings and by important palæobotanical communications. Deploring the loss of so active and distinguished a Fellow, the Society desires to assure the relatives of Dr. Scott of its deep sympathy with them in their bereavement.

Prof. Noel J. G. Smith showed lantern-slides of *Welwitschia mirabilis*, illustrating the differences in the characters of the habitats of two localities in which the plant occurs in S.W. Africa.

Dr. J. M. Dalziel gave an account, illustrated with lantern-slides, of "Successful Introduction of Plants from West Africa to Tropical America."

Mr. S. Savage read a paper on "John Ellis, F.R.S., and his Manuscripts."

The Meeting on February 15 took the form of a Symposium on Marine Algæ. Miss B. D. Gregory read a paper on "The Life-history of *Gymnogongrus Griffithsiae*," and showed that the so-called parasite *Actinococcus aggregatus* is merely an asexual biont developed upon the sexual plant. *Ahnfeltia plicata* also develops an asexual biont. Mr. G. Tandy referred to the difficulty in distinguishing species in marine algæ, and cited the genus *Caulerpa* as an example. Mr. A. D. Cotton discussed the possibility of the existence of an alternation of generations in the Myrionemaceae, a small family of Brown Algæ usually placed next to the Ectocarpaceae.

THE GREEN CROSS SOCIETY (47 Victoria Street, London, S.W. 1) has issued a printed list in leaflet form of about 180 kinds of wild flower seeds received from Kew and from the University Botanic Gardens of Oxford and Cambridge. The seeds are offered for sowing mainly in school gardens, but also in the wild flower sanctuary of private park or private garden of size.

It is made clear that a record is essential of what is sown, to check escapes and to learn what plants will flourish away from their natural habitat. The important admonition is now added—that the seeds should on no account be sown by roadsides, nor in fields or woods, nor on commons, nor other wild localities.

With the exception of two or three, all who applied for seeds in the Spring need to be reminded that a record is essential, and are being asked for information in the following order :—NAME OF PLANT. 1. Date when seeds sown; 2. Soil; 3. Whether kept watered ; 4. Whether grown in shade or sun ; 5. RESULTS: (*a*) Good ; (*b*) Fairly good ; (*c*) Poor (*e. g.*, merely one or two seeds germinated) ; (*d*) Failure.

The importance of the above is urged, as such record should form an effective means of tracing the source of escapes. Botanists who find an unusual escape may be able to learn if the seed of that particular plant was ever distributed through the Green Cross to anyone in that neighbourhood.

'BULLETIN DE LA SOCIÉTÉ ROYALE DE BOTANIQUE DE BELGIQUE.'—Vol. lxvi. fasc. 1 contains reports on the activities of various local sections and of papers read at the meetings of the Society. M. Braecke has continued her studies on the cause of the *post-mortem* blackening of *Pedicularis*, and has extracted mannitol from fresh plants. M. Beeli makes a further contribution to the mycological flora of the Congo, and M. Homès describes methods of conservation of *Codium Bursa* in the herbarium and in liquid by injection of a solution of agar-agar. R. Bouillenne has investigated the formative substances in the roots of the higher plants ; P. Martens describes the spontaneous rupture of the cuticle on the petals of *Tradescantia*, and M. Henrotin a preliminary study on the production and development of the serial buds in the leaf-axils of species of *Juglans*. J. Coulouma gives the results of a chemical analysis of five species of *Cistus*.

'SINENSIA,' vol. iii. parts 11 & 12.—These two instalments of 'Contributions from the Metropolitan Museum of Natural History, Academia Sinica,' contain three papers. T. F. Yu gives the result of his studies on the "*Helminthosporium* Leaf-spot of Maize," caused by *Ophiobolus heterostrophus*. The morphology and life-history of the fungus are described and also the results of inoculation experiments. R. C. Ching contributes a list of the Pteridophyta of Kiangsu Province, with notes on habitat and local distribution ; and C. Y. Chiao describes a new species of *Ormosia* (*O. Taiana*) from Kiangying.

'TOPOGRAPHICAL BOTANY.'—Prof. J. R. Matthews is compiling a Third Supplement and would be glad to receive particulars of new vice-county records, more especially those that may have been published in the 'Transactions' of local Natural History Societies. Particulars should be sent to Prof. MATTHEWS, The University, Reading.

CORRECTION.—In the January number, p. 23, line 2, for *Rubus rectiramus* read *Rubus sectiramus*.

ORCHIS LATIFOLIA VAR. MAJALIS KITTEL.

ORCHIS LATIFOLIA L.

BY P. VERMEULEN (Amsterdam).

(PLATE 603.)

" ONE is driven to ask the question—Is there such a species ? Or is not the *latifolia* of British botanists a dust-bin into which every hybrid of *praetermissa* and *maculata* (in the wide sense) has been cast ? " (Druce, Bot. Exch. Cl. Rep. for 1917).

The most common race of *O. latifolia*, *O. latifolia* var. *majalis* Kittel (1837), is an early-flowering plant. In the Western part of the Continent, where this plant is a common one, it flowers in the plains about fourteen days before *O. incarnata* L. As the orchids have a long period of flowering and vary a good deal, *O. incarnata* is in flower when *O. latifolia* var. *majalis* is not yet over. In Holland in normal years the latter begins to flower about May 10, while *O. incarnata* comes at the end of the month : till the second week in June, when *O. latifolia* var. *majalis* is over, the time of flowering of the two species overlaps.

The photograph (Pl. 603) represents two robust specimens. The leaves are broad, and the name Broad-leaved Orchid is well-chosen. One or two leaves are bract-like ; the upper bract-like leaf reaches the spike. In most cases they are spotted with solid spots ; very rarely the spots are ring-shaped. Among the spotted plants are always some unspotted ; I once found in a meadow, where *O. latifolia* was the only Dactylorchid, 8 per cent. unspotted plants. When the plants begin to flower they often give a rather compact impression. The colour of the flower is a dark purple, such as *O. purpurella* Stephenson. The form of the lip is very variable (see fig. 1) ; it is three-lobed, much broader than long, and the mid-lobe is mostly rather large. I gathered the lips in a meadow where only *O. latifolia* var. *majalis* and *O. Morio* were present.

I believe for the following reasons that this plant does not occur in England :—

1. The diagnosis of the English *latifolia* does not agree with that of *O. latifolia* var. *majalis* (ring-spots, lip-form, colour, etc.). The figures of English *latifolia* (Godfery, ' Monograph,' pl. 47 ; Stephenson in Journ. Bot. 1920, pl. 566) do not represent this Continental plant.

2. *O. latifolia* var. *majalis* plants which were forwarded to Col. Godfery and Dr. Stephenson were named by them *O. latifolia*, though somewhat differing from the English form.

3. In England *O. incarnata* is the first in flower. Tahourdin called it the " Early-flowering Orchid." Dr. Druce, in reply to my query, wrote, " We surely have no earlier flower than *O. incarnata* in Britain," and Dr. Stephenson, " I have always

been puzzled by statements in Continental works that *O. latifolia* flowers before *O. incarnata*."

In the North of England and in Scotland there is an early-flowering *O. praetermissa*, as Mr. W. E. Evans (Edinburgh) informed me (see also Bot. Exch. Cl. Rep. 1917, 170). Perhaps it would be possible to consider this plant an unspotted type of the Continental *O. latifolia* var. *majalis*. Some Orkney plants sent to me by Col. Johnston, though very much like the early-flowering plant, were called *O. purpurella* by Dr. Stephenson.

In Holland we have also a late-flowering *O. latifolia*, named by me var. *junialis*—a plant flowering at the same time as *O. praetermissa*. The plant does not make such a compact impression as *O. latifolia* var. *majalis*, the leaves are not so broad, but also have the widest part near the middle. It grows in marshes and is mostly taller than the early-flowering plant. The leaves are ring-spotted, the spots being very rarely solid. Often the

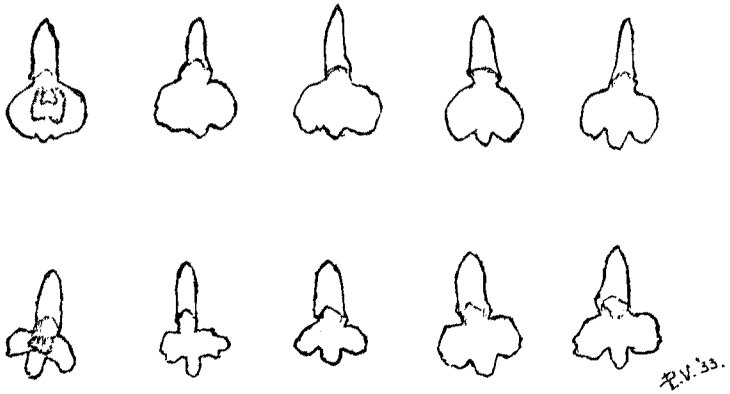


Fig. 1.—Variation in form of lip in *Orchis latifolia*; var. *junialis* (upper row), var. *majalis* (lower row).

upper bract-like leaf does not reach the spike. The colour of the flower is not so dark as in var. *majalis*, and mostly the mid-lobe of the lip is very small (fig. 1). The loop-shaped lines on the labellum are still more striking because the ground-colour is somewhat lighter. The plants flower about two weeks later than *O. incarnata*, when the flowering of var. *majalis* is practically over. Plants forwarded to Col. Godfery and Dr. Stephenson were named *O. latifolia* by them, and agreed well with English *O. latifolia* (Godfery, 'Monograph,' 199).

One might ask—Is there a constant difference in time of flowering between the early- and late-flowering plants? I had the orchids under observation for two years in my garden, and the differences in time of flowering were identical. Moreover, I know some marshes where *O. latifolia* var. *majalis*, *O. praetermissa*, and *O. latifolia* var. *junialis* grow together, and here also the difference is maintained.

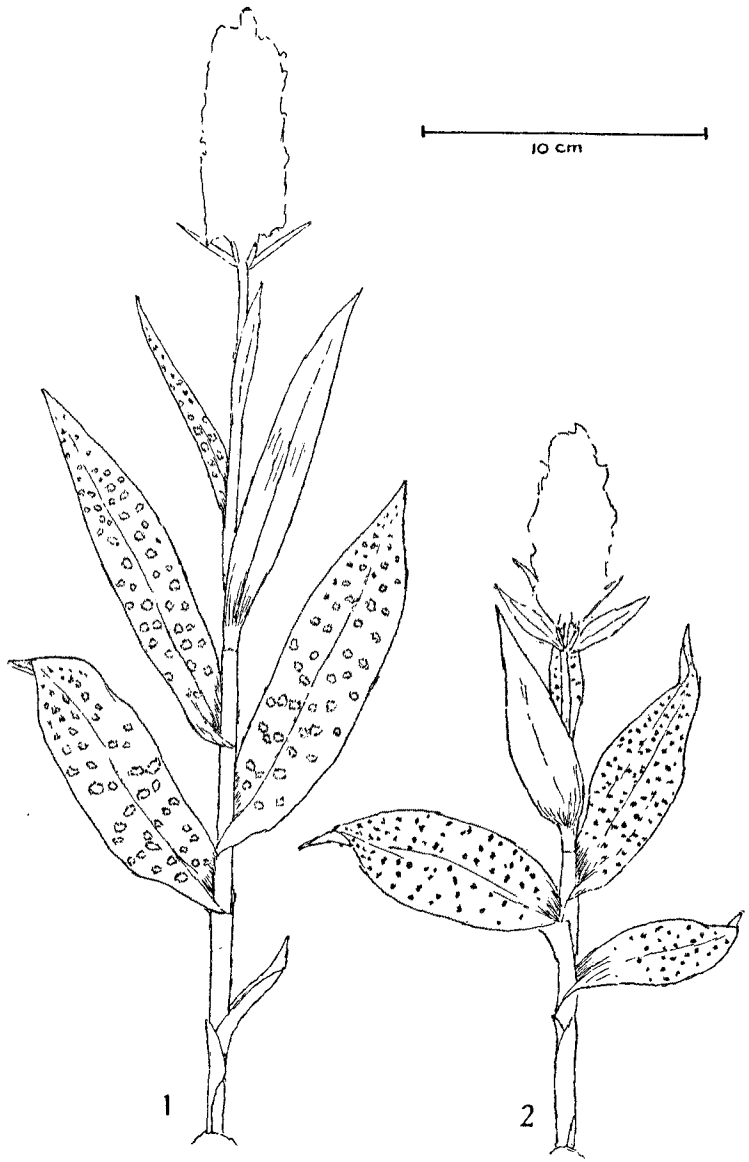


Fig. 2.—Habit of (1) *Orchis latifolia* var. *junialis* Vermeulen, (2) var. *majalis* Kittel.

The late Dr. Druce called the late-flowering *Orchis latifolia* a hybrid between *O. praetermissa* and *O. maculata*. I disagree for the following reasons:—(1) In the marshes of the Dutch district where *O. latifolia* var. *junialis* occurs we do not find *O. maculata*. (2) There is no reason why this hybrid should have ring-spotted leaves. Dr. Druce wrote (Bot. Exch. Cl. Rep. 1917, 166) that the hybrid between *O. maculata* and *O. foliosa* Sol. was also ring-spotted, but nobody can tell that these plants were indeed the supposed hybrids, as controlled cultures were not made. (3) The seed of *O. latifolia* var. *junialis* does not show any signs of sterility.

In the marshes from the turf-moor district where var. *junialis* is found *O. praetermissa* also occurs. In Journ. Bot. 1923, 65, the Stephensons describe the differences between the plants mentioned as follows (see also Journ. Bot. 1924, 175, "Dactylorchids," by Godfery and T. & T. A. Stephenson):—"*O. praetermissa* has the leaves always unspotted; *O. latifolia* (*junialis*) has a double loop-shaped line on the labellum, whereas *O. praetermissa* has only fine dots and little stripes." According to Stephenson the spurs of *O. latifolia* are somewhat more slender and the habit is different. Perhaps this is the case in England, but in Holland I cannot find other differences than the spots and the double loop-shaped lines on the labellum. It may be possible to find in Holland spotted plants, which differ from the unspotted ones only in having more anthocyan. In my opinion the differences between the *O. latifolia* var. *junialis* and *O. praetermissa* in Holland are too small to justify the establishment of two different species. And in England? I never saw the English *latifolia* alive, but to judge from the determinations of Dr. Stephenson, who called spotted plants from a Dutch marsh *O. latifolia*, and similar unspotted ones from the same marsh *O. praetermissa*, the differences in English plants will not be much greater. Undoubtedly the unspotted plants (*O. praetermissa*) are present in a much larger quantity among the late-flowering plants than among *O. latifolia* var. *majalis*. In some marshes the unspotted *O. praetermissa* forms the majority, in others it is *O. latifolia* var. *junialis*. Perhaps in England *O. praetermissa* dominates still more. According to Mr. T. A. Dymes the seeds of *O. latifolia* (*junialis*) were "very close to *O. praetermissa*, the differences being merely in the degree of the qualities common to both."

"The evidence of the seeds of these plants, which came from Winchester and Chippenham Fen, suggests that *O. latifolia* and *O. praetermissa* are close allies or forms of the same species." (Godfery, 199).

There is another similar case in *Orchis purpurella*. In Scotland *O. praetermissa* is replaced by *O. purpurella*, which flowers later than *O. incarnata*, the former being a plant with small spots at the end of the leaves, dark purple flowers, and diamond-shaped lips. The unspotted plants with dark flowers in Scotland were first named "northern *incarnata*" and then *O. praetermissa* var. *pulchella* Druce. Dr. Stephenson wrote to Col. Johnston that in his opinion "all these unspotted Orkney plants should be put down to *O. purpurella*" (see also Godfery, 195). Here it is also impossible to maintain a spotted and an unspotted form as two separate species.

I conclude therefore that *O. latifolia* var. *majalis* Kittel does not occur in England; but perhaps in Scotland. And, with regard to the few and small differences between the late-flowering English *latifolia* (*O. latifolia* var. *junialis* Vermeulen) and *O. praetermissa* Druce, it is not justifiable to consider them as two different species.

THE IDENTITY OF *LASSONIA* BUC'HOZ.

By J. E. Dandy.

The genus *Lassonia* was founded by Buc'hoz (Pl. Nouvellem. Découv. 21 (1779)) on two species, *L. heptapeta* Buc'hoz and *L. quinquepeta* Buc'hoz, which were known to him only from Chinese native drawings. Buc'hoz named the genus in honour of a fellow Frenchman, M. de Lassone, "premier Médecin du Roi en survivance, & de la Reine, également recommendable par son amour pour le bien de l'humanité, & par son urbanité." For more than a century *Lassonia* was completely neglected by other botanists. It was not mentioned in Bentham and Hooker's 'Genera Plantarum' nor in Engler and Prantl's 'Die natürlichen Pflanzenfamilien," but eventually it appeared in the Appendix to the 'Index Kewensis' (ii. 1289 (1895)), where it was designated "Genus spurium Magnoliacearum," and later was included by Dalla Torre and Harms (Gen. Siphonog. 172 (1901)) at the end of the Magnoliaceae among the "Genera incertæ sedis." *Lassonia* cannot, however, continue to be regarded as *incertæ sedis*, for although the black-and-white figures published by Buc'hoz (*op. cit.* t. 19) to illustrate the genus are certainly rather crude (being evidently reproduced from the original Chinese drawings) they are easily identifiable: they clearly represent two well-known species of *Magnolia* L. which have been cultivated in China for hundreds of years and have been grown in European gardens since the end of the 18th century. Unfortunately Buc'hoz's specific names, which were legitimately published, are the oldest for these two species and necessitate name-changes that are particularly undesirable because the nomenclatural history of the plants concerned is already very complicated. Moreover, the specific epithets *heptapeta* (seven-petalled) and *quinquepeta* (five-petalled) which must be taken up are mis-

leading*, owing to the fact that Buc'hoz had to rely entirely on what he could see in the drawings, which formed his only source of information.

Coloured reproductions of the original drawings were published, without botanical names, by Buc'hoz (Collect. Precieuse, i. tt. 4, 9) in 1776, and these were referred to by him in 1779 when he founded the genus *Lassonia* and illustrated it with a black-and-white plate. Figure 1 in the latter plate, corresponding to plate 4 in the 'Collection Precieuse' (part i.), is *L. heptapeta* and represents the white-flowered species which has been known by such names as *M. denudata* Desr., *M. precia* Corréa ex Vent., *M. conspicua* Salisb., and *M. Yulan* Desf. The second figure in the black-and-white plate, corresponding to plate 9 of the earlier work, is *L. quinquepeta* and portrays the purple-flowered plant which has been called *M. liliflora* Desr., *M. purpurea* Curt., *M. discolor* Vent., *M. gracilis* Salisb., and (by error) *M. obovata* Thunb.

Buc'hoz's description of *Lassonia* and its constituent species runs as follows: "Ce genre de plantes a un calice d'une seule piece, mais frangée; sa corolle est de sept pétales dans une espece, & seulement de cinq dans l'autre; chaque pétale est grand, supérieurement obtus, & presque semblable au pétale de la tulippe; mais cette derniere en differe, en ce qu'elle n'a point de calice; d'ailleurs les étamines dans ce nouveau genre de plantes paroissent suivant la figure, très-nombreuses, tandis que dans la tulippe le nombre en est fixé, aussi nous croyons devoir classer cette plante, parmi des polyandriques; on a représenté ici deux especes de ce genre; la premiere est la Lassone à sept pétales, *Lassonia heptapeta*. Dans cette espece, la fleur paroît avant la feuille; les pétales sont d'un blanc verdâtre, & au nombre de sept; le calice est frangé & brunâtre, les étamines paroissent violettes; chaque fleur paroît au bout de chaque branche; la tige de cet arbrissau est tortue, raboteuse, & grisâtre: la seconde espece est la Lassone à cinq pétales, *Lassonia quinquepeta*: cette espece, suivant la figure, n'a que cinq pétales; chaque pétale est d'une couleur violette, & leur bords sont jaunâtres; les étamines sont d'une couleur rougeâtre; on a représenté cette espece avec ses feuilles naissantes, dont la partie supérieure est obtuse: elles sont alternes & entieres . . ." Comparison of this description with the two species of *Magnolia* mentioned above shows some discrepancies which are fully accounted for by defects in the drawings which Buc'hoz had before him. His "calice" is the spathaceous bract (crudely portrayed) which at first envelops the flower-bud and later falls away; it is brownish in colour and is usually hairy on the outer

* But not more so than Linnæus's epithet *tripetala*, which is valid for one of the best-known North American species of *Magnolia*. In *M. tripetala* (L.) L. the flowers have 9–12 or sometimes 15 tepals; they may, perhaps, be regarded as having 9–15 petals or as having 3 sepals and 6–12 petals, but *never* as having 3 petals.

surface. More important, however, are the erroneous numbers of tepals ("pétales"), for it was on these that the specific epithets were based. From the drawings Buc'hoz counted 7 tepals in the white-flowered species (*L. heptapeta*) and 5 in the purple-flowered species (*L. quinquepeta*). Actually the white-flowered plant has normally 9, or occasionally 10–12, subequal tepals, while the purple-flowered species has 6–12 (usually 6) large tepals accompanied by 3 much smaller outer ones which are not shown in Buc'hoz's plates.

The necessary new combinations for the two species are published below, along with their most important synonyms:—

Magnolia heptapeta (Buc'hoz) Dandy, comb. nov. *Lassonia heptapeta* Buc'hoz, Pl. Nouvellem. Découv. 21, t. 19, fig. 1 (1779); Grand Jard. Univers, t. 131 ("*heptapetala*") (1785)*. *Magnolia denudata* Desr. apud Lam. in Encycl. Méth., Bot. iii. 675 (1791), pro parte, excl. syn. Kæmpf. Amœn. et Thunb. *M. liliflora* Desr. *loc. cit.*, pro parte, quoad syn. Kæmpf. Amœn. *M. obovata* Thunb. in Trans. Linn. Soc. ii. 336 (1794), pro parte, quoad Kæmpf. Icon. Select. t. 43. *M. precia* Corréa ex Vent. Jard. Malm. i. sub t. 24 in obs. (1803). *M. conspicua* Salisb. Parad. Lond. i. t. 38 (1806). *M. Yulan* Desf. Hist. Arb. & Arbriss. ii. 6 (1809). *Michelia Yulan* Kostel. Allgem. Med.-pharm. Fl. v. 1700 (1836). *Yulania conspicua* Spach, Hist. Nat. Vég., Phan. vii. 464 (1839).

Magnolia quinquepeta (Buc'hoz) Dandy, comb. nov. *Lassonia quinquepeta* Buc'hoz, Pl. Nouvellem. Découv. 21, t. 19, fig. 2 (1779). *Magnolia glauca* var. β Thunb. Fl. Jap. 236 (1784), pro parte, quoad syn. *Mokwuren*. *M. denudata* Desr. apud Lam. in Encycl. Méth., Bot. iii. 675 (1791), pro parte, quoad syn. Kæmpf. Amœn. et Thunb. *M. liliflora* Desr. *loc. cit.*, pro parte, excl. syn. Kæmpf. Amœn. *M. obovata* Thunb. in Trans. Linn. Soc. ii. 336 (1794), pro parte, quoad syn. Fl. Jap. partim et Kæmpf. Am. Exot. et Icon. Select. t. 44. *M. purpurea* Curt. Bot. Mag. xi. t. 390 (1797). *M. discolor* Vent. Jard. Malm. i. t. 24 (1803). *M. gracilis* Salisb. Parad. Lond. ii. t. 87 (1807), pro parte, excl. syn. *M. Kobus* DC. Syst. i. 456 (1818), pro parte, quoad syn. Salisb. et specim. *Michelia gracilis* Kostel. Allgem. Med-pharm. Fl. v. 1701 in obs. (1836), pro parte, excl. syn. Thunb. *Yulania japonica* Spach, Hist. Nat. Vég., Phan. vii. 466 (1839), pro parte, excl. var. γ. *Y. K bus* Spach, *tom. cit.* 467, pro parte, excl. syn. Thunb. *Talauma obovata* Benth. & Hook. ex Hance in Journ. of Bot. xx. 2 (1882), *nomen nudum*—non *T. obovata* Korth. (1851). *Magnolia Soulangeana nigra* Hort. ex Nicholson in 'The Garden' [xxiv. 510 in obs. (1883), *nomen nudum*], xxv. 276, t. 434 (1884). *M. liliflora* var. *gracilis* Rehd. Man. Cult. Trees & Shrubs, 257 (1927). *M. liliflora* var. *nigra* Rehd. *loc. cit.*

* This is a coloured plate, apparently from another source, accompanied by the legend "Lassonia heptapetala. *Nobis. l'Iulan blanc.*"

SYNOPSIS OF THE EUROPEAN SPECIES OF *POGONATUM* AND *POLYTRICHUM*.

By J. H. Albrecht.

(Concluded from p. 80.)

Section I. Serræfolia.

Subsection A. Aloidea.—1. Margins of lamina serrate; teeth multicellular (rarely undeveloped); elamellose cells not differentiated 2. Upper margin of lamellæ crenulate; border-cells thin-walled and smooth, similar to the rest. 3. Perichætial bracts lamellose.

1 A. *P. aloides* Hedwig. Leaf-apex acute, margins sharply serrate from the base upwards; lamellæ 4–5 cells high; basal cells subquadrate; capsule cylindrical, 3 mm. : 1 mm.; exothecium cells large and elongate-rectangular, each surmounted with a prominent papilla; stem 10–15 mm.; seta 15–35 mm.; spores 8–12 μ. Habitat: clayey or sandy banks; frequent.

Subsp. nov. 1 B. **Briosianum** (Farneti). Differs from *P. aloides* in: leaf-apex obtuse; spores 14–20 μ, finely papillate. Habitat: stoney chalk (Northern Italy). Probably a hybrid.

Subsp. nov. 1 C. **nanum** (Hedw.). More stunted in all its parts than *P. aloides*; differs in: lamina shorter and broader, margins bluntly toothed, only in the upper half; lamellæ 6–8 cells high; capsule short, 1 mm. : 1 mm., wide-mouthed; exothecium cells small, round or oval, with thick walls, without papillæ; stem 5–10 mm.; seta 10–25 mm.; spores 14–19 μ. Habitat: clayey or sandy banks; frequent.

Subsection B. Urnigera.—1. Margins of lamina serrate; teeth multicellular (rarely undeveloped); elamellose cells not differentiated. 2. Upper margin of lamellæ straight, forming a thick roof, border-cells usually yellowish and minutely papillate (except in species 4). 3. Perichætial bracts lamellose.

Series *. Border-cells of lamellæ finely papillate, yellowish.

2 A. *P. urnigerum* Hedw. Leaves glaucous green; lamellæ 4–6 cells high, border-cells broader than high (rounded in cross-section); basal cells elongate, 5 : 1; capsule regularly cylindrical, 3 mm. : 1 mm.; exothecium cells rounded-hexagonal, with thick walls, papillose; stem 2–5 cm.; seta 1–4 cm.; spores 12–14 μ. Habitat: gravelly soil; common in subalpine regions.

Subsp. nov. 2 B. **capillare** (Michaux). Smaller than *P. urnigerum*; differs in: lamellæ 4–6 cells high, border-cells broader than high (truncate in cross-section); basal cells subquadrate; stem 10–20 mm.; seta 15–30 mm.; spores 16–21 μ. Habitat: dry strong ground (Scandinavia, North America).

3. *P. alpinum* Hedw. Leaves dull green; lamellæ 6–8 cells high, border-cells higher than broad; basal cells 5 : 1; capsule ovate, gibbous, narrowed at the mouth; exothecium cells irregularly hexagonal, thin-walled, without papillæ; stems tall, up to 20 cm.; seta 3–5 cm.; spores 18–21 μ. Habitat: grassy or sandy places in alpine and subalpine districts; frequent.

Var. β *arcticum* Wahl. Differs in: leaves long and flexuose (lamina 6 mm.), loosely arranged on the stem; sheaths long, basal cells 6–8 : 1; capsule long-cylindrical 5 mm. : 2 mm. Habitat: alpine (500–1000 m.).

Var. γ *septentrionale* Brid. (including var. *campanulatum* Hornschuch). Differs in: leaves short and crowded (lamina 4 mm.), somewhat secund, margins subentire to entire, somewhat inflexed, sheaths short and wide; capsule subglobose; exothecium cells more regularly hexagonal, without papillæ; stems short, up to 3 cm.; seta 10–20 mm. Habitat: alpine (500–1000 m.).

Series **. Border-cells of lamellæ smooth.

Species 4. *P. norvegicum* Hedw. (*P. sexangulare* Floerke). Leaves obtuse and cucullate at the apex, margins quite entire and inflexed; lamellæ 4–6 cells high, rarely coloured; sheaths short, basal cells 5 : 1; capsule ovate, with 5–6 obscure angles, 3 mm. : 1·5 mm.; exothecium cells hexagonal without papillæ; stem 2–5 cm.; seta 2–3 mm.; spores 15–18 μ. Habitat: alpine (1500 m.).

Section II. Spinosifolia.

Subsection C. Formosa.—1. Margins of lamina spinose; spines unicellular; elamellose cells not differentiated. 2. Upper margin of lamellæ straight or slightly crenulate (not doubled). 3. Perichætial bracts lamellose. 4. Sheaths on the stem dull green.

5. *P. gracile* Smith. Leaves with 4–8 (or even more) marginal rows of elamellose cells; lamellæ 5–7 cells high, upper margin more or less straight, not thickened; basal cells 4 : 1; capsule ovate, inflated, 4 mm. : 2·5 mm., obscurely 5–6 angled; exothecium cells rounded-hexagonal, with thick walls, not papillose; stem 3–10 cm.; seta 6–8 cm.; spores 18–22 μ. Habitat: peaty woods, and dry heaths on turf; uncommon.

Var. β *anomalum* (Milde) Limpr. Stems slender, 6 cm. Leaves laxly arranged, ovate below, becoming lanceolate above; lamellæ confined to the region of the nerve; cells of the lamina 16–21 μ, chlorophyllose. Habitat: banks of overflown streams and lakes (Fennoscandia). Sterile only.

6 A. *P. formosum* Hedwig. Leaves lamellose to within 2–3 marginal rows of cells; lamellæ 3–5 cells high, upper margin more or less straight, not thickened; basal cell 5 : 1 (in the upper leaves as much as 8–10 : 1); capsule prismatic, with 4 acute angles, 5 mm. : 2·5 mm.; exothecium cells hexagonal, thin-walled, not papillose; stem 5–15 cm.; seta 4–8 cm.; spores 10–14 μ. Habitat: dry lowland woods; frequent.

Subsp. nov. 6 B. **decipiens** (Limpricht). I do not consider that this plant differs specifically from *P. ohioense* R. & C. It may be distinguished from *P. formosum* by: leaves narrower and more strongly spinose; lamellæ 5–6 cells high, with thickened crenulate upper margin; capsule more slender, 4 mm. : 1·5 mm., with a long beak, 2 mm.; stem 3–6 cm.; seta 3–4 cm.; and spores 8–10 μ. Habitat: subalpine and alpine (Riesengebirge, 1000 m.).

Subsection D. Communia.—1. Margins of lamina spinose; spines unicellular (rarely undeveloped); elamellose cells not differentiated. 2. Upper margin of lamellæ crenate or crenulate, doubled owing to the presence of a longitudinal furrow. 3. Perichætial bracts membranaceous. 4. Sheaths on the stem whitish above to a coppery brown below.

Series *. Margin of lamellæ crenate, furrow deep.

7 A. *P. commune* Hedw. Lamina sharply spinose from the base upwards; lamellæ 5–7 cells high, furrow in cross-section deeper than broad; basal cells 5–10 : 1; capsule 4-angled, 5 mm. : 3 mm.; exothecium cells hexagonal, papillose; stem 3–20 cm. (up to 78 cm.); seta 3–15 cm.; spores 8–10 μ. Habitat: marshes and bogs; frequent.

Subsp. nov. 7 B. **Jensenii** (Hagen). Differs from the species in: lamina entire below, weakly spinulose above; lamellæ 5–7 (up to 10) cells high, furrow in cross-section broader than deep, often undeveloped. Habitat: swamps and margins of ponds; uncommon.

Series **. Upper margin of lamellæ crenulate only, furrow shallow.

Subsp. nov. 7 C. **perigoniale** (Michaux). Leaves crowded towards the summit of stem; lamina 5–10 mm. long; lamellæ 6–7 (up to 10) cells high, upper margin thickened as well as doubled; basal cells 5 : 1, sheaths short; capsule 5 mm. : 3 mm. and 3 mm. : 2 mm.; exothecium cells as in the species; stem 5–10 cm., usually short; seta 5–7 cm.; spores 8–10 μ. Habitat: dry heaths; frequent.

Var. β *minus* (Weis), comb. nov. (*P. commune* var. *minus* Weis). A much misunderstood plant; it may be distinguished from the subspecies by the shortness of the perichætial bracts, about 6 mm., which do not overlap the comal leaves, as is markedly

the case in all other plants of this subsection. Capsule regularly small, 3 mm.: 2 mm. Habitat: alpine (500–1000 m.); uncommon.

Subsp. 7 D. *Swartzii* Hartm. Leaves laxly and regularly arranged on the stem, short, lamina 3–5 mm.; lamellæ 5–7 cells high, upper margin scarcely thickened or doubled; basal cells 5 : 1, sheaths short; capsule always small, 3 mm. : 2 mm.; exothecium cells as in the species; stem up to 15 cm., usually tall and branched; seta 5–8 cm.; spores 8–10 μ. Habitat: marshy ground on heaths and moors; probably not uncommon.

Section III. Inflexifolia.

Subsection E. Juniperina.—1. Margins of lamina entire and broadly inflexed; elamellose cells (vermicular) differentiated from the lamellæ-bearing medial cells (otherwise see other subsections). 2. Upper margin of lamellæ deeply crenate, border-cells each with a cartilaginous thickening at the apex. 3. Perichætial bracts membranaceous.

Series *. Leaf-arista short, red or brown; nerve spinulose at the back of apex.

8 A. *P. juniperinum* Hedw. Leaves long (lamina 5–10 mm.), crowded and recurved, dull green; lumen of the border-cells of the lamellæ well below the crenate projection; sheaths on the stem dull green; root-tomentum scanty; capsule 4-angled, large, 5 mm. : 3 mm.; exothecium cells hexagonal, papillose; stem 5–10 cm.; seta thick, 2–6 cm.; spores 8–10 μ. Habitat: dry waste places; not common.

Subsp. 8 B. *strictum* (Smith) Dixon. Leaves short (lamina 3–5 mm.), erecto-patent, glaucous; lumen of the border-cells of the lamellæ included in the crenate projection; sheaths on the stem whitish above to a coppery brown below; root-tomentum copious; capsule smaller, 3 mm. : 2 mm.; exothecium cells as above; stem 5–30 cm.; seta thin, 6–10 cm.; spores 8–10 μ. Habitat: boggy heaths and damp ground generally; common.

Series **. Leaf-arista long, hyaline, piliform; nerve smooth at the back of apex.

9 A. *P. piliferum* Hedw. Leaves crowded towards the summit of the stem, forming a pronounced coma; border-cells of lamellæ each with a tall tooth-like thickening, half the height of the cells; root-tomentum absent; capsule 4-angled, 3 mm. : 2 mm.; exothecium cells as above; stem 2–5 cm.; seta 3 cm.; spores 9–11 μ. Habitat: driest parts of heaths; frequent.

Subsp. nov. 9 B. **hyperboreum** (R. Br.). Closely allied to the above; distinguished by: taller, usually branched stems with more regularly arranged leaves; border-cells of lamellæ only slightly thickened at the apex; stem 5–10 cm.; seta 2–3 cm.; spores abt. 18 μ. Habitat: subalpine 500 m. (Scandinavia, North America, Siberia).

Remarks on the Subsections.

Subsection A.

The researches of Timms and Schratz seem to establish that the sporophyte generation of *P. aloides* var. *minimum* (Crome) P. B. (*P. Dicksoni* Turner) and of *P. nanum* var. *longisetum* (Hampe) B. & S. is the result of crossings between the two plants. From an examination of the exothecium cells and the size of the spores, it would appear that the former (sporophyte) is a hybrid between *P. aloides* (female) and its subspecies *nanum* (male), and that the latter (sporophyte) is a hybrid between *nanum* (female) and *P. aloides* (male).

Subsection B.

P. urnigerum subsp. *capillare*, which much resembles the species in microscopical characters, is a smaller plant, and has probably been mistaken for *P. aloides* in the field.

The leaves of *P. alpinum* var. *septentrionale* often appear entire under the low-power, and it is consequently liable to be confused with *P. norvegicum*. The papillose border-cells of the lamellæ should in most cases distinguish it without difficulty. The papillosity is sometimes faint; but the upper margin is always coloured brownish or yellowish, which is rarely the case in *norvegicum*. The fruit, of course, is quite different.

P. alpinum var. *arcticum* is quite unlike the type in general appearance; it might easily be mistaken for a plant in the *Communia* subsection, though the colour of the sheaths is different. If in fruit the elongate cylindrical capsules will prevent its being mistaken for any other plant. This and the var. *septentrionale* represent the two extremes of *P. alpinum*.

Subsection C.

P. formosum subsp. *decipiens* is a plant that possibly occurs in the highlands of Scotland. The slender capsule with the long beak should be sufficient to indicate it in the field. The leaves are narrower and more strongly spinose than those of the species, from which it is in the barren state otherwise scarcely distinguishable, except for the microscopical character in the lamellæ. Loeske, indeed, is of opinion that in subalpine districts the one passes into the other; and he refers to the climb from Krummhübel to the Kamm in the Riesengebirge, where this gradual change may be observed. It is possible that confirmation of this view may be found in Scotland, if not the typical subspecies.

The breadth of the elamellose margins in *P. gracile* is very variable; the damper the habitat, the broader the margins tend to become. The one extreme is reached in the var. *anomalum*, where the lamellæ are confined to the region of the nerve. The areolation also tends to broaden with the margins, and conversely; so that when the other extreme is reached—where the one extreme is known to exist, we may reasonably expect the other under the opposite conditions—the areolation should not differ from that of *P. formosum*; and the barren plant may consequently be difficult of determination. I have refrained from giving measurements of the breadth of the marginal cells in the two species, as I am convinced that these figures are only a restatement of the fact that the elamellose margins are generally broader in *P. gracile* than in *P. formosum*.

Catharinea Dixoni (Dixon) Braithw., although usually given as a synonym of var. *anomalum*, seems to be a young undeveloped form of *P. gracile*, which its occasional presence with the normal plant tends to confirm.

Subsection D.

P. commune (*in typo*) has long recurved leaves, crowded, but regularly arranged on the stem. There are two forms worthy of notice: (1) f. *distantifolium* (var. *uliginosum* Huebener) in the margins of ponds, with very long (up to 15 mm.) squarrose-recurved leaves, widely separated, so that the whole of the sheath is visible; (2) f. *gracilentum* on damp shady ground, with short erecto-patent leaves, laxly arranged.

Subsp. *Jensenii* is an ecological variation of *P. commune*; in general appearance it is intermediate between the forms *distantifolium* and *gracilentum*. It grows in swamps, and is best distinguished by the weakly toothed leaves.

Subsp. *Swartzii*, a regular swamp moss, has a markedly smaller capsule than the other plants of this subsection (except *P. perigoniale* f. *pauperum*). It is usually tall and branched, slender, much resembling *P. commune* f. *gracilentum* in habit, but may be known in the field by adpressing the leaves to the stem, when the sheaths will be entirely obscured. There are two rare forms that might occur here:—f. *integrifolium* (*P. algidum* Jensen & Hagen) with entire leaves; f. *nigrescens* (*P. inconstans* Hagen) resembling the type in habit, but with the apical cell of the lamellæ occasionally bicuspidate. Sterile.

Subsp. *perigoniale* may be recognised in the field by the leaves being crowded towards the summit of the stem. There is also a stunted form with a short seta and a correspondingly small capsule (f. *pauperum*); this has—in this country—usually been mistaken for the var. *minus* (*P. commune* var. *minus* Weis), which is a much rarer plant, found, as Limpricht mentions, only at high altitudes; it is distinct from all other species and forms of this subsection by the shortness of the perichætial bracts, which do not overtop the comal leaves, whereas in the others the perichætial bracts creep high up the seta.

Subsection E.

P. piliferum subsp. *hyperboreum*, although closely allied to the species, resembles subsp. *strictum* most in habit; but the lens will show the hyaline arista on most of the leaves; and the nerve is smooth at the back above. To distinguish it from the species recourse must be had to the microscope, the most reliable character being in the border-cells of the lamellæ.

There is a dwarf alpine form of *P. piliferum* with short leaves and a very long piliform arista (*P. Hoppei* Hornschuch), which may possibly occur.

In the past there has been much confusion between *P. juniperinum* and its subspecies *strictum*; and the former has always been considered the commoner of the two plants. They are indeed closely allied, but I feel they are sufficiently distinct to merit the co-ordination adopted. The subspecies has a peculiar appearance, and, when once known, is not likely to be mistaken for any other moss. One extreme is represented by f. *elongatum*, with short, widely distant leaves on much elongated stems (up to 30 cm.)—doubtless through excess of moisture. On the other hand, it may be stunted, owing to the damp ground, where it usually grows, drying up in the summer months; it is this form that is generally mistaken for *P. juniperinum*. The best character in the field is that of the sheaths (see synopsis); if in fruit, the size (not shape!) of the capsule and the thickness of the seta will abundantly distinguish the two. In cases of doubt the microscopical character in the apical cells of the lamellæ (first mentioned by Limpricht) will definitely determine to which the plant in question belongs.

BIBLIOGRAPHICAL NOTES.

C. 'Catalogue of Trees, Shrubs [&c.] in the Gardens near London,' 1730.

A Society of Gardeners met at Newhall's Coffee-house, and other convenient places, in Chelsea, for many years, and in 1724 Philip Miller issued, with their approval, his 'Gardeners and Florists Dictionary,' in octavo. Opposite the title-page is printed "We, whose Names, are under-written, do approve and recommend this Book," the list of names that follows is a very representative one and seems worth printing here:—Tho. Fairchild (Hoxton), Rob. Furber (Kensington), Rob. Smith (Vauxhall), Sam. Driver (Lambeth), Moses James (Standgate), Obadiah Low (Battersea), Christ. Gray (Fulham), Benj. Whitmil (Hoxton), Fran. Hunt (Putney), and Will. Gray Jun. (Fulham). At the end of Vol. 2 is "A Catalogue of Curious Trees, Plants, &c." which is, no doubt, a preliminary essay for the volume issued in 1730.

The title-page and preface of the later folio catalogue also repeat, with three exceptions, the list of gardeners as printed in 1724, with the following additional names: John Alston (Chelsea), John Thompson (Chelsea), George Singleton (Neat Houses), Thomas Bickerstaff, William Wood (Hyde Park Corner), Richard Cole (Battersea), S. Hunt (Putney), Stephen Bacon (Hoxton), William Welstead, John James, and W. Spencer.

The preface contains a good deal of information about the gardens of the time and also informs us that the Society of Gardeners agreed to hold a monthly exhibition of interesting plants, particulars of which were registered. Having pursued this method for five or six years, it was decided to publish the plant-notes, with illustrations "drawn and painted by an able hand." Jacob van Huysum (1687–1749) was the artist chosen, brother of the more celebrated flower-painter, Jan (1682–1749), and son of Justus, another artist (1659–1716). Twenty-one plates were issued in the only part that appeared of the work, the plates being hand-coloured engravings by Henry Fletcher and Edward Kirkall (1695–1740). The original drawings, from the library of Sir Hans Sloane, for the published and unpublished parts, are in the Print Room, British Museum.

The authorship of the work seems to have puzzled many cataloguers, but it seems to be correctly placed under "Society of Gardeners," as issued by them, Philip Miller as their Secretary, editing the work, and probably writing most of it. Linnæus in 'Species Plantarum' abbreviates the title as "Hort. angl." It is to be regretted that the work was never completed; the notes of various species then growing near London are historic, and some of the descriptions, *e. g.*, honeysuckle, are miniature monographs. There is a copy of the work in the Department of Botany.—J. Ardagh, Department of Botany, British Museum.

OBITUARIES.

George Russell Bullock-Webster

(1858–1934).

Canon Bullock-Webster, who died after a long illness at his home at Parkstone, Dorset, on February 16, will be remembered among British botanists for his work on Charophytes. His partnership with James Groves, who died last year, yielded what will long be the standard work on the group—'The British Charophyta,' published in two volumes by the Ray Society (1920 and 1924). Bullock-Webster had made a special study of the Irish Charophytes, and from 1898 onwards contributed papers to the *Journal of Botany* and the *Irish Naturalist*; these included a new species of *Nitella* (*N. spanioclema*), figured in this

Journal in 1919. In 1924 he issued, with James Groves, two fascicles of British and Irish Charophyta.

A few months before his death he distributed sets from his collections to various provincial Universities, and a full record of his work will be found in the Cryptogamic Department of the British Museum, to which he was a frequent and welcome visitor.

Bullock-Webster was educated at Hereford Cathedral School and St. John's College, Cambridge, where he graduated B.A. in 1880 and M.A. 1888. He was ordained in the diocese of Ely, and was successively Chaplain of the Ely Theological College and resident Chaplain to the Bishop (Lord Alwyne Compton). He was an Honorary Canon of Ely. From 1910–1932 he was rector of a London city Church, St. Michael's, College Hill, and took an active part in general church work, serving numerous societies and other movements. He was also the author of several religious works. Failing health in 1932 led to his retirement to Dorset. Botany was his relaxation—he joined the Linnean Society in 1918 and was a frequent and interested attendant at the Meetings. He was also a Fellow of the Royal Microscopical Society.

Bullock-Webster was a delightful companion—in a pleasing courteous manner with quiet voice he would seek information on the special subject on which he graciously assumed his listener was an authority. But beneath the quiet exterior were strong feelings which became apparent if aroused in matters of conscience. Such an occasion was his public denunciation of the Bishop of Birmingham in 1927 in St. Paul's Cathedral for alleged false and heretical teaching.

Bullock-Webster was unmarried; to his sister, who has been for many years his companion, we extend our sympathy.—A. B. R.

Dr. Lilian Clarke

(1866–1934).

The death of Lilian J. Clarke on February 12 will be deeply regretted by many botanists as well as by educationalists. Born in 1866, she studied Botany under Prof. Oliver at University College, and entered the teaching profession as Science mistress at the James Allen's Girls' School in 1896. She was convinced that the approach to a scientific subject should be through experiment and observation, and, though interested in general science, her most valuable contribution to education was in the development of the new methods in the study of Botany as a school subject. For Dr. Clarke, text-books were unnecessary; she preferred to utilise observations made in the laboratory or in those botanic gardens which under the stimulus of her guidance were gradually evolved, largely by the work of generations of

girls. Systematic records of the plants were kept and each year added to the experiments or observations which were made and duly noted. The cumulative experience has proved a contribution not only to the teaching of Botany, but also to the advancement of the subject itself.

In 1917, she was awarded the D.Sc. of London University for a thesis on the organisation and development of the "Botany gardens" at the school, and in 1921 prepared a report on their progress, which was published by the Board of Education. Shortly before her death she completed the manuscript of a book entitled 'Botany, as an Experimental Science in Laboratory and Garden,' which will shortly be published.

In 1905 Dr. Clarke was elected a Fellow of the Linnean Society, being one of the first six women to be admitted. In 1902 she became a life-member of the British Association for the Advancement of Science, and was elected to the General Committee in 1908. She attended the meetings with regularity, both in Britain and overseas. She was often seen in Section K (Botany), although she was more actively concerned with Section L (Education), served as secretary for the latter from 1921–1926, and acted on many subcommittees from time to time. She had been for many years a helpful member of the Committee of the South London Botanical Institute.

In spite of numerous activities, Dr. Clarke remained primarily a teacher and a lover of nature. Few probably combined so markedly her capacity for accurate presentation of elementary facts with the instinct for adding from time to time such new facts as could profitably be utilised for school purposes. For her, teaching was in itself a research; constant progress kept the familiar from becoming stale with repetition. She was not only a keen botanist: it was her wish that the gardens she founded should inspire pleasure from their natural beauty as well as interest for what they represented. Those who have had the privilege of seeing them can realise how truly she has succeeded in the dual aim.—E. M. Delf.

SHORT NOTES.

Viola lepida Jord.—In this Journal (1927, 170) the late Dr. Drabble referred to some Furness specimens of this species which I was keeping under observation. As the note stands it may leave the impression that the identity of these plants was doubtful. As that is not the case, a few details of their subsequent history may be of interest. The plants referred to are not Furness but Cumberland examples—my postal address was Broughton-in-Furness, Lancs, but the habitats of the plants in question were on the other side of the R. Duddon, in Cumber-

land. The species is, however, also found in Furness, and in both counties grows in patches on gravelly or stony soil covering the slopes of wooded hills. The plants referred to (*l. c.*) were kept under observation during three years (1926–8) and specimens were sent to Dr. Drabble several times annually from two distinct habitats three miles apart.—I. "Woods behind Elf Hall"; II. "Right bank of the R. Duddon below Duddon Hall." In Dr. Drabble's original paper (Journ. Bot. 1909, Suppl.) the height of the plant is given as 6–12 inches, the mid-lobe of the stipules as "*entire* or subentire . . . . *not foliaceous.*" Plants sent from I. in 1926 showed the following deviations from the description: height 18–24 inches; mid-lobe of stipules never entire, usually having at least two crenulations, often more; mid-lobe of many of the lower stipules distinctly dissected (sometimes deeply) with 1–4 lateral divisions; often sub-foliaceous. Plants sub-cæspitose (16–20 stems), but the perennating underground branches very difficult or impossible to make out.

In 1927 plants from II. were sent to Dr. Drabble. These grew among stones on rich alluvium near the river. They appeared to be identical with those from I., but much larger. In two colonies the average height was 24 inches, and the tallest were 34 inches above the ground. Their characters were almost exactly those of plants from I. All leaves were broad; the peduncles often 4 inches in length and the flowers large ($\frac{3}{4}$–1 inch in length) and very conspicuous from the *markedly whitish backs of the lowest petals.* The main difficulty in determination, apart from size, was that of proving that the plants were perennial. In both habitats the roots were so intertwined among those of the surrounding vegetation that it was almost impossible to avoid breaking many of them off when collecting. However, on June 30, 1928, I dug up with a garden fork two entire plants and the soil surrounding their roots. Each root-system and its soil filled a fishing-bag, and was subsequently transferred to a bucket of water. With a camel-hair brush the soil was carefully teased away from the roots and a perennating branch of each plant laid bare. This was very slender, and similar in colour, thickness, and appearance to thin white twine. It grew horizontally just below the surface of the soil, and showed a few tiny, very young leaves at its extremity. These plants were from II., and each was 34 inches in height. After drying, they were sent to Dr. Drabble, who replied "magnificent *lepida.*"

I naturally left the published description of these Cumberland plants to my friend, and it is in justice to him that I write. No one could have been more careful and painstaking than he was over their identity. It was probably owing to the fact that he was very anxious to see similar plants from other British or foreign stations that no published description of my plants has hitherto appeared.—W. H. PEARSALL.

JEAN LOUIS BERLANDIER.—We acknowledge the receipt of a copy of the Summer Number of the South-West Review (Dallas, Texas, July 1933) which contains an interesting article by Samuel Wood Geiser, "In Defence of Jean Louis Berlandier," the pioneer in the botanical exploration of the country on the American-Mexican frontier. Born "in dire poverty," probably before 1805, near Geneva, he was befriended as a boy by Alphonse de Candolle who trained him as a botanist. Berlandier contributed the account of the Grossularieae to the 'Prodromus' on which his patron had recently embarked. About 1826 he was selected by de Candolle and three other Genevan botanists to go on a collecting expedition to Mexico, then practically a *terra incognita* botanically. He was attached to a Mexican Boundary Commission, the object of which was to survey and establish the boundary between the Mexican Republic and the United States. The story of the wanderings of the Commission and the terrible hardships, climatic and other, that its members encountered is told in detail by Mr. Geiser.

Berlandier's collecting was done mainly in south-west Texas in 1828, but the results were disappointing and de Candolle complained bitterly of his failure. But as the late Dr. Briquet remarks in a letter to the writer of the article, although the explorations were carried on under very difficult material conditions, Berlandier's collections aggregated several thousands of species, many of which are represented by a considerable number of specimens; and they have furnished materials for the description of a great number of new species.

Berlandier did not return to Europe. He settled at Matamoros, married a Mexican woman, set up as a physician, and became a man of influence locally. He made frequent botanical explorations (1830–51) into various parts of Mexico. He was drowned in an attempt to cross a river in 1851. His books, papers, and collections were bought by a private individual and were subsequently scattered.

REVIEWS.

Minya Gongkar, Forschungsreise ins Hochgebirge von Chinesisch Tibet, Erlebnisse und Entdeckungen. By ARNOLD HEIM. Roy. 8vo, pp. 244, 3 folding maps and panoramas, 26 text-figs, 147 photographs (6 coloured). Hans Huber: Berne, Berlin, 1933. Price not stated.

THIS profusely and beautifully illustrated volume is one of the results of the expedition led by the author under the auspices of the national Sunyatsen University in Canton in 1930–31. The object of the journey was especially the geographic and geological investigation of the mountain region of western China

on the borders of Tibet. The scientific results are in course of publication in China in the English language. The present volume is an account in diary form of the route taken by the expedition, with descriptions of the peoples, their towns and hamlets, and the nature of the country. Topography and geology were the chief objects of interest, the central attraction being the exploration of the little-known Minya Gongkar massif which gives the title to the book. The height was determined as 7700 m. by Prof. Ed. Imhof, a member of the expedition, on whose measurements are based the panoramic sketches of the massif and the detailed map of the area explored. The numerous excellent photographs, which with a few exceptions were taken by the author, give a striking picture of the wonderfully rugged and wild country traversed ; those in colour showing light effects on the snow-mountain peaks are very beautiful. Though the author does not claim any special botanical knowledge, he gives occasional notes on the vegetation, and an indication of its character may be gained from some of the photographs. Of special botanical interest are fig. 68, showing the native fan-palm, *Trachycarpus Martiana* Wendl. at an elevation of 1900 m., and representing the northernmost limit of the species, and fig. 115, a dry slope covered with rolled up plants of *Selaginella rediviva*.

The book is full of interest and is well worth possessing for the illustrations alone. Unfortunately it has no Index.

Plants and Human Economics. By RONALD GOOD, M.A., Head of the Department of Botany, University College, Hull. Sm. 8vo, pp. xii, 174, 8 maps. Cambridge University Press : 1933. Price 5*s*.

As stated in his preface, Mr. Good's object is to combine in a small compass and in readable fashion botanical facts with the historical and economic facts required to give an adequate humanistic background of reality to the subject. At the same time he deplores the restrictions of the examination syllabus which neglects this aspect. The object is commendable, and we congratulate the author on the result. In a series of chapters he deals with the various economic products—cereals and pulses, vegetables, fruits, timber and coal, rubber, &c., indicating their botanical origin and the geographical source of supply. About 600 plant species are mentioned—a fairly complete list of those which are at the present day of value in world commerce. Six maps indicate the distribution of the product in the various continents, and there are also two folding maps showing respectively the general distribution of vegetation—grassland, forest, &c.—and the sources of coal and oil. In four introductory chapters the author discusses the nature and sources of food,

gives a brief account of the nutrition of the green plant, and discusses the ethics of agricultural production and the bearing of Science on Agriculture.

The book is a useful and handy primer, and should be welcomed by teachers and students. If and when a new edition is called for, Mr. Good might consider making his general Index more inclusive. His Appendix, which usefully classifies the plant products under a botanical sequence, hardly takes the place of a full index. And there are a few slips to be corrected. The statement (p. 80) that the sweet chestnut is " a so-called fruit that is actually a seed " resembling the horse-chestnut is a bad one ! And to call the fruits of the Cucurbitaceae " false-fruits " is an extension of the general use of this term.

Lily Year-book, 1933. *Conference Number. Royal Horticultural Society.* Roy. 8vo, pp. 243, 59 figs. Royal Horticultural Society : London, 1933. Price 5*s*. paper, 6*s*. cloth.

THIS volume, the report of the Lily Conference, held in London under the auspices of the Royal Horticultural Society last July (11–13), has been edited by Mr. F. J. Chittenden with the help of a small editorial Committee. The opening address by the Chairman (the Hon. Henry McClaren), the various papers read, and the ensuing discussions are fully reported, and the volume forms a valuable record of present-day knowledge of the genus viewed especially from a gardening standpoint. In his opening address the Chairman reviewed the progress which had been made since the previous congress in 1901. Dr. F. Stoker, in discussing the environment of lilies in nature, traced their distribution southwards from a former temperate circumpolar area in an attempt to explain their reactions to altitude, heat, light, and other factors, and gave a synopsis of the natural environment of individual species. " A survey of lily-soils " by Sir Daniel Hall and Dr. Tincker included the results of analyses of soils from various localities. Vegetative propagation and propagation by seed were discussed respectively by Dr. David Griffiths and Mr. F. C. Stern. Dr. A. B. Stout, of the New York Botanic Garden, communicated a paper on " Sterilities in Lilies," which he attributed to a very general physiological incompatibility in fertilization ; and Miss I. Preston sent from Ontario, Canada, an account of her experiments on hybridization. Mr. E. Krelage gave some historical notes on the early distribution of lilies on or from the Continent of Europe ; and Mr. A. D. Cotton discussed the detection and control of lily-diseases. The numerous excellent illustrations are mainly photographic reproductions of individual species or varieties.

Moss Flora of North America North of Mexico: Grimmiaceae. By George Neville Jones, M.Sc., Assistant in Botany, University of Washington. Edited by A. J. Grout, Ph.D., Biological Laboratory, Cold Spring Harbor, L.I., N.Y. Vol. II. Part 1. Large 8vo, pp. 65, 25 pls. A. J. Grout: Vermont, 1933. Price 2 dollars 50 cents.

In this monograph of the Grimmiaceae of North America the family is divided into four subfamilies:—(1) *Grimmieae*, containing two genera, *Glyphomitrium* (1 species) and *Grimmia* (47 spp.); (2) *Scoulerieae* with a single genus, *Scouleria* (2 spp.); (3) *Hedwigieae*, with *Braunia* (2 spp.), and *Hedwigia* (1 sp.); (4) *Ptychomitrieae*, with *Campylosteleum* (1 sp.), *Ptychomitrium* (4 spp.), and *Rhacomitrium* (9 spp.). Great pains have evidently been taken to render the monograph as useful as possible to students of mosses. The descriptions are adequate. All or nearly all the species and several varieties are freely figured—a number of them for the first time. The synonymy and citations are numerous and drawn from European as well as American works, thus linking and contrasting the Grimmiaceae on the two sides of the Atlantic. Illustrations and exsiccata are cited. And the synopses and artificial keys will prove to be of very great help in the determination of specimens.—A. G.

BOOK-NOTES, NEWS, etc.

Linnean Society of London.—The General Meeting on February 15 took the form of a symposium on marine Algae. Miss B. D. Gregory described the life-history of *Gymnogongrus Griffithsiae* Mart. and *Ahnfeltia plicata* Fries, two British red sea-weeds; Mr. G. Tandy discussed experimental taxonomy with special reference to the genus *Caulerpa*, and Mr. A. D. Cotton the possibility of an alternation of generations in the Myrionemaceae, a family of minute epiphytic brown Algae. A discussion followed.

At the meeting on March 15 Mr. A. J. Wilmott gave a description, illustrated by numerous specimens, of various forms of British *Sorbi* intermediate between the three species *Aucuparia*, *Aria*, and *torminalis*. Miss E. N. Sparshott described her investigations into the structure and development of the tuber of the remarkable plant of the South African Karroo, *Testudinaria Elephantipes*, and the origin of the vegetative shoot. A new leaf and flowering shoot replaces the old one each season, arising from its base, the development being sympodial. The tuber is a development of the hypocotyl and epicotyl, and increases in volume continuously by means of a layer of meristem in the form of an inverted cup. The characteristic angular protecting masses of cork are produced by successive phellogens arising just below the surface. Some account of the Reptiles and Finches

endemic in the Galapagos Islands emphasised the need for the protection of the remarkable fauna and flora of the group, which are threatened by the introduction of various domestic animals and the indiscriminate felling of trees.

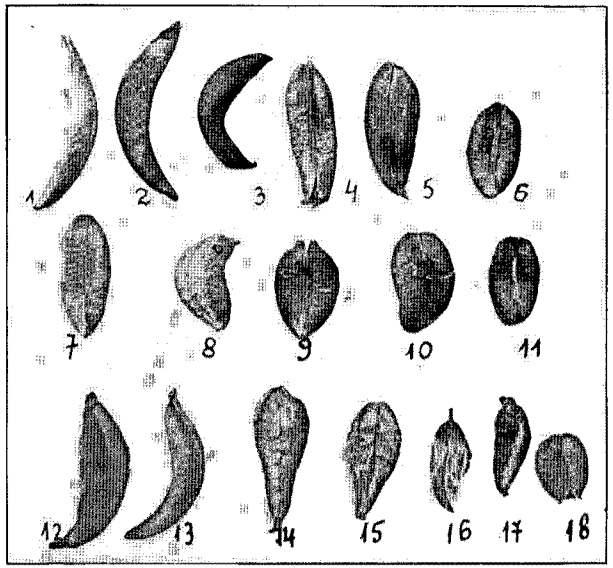
'Journal of the Linnean Society of London.'—The recent issue (Botany, xlix. 393–502, Jan. 1934) contains a revision of the genus *Lobostemon* (Boraginaceae) by Margaret R. Levyns, the result of some years of study in the Cape Province of South Africa. The genus, which is purely South African, includes 28 species of shrubs; the three herbaceous species are separated as a new genus *Echiostachys*. A full account is given of the floral structure and its variations which characterise the five sections of the main genus. The species are very variable; the variations may be due to environment or be seasonal, but mutation also plays an important part, in which extremes both of heat and cold may be factors; the same type of mutation recurs in different species. The cytology of about half the species was examined; the basic number of chromosomes in both genera is seven. A study of *Veronica* by E. R. Saunders is a detailed account of the variations in the vascular anatomy of the flower in a number of species of the genus. The results confirm the generally accepted view of the derivation of the usual tetramerous flower from a primitive pentamerous form. A third paper gives the results of a study of the water relations of the plant cell by Elizabeth C. M. Ernest. An enumeration of the Algae from the East African Lakes forms a part of the Scientific Results of the Cambridge Expedition 1930–1, issued in the Society's Zoological Journal.

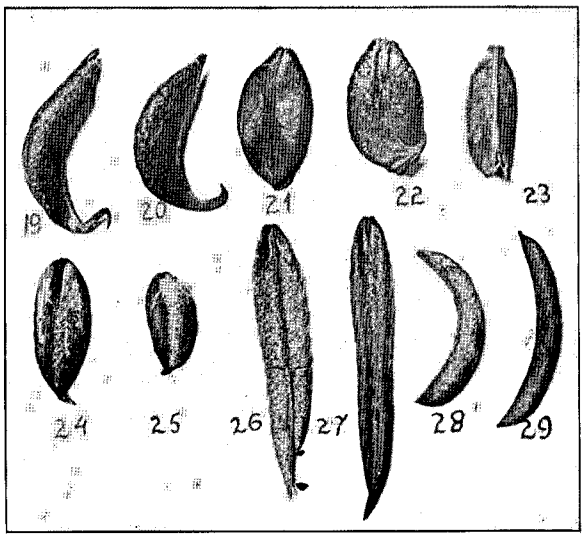
British Mycological Society.—Vol. xviii. pts. 2 & 3 of the Transactions contain several articles of bibliographical interest. Miss Lorrain Smith contributes a valuable critical *résumé* of recent Lichen literature with a list of papers occupying 16 pages. J. Ramsbottom gives a list of the dates of publication of the thirty-two parts of Sowerby's 'English Fungi,' rendered possible by the lucky acquisition of a copy in the original wrappers; also a note on the 'English Index to Persoon's Synopsis,' a small 12mo published in 1819. He also describes the tremelloid outgrowths on *Collybia dryophila*, the occasional occurrence of which has been variously interpreted. H. C. I. Gwynne-Vaughan and H. S. Williamson contribute notes on the origin of the fructification and coloration of the spores in the Ascobolaceae. S. P. Wiltshire has made a critical study of the foundation species of the genera *Alternaria* and *Macrosporium*. There has been much confusion in the use of the two names, which are known to have a common origin—the author gives reasons for retaining *Alternaria* and relegating *Macrosporium* to the list of *nomina ambigua*. R. M. Nattrass describes a new

species of *Hendersonula*, a serious disease of stone-fruit trees in Egypt; C. G. C. Chesters a new genus of Phycomycetes (*Azygozygum*) associated with a diseased condition of *Antirrhinum majus*; and F. K. Sparrow, Jr., new genera and species of Chytridiaceous fungi found mainly in or near Cambridge. R. W. G. Dennis gives the results of investigations on *Helminthosporium Avenae*, the cause of leaf-stripe disease in Oats; and R. A. Sillow reports on a systemic disease of Red Clover, *Botrytis anthophila*, which replaces the pollen grains in the anthers of infected plants; its spores are carried by bees and infect the stigmas of healthy plants.

'ORCHID REVIEW.'—The January and February numbers contain full descriptions, with illustrations, by C. E. Carr of Singapore, of two new species, *Dendrobium Takahashii*, from South Borneo, named after its discoverer, a Japanese Orchid collector, and described as one of the most attractive members of the *nigro-hirsuta* group; and *Coelogyne* (§ *Verrucosae*) *Zurowetzii*, sent to the Botanic Gardens, Singapore, by Mr. Zurowetz, from Dutch West Borneo. C. H. Matschat describes the method of cultivation and preparation of Vanilla (*Vanilla planifolia*) by the Mexican Huaxtecs on the coastal slopes of the Vera Cruz province. The flowers are artificially self-pollinated before opening. A list of new orchid hybrids, largely bigeneric, is included.

'FLORA OF TROPICAL AFRICA.'—We welcome the appearance of the concluding part (pt. 6) of vol. ix. of the Flora, which marks also the conclusion of Sir David Prain's connection with it; the completion of the work he resigns to his successor at Kew, Sir Arthur Hill, as Editor. Part 1 of this volume appeared in 1917; the protracted period of preparation is attributed to the continuous accession of new material for study. The volume, which deals with the first moiety of the Gramineae (Maydeae–Paniceae), represents as regards two-thirds of its extent the work of the late Dr. Stapf; for the remaining third Dr. Stapf worked in collaboration with Mr. C. E. Hubbard. Nearly two-thirds of the present part is occupied by the treatment of the genus *Pennisetum*, represented in tropical Africa by 91 species, excluding five species which the authors segregate under *Beckeropsis*. The cultivated species of the section *Penicillaria* (pearl-millets) have been kept apart from the wild types, since adequate knowledge is wanting for grouping them with the wild species into a natural arrangement. Dr. Stapf concluded that their home is African and that they have been derived in part from the widely spread *P. purpureum*. An interesting addition to the flora since the elaboration of the key to the genera is the genus *Paratheria* Griseb., a monotype with a remarkable distribution—West Africa, Madagascar, Cuba, and Brazil.





PALESTINIAN SPECIES OF *ASTRAGALUS*.

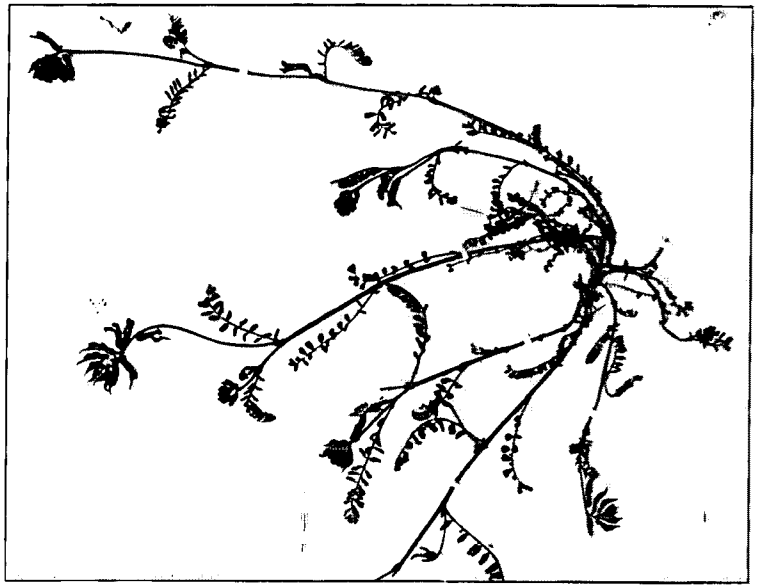


Fig. 2.—Subsp. *heteranthesmus* Eig.

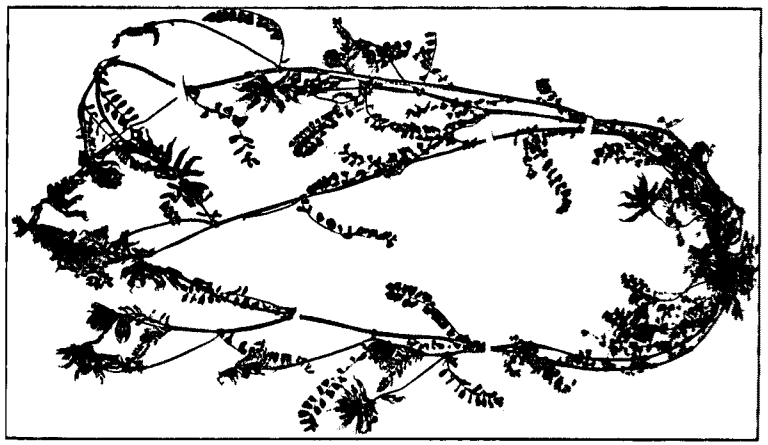


Fig. 1.—*Astragalus palaestinus* Eig.

ASTRAGALUS (SECT. *PLATYGLOTTIS*): REVISION OF PALESTINIAN SPECIES.

BY A. EIG (Hebrew University, Jerusalem).

(PLATES 604 & 605.)

A. HISTORICAL.

Boissier (1872) reports seven species of the section *Platyglottis* of the genus *Astragalus*, subdivided into two groups :—

A. Legumen oblongum : (1) *A. Haarbachii* Sprun., (2) *A. Pamphylicus* Boiss., (3) *A. tuberculosus* DC., (4) *A. ancyleus* Boiss., (5) *A. bombycinus* Boiss.

B. Legumen lanceolatum : (6) *A. berytheus* Boiss. & Bl., (7) *A. peregrinus* Vahl.

In 1827 Moris published *Astragalus verrucosus* from Sardinia, which Martelli (1892), Fiori (1923–25), and some other Italian authors attributed to *A. tuberculosus* DC. (1802). Being limited to a country outside the region of the 'Flora Orientalis' of Boissier, this author did not mention it.

Three other species of the section have been published since the 'Flora Orientalis,' two within the limits of the area covered by this work, a third outside it. In 1890 Post published ('Plantæ Postianæ') *A. palmyrensis* "species *affinis* ad *A. bombycinus*." In 1910 Ascherson and Barbey described in Durand and Baratte, 'Floræ Lybicæ Prodromus,' *A. Taubertianus*, a new species related to *A. tuberculosus* DC. In 1917 Gandoger published *A. kuphoënsis*, previously named by him *A. aegiceras*; this name having already been applied, Gandoger was obliged to change it. Hayek (1927) united it with *A. peregrinus* Vahl under the name *A. peregrinus* var. *kuphoënsis* (Gandog.) Hayek. These are all the species of this section known to me.

For Palestine Boissier reports *A. tuberculosus* (leg. Ky; without exact location), *A. bombycinus* ("in deserto Arabiæ Petreæ ad meridiem jugi Tih," leg. Boiss., and "deserto ad meridiem Palæstinæ," leg. Ky), and *A. peregrinus* ("in deserto Palestinæ ad meridiem Gaza," leg. Boiss.) as growing in Palestine. Barbey (1882) adds some new localities for *A. tuberculosus*: in aridis et agris calcareis ad Daharieh, Hebron et Chefa Omar. Post (1897) does not report other exact localities for this species. Dinsmore in his catalogue (1912) reports with certainty for Palestine only *A. tuberculosus*, but in the second edition of Post's book, revised by Dinsmore *, we find a series of new localities for Palestine for these species of *Astragalus*.

* Dinsmore added in the second edition of Post's book the exact localities, which Post himself did not do. This is an improvement, even though the new data are not always quite correct.

For *A. tuberculosus*: Jaffa, Jarash, Medaba, Nablus, Haifa, Wadi Kilt, Ramlah, etc. The specimen from Jaffa, mentioned by Dinsmore, which I have examined, is *A. berytheus* Boiss. & Bl. As I did not see the other specimens I cannot say what they are, but they are certainly not *A. tuberculosus*, which does not grow in Palestine; probably they are *A. palaestinus*, sp. nov. A new locality is cited for *A. bombycinus*: "South of Yibnah," but the plant in question is not *A. bombycinus* but *A. berytheus*. For *A. peregrinus* he reports a new locality: "Ness Ziona, leg. Eig," but I have never collected this plant in Ness Ziona, and it is certainly an error. Probably it is *A. berytheus*.

B. *Astragalus* § *Platyglottis* in Palestine (based chiefly on the Material of the Hebrew University Herbarium).

I. Sub-sect. *Lanceolati* Boiss.

(1) A. peregrinus Vahl. (Pl. 604, figs. 26, 27.)

Our specimens often have the calyx white hirsute only. Some specimens are biennial and even perennial, as are the majority of the species of this section.

Localities.—Arish, bed of wadi, 2. iii. 25 (Eig) (on the Egyptian boundary); *ibid.* 1. v. 25 (Eig); environs of Abu Daha, about 18 km. from Beer Sheba, 15. iv. 28 (Eig, Feinbrun, Zohary); about 4 km. south of Beer Sheba, 17. iv. 28 (Eig, Feinbrun, Zohary); between Beer Sheba and Tel Melah and at Tel Melah, 4. iv. 27 (Eig, Feinbrun, Zohary); between Barbara and Deir Sneid, 3. iv. 27 (Eig, Feinbrun, Zohary) *. This last locality is the northern limit of the species in Asia. Everywhere it prefers somewhat sandy soil. With the exception of the last locality, all the others are from the Sahara-Sindian (Eig, 1930) Negueb of Palestine.

(2) A. berytheus Boiss. & Bl. (Pl. 604, figs. 28, 29.)

We have specimens with 13 flowers (in the original description 7–8), and with 12–13 pairs of leaflets (in the original description 7–8); some of our specimens seem to be biennials.

Localities.—Haifa, 17. v. 27 (Eig); Cæsaria, 26. iii. 27 (Smoly); between Benjamina and Cæsaria, 27. v. 29 (Eig and Zohary); between Benjamina and Zichron Jacob, 22. v. 29 (Eig and Zohary); Herzelia, iii. 28 (Smoly and Zohary); between Ramat Gan and Petach Tikwa, 10. iii. 22 (Eig and Faktorofsky); Bnei Brak, 18. iii. 26 (Zohary); Ramath Gan, 4. iii. 24, 9. iii. 24, 4. iii. 25 (Eig); Shechunath-Boruchov, 15. iii. 24, and 5. iii. 27 (Eig); Tel-Aviv, 17. ii. 24, 4, 9, 28. iii. 24 (Eig and Faktorofsky); Sarafend, 18. iii. 27 (Eig); Ness Ziona, 22. iii. 24 and 3. iv. 26 (Eig); Wadi Rubin, 25. ii. 26 (Eig and Zohary); Gaza, 6. v. 27 (Eig, Feinbrun, and Zohary).

* In the Herbarium of Montpellier there is a plant under this name from Wadi Abu Nar, leg. Aaronson, 23. iii., det. Daveau-Bat. It is *A. palaestinus*.

In all the localities on light sandy soils, and calcareous sandstone hills in the light soil-belt of the maritime plain, between Haifa and Gaza.

Not previously reported for Palestine. Hitherto known only from Beyrouth, where it was found by Blanche and Peyron.

In the Herbarium of Montpellier University I have seen a specimen of *A. berytheus* collected by Aaronson at Jericho, 29. iii. 06, but there is no doubt that this locality is incorrect. I have also seen there a specimen of Aaronson's from Zargonia, 9. iv. 06: this is undoubtedly correct.

II. Sub-sect. *Oblongi* Boiss.

(3) A. bombycinus Boiss. (Pl. 604, figs. 14, 15.)

Localities.—8 km. from Maan, 16. iv. 32 (Eig and Zohary); between Maan and Ein Mussa, 16. iv. 32 (Eig and Zohary): both in the southern part of Transjordania.

Tristram's (1884) citation for this species ("Gaza") is doubtful. As we have already stated, the plant of this name reported by Dinsmore from south of Yibnah is *A. berytheus*.

All these three species are localized in special districts of Palestine; *A. peregrinus* and *A. bombycinus* practically in the southern deserts and semi-deserts, and *A. berytheus* in the sandy soil-belt of the maritime plain. But other forms of this section grow in the Mediterranean hill and mountain districts of Palestine as well as in the Irano-Turanian and Saharo-Sindian Judæan Desert and Jordan Valley. Some of these forms have previously been attributed to *A. tuberculosus* (by Boissier, Post, Dinsmore, etc.), others are new forms. After having studied them in different European herbaria (in Leningrad, Berlin, Geneva, Paris, and Montpellier) I have come to the following conclusions:—

(1) Not one of these forms is *A. tuberculosus*.

(2) In spite of great differences in shape and size of pods, these are closely related species or forms of a wide collective species.

(3) Their nearest relatives are *A. pamphylicus* Boiss. on the one hand and *A. Taubertianus* Asch. & Barbey on the other, and possibly also *A. palmyrensis* Post. For the present I include all these forms in one collective species, until their taxonomic value can be studied on cultivated specimens in all stages of their development *.

* I am indebted to Dr. Rendle for a very interesting observation, which I have the opportunity to insert in the proof. In a letter of Oct. 12, 1933, he informs me that Mr. E. G. Baker, who has seen my *A. palaestinus*, "points out a close resemblance between *A. palaestinus* and *A. suberosus* Russell (Nat. Hist. of Aleppo, ii, 260)." Mr. Baker suggests the identity of Russell's Aleppo plant with one collected by Post at Aintab, June 1889. Now Post's plant is a true *A. tuberculosus* and not *A. palaestinus*. Neither in Post's Herbarium nor from several European Herbaria where I studied this question did I see *A. palaestinus* from Syria farther north than the district bordering on Palestine. It is more probable that *A. tuberculosus* DC. is a synonym of *A. suberosus* Russell and not of *A. palaestinus*, but not having seen Russell's plant I cannot decide in this matter.

Astragalus palaestinus, sp. nov., subsp. **eu-palaestinus.** Planta annua, biennis et perennans, patule albo et plus minus nigro hirsuta. Caules numerosi prostrati. Foliola 8–12-juga (sæpius 10–11) obovata obcordata vel oblonga 4–12 mm. longa. Pedunculi folio æquilongi vel longiores. Flores 8–17, 18–20 mm. longi. Calyx nigro- et albo-villosus. Legumen anguste-oblongum plus minus curvatum 15–22 mm. longum plus minus rugosum et minute tuberculoso-asperum in mucronem brevissimum abiens, dorso profunde, ventre parum vel profunde sulcatum. (Pl. 604, figs. 1–11; subsp. *eu-palestinus*, figs. 3–5; Pl. 605, fig. 1.)

Racemes at first ovate dense, then oblong loose, together with peduncle longer than leaf, rarely nearly as long. Flowers lurid violet. Calyx 10–12 mm. long, teeth lanceolate, a little shorter than or rarely as long as calyx-tube. Standard 17–22 mm. long, oblong-rhomboid, wings 13–15 mm. long, keel 12–14 mm. long. Pod generally somewhat white hirsute.

Localities.—Tiberias, 26. ii. 23 and 3. iii. 23 (Eig and Faktorofsky); Kinereth, 16. ix. 23 (Eig); Ein Tabaun (Kfar Yecheskiel), 21. ii. 24 and 31. v. 24 (Eig); Balfouria, 15. iv. 24 (Eig); Kfar Yeladim, 9. iii. 30 (Feinbrun and Zohary); between Hartuf station and Beith Gamala, 8. iii. 24 (Eig); Kiriath Anavim, iii. 30 (Amdursky).—Transjordania: 4 km. from Aman, 7. v. 27; environs of Sahab, 7. v. 27 (Eig and Zohary).

All the localities in Cisjordania are typically Mediterranean; in Transjordania they are situated in a transitional territory between the Mediterranean and the Irano-Turanian.

The subsp. *eu-palaestinus*, like all the following forms of the collective species, is sharply distinguished from *A. tuberculosus* by its pods. It is more closely related to *A. pamphylicus*, *A. Taubertianus*, and *A. palmyrensis*. It differs from *A. pamphylicus* in its more numerous flowers (generally 8–17 and not 6–8), by the relation of calyx-lobes to calyx-tube (4–6 or 5–6 and not 3–6), by its hairiness, which is generally white and black, and by the more sulcate ventral suture of the pods. From *A. Taubertianus* it differs chiefly in the shape of its fruits (compare Pl. 604, figs. 1–11 and 18). *A. Taubertianus* has very small fruits with a small difference between length and breadth (about 11 mm. long and 8·5 mm. broad; the smallest fruits of the subsp. *eu-palaestinus* are 15 mm. long and 9 mm. broad), nearly flat (and not curved as in subsp. *eu-palaestinus*), and entirely lacking a beak.

Subsp. **eu-palaestinus** var. nov. **deserticolus.** Legumen brevius, compressum, densius pubescens, utrimque lato-sulcatum.

Pods flatter, more hairy; proportion of teeth to calyx-tube 5·5–6 to 3–3·5 (Pl. 604, fig. 7).

Localities.—Wadi Kilt, 13. ii. (Meyeres and Dinsmore); midway between Wadi Abu Hindi and Jebel Muntar, 1. iv. 23 (Eig). Both in the Irano-Turanian part of the Judæan Desert.

Subsp. nov. **jordanensis.** Legumen 14–16 mm. longum, 9–11 mm. latum, depresse et parum profunde sulcatum. Indumentum totæ plantæ densissmum. (Pl. 604, figs. 8–10.)

Pods curved, slightly beaked, broadly but shallowly sulcated, wrinkled and tubercled somewhat more than in type. The whole plant more densely and more white hairy. [Flowers unknown.]

Localities.—Wadi Fara (Jordan Valley), slopes of the mountains, 6. ii. 27 (Eig, Feinbrun, Zohary); Guveira (Dead Sea), 2. iv. 25 (Eig and Zohary).

This form has the broadest fruits in the collective species and one of the broadest in the whole section.

Var. nov. **Taubertianoides.** Legumen minus et angustius. (Pl. 604, fig. 11.)

Differs from the type of the subsp. by its smaller narrower fruits less tubercled and wrinkled.

Localities.—Between Wadi Shakif and Wadi Sidre (environs of Dead Sea), 23. iii. 26 (Eig, Feinbrun, Zohary).

Taxonomic value and position very uncertain. On the one hand, it closely resembles some forms of subsp. *eu-palaestinus*, and may even perhaps be ranged with this; on the other hand, it has much affinity with *A. Taubertianus*. At all events, this is the form which links *A. Taubertianus* with the series of forms of *A. palaestinus*.

Subsp. nov. **heteranthesmus.** Inflorescentiæ 1–2, superiores 6–10-floræ, folio longiores; inferiores 1–2 unifloræ folio breviores; indumentum eo ssp. *eu-palaestini* simile; fructus immaturus fructu var. *deserticoli* similis. (Pl. 605, fig. 2.)

Sparingly patulate hirsute; leaflets oblong-linear.

Locality.—Syrian Hauran, between Der'a to Bosra (J. E. Dinsmore, 27. iii. 1932).

A striking form, the systematic position of which is doubtful. Only in var. *Taubertianoides* did we occasionally find 1-flowered inflorescences, but longer, not shorter than the leaf. In subsp. *heteranthesmus* the lower inflorescences are 1-flowered (by abortion) and shorter than the leaf, even in fruit, whereas the upper many-flowered are longer than the leaves even in flower, The calyx-shape is rather that of var. *Taubertianoides*, whereas the indumentum and the young fruits are similar to those of subsp. *eu-palaestinus*. The flowers as compared with other forms of this collective species are rather small, perhaps the smallest. Their colour is uncertain. The systematic position of this form will be clearer when ripe fruits are available.

Subsp. nov. **hierosolymitanus.** Legumen lanceolatum, 28–30 mm. longum, 5–6 mm. latum, ventre carinatum vel paulo sulcatum, dorso anguste sulcatum. (Pl. 604, figs. 1, 2.)

Localities.—Jerusalem, 4. v. 24; 15. iii. 25; 15. iv. 25; 4. iv. 26 (Zohary); 12. iv. 29 (Eig).

A striking form, approaching *A. pamphylicus* (Pl. 604, figs. 12, 13) and *A. berytheus* in the form of its pods. This form links the subsections *Oblongi* and *Lanceolati* (*A. palaestinus* subsp. *hierosolymitanus–A. berytheus*) (Pl. 604, figs. 1, 2, 28, 29).

From *A. pamphylicus* it is distinguished by the same characters as the type, but the ventral suture here is generally keeled and the pods are somewhat longer and thinner. From *A. berytheus* it is easily distinguished by the vegetative parts and by the thinner pods less strongly keeled.

C. Systematic and Phytogeographical Remarks on the Section.

The section is a natural one and presents many interesting topics from the systematic, ecological, and phytogeographical points of view. The central position of the section is occupied by *A. palaestinus*, which includes nearly the entire amplitude of the morphological characters of the section and the ecological requirements known in general for it.

The differentiation in the vegetative parts of the different species of the section is rather limited, as is also that in the flowers. The centre of the specific differentiation lies in the shape, form, rugosity, and hairiness of the pods: the form varies from straight to sharply curved; the length ranges from 1 cm. (*A. Taubertianus*) to 5 cm. (*A. peregrinus*); the breadth from 5 mm. (*A. berytheus*, *A. palaestinus* subsp. *hierosolymitanus*) to 11–12 mm. (*A. palaestinus* subsp. *hierosolymitanus*, *A. ancyleus*), and the proportion of length to breadth from 1–7 (*A. peregrinus*) to 0·8–1 (*A. Taubertianus*, *A. palaestinus* subsp. *jordanensis*). Of great importance is the character of the structure of the ventral and dorsal suture; the ventral is carinate to broadly sulcate, the dorsal narrowly to broadly sulcate. The pod is rather clearly tubercled (*A. ancyleus*, *A. tuberculosus*) or only more or less wrinkled or even not wrinkled.

I have been able to examine numerous specimens of different species and varieties of this section, and among them nearly all the original types. The only form which I have not seen is the *A. kuphoënsis* (*A. peregrinus* var. *kuphoënsis* (Gand.) Hayek). If it is really an indigenous plant in the island of Kupho, it is very doubtful whether Hayek was justified in uniting it with the Sahara-Sindian *A. peregrinus*.

A. verrucosus is another form of this section, the specific independence of which is rather doubtful. U. Martelli ("Astragali Italiani," 1892), speaking of *A. verrucosus*, says: "... dell' *A. verrucosus* descritto dal Moris cone speciale dell' isola di Sardegna non si puo riconoscerne l'autonomia ma devesi riunire all' *A. tuberculosus* DC. della Siria, Cappadocia, Mesopotamia, etc., quantunque gli esemplari (soli da me veduti) dell' erbario Moris comunicatimi dal gentilissimo prof. Gibelli e quello donato dallo stesso Moris all' erbario fiorentino abbiano le foglioline e le stipole piu grandi. Le stipole che talora nei campioni orientali sono sublibere variano anche nello stesso individuo e negli stessi esemplari della Cirenaica raccolti dal sig. G. Ruhmer sono affato identiche a quelle degli esemplari sardi." The last part of this passage is particularly interesting. No other author known to me mentions *A. tuberculosus* from Cyrenaica, and I supposed that Martelli meant the plant of Ruhmer, which was later described by Ascherson and Barbey under the name of *A. Taubertianus*. But in this case, if Martelli failed to notice the great difference between *A. Taubertianus* and *A. tuberculosus*, it is doubtful whether his assertion that *A. verrucosus* and *A. tuberculosus* are the same plant has great value. I have seen only one specimen from Sardinia of *A. verrucosus*, and that in very bad condition; it closely resembled *A. tuberculosus* with but a slightly larger pod and shorter beak. But since I have seen only one rather poor specimen, I refrain from a decision on its taxonomic position.

The taxonomic value of *A. palmyrensis* Post is also somewhat doubtful. I have examined the original unique specimen of *A. palmyrensis* Post (Pl. 604, figs. 16, 17), and noticed that its peduncles are much longer than the leaves, and not shorter as is stated in the original description and in the first and second edition of Post's work. The pods are too young to enable one to be certain of their shape and form when ripe; however, most of the young pods have an oblong-triangular form, of the type of *A. bombycinus* *.

I wish to add a few remarks specially touching the morphology and taxonomy of *A. tuberculosus*, described by de Candolle on two specimens, one from Cappadocia, the other from Syria (leg. Billiardière) in 'Astragalogia,' 166 (1802), where the pod is figured on pl. 22. In 'Prodromus,' ii. 290 (1825), de Candolle adds at the end of the description of *A. tuberculosus*: "In Syria et Cappadocia, specimen cappadocicum fructu majore quam syriacum sed simile videtur." But Boissier did not agree in this point with de Candolle; he recognized these two specimens as belonging to two different species, describing the specimen of Cappadocia as a new species, *A. ancyleus* †. De Candolle's

* I had the opportunity to study *Astragalus bombycinus* and *A. palmyrensis* in a trip this spring to Syria and Iraq. We found rich material of *A. palmyrensis* (both in flower and in fruit) in the northern part of the Syrian Desert, and of *A. bombycinus* in the southern. *A. palmyrensis* is a good species, having indeed its fruits very similar to those of *A. bombycinus* (oblong-triangular, incurved, white-hairy, netted-wrinkled), but is readily distinguished. It is a perennial and much larger plant and is further distinguished by more numerous flowers, by its calyx, etc.

† Apparently the first, and only, representation of the pods of *A. ancyleus*, a very good one, is given by Bornmüller, "Zwei neue *Astragalus*-Arten der Flora Persiens" (1914).

description, it is true, may also apply to *A. ancyleus*, but the figure accompanying the original description leaves no doubt that he had before him a specimen that is also considered by us as belonging to this species (compare Pl. 604, figs. 21–23 and 19, 20). I emphasise this point because, when wishing to examine the original specimen of *A. tuberculosus* DC. in Geneva, I found on the sheet bearing the name of *A. tuberculosus* only one specimen, which was *A. ancyleus* Boiss. from Cappadocia. Some time later I wrote to the Director of the " Conservatoire " in Geneva where de Candolle's Herbarium is now preserved, asking for additional information, and I am indebted to him for the following answer : " J'ai fait rechercher la plante dont vous me parlez (*Astragalus tuberculosus*, leg. Labillard. in Syria). Cette plante, qui devrait se trouver dans l'herbier du Prodrome DC., y manque. Donc, ou bien elle a été volée ou bien a été détruite. Il est probable que c'est la seconde alternative qui est la vraie, parce que la plante de Cappodoce qui l'accompagne est fortement mangée des insectes, et je sais que c'est seulement après avoir constaté la destruction d'une grande quantité de ses spécimens que de Candolle prit la décision (trop tardive, évidemment) de faire empoisonner ses collections au sublimé. Comme les Légumineuses sont fréquemment mangées par les insectes, il me paraît infiniment probable que cette plante fut un des spécimens dont on a à déplorer la destruction." The figure given, together with the original description by De Candolle, thus is now of great importance for the identification of this species.

I would add that the figure of the pods of *A. tuberculosus* in Post, ' Flora of Syria, &c.' (ed. 1, 261, ed. 2, 382) represents pods of *A. palaestinus* drawn from the single specimen of *A. palaestinus* in Post's Herbarium. (One of the pods of this specimen is represented in Pl. 604, fig. 3.) It is unfortunate that Post chose for his drawing the pods of this one specimen (collected in a locality between Syria and Palestine), and not those of one of the many very good specimens of the true *A. tuberculosus* in his herbarium.

Regarding the description of *A. tuberculosus* in Boissier's and Post's works, I would remark that Boissier's statement " stipulis triangularibus minutis " is not correct. De Candolle says of the stipules merely " oblonga subacuta," mentioning nothing regarding size. The stipules of this species are not smaller than in the majority of the species of the section. Post's statement that the flowers are yellowish (Dinsmore in the second edition even emphasizes this character) is also incorrect, as is also his statement that the pod of *A. tuberculosus* reaches 3 cm. in length. Boissier's note on this point (23 mm.) is correct.

The sub-section *Lanceolati* is a natural sub-group in this section. The pods of its species are long, narrow, nearly or

quite straight, keeled at the ventra suture and sulcate at the dorsal (Pl. 604, figs. 26–29). *A. peregrinus* is phytogeographically a middle Sahara-Sindian species, reaching in Algerian Sahara the western limit of the area of the section. In Palestine, at least, we observed that it prefers somewhat loose soils. *A. berytheus* is an East-Mediterranean species, endemic for Palestine and southern Syria (to Beyrouth). It is limited to the sandy soils of the light soil-belt of the sea-plain, but does not advance south of Gaza. It is thus an eu-Mediterranean species, with a very limited geographical area and ecological requirements.

A. kuphoënsis, if really a special form and not an adventive *A. peregrinus*, is, as I have already said, a special East-Mediterranean species, rather than a variety of the Sahara-Sindian *A. peregrinus*. If so, it would, in this sub-section, be a second species very limited in its area.

In the sub-section *Oblongi* we have to distinguish between two groups of species : one northern, the other southern. In the first we include *A. Haarbachii*, *A. tuberculosus*, *A. ancyleus*, and *A. verrucosus* (if it is an independent species).

A. tuberculosus and *A. ancyleus* are very closely allied and chiefly distinguished by length and shape of the beak of the pod (Pl. 604, figs. 19–23). *A. Haarbachii* (figs. 24, 25) presents characters intermediate in some sense between the northern and southern groups. Phytogeographically all species of this group are East Mediterranean, *A. tuberculosus* being a sub-East-Mediterranean species, penetrating into the northern (mountain) part of the Irano-Turanian Iraq. *A. verrucosus*, indeed, if a separate species, is rather West Mediterranean in its distribution, but undoubtedly East Mediterranean in origin. With *A. verrucosus* the section reaches its western limit in the northern part of its area, and with *A. Haarbachii* it reaches its northern limit.

The distribution of *A. pamphylicus* (Pl. 604, figs. 12, 13) would place it in the northern group, but morphologically it is more related to the southern, especially to the subsp. *hierosolymitanus* of *A. palaestinus* ; hence we prefer to include it in the southern. It is an East-Mediterranean species hitherto known from few localities in Mediterranean Asia Minor. This group also includes *A. pamphylicus*, *A. palaestinus*, *A. bombycinus*, *A. Taubertianus*, and *A. palmyrensis*.

A. bombycinus is well delimited ecologically and morphologically. Its almost narrow-triangular, generally white hirsute pods, when ripe, are very characteristic and have something of the shape of those of the northern group. Ecologically it is a steppe-desert species, preferring hard soil. Phytogeographically it belongs to the sub-Sahara-Sindian element, penetrating into the southern part of the Irano-Turanian region. It may be necessary to create a separate group for this species, perhaps together with *A. palmyrensis*.

Closely related ecologically, and it seems also morphologically, to *A. bombycinus* is *A. palmyrensis*.

In the opposite end of the East-Mediterranean sub-region, in Cyrenaica, *A. Taubertianus* (Pl. 604, fig. 18) is endemic. According to the localities assigned by Pampanini (1930) for this species, it seems to be a Mediterranean and not a Sahara-Sindian species. Its nearest relative, nevertheless, is the Sahara-Sindian *A. palaestinus* var. *Taubertianoides*.

We shall now consider *A. palaestinus*, the most interesting species of the section. All the other species, so far as I can judge from the generally scant herbarium material, definitely preserve within their variability the fundamental character of their pod as well as a certain limit in their ecological requirements. *A. palaestinus*, on the contrary, is extremely variable in the form and size of its pods and in its ecology. Its morphological variability is closely parallel to its ecological changes. The relation of length to breadth of the pods decreases as one passes from the forms growing in the eu-Mediterranean climatic conditions to those of more steppe and desert habitats. The breadth of the grooves of the sutures also changes in the same direction.

The most prominent units of this collective species have their own ecology and phytogeographical value. Subsp. *eu-palaestinus* is a Mediterranean group of forms, but has transitional forms to the subsp. *jordanensis* in the transitional Mediterranean-Irano-Turanian districts (as, for example, a form from the environs of Sahab, the pod of which is represented on Pl. 604, fig. 6); its var. *deserticolum* is special for the Irano-Turanian part of the Judæan desert or for the transitional Mediterranean-Irano-Turanian territory; subsp. *jordanensis* is a Sahara-Sindian or Sahara-Sindian-Irano-Turanian form, endemic for the lower Jordan Valley; its var. *Taubertianoides* seems to have the same ecology; subsp. *hierosolymitanus* is, on the contrary, an eu-Mediterranean form; subsp. *heteranthesmus* is a transitional Mediterranean-Irano-Turanian form.

It is very probable that further study will show that some of these units are separate species, but in this preliminary article on the subject we cannot make a decided statement on the matter.

Whatever the case may be, whether separate species or parts of one wide species, all these forms (together with *A. Taubertianus* and *A. pamphylicus*) are, in my opinion, a young group of forms fully developed, but not yet sufficiently differentiated in its forms. I should further suggest that the Mediterranean forms of subsp. *eu-palaestinus* are the father-forms of the whole Palestinian group, and the Irano-Turanian and Sahara-Sindian forms are younger derivatives.

Palestine is the richest country for this section. The only important type which is lacking in Palestine is *Haarbachii-ancyleus-tuberculosus*, the northern group of the sub-section *Oblongi*. All the other species of this section either grow in Palestine or possess parallel forms in the collective species of *A. palaestinus* (*A. Taubertianus*—*A. palaestinus* var. *Taubertianoides*; *A. pamphylicus*—*A. palaestinus* subsp. *hierosolymitanus*). But phytogeographically Palestine is closely related to southern and central Syria, and if we regard these as a phytogeographical unit, not one of the important types of the section is lacking. These countries are the geographical centre of the section; they possess areas with the whole ecological amplitude required by the section; here we find the group of forms which show the widest morphological and ecological differentiation and, finally, two endemic species and some endemic varieties. We may thus suggest that these countries are not only the centre of the geographical distribution of the section and the centre of richness of forms, but also presumably the centre of origin of the whole section.

By its ecology and geographical distribution the section seems to be originally a Mediterranean group. Only *A. bombycinus* penetrates as far as Persia to the Irano-Turanian region. But it also has its centre of mass-distribution in the Sahara-Sindian and Irano-Turanian districts close to the Mediterranean region. The second Sahara-Sindian species, *A. peregrinus*, grows in the Sahara-Sindian districts adjacent to the Mediterranean territories, into which it occasionally penetrates. The Irano-Turanian endemic *A. palmyrensis* is also in an area close to the Mediterranean territory. We have already spoken of the Sahara-Sindian and Irano-Turanian forms of the collective *A. palaestinus*, suggesting that they are derived from the Mediterranean forms. *A. bombycinus* (and perhaps *A. palmyrensis*) and *A. peregrinus* seem to be old steppe-desert derivatives of this section, as compared with the Sahara-Sindian and Irano-Turanian forms of *A. palaestinus*, which seem to be comparatively young.

That the Sahara-Sindian and Irano-Turanian derivatives of the Mediterranean element have furnished a large number of Sahara-Sindian and Irano-Turanian plants is a recognised fact. Many phytogeographers, emphasising the historical point of view, on the basis of this fact have even included the larger parts of the Irano-Turanian and Sahara-Sindian regions in the Mediterranean region. We are far from sharing this view. But we agree entirely that the process of Sahara-Sindian and Irano-Turanian form-derivation of Mediterranean origin is an old one; that this process has had various stages of intensity; that the last stage seems to have begun with the close of the pluvial period. The section *Plattyglottis* may furnish us with examples of such old derivatives (*A. bombycinus*, *A. peregrinus*) as well as of new derivatives (*A. palaestinus* var. *deserticulum*; subsp. *jordanensis* and its var. *Taubertianoides*; subsp. *heteranthesmus*).

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Explanation of the Plates.

Plate 604.

Figs. 1–11. *Astragalus palaestinus*, sp. nov. 1–2, subsp. *hierosolymitanus*; 3–5, type-forms of subsp. *eu-palaestinus*; 7, *eu-palaestinus* var. *deserticolus*; 6, transitional form between *eu-palaestinus* and subsp. *jordanensis*; 8–10, type-forms of subsp. *jordanensis*; 11, subsp. *jordanensis* var. *Taubertianoides*. 12–13, *A. pamphylicus* Boiss. 14–15, *A. bombycinus* Boiss. 16–17, *A. palmyrensis* Post (type). 18, *A. Taubertianus* Aschers. & Barbey (type). 19–20, *A. ancyleus* Boiss. 21–23, *A. tuberculosus* DC. 24–25, *A. Haarbachii* Sprun. 26–27, *A. peregrinus* Vahl. 28–29, *A. berytheus* Boiss. & Bl. All 5/6 nat. size.

Plate 605.

Fig. 1. *A. palaestinus*, sp. nov. Fig. 2. Subsp. nov. *heteranthesmus*. ¼ nat. size.

NOTES ON HYDROCHARITACEAE.—I.

By J. E. Dandy.

In this series of notes it is proposed to deal with various points concerning the taxonomy and nomenclature of members of the family Hydrocharitaceae *. As regards its external limits the family is accepted in the same sense as that adopted by Bentham and Hooker (Gen. Pl. iii, 2, 448–455, 1883), who called it Hydrocharideae, and by Ascherson and Gürke (in Engl. & Prantl, Nat. Pflanzenfam. ii, 1, 238–258, 1889).

1. The Delimitation and Subdivision of *Ottelia*.

The genus *Ottelia* Pers. forms the basis of the tribe *Ottelieae* Aschers. & Gürke (*tom. cit.* 247, 255), under which, as originally constituted, two genera were recognized as valid—*Ottelia* and *Boottia* Wall. Since Ascherson and Gürke published their classification in the 'Natürlichen Pflanzenfamilien' many new species have been described under *Ottelia* and *Boottia*, and two new genera, *Oligolobos* Gagnep. and *Xystrolobos* Gagnep., have been added to the tribe. So varied are the combinations of

* Hydrocharitaceae Lindl. Key Struct. Physiol. & Syst. Bot. 70 ("Hydrocharaceæ") (1835).

characters presented by these numerous additions that it is necessary to review the classification of the group, and such a review leads to the conclusion that all the forms belonging to the tribe should be united under a single genus, *Ottelia*, comprising about forty known species, several of which have not yet been described.

Ottelia was founded by Persoon (Synops. Pl. i. 400, 1805) on *O. alismoides* (L.) Pers., based on *Stratiotes alismoides* L. Actually Schreber (in Linn. Gen. Pl. ed. 8, i. 242, 1789) was the first to separate this species as generically distinct from *Stratiotes* L., but the name (*Damasonium* Schreb.) proposed by him is invalidated by the earlier *Damasonium* Mill.* In 1812 the name *Hymenotheca* Salisb., without generic diagnosis, was published by Salisbury (in Trans. Hort. Soc. Lond. i. 268) for the same species. *O. alismoides* is now known to be a very variable and widespread species, with an extensive range in south-eastern Asia and occurring also in eastern tropical Australia and north-eastern Africa. Normally its principal characters are as follows: flowers hermaphrodite; spathes one-flowered, with several more or less well-developed foliaceous longitudinal wings; stamens 6; styles 6; leaves submersed. In depauperate plants the spathe-wings are sometimes obsolescent.

Boottia was based by Wallich (Pl. As. Rarior. i. 51, 1830) on *B. cordata* Wall., the only original species. This is known from Burma and Hainan †, and has the following characters: flowers diœcious; spathes unwinged, the male many-flowered, the female one-flowered; stamens 12; styles 9–15; leaves (at least the upper ones) with a clearly defined floating lamina.

When Ascherson and Gürke (*loc. cit.*) founded the tribe *Ottelieae* they gave the following key to the two genera which they recognized:—

"A. Bl. 2häusig. Spathen meist ungeflügelt, seltener sehr schmal geflügelt, die ♀ meist 1-, die ♂ mehrblütig. N. 6–15 ..... 10. *Boottia*.
B. Bl. zwitterig. Spathen 1-blütig, oft mit 2–6 geflügelten Rippen. N. 6 ..... 11. *Ottelia*."

From this it is seen that these authors relied primarily on the monocliny or dicliny of the flowers to separate the genera, and the species subsequently described under *Ottelia* and *Boottia* have been classified on this same ground, irrespective of other characters. If, however, these additional species are examined it is at once evident that the distinction based on bisexuality

* *Damasonium* Mill. (1754) is the valid name for a genus of Alismataceae.

† *B. cordata* has been erroneously recorded from Madagascar by Ridley (in Journ. Linn. Soc., Bot. xxii. 240, 1886), Durand and Schinz (Consp. Fl. Afr. v. 4, 1892), and Jumelle (in Ann. Mus. Colon. Marseill. sér. 3, iv, 2, 36, 1917). The plant concerned is *J. Forbes* 1 (in Herb. Brit. Mus.), which was collected in Madagascar but is certainly not conspecific with *B. cordata*. It is more closely related to *B. exserta* Ridl.

or unisexuality of the flowers, though perhaps convenient, is artificial, for it has resulted in closely allied plants being separated generically, whilst others, more distantly related to each other, have been grouped together. Some examples may be mentioned. The diclinous plant described under the name *B. brachyphylla* Gürke is obviously very closely allied to the monoclinous *O. ulvifolia* (Planch.) Walp., differing only in the diœcism accompanied by multiplication of the male flowers and stamens; both these species have two-winged spathes and submersed leaves. Another diœcious plant, *B. Bodinieri* (Lév. & Van.) Lév. & Van., in which the spathes have several wings, bears a similar relationship to the monoclinous *O. alismoides* as does *B. brachyphylla* to *O. ulvifolia*. *B. cordata*, the type-species of *Boottia*, together with related diclinous forms such as *B. exserta* Ridl., *B. Fischeri* Gürke, and *B. Schinziana* Aschers. & Gürke, shows considerable affinity with the monoclinous *O. ovalifolia* (R. Br.) Rich. Since the tendency to diœcism is strongly marked in the Hydrocharitaceae, and must have acted independently in some of the tribes, e. g., *Ottelieae*, *Anachariteae* (*Hydrilleae*) *, and *Blyxeae* †, it is reasonable to assume that it may also have acted along parallel lines within the *Ottelieae*. On this assumption the genus *Boottia*, as currently interpreted, is polyphyletic, and must therefore be either reorganized or reduced if the classification of *Ottelieae* is to be natural. Before deciding between these alternatives it is necessary to consider other characters which may be of generic importance in the tribe, namely, the presence or absence of wings on the spathes, the number of flowers in the latter, and the numbers of stamens and styles.

Spathe-wings. The spathes are composed of two concave bracts connate to form a tubular involucre, which is wingless or bears two or more longitudinal foliaceous wings. According to the absence or presence of these wings, and their number, the species may be divided into three groups. In such species as the monoclinous *Ottelia ovalifolia*, *O. Verdickii* Gürke, *O. scabra* Bak.‡, *O. brasiliensis* (Planch.) Walp., *O. benguellensis* Gürke, and *Oligolobos Balansae* Gagnep., and the diœcious *Boottia cordata*, *B. exserta*, *B. Fischeri*, *B. Schinziana*, *B. kunenensis* Gürke, *B. muricata* C. H. Wright, *B. cylindrica* T. C. E. Fr.,

* *Anachariteae* Endl. Gen. Pl. 161 ("*Anacharideae*") (1837). *Hydrilleae* Casp. in Monatsber. K. Preuss. Akad. Wissensch. Berl. 1857, 39 (1857), *nomen illegitimum*.

† These three tribes all contain both hermaphrodite and diœcious forms.

‡ This species has bisexual flowers, but owing to an erroneous supposition that they were unisexual it has been placed in the genus *Boottia* as *B. scabra* (Bak.) Benth. & Hook. ex Ridl. in Journ. Linn. Soc., Bot. xxii. 239 (1886). Ridley attributed this name to Bentham and Hooker, Gen. Pl. iii, 2, 454 (1883), but these authors did not publish the combination; they only suggested the inclusion of *O. scabra* among the species of *Boottia*.

and *Xystrolobos yunnanensis* Gagnep. the spathes are unwinged, though they may be more or less keeled along the midrib of each bract and sometimes may have a number of additional conspicuous (but not wing-like) longitudinal nerves or ribs *. The second group of species, which is entirely African and comprises the monoclinous *Ottelia ulvifolia* and the diclinous *B. brachyphylla*, is characterized by two-winged spathes; the wings are opposite, one being developed along the midrib of each bract. In the third group the spathes are similar to those of the second group, except that additional wings occur on the sides of the spathe, which therefore in all has several (about 5–10) wings; this last group includes the monoclinous *O. alismoides* and such diœcious species as *B. Bodinieri* and *B. lanceolata* Gagnep.

Classification into these three groups based on winging of the spathes appears to afford the most natural primary division of *Ottelieae*, but the groups are subgeneric rather than generic in status, for the character is not altogether stable. In those species with winged spathes the wings may vary greatly in degree of development and in depauperate plants are sometimes obsolescent, while in the diœcious *B. Thorelii* Gagnep. the female spathes have several wings whereas the male spathes are wingless.

Number of Flowers. Almost throughout the tribe the fertile (*i. e.*, hermaphrodite and female) plants have the spathes normally one-flowered. The exceptions include the species referred to *Oligolobos* and *Xystrolobos*. Two species have been placed in the former genus; both are monoclinous, and one (*O. Balansae* Gagnep., the type-species) has about 10 flowers in each spathe, whilst the other (*O. triflorus* Gagnep.) has only 2 or 3 flowers to a spathe. *X. yunnanensis* Gagnep., the only original species of *Xystrolobos*, is a diœcious plant in which the female spathes contain several (5–7) flowers. The presence of more than one flower in the fertile spathes, however, can scarcely be regarded as a basis for generic separation, for multiplication of the fertile flowers occurs in species which normally have them solitary. In *Ottelia ulvifolia*, a monoclinous species, the spathes are usually one-flowered, but in some of its forms, such as that described as *Boottia abyssinica* Ridl., there is an additional flower, and in others, such as Schweinfurth's n. 1159 (the basis of *B. Rohrbachiana* Aschers. & Gürke) and the Sudan Government Herbarium's n. 1466 (in Herb. Brit. Mus.), the spathes contain 1, 2, or several flowers. The diœcious members of the tribe always have several or numerous flowers in the male spathes, for dicliny in *Ottelieae*, as in many other Hydrocharitaceae, is accompanied by multiplication of the male flowers.

* This ribbing of the spathes is most noticeable in *Ottelia crassifolia* (Ridl.) Welw. ex Rendle, in which species they bear numerous prominent ribs which in cross-section are seen to be very thick and cannot be termed wings.

NUMBERS OF STAMENS AND STYLES. It is difficult in this tribe to secure trustworthy data concerning the numbers of stamens and styles, owing to the fact that most of the species are known to botanists only from dried material, which is not easy to dissect. Some of the published descriptions are certainly inaccurate, and others may be unreliable. The available evidence, however, points to the conclusion that the numbers of stamens and styles do not afford good generic, or even subgeneric, characters, though they may prove to be of value in separating minor groups. In *Ottelia* as hitherto interpreted (*i. e.*, as a monoclinous genus) the stamens range from 3 (in *O. benguellensis*) or 6 (in *O. ulvifolia*, *O. alismoides*, etc.) to 9 or more (in *O. ovalifolia*, *O. Verdickii*, etc.), and in *Oligolobos*, also monoclinous, they are described as 3. The diclinous species, comprising *Boottia* (as currently interpreted) and *Xystrolobos*, have 9–12 (? –15) stamens in the male flowers. Thus dicliny is generally accompanied by an increase in the number of stamens as well as in the number of male flowers. Styles are commonly 6 or more, the number sometimes varying considerably in one and the same species, as in *B. cordata* (9–15). In *Oligolobos* and *Xystrolobos* the styles are apparently only 3, but the same number seems to be characteristic also of such different species as *Ottelia benguellensis*, *B. muricata*, and *B. lanceolata*.

From the above considerations it is reasonably evident that the current interpretation of *Boottia* as a genus separated from *Ottelia* merely on account of dicliny (and its attendant features) is unnatural and should be discarded. Further, there appears to be no character or group of characters by which *Boottia* can justifiably be retained as generically distinct, and this is true also of *Oligolobos* and *Xystrolobos*. These three genera, therefore, are here united with *Ottelia* to form a single aggregate genus which is very uniform in habit, the most apparent differences being due to purely vegetative characters such as the presence or absence of clearly differentiated floating leaf-laminas. The species seem to fall primarily into three main groups depending on the presence or absence of spathe-wings and their number. These three groups are proposed below as subgenera; they can apparently be subdivided into minor groups, in whose classification some of the characters mentioned above (but not regarded as generic or subgeneric) may be brought into play. Such subdivision, however, is not attempted in the present note.

OTTELIA Pers. Synops. Pl. i. 400 (1805). *Stratiotes* L. Sp. Pl. i. 535 (1753) & Gen. Pl. ed. 5, 238 (1754), pro parte, quoad sp. 2. *Damasonium* Schreb. in Linn. *op. cit.* ed. 8, i. 242 (1789)—non *Damasonium* Mill. (1754). *Hymenotheca* Salisb. in Trans. Hort. Soc. Lond. i. 268 (1812), *nomen nudum*—non *Hymenotheca* F. Muell. (1859). *Boottia* Wall. Pl. As. Rarior. i. 51 (1830)—non *Bootia* Bigel. (1824).* *Oligolobos* Gagnep. in Bull. Soc. Bot. Franc. liv. 542 (1907). *Xystrolobos* Gagnep. *tom. cit.* 544 (1907).

The type-species is *Ottelia alismoides* (L.) Pers. (*Stratiotes alismoides* L.). About 40 species are referable to the genus, which is here divided into the following three subgenera :—

A. **BOOTTIA** (Wall.) Dandy, subgen. nov. *Spathæ* exalatæ, ecostatæ vel costis longitudinalibus plus minusve prominentibus (sed vix aliformibus) percursæ. *Plantæ* acaules vel interdum subcaulescentes, foliis in laminam petiolumque abrupte vel sensim divisis, lamina submersa vel in aquæ superficie natanti.

This subgenus is based on *Boottia* Wall. Pl. As. Rarior. i. 51 (1830), the type-species being *Ottelia cordata* (Wall.) Dandy (*B. cordata* Wall.). The species are found in tropical Africa (including Madagascar), south-eastern Asia, Australia, New Caledonia, and south-eastern South America. Among the monoclinous species are *O. benguellensis* Gürke, *O. brasiliensis* (Planch.) Walp., *O. crassifolia* (Ridl.) Welw. ex Rendle (*B. crassifolia* Ridl.), *O. ovalifolia* (R. Br.) Rich., *O. scabra* Bak. (*B. scabra* Benth. & Hook. ex Ridl.), *O. Verdickii* Gürke, and the following :—

Ottelia Balansae (Gagnep.) Dandy, comb. nov. *Oligolobos Balansae* Gagnep. in Bull. Soc. Bot. Franc. liv. 543 (1907).

Ottelia sinensis (Lév. & Van.) H. Lév. in Fedde, Repert. Nov. Sp. v. 10 (1908), *nomen synonymum.* *Boottia sinensis* Lév. & Van. apud H. Lév. *loc. cit.* (Jan. 1908). *Oligolobos triflorus* Gagnep. *op. cit.* lv. 34 (Mar. 1908).

The diclinous species include the following :—

Ottelia acuminata (Gagnep.) Dandy, comb. nov. *Boottia acuminata* Gagnep. in Bull. Soc. Bot. Franc. liv. 538 (1907).

Ottelia cordata (Wall.) Dandy, comb. nov. *Boottia cordata* Wall. Pl. As. Rarior. i. 52, t. 65 (1830).

Ottelia cylindrica (T. C. E. Fr.) Dandy, comb. nov. *Boottia cylindrica* T. C. E. Fr. apud R. E. Fr. in Wissensch. Ergebn. Schwed. Rhodes.-Kongo-Exped. i. 190, fig. 18 *b–c* (1916).

Ottelia Esquirolii (Lév. & Van.) Dandy, comb. nov. *Boottia Esquirolii* Lév. & Van. apud H. Lév. in Fedde, Repert. Nov. Sp. v. 9 (1908).

Ottelia exserta (Ridl.) Dandy, comb. nov. *Boottia exserta* Ridl. in Journ. Linn. Soc., Bot. xxii. 240, t. 13 (1886).

Ottelia Fischeri (Gürke) Dandy, comb. nov. *Boottia Fischeri* Gürke in Engl. Pflanzenw. Ost-Afr. C. 95 (1895).

Ottelia kunenensis (Gürke) Dandy, comb. nov. *Boottia kunenensis* Gürke in Warb. Kunene-Sambesi Exped. Baum, 172 (1903).

* *Bootia* Bigel. and *Boottia* Wall. (which has also been spelt *Bootia*) both commemorate Francis Boott (1792–1863), and are therefore orthographic variants which must be treated as homonymous.

Ottelia macrantha (C. H. Wright) Dandy, comb. nov. *Boottia macrantha* C. H. Wright in Dyer, Fl. Trop. Afr. vii. 9 (1897).

Ottelia muricata (C. H. Wright) Dandy, comb. nov. *Boottia muricata* C. H. Wright, *tom. cit.* 569 (1898). *B. Aschersoniana* Gürke in Warb. Kunene-Sambesi Exped. Baum, 173 (1903).

Ottelia Schinziana (Aschers. & Gürke) Dandy, comb. nov. *Boottia Schinziana* Aschers. & Gürke in Engl. & Prantl, Nat. Pflanzenfam. ii, 1, 256 in obs. (1889).

Ottelia Stratiotes (T. C. E. Fr.) Dandy, comb. nov. *Boottia Stratiotes* T. C. E. Fr. apud R. E. Fr. in Wissensch. Ergebn. Schwed. Rhodes.-Kongo-Exped. i. 189, fig. 17 (1916).

Ottelia yunnanensis (Gagnep.) Dandy, comb. nov. *Xystrolobos yunnanensis* Gagnep. in Bull. Soc. Bot. Franc. liv. 544 (1907).

B. **DIPTERON** Dandy, subgen. nov. *Spathæ* bi-alatæ, alis longitudinalibus foliaceis oppositis (bractearum dorsa percurrentibus) interdum obsolescentibus. *Plantæ* acaules vel rarius subcaulescentes, foliis in laminam petiolumque sensim divisis, lamina normaliter submersa.

This subgenus is based on *Ottelia ulvifolia* (Planch.) Walp. as type-species. It is restricted to Africa (including Madagascar). *O. ulvifolia* (including *O. lancifolia* A. Rich., *O. vesiculata* Ridl., *O. plantaginea* Welw. ex Ridl., *Boottia abyssinica* Ridl., *B. Rohrbachiana* Aschers. & Gürke, and other forms which have been described as species) is a widespread and variable plant with bisexual flowers. The subgenus also includes the following diœcious species :—

Ottelia brachyphylla (Gürke) Dandy, comb. nov. *Boottia brachyphylla* Gürke in Urb. & Graebn. Festschr. Aschers. 539 (1904). *B. parviflora* Gürke, *op. cit.* 537 (1904).

C. **OTTELIASTRUM** Dandy, subgen. nov. *Spathæ* (saltem fertiles) pluri-alatæ, alis longitudinalibus foliaceis interdum obsolescentibus. *Plantæ* acaules, foliis in laminam petiolumque abrupte vel sensim divisis, lamina normaliter submersa.

This subgenus is based on *Ottelia* Pers. Synops. Pl. i. 400 (1805), the type-species being *O. alismoides* (L.) Pers. The species are distributed in south-eastern Asia, north-eastern Australia, and north-eastern Africa. *O. alismoides* and *O. condorensis* Gagnep. are monoclinous species. The following are diclinous :—

Ottelia Bodinieri (Lév. & Van.) Dandy, comb. nov. *Hydrocharis Bodinieri* Lév. & Van. apud H. Lév. in Fedde, Repert. Nov. Sp. v. 10 (1908). *Boottia Bodinieri* Lév. & Van. apud H. Lév. *op. cit.* viii. 141 (1910).

Ottelia lanceolata (Gagnep.) Dandy, comb. nov. *Boottia lanceolata* Gagnep. in Bull. Soc. Bot. Franc. liv. 540 (1907).

Ottelia Thorelii (Gagnep.) Dandy, comb. nov. *Boottia Thorelii* Gagnep. *tom. cit.* 541 (1907).

Excluded Species.—*Boottia Mairei* H. Lév. Cat. Pl. Yun-Nan, 131 (1916) is *Monochoria vaginalis* var. *plantaginea* (Roxb.) Solms in A. & C. DC. Monogr. Phan. iv. 524 (1883), a Pontederiaceous plant. *B. renifolia* Merr. in Philipp. Journ. Sci. iv, C. 247 (1909) is *Hydrocharis dubia* (Bl.) Dandy in Journ. Bot. lxx. 328 (1932), which belongs to the tribe *Limnobieae* (*Hydrochariteae*) *.

OBITUARIES.

Sydney Howard Vines

(1849–1934).

The death of Sydney Howard Vines at the ripe age of eighty-four removes a personality which fifty years ago was playing a leading part in reforming the teaching of Botany in this country.

Born in London, December 31, 1849, Vines was educated at a private school, and after a three years' medical course at Guy's Hospital went up to Cambridge in 1872 with a scholarship at Christ's College. In 1875 he headed the list in the Natural Sciences Tripos, and in the following year was elected Fellow and Lecturer of his college. Periods of study under Sachs at Würzburg and De Bary at Strassburg brought him into touch with the "new" Botany then developing in Germany, and fitted him to share in the development of the teaching of science at Cambridge which was taking place under the leadership of Michael Foster. Vines was a good German scholar, and a solid contribution to the new movement was his preparation of the second English Edition of Sachs's 'Text-Book,' enriched with his own footnotes and Appendix, published by the Clarendon Press in 1882. In 1880 he had translated and revised Prantl's 'Lehrbuch der Botanik,' which was published as an 'Elementary Text-book of Botany' under the joint names of author and reviser. This developed later into his larger and more advanced 'Students' Text-book of Botany' (1895), an elementary edition of which appeared in 1898 to replace the old "Prantl and Vines." Vines's special interest was plant physiology, and his 'Physiology of Plants' (1886) was based on a course of lectures in that subject; it was a clear and scholarly exposition of a rapidly advancing phase of botanical science.

In 1883 Vines was appointed University Reader in Botany. Babington, the Professor, was an old man, and took little part

* *Limnobieae* Dumort. Anal. Fam. Pl. 54 (1829), excl. *Ottelia*. *Hydrochariteae* Reichb. Consp. Reg. Veg. 46 ("*Hydrochareae*") (1828), *nomen nudum*, excl. gen. 811–813; Parl. Fl. Ital. iii. 582 ("*Hydrochareae*") (1858).

in the work of the Botanical Department, for the organization of which the Reader was mainly responsible. I can heartily endorse the impressions of the writer of an appreciation in 'The Times' of April 6 on the high qualities of Vines's teaching. As a lecturer he was clear, painstaking, and impressive; at the beginning of each lecture he would carefully resume the subject-matter of the last before proceeding further. In the laboratory he was on excellent terms with his students, encouraging the worker or tactfully reproving the careless. "Screws are like cash, Mr. ——, they come to an end," was a rebuke to a student in difficulties with the fine adjustment of his microscope. "Ah! my dear Rendle, that's the penalty we pay for greatness," was the excuse with which he took for the slide-collection my really beautiful hand-section of the sporocarp of *Pilularia*. The 'Practical Botany,' in which he co-operated with F. O. Bower, marked a new departure in laboratory instruction. During my time at Cambridge, from 1883 to 1888, he was indeed my guide, philosopher, and friend, and his removal to Oxford in 1888 was a determining factor in my candidature for a post at the British Museum. Among his old Cambridge pupils who have attained distinction in Botany one recalls Walter Gardiner, Reynolds Green, R. W. Phillips, F. W. Oliver, A. C. Seward, Percy Groom, Miss Sargent, and Miss Saunders.

In 1888 Vines migrated to Oxford, to succeed Bayley Balfour in the Sherardian Professorship, which, with a Fellowship at Magdalen College, he held until 1919, when he retired with the title "Professor Emeritus." In his Cambridge days Vines was a tremendous worker; he once remarked that he could lose one night's rest at work without feeling it. But his health was not good, and lack of sympathy reacting on a somewhat sensitive, peace-loving disposition, prevented the repetition at Oxford of his fine success at Cambridge, though the school grew considerably in importance under his direction. During his tenure of the professorship the new Forestry School was established.

Though it is as a teacher that Vines should best be remembered, he also did pioneer work in the investigation of the proteolytic enzymes of plants. In the 'Journal of Physiology,' 1880–1, he published a paper on the proteid substances in seeds, and a series of papers appeared from 1897–1910 in the 'Annals of Botany,' of which he was one of the founders in 1897 and until 1899 a co-editor. During his term as President of the Linnean Society, 1900 to 1904, various aspects of proteid digestion in plants were the subjects of presidential or ordinary addresses to the Fellows; and recently (1930) he published a short summary entitled "The proteases of plants: a record and reply" (see this Journal, 1930, 318), in which he pointed out that his isolation from vegetable tissue of an essentially peptic protease, the existence of which had been controverted by Willstätter, was

confirmed by recent work undertaken at his own suggestion in Sir J. C. Bose's laboratory at Calcutta.

Vines's presidency of the Linnean Society was memorable for the decision in 1903, agreed to by a large majority of the Fellows, to admit women on equal terms with men. But the process of obtaining the necessary supplemental charter postponed the realization of the decision, and in his farewell address in 1904 the President regretted that he would not have the opportunity of welcoming the first lady fellow. In commemoration of his presidency his portrait by the late Hon. John Collier was, in January 1906, presented to the Society by William Carruthers on behalf of the subscribers.

Two products of his period at Oxford were 'The Dillenian Herbarium' by G. C. Druce (1907), which he edited and to which he contributed an introduction, and 'The Morrisonian Herbarium' (1914) by Druce and himself; these are interesting accounts of the historic botanic garden and herbaria in the University. On his retirement from the professorship Vines went to live at Exmouth, where he died on April 4.

The early eminence in his subject which Vines attained, and the recognition of his merits among his contemporaries, are indicated by his election into the Royal Society in 1885, at the age of thirty-six, and by the fact that there was no competing candidate for the Oxford Professorship in 1888. He was M.A. of Cambridge and Oxford, and D.Sc. of Cambridge and London, a Fellow of the London University, and Honorary or Corresponding Member of various scientific societies at home and abroad.

After his presidency of the Linnean Society Vines did not frequent botanical gatherings, and one saw little of him in later years. His friends and former colleagues will recall his great personal charm and, when in health, delightful humour. His practical love of plants found an outlet in the pleasant and interesting garden that he had made at his Oxford home on Headington Hill. By his marriage in 1884 with Agnes Bertha, daughter of Mr. W. W. Perry of Chelmsford, he had two sons and one daughter. His connection with the sister Universities is continued in the sons—the elder, W. S. Vines, an alumnus of New College, Oxford, Professor of English Language and Literature at University College, Hull, and the younger, H. W. C. Vines, M.D., a former Fellow of Christ's College, Cambridge.—A. B. Rendle.

Thomas Lane Bancroft

(1860–1933).

By the death of Thomas Lane Bancroft, M.B. (Edin.), at Wallaville, Queensland, on November 12, 1933, at the age of 73 years, Australian botany has lost one of its most ardent supporters. Born at Brisbane, and educated at the Brisbane Grammar School, at an early age he proceeded to Edinburgh,

where he took his medical degree. On returning to Brisbane in the early 'eighties he soon showed his strong leaning towards natural history pursuits, and wide travelling in the state gave him the opportunity of collecting extensively specimens of both the flora and the fauna of the country, the Queensland Herbarium and the Queensland Museum respectively benefiting greatly by his keenness. He took a very keen interest in the pharmacology of the Queensland flora, and papers from his pen on this subject are to be found in the 'Proceedings of the Royal Society of New South Wales,' the 'Proceedings of the Royal Society of Queensland,' and the 'Transactions of the Intercolonial Medical Congress.' He continued his interests in natural history pursuits to the end of his life, and at the time of his death was probably the leading authority on the life and habits of that peculiar animal, the Queensland lung-fish, *Ceratodus forsteri*. In 1927 he read a paper before the Royal Society of Queensland on the occurrence of Flagellates in the latex of certain Queensland plants, namely, *Sarcostemma australe*, *Hoya australis*, and *Ficus stephanocarpa*. A special feature of the late Dr. Bancroft's character was his willingness to help scientific men with material, and both the late F. M. Bailey and J. H. Maiden received a great wealth of specimens from him for their investigations on the Australian flora.—C. T. WHITE.

ABSTRACTS OF PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA.

ADDITIONS TO THE ORKNEY FLORA.—Col. H. H. Johnston has issued his seventeenth paper on the Orkney Flora (dated Jan. 1, 1934), which includes eleven new records for Watson's vice-county no. 111. These include the following new species of Dahlstedt:—*Hieracium patens*, belonging to Zahn's capital or group-species *H. olivaceum*, and to be inserted in the 'London Catalogue' (ed. 11) between nos. 1025 and 1026; *Taraxacum unguilobiforme*, which belongs to *Spectabilia* and seems to be related to *T. unguilobum* Dahlst.; *T. plicatum*, which belongs to *Vulgaria* and is allied to *T. pallescens* Dahlst. and related species. Also *Rosa villosa* L. var. *mollis* Sm. The remainder are non-native species. Col. Johnston also records a number of corrections to entries in previous papers. "*Hieracium saxifragum* Fries, modification" (sixteenth paper, 1933) should be referred to *H. pseudomicrodon* Dahlst. (thirteenth paper, 1929); *H. sagittaticeps* Dahlst. sp. n. (fifteenth paper, 1932) is a synonym of *H. bifidum* Kitaib. subsp. *tenue* W. R. Linton; and *H. inuloides* Tausch, subsp. *strictum*, f. *angustiloba* Dahlst. (twelfth paper, 1929) should be grouped under *H. umbellatum* L.

THE GENUS VERBASCUM.—Dr. Sv. Murbeck ('Monographie der Gattung *Verbascum*,' Lunds Universitets Årsskrift, N.F. Avd. 2, xxix. no. 2, pp. 630, pls. 31, 1933) is to be congratulated on his comprehensive account of this difficult genus and its complicated hybrids. The headquarters of the genus is the Southern Mediterranean Region and Asia Minor. In Britain only six of the 251 species here described are recorded.

According to the author's arrangement the British species would be arranged as follows:—

Sect. I. BOTHROSPERMA. Seeds not sculptured with transverse foveolæ. The two anticous sepals slightly larger than the others, before flowering exterior. Lowest lobe of corolla slightly larger than the rest.

Subsect. I. FASCICULATA. Flowers fasciculate or glomerate in the axils of the bracts.

A. Heterandra. Anthers of the two anticous stamens basifixed.—*V. Thapsus* L., *V. virgatum* With.

B. Isandra. Anthers of the two anticous stamens medifixed.

Wool on filaments whitish or yellowish.—*V. Lychnitis* L., *V. pulverulentum* Vill.

Wool on filaments purplish-violet.—*V. nigrum* L.

Subsect. II. SINGULIFLORA. Flowers in axils of bracts solitary.—*V. Blattaria* L.

Under *V. Thapsus* L. is included the hybrid *V. Thapsus* L. × *virgatum* With. (*V. Lemaitrei* Boreau).

V. pulverulentum crosses with *V. Thapsus*, the hybrids being *V. Godroni* Bor. and *V. Lamottei* Franch.; *V. Lychnitis* crosses with *V. nigrum* and several other species; but Dr. Murbeck does not record any of these hybrids for Britain. *V. nigrum* crosses with *Thapsus*, *pulverulentum*, and other species; and *V. Blattaria* with *Lychnitis*, *nigrum*, and *Thapsus*.

Dr. Murbeck also describes a number of new species and hybrids from Southern Europe, Syria, Asia Minor, and Abyssinia.—E. G. B.

SOME RUBUS PROBLEMS IN THE LIGHT OF GENEVIER'S HERBARIUM.—Messrs. Barton and Riddelsdell (Proc. Cotteswold Nat. Field Club, xxiv. pts. 2–3, 197 *sq.*, 1933) review at length Genevier's species of *Rubus*, as represented in the British flora, after an examination of the material in various herbaria, notably that of Genevier, now at Cambridge. The result of this work involves some important changes in the *Rubus* List of the London Catalogue, ed. 11. The names *cariensis*, *anglicanus*, *mutabilis*, *nutans*, *plinthostylus*, and *horridicaulis* disappear from the list, and new names take their places. *R. cariensis* of Rogers's 'Handbook' is held to be distinct from *R. cariensis* Genev., and is now named *R. altiarcuatus*. Two of our plants have been confused under *R. adscitus* Genev., and one of these is now

distinguished as *R. griseoviridis*. *R. ericetorum* Lefv. ex Genev., identified by Rogers with a sub-Koehlerian plant, is shown to be identical with *R. radula* var. *anglicanus* Rog., and Roger's sub-Koehlerian form is re-named *R. Moylei*. The British plants referred hitherto to *R. mutabilis* Genev. and *R. plinthostylus* Genev. are not considered conspecific with the French types, and are now named *R. Wedgwoodiae* and *R. Rilstonei* respectively. *R. fuscus* W. & N. var. *nutans* Rog. is separated as a distinct species *R. nuticeps*; and *R. horridicaulis* P. J. Muell. of the 'Handbook' is stated to differ essentially from Mueller's type and is re-described as *R. morganwgensis*.

The paper gives full accounts of the new species and will be indispensable to all students of the genus. The diagnoses of the new groups are as follow :—

RUBUS ALTIARCUATUS, sp. nov. *R. cariensis* Rogers, Handbook, 25 (non Rip. & Genev.); Focke, Species Ruborum, 333, pro parte; *R. imbricatus* Hort. var. *rectispinus* Sudre, Obs. Set of Br. Rubi, 16, Rubi Europæ, 67.

Turiones alte arcuati, glabri, subfusci, aculeis longis e basi brevi plerumque rectis instructi. *Folia* ampla, quinata, digitata, supra parce pilosa, subtus tomentosa vel capillis densis vestita, dentibus compositis valde incisis; foliolum terminale plerumque ellipticum acuminatum, ad basin subcordatum vel emarginatum; foliola infima breviter petiolulata. *Inflorescentia* bene evoluta, apicem versus vix decrescens; rachis aculeis e basi brevi tenuibus armata, hirsuta. *Petala* alba; stamina stylos superantia; sepala aciculata, laxe reflexa; carpella pæne glabra.

RUBUS GRISEOVIRIDIS, sp. nov. *R. micans* of Rogers's Handbook, 48, non Godron; *R. adscitus* of many writers, non Genev.

Turiones arcuati, canaliculati, sulcati, tomentosi, pilosi, aculeis robustis e basi longa declinatis, rarius aculeolis, aciculis, et glandulis stipitatis perpaucis instructi. *Folia* 3–5-nata, supra griseo-viridia, subtus tomentosa et molliter hirsuta, dentibus compositis; foliolum terminale obovatum vel ellipticum, sat longe acuminatum, ad basin integrum vel emarginatum. *Inflorescentia* laxa, apicem versus lata subpyramidalis, nonnullis foliis ornata; rami inferiores longi, ± patentes. *Rachis* sat flexuosa, aculeis multis debilibus, aliisque armis perpaucis instructa; rachis cum pedicellis griseo-tomentosa pilosa. *Petala* magna; stamina stylos superantia; sepala triangularia, breviter acuminata, arcte reflexa.

RUBUS MOYLEI, sp. nov. *R. ericetorum* of Rogers's Handbook, non Lefv. ex Genev.

Turiones angulati, hirsuti, aculeis inæqualibus reclinatis, aculeolis e basi dilatata ortis, aciculis et glandulis stipitatis instructi. *Folia* supra læte viridia, subtus cano-tomentosa, dentibus parum incisis. *Foliola* angusta et inter se discreta, obovata, acuminata, ad basin integram angustata. *Inflorescentia* lata; rachis hirsuta, aculeis inæqualibus reclinatis, aciculis (quorum multi glanduliferi) glandulisque stipitatis armata. *Petala* angusta; stamina stylos superantia; sepala reflexa, cano-tomentosa.

RUBUS WEDGWOODIAE, sp. nov. *R. mutabilis* of Rogers's Handbook, non Genev.

Turiones angulati, canaliculati, sæpe sulcati, sat pilosi, aculeis multis ad angulos pro maxima parte dispositis, aculeolis aciculisque inæqualibus et paucis glandulis stipitatis instructi. *Folia* quinata, subtus tomentosa et pilosa. *Foliola* longissima, dentibus compositis incisis; foliolum terminale angustum, ellipticum, sensim acuminatum, ad basin integram angustatum. *Inflorescentia* bene evoluta, multiflora, lata et apicem versus vix decrescens vel pyramidalis, interdum arctior. *Rachis* cum pedicellis tomentosa pilosa, aculeis multis, aciculis, glandulisque stipitatis armata. *Petala* alba, sat longa, angusta; sepala sæpe elongata, laxe reflexa; carpella pilosa.

Var. SABRINAE, var. nov. Differt a *Rubo Wedgwoodiae* turionum aculeis validioribus, foliis minus tomentosis, foliolis minore intervallo separatis, petalis latioribus, dilute rubentibus vel lilacinis.

RUBUS RILSTONEI, sp. nov. *R. plinthostylus* of Rogers's Handbook, p.p., non. Genev.

Turiones virides, pilosi, canaliculati, aculeis multis inæqualibus e basi brevi hinc illinc dispositis, aculeolis multis valde inæqualibus aciculis glandulisque stipitatis multis inæqualibus nec longis prædiiti. *Folia* 3–5-nata, subtus molliter hirsuta, dentibus peracutis inæqualibus compositis; foliola elongata, ad basin angustata, longe acuminata. *Inflorescentia* mediocris, valde foliosa, angusta et apicem versus vix decrescens; rami breves, pauciflori. *Rachis* flexuosa, capillis longis patentibus vestita, aculeis debilibus multis, aculeolis, aciculis et glandulis stipitatis brevibus inæqualibus armata. *Flores* mediocres, albidi; petala discreta; stamina brevia; sepala viridia, in anthesi patentia, postea subpatentia vel laxe reflexa. Carpella glabrescentia. Fructus parvus.

RUBUS NUTICEPS, sp. nov. *R. fuscus* Whe. var. *nutans* Rogers, Handbook, 74.

Turiones tenues, longissimi, virides, pilosi, aculeis brevibus declinatis instructi, aciculati, glandulosi. *Folia* plerumque quinato-pedata, obscure viridia, dentibus valde incisis. *Foliolum* terminale ovatum apicem versus longe attenuatum. *Inflorescentia* laxa, elongata, apicem versus decrescens, sæpe nutans, bracteis foliaceis multis ornata. *Rachis* cum pedicellis hirsuta, glandulosissima. *Petala* angusta; sepala post anthesin adscendentia.

RUBUS MORGANWGENSIS, sp. nov. *R. horridicaulis* of Rogers's Handbook, 91, and Journ. Bot. 1906, 60, non P. J. Mueller.

Turiones robusti, obsolete angulati, fusci vel ochracei, subglabri, armis variis e basi dilatata sat brevibus hinc illinc dispositis, glandulisque stipitatis paucis instructi. *Folia* ampla, juniora subtus molliter hirsuta, dentibus peracutis. *Foliola* infima breviter petiolulata; foliolum terminale latum, ellipticum vel obovatum, truncatum, cuspidatum. *Inflorescentia* lata, foliis magnis bracteisque ad verticem fere ornata. *Rachis* angulata, aculeis multis tenuioribus aculeolis multis, aciculis tenuibus, glandulis breviter stipitatis et capillis nonnullis brevibus prædita. Flores mediocres. Sepala triangularia fructus fundum laxe amplectantia. Carpella pilosa.

Var. DEVONIAE, var. nov.

Turiones angulati, aculeis e basi minore ortis instructi, pilosiores, glandulosiores. *Foliola* angusta, obovata, elongata, majore intervallo separata. *Inflorescentiæ* rami valde adscendentes, pedicelli tenuiores; inflorescentia ad verticem laxior. *Rachis* pilosior, aculeolis aciculisque rarioribus, et glandulis breviter stipitatis densioribus prædita. *Sepala* aliquantum angustiora, laxe reflexa vel subpatentia.—H. W. P.

SALT MARSHES OF THE DOVEY ESTUARY.—F. J. Richards (Annals of Botany, xlviii, pp. 225–259, 10 figs., 1934), continuing the work of the late Professor Yapp, has studied the rate of vertical accretion in five selected areas. The rate, which differs in different sward associations, has been correlated with the height above sea-level and the distance from the main river-front. When very high the rate has a great influence on the morphology of the plants concerned.

REVIEWS.

The Freshwater Algæ of the United States. By GILBERT M. SMITH. 8vo, pp. xi, 716, 449 figs. McGraw-Hill Book Co.: New York and London, 1933. Price 36*s*.

THE present century has seen a very considerable increase in the facilities available to the worker in the realm of freshwater algal taxonomy. Commencing with Chodat's 'Algues vertes de la Suisse,' a number of more or less comprehensive volumes dealing with this aspect of botanical science have successively appeared, many of them not only furnishing a wealth of taxonomic detail, but also affording numerous data on the morphological features of the groups considered. Smith's 'Freshwater Algæ of the United States' adds another to the list of valuable taxonomic

works, and, among its many useful aspects, is of special value in bringing together the many facts relating to the freshwater Algæ of the United States that are to be found scattered in often rather inaccessible periodicals. Conceived on the same lines as 'British Freshwater Algæ,' it goes beyond it in scope and wealth of illustration, no less than in the wide range of genera met with in such an extensive tract of country. The introductory matter to the various sections affords a mass of up-to-date information, while the relevant literature is collected in an extensive alphabetical list at the end of the volume. This list, which has obviously been compiled with great care, will be of considerable value to workers in the field of freshwater algology. The only paper of importance that appears to have been missed is Czurda's on the starch-grains and pyrenoids of the Algæ in the *Beihefte* of the *Botanisches Centralblatt* in 1928. Of especial value to the beginner will be the key to the genera found in the United States given at the end of the main subject-matter.

After a brief introductory section the book deals successively with the Myxophyceae, Rhodophyceae, Heterokontae, Chrysophyceae, Bacillarieae, Chlorophyceae, Dinophyceae, and Euglenophyceae. The writer is not altogether in sympathy with the designation of the last class, since of all the different groups of Protophyta treated in this volume the Euglenineae are the only ones for which there is no distinct evidence of an algal trend, nor in view of the marked holozoic tendency does it appear very probable that such a trend will yet be established. The subdivisions recognized under the individual classes are those which have been established by Pascher and are now almost universally accepted, and it is only in relation to the classification of the Green Algæ, which naturally occupy a large part of the book, that differences of opinion are involved. Smith includes all the filamentous forms, apart from Oedogoniales and those belonging to the Conjugatae (his Zygnematales), in the order Ulotrichales. The latter thus comprises a large assemblage of genera, and the differences between the ordinary filamentous and the heterotrichous forms (Fritsch's Chaetophorales) are not recognized except for the inclusion of the forms involved in a number of separate families. Yet the heterotrichous habit, reappearing as it does in all the other great algal classes (Ectocarpales, Bangiales–Nemalionales, Chamaesiphonales, respectively belonging to Phaeophyceae, Rhodophyceae, and Myxophyceae), marks a very fundamental advance in algal organization that would appear to merit separate recognition.

Unlike most recent authorities Smith counts the Ulvales and Schizogoniales (*Prasiola*) as orders of equal rank with Volvocales, Ulotrichales, etc. The Ulvales, however, so closely resemble the Ulotrichales in nearly all features of their vegetative and reproductive organization that there is, in the writer's opinion,

little to warrant a separation. Most genera of Ulvales begin life as an *Ulothrix*-like filament, and it is only the capacity for division along several planes and the possession of an homologous alternation between two similar individuals that marks them off from the Ulotrichales. In the acquisition of a distinct alternation they show, as in their vegetative structure, an advance on the ordinary Ulotrichaceous type, but this is equally true of the Cladophorineae, which Smith treats as a suborder of the Ulotrichales. The inclusion of the doubtful genus *Schizomeris* in the Ulvales will hardly find general favour.

As regards the Schizogoniales, it is really only the axile chloroplast that marks them off from the Ulotrichales. Such a cell-structure also occurs in other orders of Chlorophyceae with mainly parietal chloroplasts, and it is at present scarcely possible to evaluate its taxonomic significance.

Smith upholds the old view of the origin of the filamentous habit from a palmelloid phase, although there is no adequate evidence in support of such an origin. On the other hand, the germination of every zoospore recapitulates ontogenetically the direct origin of the filament from the motile unicell. Space does not permit of a discussion of other points of view with which the writer is out of sympathy. These are, however, only minor matters of interpretation, and do not in any way detract from the value of the book, which will be indispensable to all engaged in work on freshwater Algæ.—F. E. FRITSCH.

Forest Trees and Timbers of the British Empire.—II. *Twenty West African Timber Trees.* By L. CHALK, J. BURTT DAVY, H. E. DESCH, and A. C. HOYLE. 8vo, pp. 108, 20 pls., 20 text-figs. Clarendon Press: Oxford, 1933. Price 7*s.* 6*d.*

THE selection of species for description in the second issue of this series is based primarily on the commercial importance of their timbers. Where a genus contains one or two trees in this category, other less well known species in the genus are also included for the sake of completeness. A brief description of each genus is followed by descriptions of the species concerned, viz.:—*Afzelia africana, A. bipindensis, Cistanthera papaverifera, Garcinia Mannii, Holarrhena Wulfsbergii, Holoptelea grandis, Hymenostegia Afzelii, Irvingia gabonensis, Lophira alata, L. alata* var. *procera, Lovoa Klaineana, Mitragyna stipulosa, Ochrocarpus africanus, Piptadenia africana, Pseudocedrela Kotschyi, Ricinodendron africanum, Terminalia glaucescens, T. ivorensis, T. sokodensis, T. superba.* Owing to the large amount of additional material which has recently been received from the Forest Services in West Africa, the editors have felt it desirable to redescribe each species in the light of the new material. The botanical

descriptions, therefore, are more complete than those hitherto available, and the same applies to the notes on distribution and common and vernacular names, which have been compiled with the assistance of Forest Officers in the Gold Coast, Nigeria, and Sierra Leone. The majority of the woods are here described in detail for the first time; the systematic thoroughness with which the anatomical descriptions have been prepared is a notable feature of the series. Honourable mention must also be made of the drawings of morphological features, the tree photographs, and the photomicrographs of wood sections. The system of selecting the species for each issue of this series on a geographical basis results in a certain amount of overlapping. Thus Part I., which is primarily concerned with East African timbers, includes a key to the nine African species of *Afzelia*, followed by a full description of *A. quanzensis*, and brief descriptions of *A. africana* and *A. bipindensis*. In Part II. the two latter species are described in full. Similarly in the case of *Piptadenia africana* it is necessary to refer back to Part I. for the text-figure illustrating the botanical description contained in Part II. Although the geographical arrangement offers certain advantages to botanists and forest officers who are concerned with the flora of a limited region, it tends to make it inconvenient for anyone using the descriptions for general reference. This disadvantage would be overcome if each description were begun on a new sheet, so that the sheets could be rearranged and ultimately bound together in systematic order. If this plan were adopted it would be necessary to print the date of publication on each description.—B. J. RENDLE.

Plant-Life through the Ages: a Geological and Botanical Retrospect. By A. C. SEWARD, Sc.D., LL.D., F.R.S. Second Edition. Royal 8vo, pp. xxii, 603, 140 illustrations. University Press: Cambridge, 1933. Price 30*s.*

THE call for a new edition, after little more than two years, of Prof. Seward's admirable account of the beginning of plant-life and its development through successive geological ages, indicates a well-deserved appreciation of its merit. A full review of the book appeared in this Journal for 1931 (pp. 267–9), and there is practically nothing to add beyond a word of congratulation to the author on the reception accorded to his work. The new edition has afforded opportunity for a few alterations and corrections, for which the author thanks Prof. Sahni of Lucknow and other palæobotanical friends. An addition of three pages is made to the bibliography, including a selection of papers published during the last three years.

Darwin. By R. W. G. HINGSTON. Sm. 8vo, pp. 144. Duckworth: London, 1934. Price 2*s*.

WE congratulate Major Hingston on his admirable contribution to Messrs. Duckworth's 'Great Lives' Series. With full knowledge of his subject, and writing in a simple attractive style, he tells the story of Darwin's life and work—his early days, his bent towards natural history, his failure successively to assimilate a classical education and to find his life-work in medicine and the church, and the happy chance which, as naturalist to H.M.S. 'Beagle,' gave the opportunity for nearly five years intensive study of nature. The painstaking accumulation and co-ordination of facts, which culminated after twenty-three years labour in the 'Origin of Species,' the effect of its publication on scientific opinion and the world in general, the patient attitude of Darwin and the aggressive enthusiasm of his protagonist Huxley, are described. The author helpfully discusses the difficulties inherent in the theory of Natural Selection and the permanency or otherwise of the various hypotheses put forward by Darwin. The relation of his later investigations, many of which were botanical, to the main thesis is explained, and the volume closes with a glimpse into his home life and methods of work, and a sympathetic appreciation of his character.—A. B. R.

Symbolæ Sinicæ.—VII. *Anthophyta.* By HEINRICH HANDEL-MAZETTI. Lief. 3. Roy. 8vo, pp. 451–730, with 10 text-figs. and 4 pls. Julius Springer: Vienna, 1933. Price R.M. 66.

PART 2 of this enumeration of the Flowering Plants collected during the expedition to South-West China, 1914–18, under the auspices of the Vienna Academy of Sciences, was noticed in this Journal in 1932 (p. 28). In the present instalment Dr. Handel-Mazetti concludes his thorough and critical account of the Archichlamydeous families of Dicotyledons (Rosaceae to Umbelliferae). As in the earlier parts, a considerable number of new species are described. The most largely represented family is Rosaceae, which with Leguminosae occupies nearly half of the part. *Rubus*, *Sorbus*, *Potentilla*, and *Prunus*, *Acer*, *Impatiens*, *Euonymus*, and *Aralia* are well represented. In some cases the author gives a clavis of the Chinese species—for instance, the herbaceous *Hedysara*, 18 species, and *Circaea*, 8 species. Two new genera of Umbelliferae are described. Throughout species new to China are indicated by an asterisk and those new to science by a double asterisk. The plates are photographic reproductions, sometimes fragmentary, of herbarium material, with occasional dissections of the flower or fruit. Dr. Handel-Mazetti is to be congratulated on the steady progress of his important contribution to Chinese taxonomy.

British Trees. Second Series. By BARBARA BRIGGS, F.Z.S. *British Wild Flowers.* First and Second Series. By LOUIS JOHNSTONE. Each series of 16 coloured plates and 16 diagrams ($14\frac{1}{2} \times 9\frac{1}{2}$ inches). Lutterworth Press: London. Price 3*s*. 6*d*. each series.

THESE studies, which have been specially prepared for educational use, will provide a decorative and instructive exhibit for the schoolroom or laboratory. The second series of trees (we have not seen the first) includes Acacia (*Robinia*), Apple, Box, Cedar, Cherry, Chili Pine, Elder, Field Maple, Hawthorn, Hazel, Holm Oak, Hornbeam, Lime, Rowan, Sweet Chestnut, and Walnut, from which it will be seen that by British we understand British grown, not necessarily native. The coloured plate shows the habit, generally in leaf or flower, and the accompanying "diagram" is a series of black and white sketches of leaf, flower, fruit, winter twig, or bole. These sketches are very clear and mostly of natural size.

In treating the Wild Flowers the artist has had the more difficult task to depict a large number of species (135 on the 32 plates) in their natural surroundings. For example, in plates 17–23, entitled "In the Meadows," an attempt is made to illustrate the plants in flower at different seasons—February, Early Summer, Midsummer, and Late Summer. The characters of the plants are well shown in the foreground of each plate, but the grouping is necessarily unnatural and proportions of size cannot always be observed. But the children will have no difficulty in recognizing the plants. The diagrams in black and white illustrate details of leaf-form, flower, or fruit.

The low price should put the series within the reach of many teachers, to whom they will be helpful.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on April 12 the President, Prof. F. E. Weiss, F.R.S., referred to the recent loss sustained by the Society by the death of Prof. Sydney Howard Vines, F.R.S., a former President. A resolution of condolence with the family was read from the Chair, the Fellows expressing their sympathy by rising in their seats.

Dr. A. B. Rendle gave an account of the geology, topography, climate, and vegetation of the Bermudas, which afford a good example of a very isolated group of oceanic islands populated by the agency of wind, ocean-currents, and birds. The original flora has been largely modified by human agency and alien introductions since their settlement by the English early in the 17th century. The remarks were illustrated by a number of lantern-slides and specimens.

NEW CALEDONIA AND THE LOYALTY ISLANDS.—A. U. Däniker (Mitteil. Botan. Museum Univ. Zürich, cxlii.) continues his list of the " Pteridophyta and Embryophyta Siphonogama " collected by himself in these islands. The present instalments conclude the archichlamydeous dicotyledons and the sympetalous families Epacridaceae to Asclepiadaceae. The most fully represented family is Myrtaceae, in which new species are described in the genera *Eugenia, Syzygium,* and *Metrosideros.* Synonymy and full notes on locality are included in the list of species.

FLORA OF GREENLAND.—Elisabeth Ekman continues her studies on the *Draba* flora of Greenland (Svensk Bot. Tidskr. xxvii. Hfts. 1 & 3) with notes on *D. crassifolia* Grah., *D. nivalis* Liljebl., and *D. Gredinii,* sp. nov. Bd. xxviii. Hft. 1 contains a critical examination of the two closely related forms *D. altaica* Bunge and *D. subcapitata* Simmons, which are, however, to be regarded as distinct ; and of *D. aurea* Vahl and *D. arabisans* Michx. It is suggested that the last-named is a hybrid, *D. aurea* × *daurica.*

'FLORA ARABICA.'—"The Records of the Botanical Survey of India " (viii. no. 5, pp. 451–501) is a sketch of the Botanical Exploration of Arabia by Ethelbert Blatter. It is intended to contain everything that has been done or written on the botanical exploration of the peninsula. It gives the names of collectors, botanists, and travellers, and, where possible, short notes on their lives and activities. The present home of collections is also indicated. The arrangement is chronological from the dates of the Old Testament books Genesis and Exodus to 1932. Dr. Blatter acknowledges the help of his assistant Mr. Joseph Fernandez in the preparation of this valuable bibliography.

ROYAL HORTICULTURAL SOCIETY.—The February issue of the Society's Journal (lix. pt. 1), edited by F. J. Chittenden, contains a report of the Masters Lecture (1933) by Prof. V. H. Blackman on the Effects of Light : the actions of visible and ultra-violet light, the effect of light on rate of growth, and the action of artificial light were severally considered. Also a report of an interesting lecture on " English Gardens in Medieval, Tudor, and Stuart Times," by Eleanour S. Rohde, with some excellent illustrations. Contributions from the Wisley Laboratory comprised results of tests of sodium chlorate as a weed-killer by Dr. Tincker, and a description of *Antirrhinum* Rust, a fungal disease new to Britain, by D. E. Green. Other articles of special botanical interest are a short summary of our knowledge on sterility in plants by Prof. Ruggles Gates and an examination of the taxonomy of *Colchicum hungaricum* by W. T. Stearn. H. E. Warr and C. E. Gresham contribute notes on plants found in flower on Mt. Troodos, Cyprus, in the summer months ; and Sir Arthur Hill an appreciation of the late Dr. Stapf, illustrated by an excellent photograph.

THALICTRUM MINUS LINNÆUS SENSU LATISSIMO IN BRITAIN.

BY R. W. BUTCHER, PH.D., F.L.S.

WHEN writing the notes of the plants in ' Further Illustrations of British Plants ' (1930) I found the taxonomy of *Thalictrum minus* in such a hopeless state of confusion that it was necessary to re-group the various forms and, in some cases, assign to them new names. This paper enlarges on my notes in the book referred to above. In trying to separate the various forms I have come to the conclusion that a great deal more information is required, which can only be obtained by careful cultivation and observation, and these notes are made to draw attention to what is lacking rather than to put forward any new arrangement.

Diagnostic Characters.—1. *Fruit.*—The fruit is the most useful single character. It is, however, very difficult to obtain specimens with well-developed fruits. In the first place, the seed does not always develop, in which case the fruits are long, thin, and narrow. Perhaps this is an indication that some plants are hybrids or self-sterile. There is abundant material with these empty carpels in various herbaria. Secondly, the ovaries are often attacked by mites, which cause the carpels to swell into many weird shapes. All fruits therefore must be carefully sectioned to see whether the seed has developed or not.

2. *Stem-base.*—This is the next most important character, and again this is rarely shown or recorded in herbarium specimens. The stem-base is either shortly creeping or subcæspitose—that is, a shoot is sent up each year from the same stock. The habitat of the plant may partly determine this character, though plants under cultivation have so far kept distinct. This is a matter for further investigation.

No other characters seem to be at all constant, nor can they be used except in a very general supplementary manner.

3. *Height.*—This varies much on the same plant in different years according to climatic conditions. A plant 20 cm. high from Royston was taken into a garden, and the following year grew to over a metre.

4. *Stem.*—Whether the stem is ribbed, striate, or smooth seems to be of very little importance.

5. *Leaves.*—The auricles of the leaves are sometimes useful on fresh material, but on dried plants they are very difficult to see. The shape of the leaflets themselves seems to be a little guide. When it is said they are cordate or cuneate at the base it can be taken only in a very general way, as no two plants have the leaflets alike. Their size also is very puzzling and seems to depend more on the moisture and soil relations of the plant than

on anything else. The clothing of the leaflets seems to be a more useful guide provided that leaflets of the same age be compared. Many plants with normally glabrous leaves have occasional glandular forms which are otherwise indistinguishable.

The Linnean Specimens.—*Thalictrum minus* L. is represented in the herbarium by two plants which are certainly different if considered from the point of view adopted in this paper. As they lack both fruits and stem-base it is impossible to assign them to any particular segregate. Judging from general appearance, one specimen corresponds to *Th. montanum* Wallroth and the other, as pointed out by N. E. Brown (Suppl. Engl. Bot. 1902), to *Th. Kochii* Fries.

Descriptions of the chief British Forms.

1. Thalictrum arenarium Butcher in Butcher & Strudw. Further Illus. Brit. Pl. 1 (1930).

Th. flexuosum var. *procurrens* Dumortier, Florula Belgica, 126 (1827).

Th. minus var. *maritimum* Syme, Engl. Bot. i. 3 (1862).

Th. minus var. *dunense* Moss, Camb. Brit. Flora, iii. 120 (1920).

Th. marinum Druce*, Rep. Bot. Ex. Club, 1929, 100 (1930), (*nomen nudum*).

Th. dunense auct. plur. non Dumortier.

Th. minus Fries, Nov. Flor. Suecica, Mant. iii. 45 (1842).

Rootstock far-creeping, sending up stems at occasional intervals. Stem 6–30 cm. high, solid, striate and faintly grooved or ribbed, usually somewhat glandular. The lowest leaves which arise from the base of the plant are usually scale-like, and only the older are wholly developed. Leaflets small, about as broad as long, or rather longer; the majority with a cuneate base, others subcordate, usually with three principal and nearly equal apices, covered with many stalked glands and hairs, especially on the lower face. Auricles variable, rather narrow, usually entire.

Panicle divaricate, with long primary branches and short secondary ones, ultimate peduncles long. The panicle is usually branched from near the stem-base and the branches arise at an angle of about 60°, giving the panicle a broad obconical outline in a well-grown plant. Flowers drooping in bud, later erect. Fruiting pedicels 15–30 mm. long. Sepals lanceolate, glandular. Anthers apiculate. Stigma usually narrow, nearly erect. Fruit long, narrow, naviculoid, slightly compressed, strongly ribbed and glandular.

Icones.—Syme, Engl. Botany, pl. iii. (1862). A poor figure; the branching does not commence low enough and the fruits are too broad.

* I am unable to trace this name in Hayward's 'Botanist's Pocket Book,' ed. 19 or 20, as claimed by its author.

Moss, *tom. cit.* fig. 120, as *Th. minus* var. *dunense*. A poor illustration, with a leaf from a Devon plant which is not this species.

Butcher & Strudwick, *op. cit.* fig. 1.

Type-locality.—Barry Sands, Forfarshire.

A new name was assigned to this familiar plant, because it is evident from Dumortier's description of *Th. dunense* that that plant has a cæspitose rootstock. On the other hand, the British plant always has a far creeping rootstock. Dumortier (Flor. Belg. 126) writes: "L'une a le rhizome très court presque nul, en forme de turion et elle n'émet jamais de stolons, c'est celle que dans notre 'Prodrome' nous avons décrite sous le nom de *T. dunense*. L'autre au contraire qui est le *T. minus* de Dodoens émet des stolons souterrains souvent tellement allongés."

Distribution.—Maritime sands in Scotland and Northern England. All records south of Norfolk and Anglesea should be carefully examined. I have seen authentic specimens from the following vice-counties:—

East Coast.	West Coast.
v.c.	v.c.
27. Caistor Denes. Rimmington.	49. Traeth Crugan. C. Bailey.
62. Redcar. J. G. Baker.	52. Common on sandhills.
66. Hartlepool. Robson.	58. River Dee. Fisher.
68. Alnmouth. W. Richardson.	60. Silverdale. J. Barrow.
82. North Berwick. G. Horn.	69. Walney Island. C. Bailey.
83. Grantown, nr. Edinburgh.	70. Silloth. C. Bailey.
85. St. Andrews etc., common.	73. Kirkcudbright. Druce.
88. Culross. T. Drummond.	103. Calgary Bay, Mull. G. Ross.
90. Dundee etc., common.	105. Gairloch. C. Bailey.
91. Nr. Montrose etc., common.	100. Nr. Thurso.
93. Nr. Aberdeen etc., common.	111. S. Ronaldshay.
94. Nr. Cullen.	

Ireland.

Lough Neagh.

Of the other records in Druce's 'Comital Flora' those for the following vice-counties are probably correct: 50, 54, 67, 74, 84, 92, 99; but those for 25, 28, 41, 44, 45, 77 should be carefully checked. There are also certain plants recorded from the south of England which are certainly not this species. 12 (Hampshire) is probably an error, as Townsend does not mention it in his 'Flora of Hampshire.' The plants from Devon, 3, and Cornwall, 1, are certainly not this species, and at the moment I refer the former to *Th. Babingtonii* and the latter to *Th. montanum* and *Th. collinum*.

It will be seen that the general distribution of this plant is on maritime sands northwards from mid-Wales and Norfolk. The west coast plants are somewhat different from those of the east. The former have broader leaflets and a greater proportion of them have a cordate base. The inflorescence also is somewhat different, as it usually arises higher up the stem, and the fruiting

pedicels are considerably longer in the west coast plants than in the eastern ones. The creeping stem-base and also the fruits are identical in both. The west coast form is thus an approach to *Th. montanum*, and it is a question whether this plant is worthy of varietal rank.

2. THALICTRUM MONTANUM Wallroth, Plantæ Schedulæ Criticæ, 258 (1822).

Th. minus L. pro parte.

Th. minus var. *montanum* (Wallr.) Syme, Engl. Bot.; Bab. Man. etc.

Th. minus var. *vulgaris* Moss p.p., *loc. cit.* (1920).

Th. calcareum auct. pl. ?, Jord.

Rootstock shortly creeping or, when growing between rocks, almost cæspitose, sending up one bud near the flowering stem and others within the next inch. Stem 20–60 cm. high, markedly ribbed and usually somewhat glandular. Lowest leaves arising from the base of the plant, usually scale-like, and only the upper wholly developed. The change from the larger leaves near the base to the nearly simple leaves of the inflorescence is usually sudden in well-grown plants. Leaflets very variable, usually on the small side, longer than broad; the majority with a cuneate or truncate base, rarely cordate. The apex in typical plants has three equal and acute teeth, but in other plants they may be rounded, and there seems to be no way of separating the forms. Leaflets either glandular or smooth. Auricles usually rather large, spreading, fringed.

Panicle pyramidal, main axis flexuose, primary branches medium, secondary branches short, ultimate peduncles medium. The panicle usually has the lowest branches rising well above the middle, and they grow out at an angle of between 90° and 30°. Flowers drooping in bud, porrect in flower, erect in fruit. Fruiting pedicels 12–25 mm. long. Sepals narrowly ovate or lanceolate, acute, glandular. Anthers apiculate. Stigmas rather large but narrow, nearly erect. Fruit long, rather narrow, elliptical or ovate, inner side slightly convex, outer side markedly so, slightly compressed, strongly ribbed and glandular.

This species varies greatly in the clothing of the leaves. This character was noted by Wallroth (*l. c.*), who subdivides it as follows:—

(*a*) Var. *virens* Wallr. Leaves obovate, cuneate, and deeply and acutely trifid, green; stem and carpels ± glabrous, blunt.

(*b*) Var. *roridum* Wallr. Leaves subrotund, glaucous, glabrous.

(*c*) Var. *glandulosum* Wallr. Leaves obovate, cuneate, glandular.

There are certainly many plants in England which answer the above descriptions; yet, as so frequently happens, many intermediates can be found, and it seems doubtful whether these divisions of the plant are more than a convenience. I have yet to see a plant which could be considered completely glabrous.

Icones.—Reichenbach, Icones Fl. Germ. iii. t. 37 (1838).
Syme, Engl. Botany, pl. iv. (1862).
Butcher & Strudwick, *op. cit.* fig. 2.

Type-locality.—Gordale Scar, Yorkshire.

Many plants in this country have been called *Th. calcareum* Jord. on the strength of the glands on the leaves. There seems to be very little difference between such plants and those which I refer to as *Th. montanum* var. *glandulosum* Wallr. Rouy and Foucaud (Flor. France) class *Th. calcareum* as a plant with cæspitose stem-base, though Jordan (Obs. Plant. Crit. v. 9; 1847) himself writes: "caude passim breviter subrepentante." All the plants named *Th. calcareum* that I have seen with the stem-base show it shortly but distinctly creeping.

Th. monticolum Jord. is another closely related plant which is distinguished by its more rounded leaves, rather larger, strongly striate stem, and lanceolate stigma. This plant seems to be almost indistinguishable from *Th. montanum* var. *roridum* Wallr.

Distribution.—On limestone cliffs and rocks from sea-level to an elevation of 2800 feet on Snowdon. Its presence on the sea-coast has led to much confusion, as such plants have frequently been called *Th. dunense*, as, for instance, those at Rill Head, Cornwall, and in Pembrokeshire.

There seem to be two essential differences between *Th. montanum* and *Th. arenarium*, and these lie in the fruit and the panicle. The fruit in the latter is very long and narrow, with one side almost straight, while in the former it is a little broader and the inner side is somewhat convex. The inflorescence in the latter is level-topped and begins very low down, the branches coming out at an angle of 60°; in the former it is more or less pyramidal and the branches come out at a broad angle, often horizontally.

Th. montanum is widely distributed, and is found particularly in Western England. I have seen authentic plants from the following vice-counties:—

v.c.		v.c.	
1.	Rill Head. Hume.	60.	Coniston. a, c.
45.	Giltar Point.	65.	Gordale etc., common. a, b. c.
49.	Llanberis. J. Ward. a.	67.	Kyloe Crags. Baker.
50.	Llandrillo yn Rhos. Baily.	69.	Helvellyn etc., common. a, c.
51.	Dyserth. Whitaker. a.	70.	Scawfell Pikes. a, c.
57.	Raven's Dale. Whitelegg. c.	73.	Kirkcudbright. Rimmington.

IRELAND.

9.	Black Head. O'Kelly.	28.	Ben Bulben. Linton. a.

There are doubtless many more places where this plant grows, but the confusion of subspecies makes the records untrustworthy.

3. THALICTRUM COLLINUM Wallroth, Plant. Sched. Crit. 259 (1852).

Th. flexuosum auct. angl., ? Bernhardi, Cat. (1915).

Th. minus var. *vulgaris* Moss pro parte, *loc. cit.*

Rootstock very shortly creeping, sending up one or more buds near the crown. Stem 30–100 cm. high, smooth or ribbed, usually not glandular. Lowest leaves arising from the base of the plant often well developed. The change from the larger to smaller leaves of the inflorescence is gradual. Leaflets very variable, small to medium, a little longer than broad, the majority with a more or less cuneate or slightly truncate base. The apex in typical plants has three or five unequal and subacute teeth, but this character is very variable. Leaves smooth or with a very few sessile glands. Auricles usually small and spreading.

Panicle as in *Th. montanum*. Flowers drooping in bud, porrect in flower, erect in fruit. Fruiting pedicels 15–25 mm. long. Sepals narrowly to broadly ovate, blunt, usually glabrous. Stigma narrow, nearly erect. Fruit medium, almost exactly oval and symmetrical, slightly compressed and glabrous.

It seems doubtful whether this plant should be kept apart from *Th. montanum*. The differences are a matter of degree and are not very clearly defined. The shape of the fruit is the only certain character, but usually *Th. collinum* is more robust, almost glabrous, and has broader leaves and sepals.

Because of its variability many names have been assigned to this plant by British botanists, and especially to the examples from Cheddar Gorge (see White, 'Bristol Flora') and the Great Orme. Other than the name here adopted, the most frequently used for this plant are *Th. montanum* and *Th. flexuosum*. I cannot see much resemblance between our plant as above described and *Th. flexuosum* as figured by Reichenbach (Ic. Fl. Germ. iii. t. 28), as described by Rouy and Foucaud (Flor. Fran.) or as represented by continental specimens. I have not been able to refer to the original description by Bernhardi *, and should the British plants prove to be identical with those described by that author his name would take priority of Wallroth's.

Icones.—Syme, Engl. Botany, pl. v. (1862) is poor, but probably represents this species.
Moss, *tom. cit.* fig. 119.
Butcher & Strudwick, *op. cit.* fig. 3.

Type-locality.—Cheddar Gorge, Somerset.

Distribution.—On limestone cliffs from sea-level to an elevation of about 1000 feet, and chiefly in western Britain from Cornwall to the Ebudes. As with *Th. montanum* its presence on the sea-coast has led to its being mistaken for *Th. dunense*. I have seen authentic plants from the following vice-counties, but doubtless it occurs in many other places :—

* Bernhardi, J. J., Cat. (1815), ex Reich. Fl. Germ. Excurs. 728.

v.c.
1. Penhale. Thurston.
6. Cheddar Gorge, common.
34. Birdlip.
42. Dyffryn Crawnon. Ley.
45. Near Tenby. Bailey.
49. Great Orme. J. B. Wood etc.
50. Nr. Colwyn Bay. Painter.
57. Miller's Dale etc., common.
83. Grantown. Mackay.

IRELAND.
9. Black Head. O'Kelly.

4. THALICTRUM BABINGTONII Butcher in Butcher & Strudw. *op. cit.* 4 (1930).

Th. saxatile Bab. Flor. Camb. 299 (1860).

Th. minus var. *vulgare* Moss p.p., *tom. cit.* fig. 120 (1920).

Th. flexuosum auct. pl. non Bernh.

Rootstock creeping, sending up several buds as far as 4 cm. from the crown. Stem very variable in height according to the habitat, from 20–100 cm. high, faintly ribbed or smooth, glabrous. The lowest leaves which arise from the base of the plant are usually well developed ; scale-leaves rare. The change from the large lower leaves to the nearly simple leaves of the inflorescence is rather gradual. Leaflets variable, usually as broad as long, the majority with a truncate or cordate base, rarely cuneate. The apex in typical plants consists of three or five somewhat obtuse lobes. Leaflets smooth or with a few glands on the veins or margin. Auricles spreading, usually rather broad, entire.

Panicle large, broadly pyramidal, main axis flexuose, primary branches long, secondary branches medium, ultimate peduncles short. The panicle usually has the lowest branches arising well above the middle, and the branches come out at an angle between 90° and 30°, giving the whole a broad outline. Flowers drooping in bud, but soon erect at or after flowering. Fruiting pedicels 1–3 cm. long. Sepals elliptical, somewhat acute, glandular. Anthers apiculate. Stigma narrow, more or less spreading. Fruit short and stumpy, roundly oval, nearly as broad as long and longitudinally symmetrical, not compressed nor glandular, strongly ribbed.

Icones.—Syme, Engl. Botany, pl. vii. (1862) is very poor, but probably represents this species.
Moss, *tom. cit.* fig. 118 (1920), as *Th. minus* var. *vulgare*.
Butcher & Strudwick, *op. cit.* fig. 5.

Type-locality.—Between Barley and Royston, Hertfordshire.

This plant has had many names assigned to it, e. g., *Th. saxatile*, *Th. flexuosum*, *Th. collinum*, etc. Babington evidently saw it was different from the sea-side and mountain plants, and, because of its small ovoid fruit, tried to fit it to *Th. saxatile* Schleich., from which it differs, however, in the drooping flowers as well as in the form of the inflorescence. I have been unable to find described anything quite like the above, so have renamed it *Th. Babingtonii*. It differs from the other species described chiefly in its fruit, but there are other less definite points of

difference in the sepals, the leaf-shape, the paucity of glands, and the creeping rootstock.

Distribution.—Chiefly in calcareous pastures in Eastern England, though plants which I am inclined to refer to this species have been collected in Devon and West Yorkshire. Its altitudinal range is from sea-level to 500 feet. The following are authenticated records :—

v.c.	v.c.
3. Nr. Torquay. Palmer.	28. Cockley Cley. Little.
19. Ickleton. Gibson.	29. Fleam Dyke, Newmarket, etc.
20. Between Barley and Royston.	64. Collingham. Horrell.
26. Icklingham etc.	

5. THALICTRUM CAPILLARE Reichenbach, Fl. Germ. Excurs. 729 (1832).

Th. majus var. *capillare* (Reich.) N. E. Brown, Suppl. Engl. Bot. 2 (1902).

Th. Kochii auct. angl. non Fries.

Th. elatum Moss, p.p., *tom. cit.* fig. 122 (1920).

Rootstock creeping, sending up buds at intervals. Stem 50–150 cm. high, faintly ribbed, either with very few glands or glabrous. Lowest leaves from the base of the plants usually fully developed, scale-leaves rare. The change from the large leaves near the base to the smaller ones of the inflorescence is gradual. Leaflets rather large, nearly as broad as long, the majority with a cordate base. The apex in typical plants has three rather rounded teeth, of which the middle is largest. Leaves with a few glands on both faces and on the veins below. Auricles usually large, entire, spreading.

Panicle very lax, broader than long, main axis rather straight, primary branches long, only once branched, ultimate peduncles very long and slender. The panicle usually has the lowest branches well above the middle and the branches come out at an angle between 60° and 30°. Flowers porrect in bud, soon erect. Fruiting pedicels 2–5 cm. long. Sepals elliptical, somewhat obtuse, usually glandular. Stigma large, broad, spreading. Fruit medium to large, roundly oval, and more or less longitudinally symmetrical, strongly ribbed, not compressed, glabrous.

This plant has been referred to *Th. Kochii*, but there is very little resemblance in general habit, though on paper it seems to possess the same salient features. There is no doubt as to the identity of the Perthshire plant with that of Reichenbach, as figured in his 'Icones' (*l. c.*). It has the same large stigma and rounded fruit which I consider to be the chief distinguishing features of the plant.

Icones.—Reichenbach, Ic. Fl. Germ. iii. t. 36, fig. 4634 (1838).
Moss, *tom. cit.* fig. 122.
Butcher & Strudwick, *op. cit.* fig. 5.

Type-locality.—Keltney Burn, Perthshire.

The above is the only locality in which I am certain this plant grows. Specimens from Great Langdale (Ley) and Coniston (Comber) may also be this species.

6. THALICTRUM MAJUS Crantz, Stirp. Austr. fasc. 2, 80 (1763).

Rootstock almost cæspitose, with two to four buds at the stem-base. Stem 50–200 cm. high, distinctly ribbed, glandular. Leaves from the base of the plant usually fully developed, scale-leaves rare. The change from large leaves to the smaller ones of the inflorescence is rather sudden. Leaflets large, rather longer than broad but variable, the majority with a cuneate or truncate base. The apex in typical plants consists of three equal and subacute teeth. Leaves covered below with stalked glands, glabrous above. Auricles usually small, fringed, spreading.

Panicle rather dense, as broad as long, main axis flexuose, primary branches medium, secondary branches short, ultimate peduncles many, crowded, short. The lowest branches of the panicle are well above the middle and the branches come out between 60° and 30°. Flowers drooping in bud and flower, later porrect, erect in fruit. Fruiting pedicels 1–3 cm. long. Sepals lanceolate, acute, glandular. Stigma medium, more or less erect. Fruits larger than in any other British plant and very numerous in each flower ; elongated, inner side only slightly convex, outer markedly so, strongly ribbed and somewhat compressed, either smooth or glandular.

Very few of the plants named *Th. majus* by British botanists are identical with those so named from continental localities, but certain plants on the eastern coast of Scotland may be so referred. The salient features are the fruit, the large number of achenes to each flower, and the large but narrow leaves.

Icones.—Jacquin, Fl. Austr. v. t. 420 (1778).
Reichenbach, Ic. Fl. Germ. iii. t. 30 (1838).
Butcher & Strudwick, *op. cit.* fig. 6.

Type-locality.—North Queensferry, Fifeshire.

The only other authenticated locality for this plant is Burnmouth Hill, Berwick (*Bailey*). Both these places are nearly at sea-level and in limestone pasture or scrub-land.

7. THALICTRUM UMBROSUM Butcher in Butcher & Strudw. *op. cit.* 7 (1930).

Th. elatum and *Th. majus* var. *dumosum* Moss, *tom. cit.* fig. 121 (1920).

Th. majus Bab. Man. 4 (1881).

Th. Kochii, *Th. flexuosum*, and *Th. collinum* auct. angl. pro parte.

Rootstock almost cæspitose, with two or three buds at the stem-base. Stem 50–200 cm. high, usually ribbed and glandular. Lowest leaves usually fully developed, scale-leaves rare. The change from large to small leaves is rather gradual. Leaflets

variable according to situation, usually large, nearly as broad as long, the majority with a cordate or truncate base, rarely cuneate: the apex in typical plants consists of three or five subequal and rather obtuse teeth. Leaves covered below with numerous sessile glands, usually glabrous above. Auricles small, fringed, suberect.

Panicle rather lax, nearly as broad as long; main axis flexuose, primary branches long, other branches short but never crowded. The lowest branches of the panicle arise well above the middle of the main stem and come out at any angle between 90° and 30°. Flowers drooping in bud, porrect in flower, erect in fruit. Fruiting pedicels ·5–2 cm. long. Sepals elliptical, subacute, more or less glandular. Anthers apiculate. Stigma medium, more or less spreading. Fruit medium to large, few in a head; almost oval, but the inner side less convex than the outer, strongly ribbed and somewhat compressed, either smooth or glandular.

Icones.—Moss, *tom. cit.* fig. 121 (as *Th. majus* var. *dumosum*) (1920), and fig. 123 (as *Th. elatum*). This is not typical.

Butcher & Strudwick, *op. cit.* 7.

Type-locality.—Western end of Loch Rannoch, Perthshire.

This is a common plant on damp soil and shingle, which has usually been referred either to *Th. majus* or *Th. flexuosum*. Neither the fruit, nor leaf-shape, nor branching of the inflorescence corresponds to what is found in the former. From the latter this plant differs in fruit, inflorescence, and cæspitose rootstock. It is desirable therefore to describe this as a new species until more work can be done on the whole group. The plant that Moss (*l. c.*) described as *Th. elatum* from Loch Tay seems to be a shade-grown form of the above, though it may prove on further study to be a definite variety. In any case it does not appear to correspond very closely to *Th. elatum* Jacq. on the evidence of continental specimens so named and of Reichenbach's 'Icones.'

Distribution.—Appears to be generally distributed in damp basic soils and shingle, such as hedgerows, woods, and lake-shores, throughout Scotland, North Wales, and Northern England, but never at a great elevation. It occurs up to 1000 feet. The following are authenticated records:—

v.c.		v.c.	
48.	Shores of Lake Bala. Mott.	69.	Brathay Banks etc., common.
49.	Woods, Llanrwst. Fisher.	70.	Foot of Whitbarrow. Bailey.
64.	Bolton Woods. Lord.	88.	Loch Tay etc., common.
65.	Tees-side, Winch Bridge. Dent.	89.	Loch Rannoch etc., common.
66.	,, ,, ,, ,,		

8. THALICTRUM EXPANSUM Jordan, Obs. Plant. Crit. v. 6 (1847).

Th. pubescens auct. angl.

Rootstock almost cæspitose, with two or more buds at the crown. Stem 50–100 cm. high, faintly ribbed and glandular.

Lowest leaves usually fully developed, scale-leaves rare. The change from large to small leaves is rather sudden. Leaflets variable, usually as broad as long, the majority with a cordate or truncate base, rarely cuneate: the apex in typical plants consists of three rather obtuse unequal lobes. Leaflets covered on both sides with very numerous sessile glands. Auricles narrow, fringed, more or less reflexed.

Panicle large, broadly pyramidal, main axis flexuose, primary branches long, ultimate branches very numerous, short. The lowest branches arise well above the middle of the main axis and come out at any angle between 90° and 30°. Flowers drooping in bud, erect in fruit. Fruiting pedicels ·5–2 cm. long. Sepals narrowly elliptical, somewhat acute and glandular. Stigma rather broad and spreading. Fruit small, rather broad and stumpy, oval, almost symmetrical, scarcely compressed, glandular, strongly ribbed.

Known only from one locality in Britain, namely Erwood, Brecon.

It is with some hesitation that I refer this to *Th. expansum* Jordan, as it is very close to *Th. umbrosum*. The characters which seem to indicate that it should be kept apart are numerous sessile glands on the leaflets, the small fruits and the large number of flowers in a cluster, a feature very rare in British though common enough in plants from other parts of Europe.

Icones.—Butcher and Strudwick, *op. cit.* fig. 8.

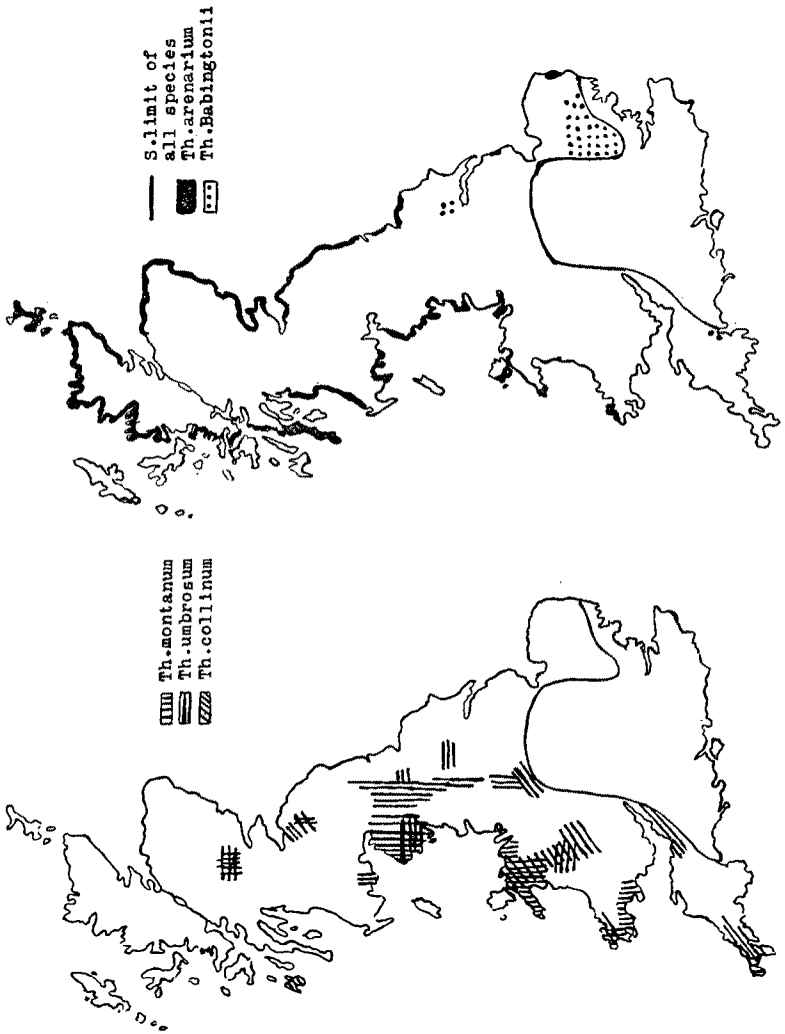
Type-locality.—Limestone rocks, Erwood, Brecon.

DISTRIBUTION OF PLANTS IN BRITAIN.

Generally speaking the various species of *Thalictrum* occur on calcareous rocks, soils, and sandy sea-shores from the extreme north of Scotland (Shetland Islands) to a line passing approximately from Torquay, Gloucester, Worcester, Derby, Bedford, Harwich—that is, all England and Scotland north and west of the Thames Valley. It is remarkable that no plants occur on the chalk of Wiltshire, Hampshire, Sussex, and Kent, though it is found plentifully enough in East Anglia. The plant recorded for Sussex (Rep. Bot. Exch. Cl. 1932, 87) would appear to be a recent arrival.

Considering the segregate species, most of these have a very definite distribution. With certain doubtful exceptions *Th. Babingtonii* is confined to the calcareous districts of East Anglia, with the northward limit of its distribution in Yorkshire. *Th. arenarium* is confined to coastal sands northwards from Central Wales and Norfolk. It has thus the same general distribution as other northern coast forms, such as *Mertensia maritima* and *Centaurium compressum* (*cf.* Salisbury *). The three closely

* Salisbury, E. J., "The East Anglian Flora," Trans. Norfolk Nat. Hist. Soc. iii. (1932).



Approximate distribution of the *Thalictrum minus* group in Great Britain.

allied forms *Th. montanum*, *Th. collinum*, and *Th. umbrosum* cover approximately the same area, except that the last is not found further south than Central Wales.

In conclusion, it should be emphasized that there appear to be very few or no clear-cut differences between any of these species, though individuals are found that are very distinct and remain so in cultivation. Many forms keep their character of fruit and creeping or cæspitose rootstock, but until further work is done in breeding plants it is impossible to obtain a true idea of the status and of the relationships of the plants here described.

I wish to express my best thanks to the Manchester Museum for the loan of a large number of sheets from the Bailey Herbarium, and to Messrs. A. J. Wilmott and J. S. L. Gilmour for help and suggestions.

AN EXTERNAL LEAF-CHARACTER OF THE CRICKET-BAT AND OTHER WILLOWS.

By Helen Bancroft, M.A., D.Sc.

In a paper entitled "The Cricket-bat Willow Problem" (Quart. Journ. Forestry, 1932) Dr. J. Burtt Davy gives photographs showing the size and spacing of surface dots on the upper side of the leaves of *Salix alba* L., *S. fragilis* L., and ×*S. viridis* var. *elyensis*. It has been suggested that these surface dots, which occur in willow-leaves generally, may be of diagnostic value in determining the true cricket-bat willow, *S. alba* var. *caerulea* Sm.; and an investigation of this feature has accordingly been undertaken.

The surface dots represent stomata, which in willow occur on the upper as well as on the lower surface of the leaf; they appear glistening when the surface of a fresh leaf is examined, owing to the fact that there is a considerable air-space immediately underneath each "stomatal apparatus" *.

In contemplating stomata as providing possible diagnostic characters due weight must be given to certain important facts. For example, with regard to their size, much evidence has accumulated to show that this feature is of no diagnostic value †; this will be immediately obvious from one fact alone, namely, that stomata are structures which are essentially adjustable to varying external conditions.

Secondly, with regard to number of stomata per unit area of leaf-surface: this, as Lotfield has pointed out, is "influenced

* That is, the two "guard-cells" surrounding the actual pore or stoma and one or more subsidiary cells accompanying each guard-cell.

† *Cf.* Odell, M. E., "The Determination of Fossil Angiosperms by the Characters of their Vegetative Organs," Ann. Bot. xlvi. 941 (1932). See pp. 954–6 and references.

by the conditions under which they were formed" *; and Eckerson has further shown that "marked variations in number .... of stomata occur .... in the same varieties grown under different external conditions" †. Factors determining this variation in stomatal frequency, as recorded by different observers, are intensity of light, humidity of the environment, altitude, and the amount of carbon dioxide in the air surrounding the plant (Odell, *l. c.* 953). Further, it must be noted that stomatal frequency per unit area may vary in one and the same leaf, for the stomata are not necessarily evenly distributed over the whole leaf-surface; there may be more stomata per unit area at the base of the leaf than at the apex, and *vice versa*, or there may be more at the margin than at the midrib, and *vice versa* (Odell, *l. c.* 951).

The evidence of many independent workers thus indicates that there is no diagnostic value in the number of stomata per unit area of the leaf; and such, in general, after an examination of a large number of leaves, is the present writer's conclusion with regard to the various species of willow. It is, however, possible that if completely comparable material of different species and varieties could be used rough estimates of stomatal frequency might be made with the aid of a good lens, which might be of some help in diagnosis. By "completely comparable material" is meant similar areas of mature leaves from similar positions on individual twigs, the leaves coming from trees grown in similar situations and under similar conditions with regard to altitude and exposure to light and air, and also with regard to humidity and purity of air. Unless these conditions can be fulfilled estimates of stomatal frequency in comparative work are unreliable. From an examination of comparable material, however, *S. alba*, for example, was found to have roughly twice as many "surface dots" as *S. fragilis*.

Actual counts of the number of stomata per sq. mm. were made by removing the epidermis from leaves by means of a weak macerating agent, and examining microscopically. The counts were most probably comparable, for the material was treated in the same way in the different cases and was in the same condition before treatment; they gave an average of 114 per sq. mm. for *S. alba* and of 50 for *S. fragilis*. It must not be concluded, however, that 114 and 50 represent the *actual* number of stomata per sq. mm. when the epidermis was in position on the leaf; for the area of a *detached* portion of epidermis is not necessarily the same as when held in position by the tension of the underlying tissues of the leaf; epidermis may shrink or stretch when removed according to the condition of the underlying tissues.

* Lotfield, V. G., "The Behaviour of Stomata," Carnegie Institution of Washington, Publication No. 314 (1921).

† Eckerson, S., "The Number and Size of Stomata," Bot. Gaz. xlvi. 221 (1908).

Unfortunately surface dots did not provide a diagnostic difference between *S. alba* and var. *caerulea* when comparable material was examined, for the number was approximately the same in the two types—113 per sq. mm. in var. *caerulea*. Dr. Burtt Davy (*l. c.* 7) notes that Dr. Floderus, of Stockholm, is unable to recognize var. *caerulea* as distinct from *S. alba*; it was certainly not differentiated by the frequency of the surface dots in the leaves for which counts were made. It should be noted that the "comparable material" used for these estimations came from the riverside in the University Parks, Oxford; it is obvious that a number of groups of such material from other situations will need to be investigated before any final statement can be made.

A note may be added with regard to the hairiness of the leaf-surfaces. It is frequently stated in Floras that var. *caerulea* may be distinguished from *S. alba* by the fact that old leaves of the former are "glabrous glaucous beneath," whereas old leaves of the latter are "silky on both surfaces" *. The degree of hairiness of "old leaves," either in the species or its variety, cannot be regarded as a fixed diagnostic character; for example, certain leaves taken from different though neighbouring trees of "var. *caerulea*" at the end of November were found to be densely clothed with silky hairs on the lower surface, while the upper surface was almost smooth; the silkiness of the lower surface, however, varied considerably in leaves from the same tree.

Hairiness is a surface feature of leaves which is variable with external conditions; and these may affect even the leaves of the same tree differently, according to their exposure and position on the tree. This also, therefore, is not a reliable diagnostic character.

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ROSA PERTHENSIS ROUY AND ITS HISTORY AS A BRITISH PLANT.

BY J. R. MATTHEWS.

THE plant described by Rouy, 'Flore de France,' vi. 430 (1900), under the name ×*Rosa perthensis* was discovered by W. Barclay in 1892 near Auchterarder Station, mid-Perth. It was referred by the collector and by both Nicholson and Baker to ×*R. involuta* Sm. var. *Sabini* (Woods), and is recorded under this name in Buchanan White's 'Flora of Perthshire,' 133 (1898). Barclay was aided in his determination by the opinions expressed by Crépin, with whom, at the invitation of

* *Cf.*, for example, Hooker, J. D., 'The Student's Flora of the British Islands,' ed. 3, 371.

Bayley Balfour, he had entered into correspondence regarding Scottish Roses in 1894. In regard to the plant under review, Crépin had written in his 'Excursions Rhodologiques' (1894), as quoted by Barclay (Ann. Scot. Nat. Hist. no. 18, 1896): "It is truly remarkable that I have seen nothing like it from the Continent or from other localities in the British Isles. Its leaflets are profusely glandular below, and have many glands also on the upper surface; but what is extraordinary is that there are numerous long, stiff bristles clothing the pedicels and receptacles. At first sight one would imagine it to be the hybrid *R. pimpinellifolia* × *rubiginosa* (*R. echinocarpa* Rip.); but this idea cannot be entertained when we look at the prickles, which are straight or but slightly curved. Moreover, *R. rubiginosa* is not found in the immediate neighbourhood. On the other hand, there is found growing beside the hybrid a form of *R. tomentosa* with leaflets glandular on both surfaces, and with pedicels and sepals thickly hispid-glandular.' Let us not forget to add that the axes of this hybrid have quite the armature of the ordinary varieties of *R. Sabini* Woods, that its receptacles have ripened quite full of achenes, and that its sepals are persistent."

The form of *R. tomentosa* referred to as growing in close proximity to the hybrid was subsequently identified as *R. omissa* Déségl., a species or subspecies allied to *R. Sherardi* Davies, and long misunderstood by British botanists. There is little doubt, as Barclay afterwards recognized, that the true *R. tomentosa* Sm. is decidedly rare, if not entirely absent, in Scotland, the majority of Scottish specimens passing as *tomentosa* being referable to Déséglise's species. Although Barclay continued to regard the Auchterarder rose as a form of the hybrid *R. involuta*, he came finally to a definite opinion regarding its parentage, and in Proc. Perth. Soc. Nat. Hist. v. (1911) he gives reasons for believing it to be a hybrid of *R. spinosissima* × *omissa*, "*with a strong leaning to the* omissa *side*." The italics are mine.

In his account of British Roses in Journ. Bot. Suppl. (1910) Lt.-Col. Wolley-Dod makes no reference to Barclay's plant, but in his 'List of British Roses,' published in the same journal (1911), he states (p. 10) that a gathering by Barclay from near Auchterarder, mid-Perth, is best referred to *R. involuta* var. *Nicholsonii* Crép., which is placed in the group *Pimpinellifoliae* × *Rubiginosae*, on account of the very large and numerous subfoliar glands. This reference is of some interest in view of Crépin's suggestion quoted above, but it is clear that Crépin had in mind not only the copious glandular development of the plant, but also the strongly echinate fruit. Subsequently Wolley-Dod accepted Barclay's conclusion regarding the parentage of the hybrid, and, recognizing that it could not be referred to either ×*R. involuta* or ×*R. Sabini*, he gave (in Journ. Bot. 1924, 203) a full description of the plant under the name ×*R. Barclayi*.

This name is, however, invalid, since it had already been used by Almquist and Traaen in Journ. Bot. (1913) for a form of *R. Afzeliana* Fr. found among Scottish specimens sent to those authors by Barclay. Later, in his "Revision of the British Roses" published as a Supplement to Journ. Bot. (1930–31), Wolley-Dod adopts the name ×*R. perthensis* Rouy, there being little doubt that it refers to the hybrid which he formerly called ×*R. Barclayi*.

Rouy's remarks (Fl. Fr. vi. 430; 1900) leave little uncertainty regarding the identity of his plant. They run as follows:—"J'estime que la plante distribuée dans l'Herbarium Rosarum de MM. Pons et Coste, No. 378, sous le nom de *R. pimpinellifolia* × *tomentosa* (*R. involuta* Sm. *var.*), est, sans doute possible, un *R. pimpinellifolia* < *omissa*. Il a, en effet, les pédicelles courts ou très courts et les fruits longuement atténués à la base. Mais il est bien différent du *R. pseudo-involuta* du Salève, par ses pédicelles et fruits couverts de longs acicules ou de sois spinescentes allongées (3·6 mm. de long), ses folioles faiblement pubescentes en dessous, glabrescentes en dessus, mais abondamment glanduleuses sur les deux pages, sa corolle d'un beau rose. Plante remarquable trouvée par M. Barclay à Auchterarder, comté de Perth, à laquelle je donne le nom ×*R. perthensis*."

The plant is figured by Heslop Harrison in Trans. Nat. Hist. Soc. Dur. v. (1921) pl. x. & pl. xx. figs. 21 & 22. These drawings show the fruit pyriform rather than ovoid-subglobose as stated in Wolley-Dod's description, and on the living plant at Auchterarder and also in cultivation fruits which are narrowed towards the base certainly predominate.

Our present knowledge of the distribution of *R. perthensis* indicates that it is a rare plant in Britain. It is known only in Scotland from its original locality in mid-Perth, and from near Forres, Elgin, where it has been found by Prof. Heslop Harrison. Specimens from Muirdrum, Angus, doubtfully referred to *R. perthensis* by Mrs. Corstorphine in Rep. Bot. Exc. Club, 699 (1931), do not match the Auchterarder plant, and I regard the Muirdrum gathering shown me by Mrs. Corstorphine as ×*R. Sabini*. The Forfarshire examples, in common with nearly all the specimens of this hybrid which I have seen in Britain, show almost complete abortion of the fruits. On the other hand, the Auchterarder plant is fully fertile and produces seed in abundance. This feature alone is sufficient to raise the question as to whether *R. perthensis* is in reality a member of the *Spinosissimae* × *Villosae* and whether it bears any relationship at all to the heterogeneous assemblage of hybrids referred by earlier rhodologists to ×*R. involuta* Sm. In 1911, nine years before the announcement by Tackholm of apomixis in the genus *Rosa*, I raised *R. perthensis* from seed, and obtained, unfortunately, only a single plant. From this individual a further supply of

seed was gathered in 1919, which Mr. Hales of Chelsea Physic Garden kindly germinated for me. About seventy-five seedlings were obtained, and in due course these were sent to me in Perthshire and planted near St. Andrews Cottage, Dunning. Most of them have survived, and the fact is now recorded in order that the origin of this colony of *R. perthensis* near Dunning, in mid-Perth, may be known to any future botanist who may "discover" it there. The individuals of the second generation are all alike, as might be expected if reproduction is apomictical, and in every character they agree with the original parent.

Prolonged study of this plant at different stages of development has led me to doubt its hybrid origin. It bears a striking resemblance to *R. omissa* Déségl., and I have arrived at the conclusion that its affinities are with this species. The suggestion of hybridity seems to have arisen mainly because of the pronounced heteracanthy, indicating, it was supposed, the influence of *R. spinosissima*. But the strong admixture of prickles is conspicuous chiefly on the flowering branches, and is not a feature of plants which have not reached the flowering stage. Young plants, in fact, are indistinguishable from forms of *R. omissa*. Moreover, it should be noted that *R. spinosissima* does not grow in the neighbourhood of *perthensis* in the Auchterarder locality. It is true that the armature of the fruit is so unusual as to have attracted considerable attention, being unlike any described form of *omissa*; but in other characters, such as colour of the stems, shape, size, and colour of leaflets, size and form of fruits and achenes, the resemblance is close.

It has already been stated that *R. perthensis* produces fruit freely, in contrast with the majority of *spinosissima* hybrids, which commonly exhibit a high degree of fruit abortion. An exception is seen, however, in ×*R. Wilsoni* Borr., a member of the *Spinosissimae* × *Villosae*, which is fully fertile. This, however, is a remarkable example of fertility having been obtained by chromosome doubling, as shown by Blackburn and Harrison in their cytological study of this plant, published in Brit. Journ. Exp. Biol. i. (1924). These authors make the interesting suggestion that *R. perthensis* may have become fertile by a similar process, but Prof. Harrison kindly informs me that he has now examined the plant cytologically and finds no evidence of its being a *spinosissima* hybrid.

Although ovule fertility in this rose is high, it resembles most British roses in producing much imperfect pollen. Only 20 per cent. of the pollen is fully developed in the Auchterarder plant, and in cultivated specimens the amount may fall to 12 per cent. In the plant of *R. omissa* growing near *perthensis* at Auchterarder the amount of fertile pollen is about 25 per cent. It is now recognized that pollen sterility is not in itself a certain criterion of hybridity, but may be due to other causes. In the genus *Rosa* the species hybrids, such as *hibernica* and *involuta*, exhibit a large proportion of infertile pollen, but the same condition is found in the great majority of our rose forms, where hybridity had not been suspected. The cytological observations reported by Blackburn and Harrison (in Ann. Bot. xxxv.; 1921) have revealed the interesting fact, however, that almost all our British roses are really of hybrid origin; but they have to be regarded as latent hybrids of unknown parentage, and in this respect they differ from the species hybrids (phenhybrids) within the genus, where the parentage can frequently be determined with some measure of certainty. To the former type *R. perthensis* would appear to belong, and it must take its place in the *Villosae* group as a form closely allied to *R. omissa* Déségl.

The rhodologist, perplexed by a multiplicity of forms, may welcome any criterion, however small, which is likely to throw light on the problems of relationship within the genus. Cytology and genetics will doubtless provide the ultimate clue, and it is of interest to note that Erlanson, in dealing with polyploidy in *Rosa*, has recently suggested (Bot. Gaz. xci.; 1931) that the size of the pollen grain may be useful even in determining herbarium material. How far this may apply to our British roses (assuming the method to be practicable) has still to be ascertained, but a few preliminary observations, to be extended at a later date, may be recorded here. In the phenhybrids *R. involuta*, *R. hibernica*, and *R. cantiana*, which have been examined in this connection, the fertile pollen grains are invariably large, their average size being 31·9 μ, 31·6 μ, and 33·6 μ respectively. On the other hand, in *R. omissa* the average size of the pollen grains is 25·8 μ, while in *R. perthensis* it is 25·2 μ. There is here no suggestion that the latter form falls into the phenhybrid group, but the agreement with *omissa* in size of microspore, though not exact, may have some significance.

TWO INTERESTING HYBRIDS IN THE BRITISH FLORA.

By J. Edward Lousley.

The following notes appear to be the first definite records of the hybrids mentioned as occurring spontaneously in wild habitats in Britain. Their detection is largely due to Mr. A. W. Graveson, to whose keen observation the writer would acknowledge his indebtedness.

Cirsium eriophorum (L.) Scop. × C. lanceolatum Scop.
(× *C. grandiflorum* Kittel; × *C. nolitangere* Borh.; × *C. Fleischmanni* Khek.).

In July 1932 Mr. A. W. Graveson showed me a colony of *C. eriophorum* near the Dorset coast between Abbotsbury and

Burton Bradstock, and, although the plants were not then in full bloom, our attention was attracted by a thistle which was not exactly *C. eriophorum* or *C. lanceolatum*, but which strongly suggested a hybrid between the two. Later in the same year Graveson wrote that he had found convincing hybrids between these two species near Newport (Essex), but that it was then too late for a visit that year. In July 1933 I happened to inform the late W. D. Miller that I was anxious to see Somerset *eriophorum* with a view to comparing it with the plant of the east of England, and also to observe whether any possible hybrids with *lanceolatum* occurred. He at once stated that the previous year he had met with such a hybrid near Street in Somerset, and the same afternoon he took me to the exact locality, where, however, a short search failed to reveal the hybrid. On August 21, 1933, I visited the Newport station with A. W. Graveson, and there we at once found most convincing hybrids of the two species as described below.

Thus *C. eriophorum* × *lanceolatum* has been certainly determined from North Essex, and probably also from Dorset and North Somerset. It is a well-known continental hybrid, well distributed in France, frequent in Germany, and long known in Switzerland, and it seems remarkable that it has so long escaped detection in this country *, where *C. lanceolatum* usually occurs in close proximity to the rarer species. That the hybrid is not difficult to distinguish is evidenced by Schultz-Bipontinus's name *C. Gerhardtii* (*C. Gerhardi*), which was given in honour of Karl Gerhardt, who detected the hybrid at the age of 16.

From *C. lanceolatum* Scop., with decurrent leaves running well down the internodes, leaf-segments fairly narrow, gradually produced into a spine, heads fascicled, and involucres ovoid, slightly cottony, and *C. eriophorum* (L.) Scop., with stem not winged, leaves half-clasping, leaf-segments very broad, heads fewer in number and less crowded, involucres globose, shaggy, with arachnoid webbing, the Newport hybrid is distinguished as follows:—*Leaves* with slightly clasping base, somewhat decurrent, segments not so gradually acuminate as in *lanceolatum*; *heads* rather crowded, intermediate in shape, with arachnoid webbing prominent, but not so dense as in *eriophorum*, but suffused with the reddish colour of that species.

Rouy (Fl. France, ix. 23; 1905) divides the aggregate hybrid *C. grandiflorum* Kittel into three forms, two of which might well occur in Britain, viz.:—

(*a*) × *C. Jaegeri* (F. Schultz) Rouy. Plant with the habit of *C. eriophorum*, with cauline leaves usually little or scarcely

* There is a remark by the late G. C. Druce (Rep. B. E. C. ii. 336; 1908) where, speaking of a locality near Leeds, he says: "*Cirsium eriophorum* (which here hybridises with *C. lanceolatum*)," but, as he makes no mention of the hybrid in either edition of the 'Plant List' or in subsequent writings, it seems reasonable to assume that there was some error.

decurrent, in any case much less so than in (*b*); heads very large, usually less numerous and more crowded, involucres very arachnoid, subglobose or turbinate, with phyllaries usually toothed and broadened towards the apex.

(*b*) × *C. Gerhardti* (Sch. Bip.) Rouy. Plant with habit somewhat that of *C. lanceolatum*; cauline leaves more decurrent than in (*a*), with narrow wings; heads large, more or less fascicled; involucre more or less webbed, ovoid-conical or subglobose, with phyllaries usually ciliate, towards the apex not or scarcely broadened.

The plant collected at Newport comes best under *C. Gerhardti*, but the other hybrid form is likely to occur and would be more easily passed over.

It is to be noted that Petrak ('Bibliotheca botanica,' Heft 78; 1912) has distinguished three races of *C. eriophorum* separated by the shape of their phyllaries, and each occupying a separate geographical area—the British race being *britannicum* (Petrak). (There is a useful drawing of the phyllaries and a distribution map in Hegi, Illus. Fl. Mittel-Europa, vi. 907.) The present note appears to be the first record of the hybrid of the variety with *C. lanceolatum*, and also the first record for Britain of the hybrid of the species with *lanceolatum*.

VERBASCUM PULVERULENTUM (Vill.) Smith × V. THAPSUS Linn.

This hybrid has already been given for the British Flora by Druce (Hayward's 'Botanist's Pocket Book,' ed. 19, 140 (1930), 'British Plant List,' 52 (1908), and ed. 2, 84 (1928)), but it has not appeared in the 'London Catalogue.' Apparently Druce relied on the note by E. F. Linton, stating that the hybrid had arisen naturally in his Bournemouth garden from parent plants introduced from Norfolk (Rep. B. E. C. i. 641; 1900).

Verbascum pulverulentum (Vill.)* Smith (*V. floccosum* Waldst. & Kit.) has long been known from East and West Norfolk and East and West Suffolk, but in the most recent Floras of these counties (Nicholson, 1914, and Hind, 1889) the present hybrid is not mentioned. In addition to these four vice-counties, Druce ('Comital Flora,' 212; 1932) gives it as native in Hertfordshire, and as doubtful or introduced in a number of other counties. To this distribution must be added North Essex, where the plant has been known near Colchester to A. W. Graveson for several years. Although the proximity to the railway suggest that seeds may have been carried by that agency from the plant's headquarters round Norwich, this appears somewhat improbable, and in any case the remoteness from houses or rubbish-dumps is against other forms of human introduction. Graveson

* Villar's description is not adequate to fix the plant, and hence it is rejected by continental authorities—see Rouy, Fl. France, xi. 13, footnote (1909), and Williams, 'Prodromus Floræ Britannicæ,' i. 271 (1909).

deserves considerable credit for having first noticed the plant from a moving train, and later for detecting the rare hybrid. When he took me to the spot on August 20, 1933, there was a large flourishing colony of *V. pulverulentum*, and several plants of the hybrid with *V. Thapsus*.

Brief descriptions of the parents for comparison with that of the hybrid are as follows :—

Verbascum pulverulentum (Vill.) Smith. (*V. floccosum* Waldst. & Kit.). Stem much branched. Upper cauline leaves sessile, lower shortly stalked, none decurrent. Flowers in small fascicles in interrupted racemes, conspicuously stalked in fruit. Limb of the corolla flatter than in *V. Thapsus*. Stamens all more or less equal in length. Capsule small, exceeding the small calyx-segments. The whole plant clothed with white floccose stellate down, which is easily rubbed off, and gives the plant a " meally " appearance.

Verbascum Thapsus Linn. Stem simple, or rarely with a few branches. Cauline leaves all decurrent. Flowers practically sessile, in a very dense, spike-like raceme. Limb of the corolla concave. Stamens of two lengths—the three upper short, the two lower longer. Capsule large, scarcely exceeding the large calyx segments. The whole plant clothed with a dense yellowish felt which is not easily detached.

The hybrid *V. pulverulentum* × *Thapsus* as found near Colchester may be described as follows :—Stem with few branches, branched only in the lower part of the panicle and at the base. Stem-leaves sessile, enlarged at the base, scarcely decurrent—none stalked as in *pulverulentum*. Flowers in conspicuous fascicles, crowded above, more interrupted below. Corolla larger than in *pulverulentum*. Capsule small, about equalling the calyx segments. The whole plant without the conspicuous floccose " meal " of *pulverulentum*, but with firmly attached " felt " as in *Thapsus*.

Probably the best general name for the hybrid is × *V. Godronii* Boreau ('Flore du Centre de la France,' ii. 472; 1857), where the hybrid nature of the plant is indicated by the quotation of *V. Thapso-floccosum* Gren. & Godr. The Colchester hybrid, however, differs from Boreau's plant in that the leaves are not " decurrent on the stem," though this would not prevent its inclusion in *V. Godroni* as emended by Rouy (Fl. Fr. xi. 21; 1909). × *V. Lamottei* Franch. (given as the hybrid name in Druce's 'List') appears to be a "*sub-pulverulentum*" form with the inflorescence and tomentum of that species.

The rarity of this hybrid in Britain is plainly accounted for by the scarcity of *Verbascum pulverulentum*, and the fact that *V. nigrum* rather than *V. Thapsus* frequently occurs with it. That the hybrid occurs freely enough when the two species grow together is evident from Linton's note (see above) and Franchet's

statement "... le *V. Godroni* croissait presque partout ou les *V. Thapsus* et *floccosum* s'épanouissaient ensemble" (Note sur Quelques Verbascum Hybrides, 5). Franchet, in the same pamphlet, remarks that when *V. Godroni* is cut to the ground, the secondary shoots thrown up are remarkable for the shortness of their decurrence. It is possible, therefore, that the trimming of the bank in early summer may account for this discrepancy between the Colchester hybrid and Boreau's description. No cut-off stems were observed, but as no special examination was made for this purpose it is advisable to bear the possibility in mind.

PROPAGATION FROM AERIAL SHOOTS IN *EQUISETUM*.

By R. Lloyd Praeger, D.Sc.

By a lakelet in Galway, at the end of May, slightly above water-level, there was a fringe of young aerial stems of *Equisetum limosum* washed ashore, and packed together on wet mud. Coots had been busy nest-building a few weeks earlier, and had bitten them off at about water-level in much larger numbers than they had used. It was noticed that the topmost three or four joints of each stem had curved into a vertical position, and were fresh and growing. Examination showed that from the lower nodes, in contact with the ground, roots had developed, and were penetrating into the mud. This ready propagation was so different from what prevails in other Pteridophyta—the ferns, for instance—that in June an experiment was started on the same lines. Portions of the aerial stems of several *Equiseta*—*E. arvense*, *E. sylvaticum*, *E. palustre*, *E. limosum*, *E. hyemale*, *E. Moorei*, *E. trachyodon*, *E. variegatum* (all of which I happened to have in cultivation) were laid on soaking soil and dusted over with sand sufficiently to hold them in place. The pieces were about three joints long, and were taken from all parts of the aerial shoots. All the species had within a few weeks developed roots from the nodes, and shortly after both aerial shoots and subterranean rhizomes began to be produced in profusion. By September *E. Moorei* and *E. variegatum* had formed branching rhizomes 2 feet long and a number of aerial stems 9 inches or more high. The other species grew less exuberantly, *E. hyemale* being the slowest. Of *E. arvense*, in which the barren and fertile stems are completely differentiated, only the former were available in May. Of the other species mentioned, both cone-bearing and barren branches were tried, and they behaved similarly. Pieces of the stems of *E. palustre*, *E. limosum*, and *E. Moorei*, allowed to float freely in water, also produced roots, rhizomes, and aerial stems from the nodes.

J. H. Schaffner has already (Bull. Torrey Bot. Club, lviii. 531–35; 1932) drawn attention to the ready propagation of horsetails from aerial stems. He found that stems of *E. praealtum*, cut off a few joints above the base and submerged in water, produced roots and stems in abundance. Transferred to pots full of earth kept wet, they developed rhizomes also. He correlates the presence or absence of light in these experiments with the production of aerial shoots or subterranean rhizomes, but no experiment was made to show that rhizomes would not have been produced eventually in both cases. Stems of *E. arvense*, which he planted with their bases fixed in soil and the stems then wholly submerged, produced roots and aerial shoots readily, and after the water had been poured off were found to have developed rhizomes in the soil. Cuttings taken from the slender 3- or 4-angled branches of *E. arvense* planted in wet soil also grew readily.

It is clear then that in the Equisetaceae propagation from aerial stems is in general singularly facile. I have not had an opportunity of testing whether the fertile stems of *E. arvense*, *E. maximum*, or *E. umbrosum*, highly differentiated structures devoid of chlorophyll and appearing at a different time of year from the barren stems, also lend themselves to such propagation.

OBITUARY.

J. D. Gimlette

(1867–1934).

We regret to have to record the sudden death of John Desmond Gimlette, M.R.C.S., L.R.C.P., on April 24, at Cheam, Surrey. He was born at Southsea, February 28, 1867, the fourth son of Fleet-Surgeon Hart Gimlette, educated at Epsom College and St. Thomas's Hospital, and was Residency-Surgeon in various parts of the Malay Peninsula from 1896 to 1921, when he retired to England. The latter part of his service was spent in the little known state of Kelantan, whence he sent plants to England. Besides a number of medical papers, he published the very valuable work on 'Malay Poisons and Charm Cures,' of which three editions appeared in 1915, 1923, and 1929, dealing largely with the poisonous plants of Malaya, their properties and effects. The last two editions were written during a period of long and painful illness due to an infection received when performing an operation to save the life of a Chinese coolie. His name is commemorated in *Cyrtandra Gimlettei* Ridley.—H. N. Ridley.

SHORT NOTES.

Cambridge University Herbarium.—During a discussion in the section on Taxonomy at the International Botanical Congress at Cambridge in 1930, it was suggested that each botanical institution should publish a list of collections under its charge and should distribute copies to other botanical institutions engaged in taxonomic work. We have received from Prof. Seward "A List of the more important Collections in the University Herbarium, Cambridge," which has been compiled by the former curator, Mr. J. S. L. Gilmour, with the help of Mr. T. G. Tutin. The pamphlet has not been published, but is being sent to the principal Herbaria with a note that additional copies can be obtained at 2*s*. 6*d*., post free. A short account is given of the history of the Herbarium, which originated in a *Hortus Siccus* of some 2600 sheets presented on his retirement as Professor of Botany in 1761 by John Martyn. Owing to lack of adequate housing and neglect much of this collection was destroyed, but under Prof. J. S. Henslow (1825–61) an extensive herbarium was formed, both British and foreign, a notable item being Darwin's plants collected during the voyage in the 'Beagle.' An important acquisition was the Herbarium of C. M. Lemman, containing over 50,000 specimens, named and arranged by Bentham, and presented in 1852. Henslow's successor, Babington, added greatly to the British and European collections, and during his régime Lindley's Herbarium, with the exception of the Orchids (which are at Kew), of about 58,000 sheets was added, and in 1880 the Herbarium of Gaston Genevier, which is especially rich in *Rubi*. Recent additions include the British herbaria of the Rev. E. S. Marshall and Spencer Bickham.

The present herbarium includes the main General Herbarium, and, as separate collections, Dr. and Mrs. Gray's Algae (presented 1876–7) and an extensive British Herbarium based on Babington's collection and including those of Marshall and Bickham.

The collections are available to visitors during University terms, and arrangements can usually be made to provide facilities for work at other times.

Isoëtes echinospora Dur. in Cornwall.—This quillwort occurs in Dosmary Pool at 900 feet on the granite rocks of Bodmin Moor, 12 miles south-west of Launceston. Some plants and many leaves, probably uprooted by birds, had drifted to the shore when I visited the place on April 12, 1934; but the water, after heavy rain, was too turbid to enable me to see the bottom of the pool or to estimate the area or abundance of the plant. Some rooted examples, however, were dredged from the peaty bed at the southern end. The pale green leaves and the spreading habit suggested *I. echinospora*, and Professor E. J. Salisbury,

to whom I submitted specimens, confirmed my surmise. I know of no authentic records of the occurrence hitherto of *Isoëtes* in Cornwall or Devon.—CHAS. OLDHAM.

BROMUS INTERRUPTUS Druce IN HOLLAND.—A Dutch correspondent, Mr. P. Jansen, of Amsterdam, reports that in 1933 he found *Bromus interruptus* Druce in two localities, at Amsterdam and at Ermelo, both on sandy clay. He has been kind enough to send me a specimen (now in the British Museum Herbarium) from the Amsterdam locality, and his identification is undoubtedly correct. I cannot find this grass recorded in such continental Floras as I have consulted, and it seems possible that this is the first time it has been noticed outside Britain.—I. A. WILLIAMS.

REVIEWS.

A Leechbook or Collection of Medical Recipes of the Fifteenth Century. Edited with notes and appendix by WARREN R. DAWSON, F.R.S.E. Cr. 8vo, pp. 334. Published for the Royal Society of Literature of the United Kingdom: Macmillan & Co.: London, 1934. Price 20*s*.

THERE is always an interest in the study of the herbs used in early days in medicine and surgery, before the time when the properties of plants had been scientifically investigated, and this book gives a very good idea of both the simples in general use and the commonest forms of illness and accidents in the reign of Henry VI. The manuscript from which it is taken belongs to the Medical Society of London and has been transcribed and a version of it in modern English given on alternate pages by the editor, who dates the work as written about 1444. The unknown scribe seems to have compiled his extensive collection of recipes mainly from the early works of the Latin and Greek doctors, adding others from contemporary friends and his own observations, so that most of the prescriptions are of herbs gathered in the hedgerows and fields of Britain; but, as the editor points out, Mediterranean and Oriental plants were used by the Greek doctors, and probably these were not identical with the English ones here substituted.

Most of the quaint and now disused plant-names are well known and correctly identified, but surely "Bane-wort," given on p. 45 as Wallflower, should be translated *Atropa Belladonna*. It appears to have been used in a fomentation for a broken skull, and the scribe almost invariably recommends the use of narcotics for outward application only. One notable exception is a decoction of hemlock root in an anæsthetic potion for operations. Compared with prescriptions of leeches of two centuries later, we note the small use of both animal and mineral products.

Rubies, pearls, and diamonds were probably out of the reach of the country physician of the fifteenth century, and the same thing apparently applies also to sugar, for though much was imported into Europe in the twelfth century it was doubtless expensive, and honey was largely used instead; even in a recipe for quince-preserve honey is used, though the scribe does say sugar is better as making it whiter. Oriental spices, especially pepper, as well as drugs, such as scammony and *Cassia fistula*, were largely used and procured from the spicers. It is delightful to read of mint sauce improved by the addition of ground pepper and cumin seed as an appetiser nearly five hundred years ago.

The work would be more easily used if an index, especially of the plants with their scientific names, had been added.—H. N. RIDLEY.

Bibliotheca Botanica. Edited by Prof. Dr. L. DIELS. Heft 108: *Pflanzensoziologische Untersuchungen in Suddeutschland.* By ALBRECHT FABER. 4to, pp. vi, 66, 7 pls. Schweizerbart'sche Verlagsbuchhandlung: Stuttgart, 1933. Price 29 Marks.

THIS is a detailed account, mainly floristic, of the woodlands and related plant-communities of Wurttemberg. The grasslands constitute two types. A steppe-like calcicole community dominated by *Bromus erectus* is accompanied by such steppe species as *Koeleria gracilis*, *Medicago minima*, and *M. falcata* among the characteristic plants. The second and more widespread type of grassland is commonly dominated by *Brachypodium pinnatum*, and amongst the more characteristic species may be mentioned *Agrimonia Eupatoria*, *Bromus erectus*, *Euphorbia Cyparissias*, *Bupleurum falcatum*, and *Potentilla verna*. A large proportion of the numerous herbaceous species present are such as might be found in a *Brachypodium* community on the English South Downs; but others, such as *Gentiana ciliata*, *G. cruciata*, *Euphrasia lutea*, and *Dianthus carthusianorum*, give the community a Central European aspect. The author, indeed, comments on the mingling in this area of Continental and Atlantic elements. Facies of this community are also met with in which *Bupleurum falcatum*, *Daucus Carota* or *Agropyrum repens* are outstanding constituents.

These grasslands may pass into scrub communities in which *Cornus sanguinea*, *Prunus spinosa*, and *Ligustrum vulgare* are the dominants, accompanied by other shrubs also found in British "chalk-scrub," though the presence of *Lonicera Xylosteum* adds a less familiar feature. The accompanying herbs are also mostly calcicole species.

The scrub is a transition phase to woodland types in which the dominant trees are *Quercus sessiliflora*, *Q. Robur*, *Carpinus Betulus*, and *Fagus sylvatica*. One type of woodland termed the *Querceto-*

lithospermetum is dominated by *Q. Robur*, with *Lithospermum purpureo-caeruleum* as the commonest herb. Here the presence of *Sorbus torminalis*, *Tilia cordata*, and a number of calcicole herbs suggests comparison with the *Quercetum sessiliflorae* of the Wenlock Limestone in the Malvern area. A damper type, with both *Quercus Robur* and *Q. sessiliflora* as dominants, is characterized by *Molinia coerulea* as the chief constituent of the ground-flora. Under the Beech community four sub-associations are recognized, namely, (1) a dry type of Oak-Hornbeam-Beech with *Pyrus torminalis* and many of the drier habitat species of beech-woods; (2) an Oak-Hornbeam-Beech type rich in herbs, and closely approximating in the ground-flora to that of true beech-wood, with *Daphne Mezereum*, *Mercurialis perennis*, *Melica nutans*, *Paris quadrifolia*, *Polygonatum multiflorum*, *Arum maculatum*, etc.; (3) a damper type with *Alnus glutinosa* and such herbs as *Impatiens Noli-tangere*, *Carex remota*, *Milium effusum*, etc.; (4) a drier acid type in which the more characteristic species include *Deschampsia flexuosa*, *Lathyrus montanus*, and *Maianthemum bifolium*.

On definitely acid soils there occurs mixed Oakwood with Birch and a shrub layer in which *Sarothamnus scoparius* and *Calluna vulgaris* are conspicuous features. Clear cutting results in the Broom and Heather becoming dominant and forming "sub-Atlantic" heath-scrub.

The effects of felling are considered, and it is evident from the account here given that the influence of man has played no small part in bringing about the diversity of woodland types which the author describes.—E. J. SALISBURY.

Texas Grasses. By W. A. SILVEUS, B.A., LL.B. Roy. 8vo, pp. xlvi, 782, illustrated. Author: San Antonio, Texas. 1933. Price $5.00.

THE author, an enthusiastic amateur student of the grasses of his State, has collected and examined thousands of specimens in the course of numerous visits to every section of Texas, necessitating some 60,000 miles of travel. He has not only collected in person most of the species hitherto known, but has ascertained the presence of many additional known species and also of a number of novelties. He shows that Texas has within its borders nearly half of all the species to be found in the United States. "The book has been written to meet the requirements of every class desiring a knowledge of grasses, for whatever purpose and regardless of previous preparation for their study." The assistance of Dr. Hitchcock and Mrs. Agnes Chase is acknowledged for verification of species and for suggestions as to descriptions and drawings; and the author desires no greater compensation for the time, labour, and expense that the work has entailed than that it may do for the development of Economic

Agrostology what the labours of these botanists have done for Systematic Agrostology. The same sequence of arrangement has been followed as in Hitchcock's 'Genera of Grasses of the United States' (U.S. Dept. of Agriculture, Bulletin no. 772), and the descriptions of the families, tribes, and genera, as well as the keys, so far as applicable, have been adopted from this bulletin. A glossary provides explanations of the terms, and indications of the pronunciation of the names are included in the text.

The keys for discrimination of the genera and species are adequate, and full descriptions of these are given, with an indication under each species of the habitat, distribution in the United States, and season of flourishing. An important feature of the book is the wealth of illustration, mainly from photographs (taken by the author) of the living plant, which is often shown as growing in the wild; these are supplemented by line drawings by Olive Vandruff. Nearly every species is illustrated, and enlarged diagrams are included to show the characters of the spike and spikelet. The text is clear and a helpful use of clarendon type is a feature of the keys and the descriptions.

Mr. Silveus has made a valuable contribution to American Agrostology.—A. B. R.

Recent Advances in Plant Physiology. By E. C. BARTON-WRIGHT, M.Sc. Edition 2. Pp. x, 341, with 54 text-figs. Churchill: London, 1933. Price 12*s.* 6*d.*

THE issue of a second edition of Mr. Barton-Wright's book is evidence that there is a demand for a book giving a concise review of the recently published work in this rapidly growing branch of botanical study.

The text for the second edition has been considerably altered, revised, and brought up to date. The size of the volume remains approximately the same, but the deletion of some subjects has made possible the expansion of others, as well as the inclusion of some themes not previously discussed. Furthermore, the author has rearranged his subject-matter more advantageously and sub-divided it into nine chapters instead of six.

The titles of the chapters indicate the range of the topics discussed; these are: (I.) "Absorption of Water and Transpiration," (II.) "Carbon Assimilation," (III.) "Nitrogen Metabolism," (IV.) "The Raw Materials of Plant Nutrition," (V.) "Translocation," (VI.) "Respiration," (VII.) "Growth," (VIII.) "Growth (*cont.*), Light and Growth," (IX.) "Growth (*cont.*), Accessory Growth Factors and Related Problems."

The principal changes in the new edition are to be found in the beginning and in the end portions of the text. The beginning sections on soil, including the absorption of its salts, are omitted,

and the work on the absorption of water and on transpiration is now reviewed in the first chapter. The final chapter on growth has been subdivided into three, and, by leaving out germination, dormancy, mycorrhiza, and heterothallism, the author has been able to devote more space to other aspects of the subject, notably to photoperiodism and to the action and chemical nature of the substance known as the "growth regulator."

A useful "index of authors" has been added, which facilitates reference to any particular work.

The value of the book is considerably enhanced by the alterations and additions, and it should prove useful to advanced students of botany, especially to those equipped with a knowledge of organic chemistry.—A. C. HALKET.

Fortschritte der Botanik. Zweiter Band. Berichte über das Jahr 1932. Edited by Prof. Dr. FRITZ VON WETTSTEIN. Roy. 8vo, pp. iv, 302, 37 figs. Springer: Berlin, 1933. Price RM. 24.

THE second annual volume of 'Fortschritte der Botanik,' devoted to a comprehensive survey of botanical work in 1932, is a useful successor to the first volume, which has already been reviewed in this journal (1933, p. 204). The book has been written by sixteen contributors, fifteen of whom were responsible for the production of the first volume. The literature lists contain about 1300 items, mostly publications in 1931 and 1932. More than half of these were published in Germany; about one-fifth came from the United States, and less than one-tenth from the British Empire. A few works from each of most of the European countries and a few from Japan and China complete the stock of material drawn upon by the authors. As about two-thirds of the volume deals with physiological subjects, the marked preponderance of German and American work is not altogether surprising, but it seems probable that less selection was exercised in the choice of German sources than of those from other countries.

Although comments are relatively few, the separate contributions are not mere lists of facts. They are interesting, and much more readable than a succession of isolated abstracts. No doubt the choice and treatment of the material has been influenced by the personal views of the authors, but they seem to treat the facts fairly. For the non-specialist the articles provide good introductions to the special aspects of the subject: they are hardly intended for the specialist, who will probably be acquainted with the current literature before the relevant volume of the 'Fortschritte' reaches him.

The index is a useful addition to the book, but it needs extension. For example, mycological and palæontological details

occur in the contributions by more than one of the authors, but this is not indicated in the index. A complete index would make the book too bulky, but the index to the second volume is hardly adequate.

One misprint needs mention. The journals containing the work by O. Schnitzler and by J. Schwemmle are not named in the literature list on p. 274.—B. BARNES.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on April 26, the President, Prof. F. E. Weiss, F.R.S., in the Chair, Miss T. E. Uyldert (Visitor) described a physiological disease which was affecting forced bulbs in Holland. A localized weakening in the peduncle caused the flower to bend over. Experiments showed that the phenomenon was accompanied by lack of sufficient calcium in the stalk. Dr. Delf suggested that so strictly localized an effect could not be entirely due to a variation in the general distribution of calcium.

Mr. H. W. Pugsley gave an historical account of the Marsh Orchids, pointing out that *O. latifolia* L. was the plant referred to *O. incarnata* L. in modern works, and that *O. incarnata* L. was not a Marsh Orchid, but a form of *O. sambucina* L. The paper concluded with a revision of the British and a few allied continental species of the group.

At the meeting on May 10 the President referred to the loss to botanical science by the death of Dr. Robert Chodat, Professor of Botany at the Geneva University. Prof. Chodat was elected a Foreign Member of the Society in 1914, and at the Anniversary Meeting last year was awarded the Linnean Gold Medal *. Professor Camille Sauvageau and Professor Otto Rosenberg were elected Foreign Members.

Dr. Margaret Madge (Visitor) gave an account of nuclear migrations in the ovule and embryo-sac of *Hedychium Gardnerianum*; the details were illustrated by a series of lantern-slides. Mr. J. S. L. Gilmour described a study of the pollination-mechanism in *Centaurium umbellatum* and *compressum*; the species were shown to be self-fertile and fertile with each other. Capt. F. Kingdon Ward gave an account of his plant-collecting journey in Tibet in 1933, illustrated by a number of excellent lantern-slides showing the character of the country and the nature of the vegetation. His investigations of the geology of the area indicated an eastern extension of the Himalayan range.

'GENTES HERBARUM,' vol. iii. fasc. 4, 5 (March 1934).—In fascicle 4—The Species of Grapes peculiar to North America—

* An appreciation of Prof. Chodat's work will appear in our next number.

Prof. L. H. Bailey provides a systematic study of the North American species of *Vitis* with a view particularly to extend the monograph prepared for Gray's 'Synoptical Flora' in 1897. A review of previous work is given, the hybridity question is discussed, and an illustrated descriptive account follows of the thirty species, two cultigens, two hybrids, and nine varieties recognized by the writer. Fascicle 5—Eubati Boreales—supplements the study of southern forms described last August in fascicle 3. Prof. Bailey recommends and practises intensive study of the plants in order to recognize the species; the question of hybrids as a taxonomic problem may then be attacked.

'SINENSIA.'—Botanical contributions from the Academia Sinica, in volume iv. are the following. *Lithostegia*: a new genus of Polypodiaceae from Sikkim–Yunnan, by R. C. Ching, based on *Aspidium foeniculaceum* Hook. (pp. 1–10). Ample material collected by Forrest in West Yunnan has made possible the solution of the hitherto doubtful taxonomic position of this monotype. "Notes on Slime-Molds from China," by S. C. and L. K. Teng (pp. 61–81). The Mycetozoa have hitherto been neglected by Chinese botanists, and it is hoped to arouse interest in their exploration. "Notes on Chinese Fungi," III., by F. L. Tai and C. T. Wei (pp. 83–128), continues previous studies. The 58 species recorded are described and illustrated with text-figures, and include some new species and combinations.

INDEX KEWENSIS: SUPPLEMENT 8.—We extend a hearty welcome to the new Supplement recently issued by the Clarendon Press (Price 75*s*.), which includes the names of genera and species of Flowering Plants published during the quinquennium 1926–1930, with some omissions from previous parts. A notable departure from the earlier issues is an Appendix containing a list of new and previously overlooked genera arranged in alphabetical order under their families. Botanists generally will be grateful to Sir Arthur Hill and his staff for the continued invaluable aid to their work, and especially to Miss M. L. Green and Dr. T. A. Sprague "quorum fide ac diligentia opus ita maturari potuit."

BOTANICAL SOCIETY OF JAPAN.—A recently issued number of the 'Botanical Magazine' is an index to the Contents of vols. xxvi.–xlv. (January 1912–December 1931). It comprises an Author Index to the Original articles and an Author Index to the miscellaneous part (articles in Japanese are indicated by an *), printed in roman characters, followed by two comparable indexes in Japanese characters.

INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE, 1930.—Separate copies of this Supplement may be obtained from the publishers, Messrs. Taylor and Francis, price 2*s*. each.

ON THE MORPHOLOGY, ECOLOGY, AND DISTRIBUTION OF *RANUNCULUS LENORMANDI* F. SCHULTZ AND *R. HEDERACEUS* L.

By E. J. SALISBURY, F.R.S.

THE two species of Batrachian "Crowfoots" here considered stand apart from the other British representatives in their general morphology and mode of growth, which is sufficiently similar to have given rise to a certain degree of confusion of approximating forms, although the typical representatives are sufficiently distinct. The distinctions between them are indeed mainly quantitative rather than qualitative, which has, perhaps, led to not a few inaccuracies in the current Floras and to various points of ecological and morphological interest having been overlooked.

The most distinctive qualitative character for the separation of *R. Lenormandi* from *R. hederaceus* would appear to be the form

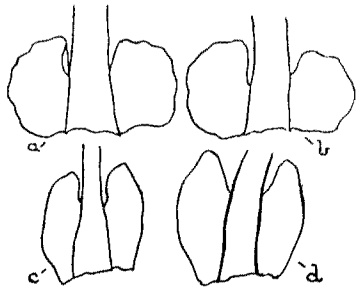


Fig. 1.—*a*, *b*. Stipules of *R. Lenormandi*. *c*, *d*. Stipules of *R. hederaceus*.

of the leaves. In *R. hederaceus* the lobes are more or less deltoid in form and widest at the base, whereas the leaf-lobes of *R. Lenormandi* are broadest just above the base, so that the central lobe and the adjacent lateral lobes frequently exhibit a slight overlap. The upper surface of the leaf of *R. hederaceus* is very commonly marked by a dark patch of pigmentation which spreads from the midrib towards the two chief lateral veins in a form slightly suggestive of a webbed three-toed foot. This feature, distinctive enough when present, is, however, often absent in plants with floating leaves. The stipules also present qualitative differences quite striking in fresh specimens (*cf.* fig. 1), those of *R. Lenormandi* being broader, more oval, and diverging more (fig. 1, *a* & *b*), whereas the stipules of *R. hederaceus* are narrower, more pointed, and attached to the petiole for a greater proportion of their length (usually about two-thirds) (fig. 1, *c* & *d*).

In many instances the flowers afford a striking distinction as regards their size, precluding any possible confusion, but the existence of small-flowered strains of the one and large-flowered strains of the other renders this an unreliable criterion in critical cases. This is true also of another qualitative distinction cited in some Floras, namely, the venation of the petals. Grenier and Godron, for instance ('Flore de France,' 19; 1848), describe *R. hederaceus* as having three veins, whilst *R. coenosus* (=*R. Lenormandi*) is stated to have from five to seven. It is true that the petals of *R. hederaceus* most commonly have three veins and those of *R. Lenormandi* most commonly five, but this distinction is, as shown later, not absolute.

A considerable amount of material of both these species has been examined by the writer, mainly with the object of ascertaining if these distinctive members of the section presented any outstanding floral characters as compared with other members of the genus (*cf.* Salisbury, Ann. Bot. xlv. 539–78; 1931). The study brought to light several features of interest, and shows the need for modifying the published description of these species in certain important particulars.

Ranunculus Lenormandi F. Schultz.

This species occurs both on mud, and in water as a floating-leaved plant. In the latter condition it may attain a considerable size, but appears to be invariably associated with peaty waters. Common in the non-calcareous areas of Ireland and in the west of England, the species becomes less frequent as we pass eastward, and, except for the eastern part of Norfolk, where it is rare, has not been recorded from the eastern counties extending from S.E. Yorks to E. Gloucester and E. Kent. The distribution is thus markedly "atlantic" in type, and the occurrence in eastern Norfolk is in conformity with the presence there of other oceanic types (*cf.* Salisbury, "The East Anglian Flora," Trans. Norf. & Norw. Nat. Soc. xiii. 191–263; 1932).

The absence from the eastern half of England is probably due to the lower rainfall and more basic character of the soils, which combine to render suitable habitats very infrequent. It is noteworthy that only in the extreme west does the species become abundant, and is seldom more than rare east of Somerset and the Welsh border. Its northern limit is Dumbarton, and it has been recorded from over 2000 feet in England and at 3300 feet in Wales (*cf.* Wilson, 'Altitudinal Range of British Plants,' 1931). The western distribution in Britain is but an expression of the general western distribution of this species on the continent, where it occurs in Belgium, the west of France from Normandy to the Pyrenees, and western Spain (*cf.* Map, fig. 2). In order to appreciate the significance of this distribution it is necessary to know the life-history, and here we meet the

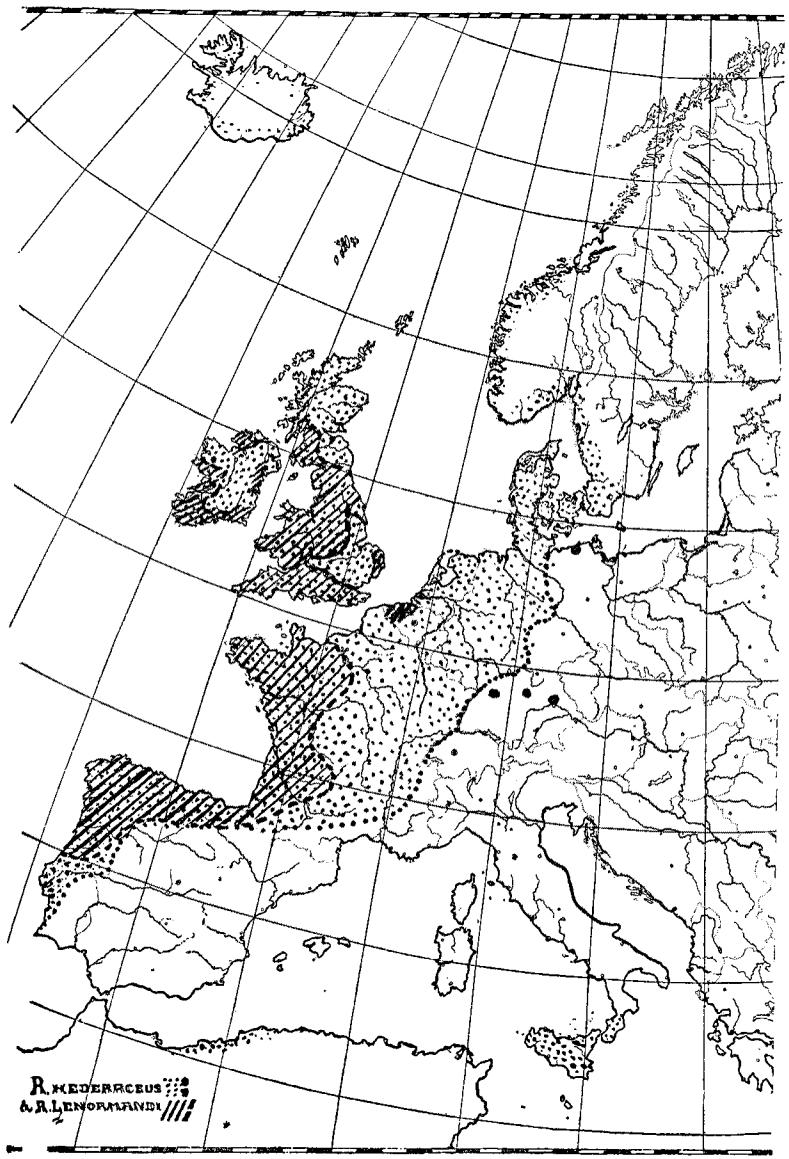


Fig. 2.—Map showing distribution of *R. Lenormandi* and *R. hederaceus*.

first discrepancy between the published descriptions and the writer's own experience. Coste ('Flore France,' 20) states that this species is perennial. Plants grown in cultivation both on mud and in water only flowered once, and there is clear evidence that in some at least of its wild stations it also behaves as an "annual." The fact that plants of this species appear on the same spot year after year is, needless to say, no evidence of its perennial character. Perhaps the species is sometimes a short-lived perennial, and, in common with many such, may persist for a few years or only one season, but clearly further evidence on the point is desirable. In either circumstance the seeds appear to germinate, normally, in the early autumn, and the seedlings persist through the winter to flower in the following spring. Even then if the plant be a "winter annual" its autumn germination and winter-green condition precludes the circumvention of severe winters by the seed stage, unless some seeds remain dormant, so that the restriction of *R. Lenormandi* to the southern part of Scotland and its absence from the Continent north of Belgium, despite the favourable edaphic conditions in the north of Scotland and in Scandinavia, is most probably an instance of climatic limitation. So, too, its absence from the flora of Central Europe and the Mediterranean region is similarly to be attributed to climatic factors, the low humidity of the air in the late spring and early summer probably precluding growth on mud, where this species most successfully fruits. On the other hand, the absence from the central region of Ireland is almost certainly to be attributed to edaphic rather than climatic factors. Similarly, *R. Lenormandi* appears to be rare in Pembroke, where the prevalence of soils rich in exchangeable bases, if not actually rich in carbonates, probably imposes an edaphic barrier.

The characteristic features of leaf-form, to which Hooker drew attention ('Students' Flora,' ed. 3, 7), have already been mentioned, and one need only add that the length of the petiole is often in this species greater than that of the lamina, whereas in *R. hederaceus* the reverse is frequently the case; but, whilst this difference commonly obtains in specimens growing on mud, the petioles of both species may become very elongated when the plants are growing in water. *R. Lenormandi* occurs less frequently on mud than *R. hederaceus*, so that the leaves are more frequently floating. In this condition they have stomata in the upper epidermis only. A few counts showed the frequency to be high for an aquatic, the range in the leaves examined being from 111 to 140 per sq. mm. with a stomatal index of 19.

The flowers of *R. Lenormandi* have a considerable range in size. Hooker ('Students' Flora') gives $\frac{1}{4}$ in. to $\frac{1}{2}$ in. The smallest flowers observed by the present writer were 7 mm. in diameter when fully open, whilst the largest were 19 mm. in diameter ($\frac{3}{4}$ inch). There appear to be definite small- and large-flowered strains, which, however, in other respects appear

to differ only in unimportant characters. Hooker (*l. c.* p. 7) gives the flowering period as from June to August, Hayward's 'Botanist's Pocket Book' as January to August. Doubtless occasional flowers may occur in sheltered places in the West of England very early in the year, but in general the flowering period appears to begin in April. Plants growing at high altitudes may be found in flower as late as September.

The calyx is reflexed at maturity and consists normally of five sepals, though flowers with only four sepals sometimes occur. The white petals are commonly from twice to three times the length of the sepals, of ovate form and usually widest near the middle. Each bears a shallow pit-like nectary bordered, except above, by a definite rim. The number of petals is commonly

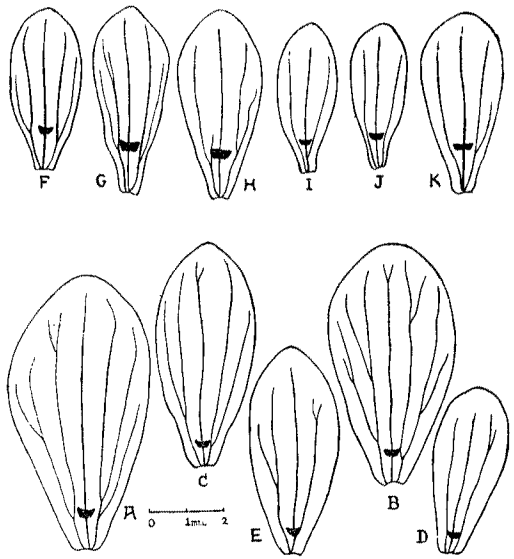


Fig. 3.—A–E. Petals of *R. Lenormandi*. F–K. Petals of *R. hederaceus*. Both on the same scale.

five, but of several hundred flowers examined over 6 per cent. had six petals and about one flower in every two hundred had seven petals. Here, as in *Ranunculus hederaceus*, the vascular bundle supplying the petal divides into three at the base, but usually, about the level of the nectary, the two lateral strands further divide to produce the five strands most frequently present in this species. In narrow petals the branches of the lateral strands may be obscure or even absent (fig. 3, E & D), and small-flowered plants have been observed by the writer in which all the petals possessed but three or four discernible strands. This distinction from *R. hederaceus* is thus unreliable, especially

as more than three strands may be present in that species. Large-flowered strains of *R. Lenormandi* may, on the other hand, contain from six to seven vascular strands in the limb.

The number of stamens is usually stated to be about ten (*cf.* Moss, Camb. Brit. Fl. iii. 139). Coste ('Flore France,' 20) gives eight to ten. As a point of difference from *R. hederaceus* it is, however, essential to assess the variation more accurately. The following data from 350 flowers from plants from various localities in Devon and one locality in Cornwall are probably adequate to present the normal range and relative frequency of the different numbers of stamens in individual flowers.

TABLE I.—*Number of Stamens in Individual Flowers of* R. Lenormandi.

Number of stamens in flower.	Number of flowers containing each number of stamens.				
	Luxulyan, Cornwall.	Devon, various localities.		Total flowers of each type.	Percentage frequency.
		Normal.	Very large-flowered strain.		
5	6	9	0	15	4·3
6	12	28	0	40	11·4
7	11	37	0	48	13·7
8	**14**	52	1	67	19·1
9	9	56	1	66	18·9
10	**14**	**64**	**6**	**84**	**24·0**
11	..	18	4	22	6·3
12	..	4	0	4	1·1
13	..	2	2	4	1·1
Totals: fls. from each locality.	66	270	14	350	99·9

It will be seen that the observed frequency is from five to thirteen stamens, and though it be true that ten stamens in the flower is the most common condition, yet less than a quarter of the flowers examined (24 per cent.) actually present this number. Moreover, about a third of the flowers have seven stamens or less, a fact of considerable importance in assessing the value of the andrœcium for diagnosis in comparison with *R. hederaceus*. Respecting these low numbers, it should be emphasized that the staminal counts were made on unopened flowers, which, together with the absence of scars on the receptacle, precludes any suggestion that the low numbers were due to precocious abscission.

It should be noted that the large-flowered strain, of which, unfortunately, only fourteen flowers were available, would appear to be characterized by the same mode and the same maximum as the normal strain from the same area, but also by an absence of the lower staminal numbers. The Cornish material, on the other hand, contained no flower with more than ten stamens, whilst no fewer than 9 per cent. had five stamens and 43 per cent. seven stamens or less. Indeed, in general it may be said that in the small-flowered strains, where confusion with *R. hederaceus* is most likely to occur, the number of stamens is more liable to be few. This is emphasized by the numbers of stamens in fourteen flowers from a very small-flowered strain; these ranged from five to nine with the mode at six (5 (1 fl.), 6 (6 fls.), 7 (2 fls.), 8 (2 fls.), 9 (3 fls.)). The stamens develop very early and the flower is markedly protandrous. The anthers dehisce extrorsely, but in flowers with ten stamens, where the spatial arrangement suggests an outer antesepalous whorl and an inner antepetalous one, the order of dehiscence observed did not correspond with this interpretation. Two examples of branched stamens were observed, indicative of the same tendency towards fission or fusion noticed in other members of the family (*cf.* Salisbury, Ann. Bot. xxxiii. 47–79; 1919).

The gynœcium shows a wide range of carpel number. The following table gives the frequencies of carpel number for 125 flowers.

TABLE II.—*Variation in Carpel Number of* R. Lenormandi.

Number of carpels.	Number of examples.	Number of carpels.	Number of examples.	Number of carpels.	Number of examples.
21	1	39	5	54	6
22	2	40	8	55	2
26	1	41	2	56	
27	3	42	3	57	2
28	4	43	3	58	
29	3	44	2	59	
30	**7**	45	4	60	1
31	2	46	2	61	
32	2	47	3	62	2
33	**9**	48	3	63	2
34	5	49	1	64	1
35	4	50	1	65	
36	**10**	51	2	66	
37	7	52	..	67	1
38	7	53	2		

The observed range is wide, namely, from 21 to 67 carpels with a mode at 36. It is, however, significant that secondary modes are shown at 30 and 33 carpels. There is thus a slight indication of the periodicity in relation to multiples of three which is a feature of so many Ranunculaceae and which is evidence of a hidden trimery (*cf.* Salisbury, Ann. Bot. xxxiii. 47–49; 1919: xxxiv. 107–16; 1920: xl. 419–45; 1926: xlv. 539–78; 1931).

Complete dissections of 110 flowers of this species, all of which had five sepals and five petals, show a marked positive correlation between carpel number and stamen number.

TABLE III.—*Correlation in* 110 *Flowers of* R. Lenormandi *between Stamens and Carpels.*

No. of carpels.	Number of stamens.									
	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
21 ..	..	1 fl.								
26 ..	..	..	..	1 fl.						
27 ..	..	2 fls.	..	1 fl.						
28 ..	..	..	2 fls.	..	1 fl.					
29 ..	..	..	1 fl.	1 fl.	..	1 fl.				
30 ..	..	..	1 fl.	1 fl.	1 fl.	1 fl.	2 fls.			
31 ..	..	1 fl.	..	1 fl.						
32 ..	..	..	1 fl.	1 fl.						
33 ..	..	..	2 fls.	1 fl.	1 fl.	3 fls.	1 fl.			
34 ..	..	..	2 fls.	2 fls.	1 fl.					
35 ..	..	..	1 fl.	..	2 fls.	..	1 fl.			
36 ..	..	..	2 fls.	1 fl.	2 fls.	1 fl.	4 fls.			
37 ..	..	..	..	3 fls.	1 fl.	2 fls.				
38 ..	..	..	..	2 fls.	1 fl.	1 fl.	3 fls.			
39 ..	..	..	1 fl.	1 fl.	..	2 fls.	1 fl.			
40 ..	..	..	..	1 fl.	4 fls.					
41 ..	..	..	..	..	..	2 fls.				
42 ..	..	..	..	..	..	1 fl.	2 fls.			
43 ..	..	..	..	..	..	2 fls.	..	1 fl.		
44 ..	..	..	..	..	..	1 fl.	1 fl.			
45 ..	..	..	..	..	..	..	2 fls.	1 fl.		
46 ..	..	..	..	..	..	..	2 fls.			
47 ..	..	..	1 fl.	..	..	..	1 fl.			
48 ..	..	..	..	1 fl.	..	..	1 fl.	1 fl.		
49 ..	..	..	..	..	..	..	1 fl.			
50 ..										
51 ..	..	..	..	..	..	..	2 fls.			
52 ..										
53 ..	..	..	..	..	..	1 fl.	1 fl.			
54 ..	..	..	1 fl.	..	..	..	1 fl.	2 fls.	..	1 fl.
55 ..	..	1 fl.								
56 ..										
57 ..	..	..	..	..	..	..	..	1 fl.		
58 ..										
59 ..										
60 ..	..	..	..	..	..	..	1 fl.			
61 ..										
62 ..	..	..	..	..	..	..	1 fl.	1 fl.		
63 ..	..	..	..	..	..	..	..	1 fl.		
64 ..	..	..	..	..	..	..	..	..	..	1 fl.
65 ..										
66 ..										
67 ..	..	..	..	..	..	..	..	1 fl.		

The most frequent conditions of floral organization met with were K 5, C 5, A 10, G 36 (4 fls.) and K 5, C 5, A 8, G 40 (4 fls.). The total number of parts in the flowers studied ranged from 36 to 88, but though the majority of the flowers had a total number of parts between 49 and 62 with a mean of 57·6, the dispersion is too great for more than the suggestion of a mode in the region of 55 to 58. Numbers that represent multiples of five are actually below expectation on the basis of a random distribution (under 21 per cent.). On the other hand, numbers

which are multiples of 3–1 are very slightly above expectation on a random distribution. It is therefore clear that whilst the gynœcium gives a definite indication of the concealed trimery so widespread in the family, the specialization of floral organization has proceeded so far that this feature is far less pronounced than in some other members of the Ranunculaceae. It is worthy of note in this connection that the vascular supply of the carpel also shows considerable specialization, being reduced to the ovular trace and the dorsal strand. In comparison with such species as *R. acris* or *R. parviflorus*, *R. Lenormandi* shows complete suppression of the paired ventral carpellary traces.

The mature achene is from 1·5 to 2 mm. in length by from 0·75 to 1 mm. in width and has a definite beak to one side of the apex. The surface is glabrous and slightly wrinkled.

RANUNCULUS HEDERACEUS L.

Like the foregoing this species occurs both on mud and as a floating-leaved plant, but in general does not appear to extend into such deep water as *R. Lenormandi*. Whilst *R. hederaceus* may also be termed a calcifuge species it is more tolerant of waters well supplied with mineral salts than *R. Lenormandi* Thus in areas where both species occur growing intermingled, *R. hederaceus* was found where the soil was contaminated with the urine of cattle, but *R. Lenormandi* was absent. *R. hederaceus* has been recorded throughout Britain and in all the divisions of Ireland, which bears witness to its less specialized soil preferences. Owing to the leaching out of salts by drainage water from the higher ground it follows that lowland soils, even in siliceous districts, are usually richer in mineral salts than the uplands. It is therefore in conformity with the less calcifuge character of *R. hederaceus* that this species is more frequent in lowland areas than *R. Lenormandi*, and probably in part at least explains its greater eastward extension. Both species have a western distribution on the Continent, but whereas that of *R. Lenormandi* is, as we have seen, very limited, *R. hederaceus* has a much wider range.

The altitudinal range of *R. hederaceus* extends from sea-level to 2200 feet in Wales, and Wilson (*l. c.*) records it at 2240 feet in Westmorland. Although stated to be perennial it certainly may be annual (perhaps normally), the seeds germinating in autumn. It is thus subject to the same dangers as *R. Lenormandi*, but its greater tolerance for higher concentrations of salts in the soil solution is perhaps indicative of a higher potential osmotic pressure, and a consequently greater tolerance of drought reflected in the further extension of this species into the area of continental climate.

The flowers of *R. hederaceus* vary in size from 4–10 mm. ($\frac{1}{6}$–$\frac{3}{8}$ in.). Here again there appear to be large- and small-flowered strains, and there is a certain amount of variation in the width of the petal. The calyx is reflexed at maturity. The

characteristic feature of the flower as compared with *R. Lenormandi* is not only the generally smaller size but the fact that the petals in this species are usually less than twice the length of the sepals with frequently only the three veins of the base continued into the limb. Large-flowered strains may show branching of the laterals, so that four to six veins are present in the limb (fig. 3, F, G, & H). Of 80 petals examined in Cornwall 21 had three veins, 19 four, 38 five, and 2 six. The petals in this species are narrower and usually widest above the middle, and hence their form is more nearly wedge-shaped than oval.

All the specimens examined had five sepals, but flowers with three, six, or even seven petals were found, although these departures from the normal five only represented 0·75 per cent. of the total examined.

Specimens dissected were chiefly from material obtained from Surrey and from Devonshire. The variation in the andrœcium for 400 flowers is shown in the subjoined table :—

TABLE IV.—*Number of Stamens in Individual Flowers of* R. hederaceus.

Number of stamens in flower.	Number of flowers containing each number of stamens.			
	Surrey.	Devon.	Total flowers of each type.	Percentage frequency.
4	0	2	2	0·5
5	6	27	33	8·2
6	5	48	53	13·2
7	36	65	101	25·2
8	39	60	99	24·7
9	69	16	85	21·2
10	18	2	20	5·0
11	7	0	7	1·7
Totals from each locality.	180	220	400	99·7

It will be seen that whilst the range observed was from four to eleven stamens, the majority of the flowers, viz. 84·3 per cent., had from six to nine stamens. Further, that the mode for the one area was nine and for the other area seven. Thus, whilst the variation curves for *R. hederaceus* and *R. Lenormandi* exhibit modes corresponding to different numbers of stamens, yet there is a considerable overlap even when the more rare conditions are excluded. The curves do, however, emphasize the marked tendency for the number of stamens to be fewer in *R. hederaceus* than in *R. Lenormandi*.

Two instances were observed in which the filament bore two anthers. It will be noted that whereas the mode for the Surrey material is a multiple of three, there is no indication of trimery when we consider the entire " population."

The gynœcium consists of a smaller number of carpels than that of *R. Lenormandi*. Table V. shows a range for *R. hederaceus* of from nine to thirty-two carpels. Here there is definite

indication of trimery. The Surrey material shows pronounced modes at twelve, fifteen, and twenty-four carpels, whilst the Devonshire material shows modes at eighteen and twenty-one carpels.

TABLE V.—*Variation in Number of Carpels in* Ranunculus hederaceus.

Number of carpels.	Surrey.	Devon.	Total.	Number of carpels.	Surrey.	Devon.	Total.
9	3	..	3	21	3	16	19
10	1	..	1	22	3	5	8
11	1	..	1	23	1	3	4
12	11	1	13	24	12	6	18
13	4	1	5	25	2	6	8
14	4	5	9	26	2	4	6
15	8	12	20	27	1	5	6
16	4	6	10	28	4	..	4
17	3	4	7	29	1	2	3
18	2	16	18	30	1	2	3
19	1	10	11	31	..	1	1
20	2	9	11	32	1	..	1
				Total..			189 fls.

When the whole 189 gynœcia from both localities are considered together the trimery is even more pronounced with a primary mode at 15 and secondary modes at 9, 12, 18, 21, and 24*. It is noteworthy that in both the species considered the evidence of trimery has persisted in the gynœcium but is almost entirely absent from the andrœcium. In this respect these species offer a striking contrast to such members of the Ranunculaceae as *Anemone apennina* (*cf.* Salisbury, Ann. Bot. xxxiv. 107–16 ; 1920), in which there is pronounced trimery in both the andrœcium and gynœcium. It is in conformity with this difference, and emphasizes the primitive nature of the trimerous condition, that the carpel structure in *Anemone* is of a primitive character, whereas in *Ranunculus*, and especially the Section *Batrachium*, the carpel structure shows marked reduction not only in respect to the single ovule and complete absence of aborted ovules, but also with respect to the vascular supply. In *Ficaria verna*, where the writer has also shown marked trimery to obtain, the carpel has a vascular supply which approximates closely to that of the folliculate condition in the same family (*cf.* Chute, "Achene Morphology," Amer. Journ. Bot. xvii. 709 ; 1930).

Complete dissection of 110 flower-buds shows that in this species also increase in the number of stamens and carpels tend to go together, as is shown by Table VI. This positive correlation between stamens and carpels is further borne out

* Of ten flowers, from sparsely blooming plants, found near Manobier, Pembroke, in late August, one had nine carpels, two had twelve carpels, one fifteen, three eighteen carpels, and one twenty-one carpels. In the other two flowers the carpels numbered fourteen and sixteen respectively.

by comparison of these two closely allied species, since in *R. Lenormandi* the increased number of carpels is also, as already noted, accompanied by an increased number of stamens.

TABLE VI.—*Correlation between Stamen Number and Carpel Number in* Ranunculus hederaceus.

Number of carpels.	Number of stamens.						
	4.	5.	6.	7.	8.	9.	10.
9	..	1 fl.					
12	..	2 fls.	..	..	..	1 fl.	
13	..	..	1 fl.				
14	..	1 fl.	2 fls.	2 fls.	1 fl.		
15	..	3 fls.	4 fls.	5 fls.	..	..	1 fl.
16	..	2 fls.	2 fls.	1 fl.	1 fl.	1 fl.	
17	1 fl.	..	..	1 fl.	1 fl.	1 fl.	
18	1 fl.	2 fls.	1 fl.	4 fls.	5 fls.	2 fls.	
19	..	2 fls.	2 fls.	2 fls.	4 fls.		
20	..	2 fls.	2 fls.	4 fls.			
21	..	1 fl.	1 fl.	3 fls.	7 fls.	2 fls.	1 fl.
22	..	..	..	1 fl.	1 fl.	1 fl.	
23	..	..	..	2 fls.	1 fl.		
24	..	2 fls.	..	1 fl.	..	1 fl.	
25	..	..	1 fl.	3 fls.	..	1 fl.	
26	..	..	1 fl.	..	1 fl.	1 fl.	
27	..	..	..	1 fl.	..	2 fls.	
28							
29	..	..	..	1 fl.	..	1 fl.	
30	..	..	..	..	1 fl.	1 fl.	
31	..	..	..	..	..	1 fl.	

The two species we have considered are evidently closely allied. Both have a considerable similarity in morphological characters, both are definitely western in their distribution. It is not unreasonable, therefore, to regard them as having originated from a common stock. If this be so, then the more restricted distribution of *R. Lenormandi*, its more specialized habitats, and the less marked evidence of trimery which *R. Lenormandi* shows, all point to this species as being of more recent origin. If this be so, the increased number of parts in comparison with *R. hederaceus* is of considerable interest as indicating that such increase may be a tendency in the group as a whole. This appears to be borne out by the fact that in general the members of the *Anemoneae* with most numerous parts are usually the most specialized, and in the *Helleboreae*, although a small number of carpels is the general condition, the most specialized flowers usually contain numerous stamens.

If *R. Lenormandi* be, as suggested, of recent origin, then other extreme western oceanic types may likewise be of comparatively recent development; and this raises the question as to whether the "Lusitanian" element is in reality of the ancient lineage which has been assumed.

THE FLORA OF AKPATOK ISLAND, HUDSON STRAIT.

By NICHOLAS POLUNIN
(Department of Botany, Oxford).

AKPATOK lies in the mouth of Ungava Bay around latitude 60° 25′ North and longitude 68° West. An island of some size and isolation, it was chosen as the main objective of the Oxford Exploration Club's 1931 Expedition* because it was quite uninvestigated, so as botanist it was my duty not only to describe the vegetation from the point of view of the ecologist†, but also, so far as possible, to obtain specimens of all the plants occurring on its about 300 square miles of land and around its shores.

Rather less than a month was spent on the island, but the material brought back, collected between August 20 and September 15, was quite bulky, the specimens of vascular plants numbering over 1600, with almost as many mosses and lichens. The resulting flora is given in the appended lists. There are 123 angiosperms, including the 22 species, forms, and hybrids of *Draba* determined critically by Mrs. E. Ekman of Upsala, and it is unlikely that many species were missed in collecting. The six vascular cryptogams recorded are probably all that occur on the island, but the same claim cannot be made in the case of the lower plants; time was short, and though the 70 bryophytes and 79 lichens probably represent the vast majority of those phyla occurring generally on the island, the algæ and fungi were not so carefully collected, while many of those which were brought back have been found impossible to name, because of the insufficiency of the material. The freshwater and marine algæ identified number 31, if we exclude diatoms, and the fungi, according to a rough determination, 27, though a larger number occurred among the more conspicuous types alone. There have been named 6 freshwater diatoms, and from the marine plankton and a little benthic material 45 diatoms and 4 other protistoid organisms have been identified.

The total named flora from all phyla is thus 391, of which about 305 live on land, but only 129 are vascular plants.

Critical determination after further collecting might, however, add several to the last number, especially in the genus *Salix*. Thus several apparently different forms of "*Salix arctica* Pall." could often be collected from the same habitat, while other types which showed a wide range of variation, sometimes even in closely contiguous plants growing under apparently identical

* See 'Akpatok Island,' by Hugh Clutterbuck, Geogr. Journ. lxxx, no. 3, 1932; also the present author's 'The Isle of Auks,' London: Edward Arnold & Co., 1932.

† A full ecological paper will be published in the 'Journal of Ecology,' xxii, no. 2 (1934), and xxiii, no. 1 (1935).

conditions, were *Cerastium alpinum**, *Saxifraga oppositifolia*, and *Silene acaulis*. These are all known to vary considerably, but, on the other hand, there appeared to be several distinct species of *Pedicularis* and *Taraxacum*.

Nevertheless, the number of vascular plants seems large considering the few that were to be met with in any ordinary part of the island, for the most remarkable feature of the vegetation was its extreme poorness. The island is formed entirely of horizontally bedded Ordovician limestone, whose surface of weathering rock or frost-shattered soil is for the most part devoid of any plant-covering. Great perpendicular cliffs, generally quite barren, extend almost all the way round the coast, and rise sheer and grey for over 600 feet in some places. Their base is generally reached by the water at high tide, the shingle bank or limestone shelf below being quite barren. In most places this shelf continues out from the foot of the cliff for a hundred yards or more seawards, and thus forms a peculiar, if dangerous, feature, being uncovered only at low tide. It again is largely barren, being scoured by heavy seas and the grinding action of ice in winter; the few fucoids and smaller algæ which exist in its more sheltered crannies, and in pools, grow as dense bobbles, and are probably all annuals. Nor are any larger algæ visible below low-tide mark, but further down grow enormously long Laminarians.

Behind the cliff-top extends a slightly undulating plateau which constitutes almost the whole area of the island. In altitude it is in most places between 500 and 800 feet, but it is embossed by hills, generally slight and rounded, but in a few cases rising to over 900 feet, and also indented by valleys and numerous narrower ravines, which, near the coast, are generally deep and rocky. After the melting of the snow these may be raging torrents, but by the middle of August the majority are dry, though there is still on the plateau much open water in the form of small shallow lakes, often in depressions which are so small as to be hardly recognizable as valleys. In sheltered ravines compacted drifts of snow may remain unmelted throughout the summer.

The limestone surface of the plateau is frost-shattered and otherwise weathered into irregular particles of all sizes. The predominant size over most areas is a fine silt or clay on the mechanical scale, and these smaller particles generally become sorted into polygonal or rounded areas delimited by intervening tracts composed of the larger stones, which may be of almost any size. Most of the area of the plateau, and thus of the island, is so covered, and supports at best only a sparse open community of dwarfed herbs and ground-shrubs. The polygons are of

* Authorities for all species will be found in the lists, and will not be given in the text.

compact soil which often remains damp, and are generally $2\frac{1}{2}$ to 5 feet in diameter. They seem to be dynamic, and rarely support any plants, in contrast with the narrower and generally raised intervening tracts, which are well drained and aërated, and support close dark tussocks of *Dryas integrifolia* and flat-pressed bushes of *Salix arctica*. There are no trees or even *Betula nana* on the island, the tallest plants being the stems of *Carex misandra* and some grasses, which occasionally reach a foot in height. They are not so high on the plateau, where occasional Saxifrages, especially *Saxifraga oppositifolia* and *S. aizoides*, occur, with Drabas and small mosses and lichens, including conspicuous white patches of *Cetraria nivalis* and brown ones of *C. islandica*.

Still more barren than this general plateau with its limestone polygons are the ravines, which have sides of cliff or dynamic scree and rocky beds disturbed by water, and the exposed hilltops, whose surface is of large frost-shattered splinters, supporting only a few tiny specks of crustaceous lichens.

The high Arctic type and almost universal poorness of the vegetation, in spite of the comparative lowness of the latitude, are due primarily to extreme exposure, the plateau being unprotected from the frequent gales, which sweep it bare of any protective snow-covering in winter and, added to a hard climate, with its attendant short growing season, make conditions extremely difficult for plant-growth. Even without these gales ceasing the island is liable to be fogbound, and additional disadvantages are the limestone nature of the island to aggravate problems of instability, local drought due to porosity, non-accumulation of humus, and lack of combined nitrogen. It was, therefore, not surprising to find the vegetation comparing most unfavourably with that of the adjacent mainland, where the rocks are acidic and non-porous.

On the other hand, in damp sheltered depressions and the occasional more extensive valleys, conditions are much better than on the rest of the island, the vegetation being closed and growth quite luxuriant in comparison, especially where there is a good snow-covering in winter. *Salix arctica*, *Carex membranopacta* and grasses, are generally the chief plants of such situations, with mosses of tufted growth, which may form little hillocks, in the damper areas. The wettest bogs, especially round the margins of the lakes, support fine beds of *Eriophorum* and *Arctagrostis latifolia*, while dry areas, which nevertheless have a kindly blanket of snow in winter, may bear a close heath-mat of ground-shrubs about four inches high, chiefly of *Cassiope tetragona*, but including *Empetrum*, *Rhododendron lapponicum*, and *Vaccinium uliginosum* var. *microphyllum*. Where the snow drifts and remains well into the growing-season, there is a dwarf community of almost pure *Salix herbacea*, while areas remaining wet after being left still later by the melting

snow support only a mixed open community of *Oxyria digyna* and *Saxifraga* spp. Still more exceptional habitats are the occasional glacial accumulations of gneissic boulders and soil, which allow a more luxuriant but very mixed vegetation even in exposed plateau regions, and the bird-cliffs at the north and south ends of the island, above which* a thick lush patchwork quilt of mixed and many-coloured mosses and lichens is developed.

Thus the vegetation is sparse and open, except in particularly favourable situations which are sheltered and covered with snow in winter or are of non-limestone material, or, best of all, have a goodly supply of nitrogenous and other foods. It is largely due to these more favourable habitats that the lists given below are of some length. This is especially true in the case of the angiosperms. The vegetation is elsewhere almost uniformly poor, consisting largely of the few species mentioned above—*Dryas*, Willow, and Saxifrage, with grasses and other puny monocotyledons with the grass habit, and a few tiny Ericaceous groundshrubs. *Draba* and *Cerastium* species and *Polygonum viviparum* are fairly common and ubiquitous ; but even the mosses and lichens to be seen in an ordinary walk over the plateau are few in species and poor in growth.

The author acknowledges his indebtedness to the Keeper and Staff of the Department of Botany of the British Museum for the determinations as follows :—A. W. Exell (Polypetalous Dicotyledons), G. Taylor (Sympetalous and Apetalous Dicotyledons), J. E. Dandy (Monocotyledons), A. H. G. Alston (Pteridophyta), G. Tandy (Algae), Miss F. L. Stephens (Fungi), Miss A. Lorrain Smith (Lichens), and to Mrs. E. Ekman (*Drabae*) and N. I. Hendey (Diatoms &c.).

The collections are deposited in the Department of Botany of the British Museum of Natural History. In the following lists the arrangement follows the Engler-Prantl system, except for the insertion of the *Tintinoinea*, and the arrangement of the marine plankton diatoms according to Lebour's ' The Plankton Diatoms of Northern Seas.'

Schizophyceae.

Phormidium sp.
Oscillatoria sp.
Calothrix scopulorum Born. & Flah.
Aphanocapsa sp. near *littoralis* Hansg.

Peridiniaceae.

Ceratium arcticum (Ehr.) Cleve, and other types.

* Nitrogenous substances are carried up by scavenging glaucous gulls and birds of prey.

Diatomeae.

Freshwater :

Fragilaria sp.
Achnanthes hyperborea Grun. ?
Cymbella arctica Lagerst.
C. cistula var. *maculata* (Kütz.) Grun.
C. cymbiformis var. *parva* W. Sm.
Schizonema sp.

Tidal pools :

Licmophora Lyngbyei (Ehr.) K. & C.
Schizonema sp.

Marine plankton :

Coscinodiscus excentricus Ehr.
C. radiatus Ehr.
C. subtilis Ehr.
Melosira Borreri Grev.
Bacteriosira fragilis Gran.
Coscinosira polychorda Gran.
Lauderia gracilis Grun.
Thalassiosira gravida Cleve.
T. Nordenskioldii Cleve.
T. rotula Meunier.
T. subtilis Ostenf.
Dactyiosolen antarcticus Cleve.
Leptocylindricus danicus Cleve.
L. minimus Gran.
Rhizosolenia alata Bright.
R. styliformis Bright.
Chaetoceros atlanticus Cleve.
C. borealis Bailey.
C. compressus Lauder.
C. constrictus Gran.
C. convolutus Castr.
C. debilis Cleve.
C. decipiens Cleve.
C. diadema Ehr.
C. fragilis Meunier.
C. gracilis Schuett.
C. holsaticus Schuett.
C. pseudocrinitus Ostenf.
C. septentrionalis Oestr.
C. socialis Lauder.
C. teres Cleve.
Biddulphia arctica (Brightw.) Boyer.
B. balaena Ehr.
Isthmia nervosa Kütz.
Eucampia groenlandica Cleve.
E. zodiacus Ehr.
Streptotheca thamensis Shrubs.
Fragilaria islandica Grun.
F. oceanica Cleve.
Rhabdonema adriaticum Kütz.
R. arcuatum var. *ventricosum* Cleve.
Cocconeis costata Greg.
Nitzschia seriata Cleve.

Also in marine plankton :

Tintinoinea.

Parafavella denticulata (Ehr.) K. & C.
P. elegans (Ost.) K. & C.
P. madia (Bdt.) K. & C.

Conjugatae.

Spirogyra sp.
Zygnema sp.

Chlorophyceae.

Enteromorpha sp.
Microspora sp.
Prasiola fluviatilis Sommerf.
Chaetomorpha sp.
Cladophora arcta (Dillw.) Kütz.
C. rupestris (L.) Kütz. ?
Cladophora sp.
Urospora penicilliformis (Roth) Aresch.

Phaeophyceae.

Pilayella littoralis (L.) Kjellm.
Scytosiphon Lomentaria (Lyngb.) Endl.
Chordaria flagelliformis (Muell.) Ag.
Agarum Turneri Post. & Rupr.
Alaria Pylaii (Bory) J. Ag.
Laminaria digitata (L.) Lamour.
L. longicruris de la Pylaie.
Fucus inflatus L. and var. *evanescens* (Ag.) Rosenv.
F. vesiculosus L.

Rhodophyceae.

Rhodophyllis dichotoma (Lepech.) Gobi.
Rhodymenia palmata (L.) Grev.
Halosaccion ramentaceum (L.) J. Ag.
Phycodrys rubens (Huds.) Batt.
Pantoneura Baerii (Post. & Rupr.) Kylin.
Ptilota pectinata (Gunn.) Kjellm.

Fungi.

Peziza Acetabulum L.
Sphaerospora asperior (Nyl.) Sacc.
Helvella lacunosa Afz.
Ustilago Caricis Fuck.
Boletus reticulatus (Schaeff.) Boud.
Boletus sp.
Cantharellus cibarius Fr.
Cortinarius spp.
Dictyolus muscigena (Bull.) Quél.
Hygrophorus sp.
Hypholoma sp.
Inocybe violacea Pat.
Inocybe spp.
Laccaria laccata (Scop.) B. & Br.
Lactarius vellereus Fr.
Mycena polygramma Quél.
Mycena spp.
Omphalia sp.
Psilocybe semilanceata Fr.
Russula emetica Fr.
R. ochroleuca Fr.
Russula sp.
Lycoperdon perlatum Pers.
Lycoperdon sp.

Lichenes.

Polyblastia intercedens Lönn.
P. Sommerfeltii Lynge.
Verrucaria obsoleta Lynge.
Sphaerophorus globosus Wain.
S. melanocarpus DC.
Biatorella morio Mudd.
Lecidea alpestris Sommerf.
L. Berengeriana Nyl.
L. emergens Flot.
L. goniophila Schaer.
L. griseoatra Schaer.
L. lapicida Ach. and var. *ecrustacea* Anzi.
L. lithophila Ach.
L. pantherina Th. Fr.
L. petrosa Arn.
L. speirea Ach.
Rhizocarpon confervoides DC.
R. gemmatum Koerb.
R. geographicum DC. and var. *atrovirens* Koerb.
R. petraeum Massal.
Cladonia amaurocrea Schaer.
C. gracilis Willd.
C. mitis Sandst.
C. pyxidata Hoffm. and var. *pocillum* Wain.
C. uncialis Web.
Cladonia sp.
Stereocaulon alpinum Laur.
Thamnolia (*Cerania*) *vermicularis* S. F. Gray.
Gyrophora cylindrica Ach.
G. hyperborea Ach.
G. proboscidea Ach.
Placynthium asperellum Trev.
Peltigera malacea Fr.
P. scabrosa Th. Fr.
P. venosa Hoffm.
Solorina saccata Ach.
Pertusaria oculata Nyl.
Pertusaria sp.
Candelariella vitellina Müll. Arg.
Lecanora calcarea Sommerf.
L. epibryon Ach.
L. gibbosa Nyl.
L. lacustris Th. Fr.
L. melanophthalma Harm.
L. rupicola Zahlbr.
L. verrucosa Laur.
Ochrolechia tartarea Massal. and var. *frigida* Kbr.
Cetraria cucculata Ach.
C. hepatizon Wain.
C. hiascens Th. Fr.
C. islandica Ach. and var. *tenuifolia* Wain. (var. *crispa* Ach.).
C. nivalis Ach.
Cetraria sp.
Parmelia omphalodes Ach.
P. saxatilis Ach. f. *furfuracea* Schaer.
P. sulcata Tayl.
Alectoria divergens Nyl.
A. jubata Ach. var. *chalybeiformis* Th. Fr.
A. ochroleuca Nyl.
Alectoria sp.
Dactylina arctica Tuck.
Caloplaca elegans Th. Fr.
C. ferruginea Th. Fr.
C. granulosa Steiner.
C. Jungermanniae Th. Fr.
C. murorum Th. Fr.
Protoblastenia calva A. Zahlbr. (*P. rupestris* A. Zahlbr. forma).
Xanthoria (*Lychnea*) *candelaria* Arn.
Rinodina mniaraea Th. Fr.
R. roscida Lynge.
Anaptychia ciliaris Massal.
Physcia hispida Fr.
P. muscigena Nyl.
Physcia sp.

Hepaticae.

Fimbriaria sp.
Marchantia polymorpha L.
Sauteria alpina N. & E.
Ptilidium ciliare (L.) Hoppe.

Musci.

Dicranoweisia cirrata (Hedw.) Lindb.
Dicranum groenlandicum Brid.
D. Muhlenbeckii B. & S.
Dicranum sp.
Ceratodon purpureus Brid. forma.
Leptotrichum brevifolium Kindb.
Swartzia inclinata Ehrh.
S. montana Lindeb.
Tortula norvegica Wahl.
T. ruralis Ehrh.
Trichostomum tortuosum Dixon.
Grimmia apocarpa Hedw.
G. plagiopoda Hedw.
Grimmia sp.
Rhacomitrium canescens Brid.
R. lanuginosum Brid.
Orthotrichum speciosum Nees.
Tetraplodon mnioides B. & S.
Bryum calophyllum R. Br. or near.
B. capitellatum forma.
B. microstegium Sch.
B. pendulum Schp.
B. pseudotriquetrum Schwaegr.
Bryum sp. (barren), near *nitidulum* Lindb.
Bryum sp. (barren).
Webera albicans Schp. and forma near var. *glacialis* Schp.
Cinclidium arcticum W. P. Sch. forma.
Mnium affine Bland.
M. affine var. *rugicum* B. & S.
M. hymenophyllum B. & S.
Aulacomnium papillosum Jaeg.
A. turgidum Schwaegr.
Meesea trichodes Spruce.
Catoscopium nigritum Brid.
Bartramia Oederi Swartz.
Philonotis fontana Brid.
P. fontana var. *adpressa* (Ferg.) L. & M.
Timmia austriaca Hedw.
T. bavarica Hessel.
Pogonatum septentrionale Rohl.
Polytrichum urnigerum Hedw.
Hedwigia ciliata Ehrh.
Myurella julacea B. & S.
Entodon compressum C. M.
Orthothecium chryseum Schwaegr.
Thuidium abietinum B. & S.
Hypnum hamulosum B. & S.
H. intermedium Lindb.
H. polygamum Schp.
H. revolutum Lindb.
H. scorpioides L.
H. stellatum Schreb.
H. stramineum Dicks.
Hypnum sp. near *molle* Dicks.
Calliergon cuspidatum Kindb.
Drepanocladus exannulatus var. *brachydictyus* (Ren.) Grout.
D. revolvens Warnst.
D. Sendtneri (Schp.) Warnst.
D. uncinatus (Hedw.) Warnst.
Hylocomium rugosum de Not.
H. splendens B. & S.
Brachythecium salebrosum B. & S.
B. salebrosum var. *arcticum* Berggr.
Camptothecium lutescens B. & S.
C. nitens Schp.

Pteridophyta.

Cystopteris Filix-fragilis (L.) Chiov.
C. Filix-fragilis var. *Woodsia glabella* R. Br. ?
Equisetum arvense L.
E. variegatum Schl.
Lycopodium Selago L.

Monocotyledones.

Alopecurus alpinus Sm.
Arctagrostis latifolia (R. Br.) Griseb.
Deschampsia alpina (L.) Roem. & Schult.
Elymus arenarius L.
Festuca brachyphylla J. A. & J. H. Schult.
F. rubra var. *arenaria* (Osb.) Fr.
Phippsia algida (Soland.) R. Br.
Pleuropogon Sabinei R. Br.
Poa alpina L.
P. rigens Hartm. (*P. arctica* R. Br.).
Puccinellia angustata (R. Br.) Rand & Redf.
P. vaginata (Lange) Fernald & Weatherby.
Trisetum spicatum (L.) Richt.
Carex Bigelovii Torr. ex Schwein.
C. bipartita All.
C. membranopacta L. H. Bail.
C. misandra R. Br.
C. nardina Fr.
C. pedata Wahlenb.
C. rariflora (Wahlenb.) Sm.
C. rupestris All.
C. scirpoidea Michx.
C. ustulata Wahlenb.
Eriophorum polystachion L.

MONOCOTYLEDONES (*cont.*).

E. Scheuchzeri Hoppe.
Kobresia simpliciuscula (Wahlenb.) Mackenz.
Juncus albescens (Lange) Fernald.
J. biglumis L.
J. castaneus Sm.
Luzula arctica Blytt.
L. hyperborea R. Br.
Tofieldia borealis (Wahlenb.) Wahlenb.

DICOTYLEDONES.

Salix arctica Pall.
S. arctica, dwarf form.
S. herbacea L.
S. Hookeriana Barr. ?
S. reticulata L.
S. reticulata × *herbacea*.
S. vestita Pursh.
Oxyria digyna (L.) Hill.
Polygonum viviparum L.
Alsine Rossii (R. Br.) Fenzl.
Ammodenia (*Arenaria*) *peploides* (L.) Rupr.
Cerastium alpinum L.
C. trigynum Vill.
Lychnis apetala L.
Silene acaulis L.
Stellaria longipes Goldie.
Ranunculus affinis R. Br.
R. aquatilis L.
R. hyperboreus Rottb.
R. pygmaeus Wahlenb.
Papaver radicatum Rottb.
Arabis alpina L.
Braya purpurascens (R. Br.) Bunge.
Cardamine pratensis L.
Cochlearia fenestrata R. Br.
C. groenlandica L.
Draba alpina L. and three forms, two approaching *D. Bellii*.
D. alpina × *daurica* ?
D. alpina × *lactea*.
D. Bellii Holm and f. *gracilis* E. Ekman, and three other forms, two approaching *D. oblongata*.
D. Bellii × *oblongata*.
D. cinerea Adams.
D. daurica DC. ?
D. fladnizensis Wulf. × *micropetala* Hook. ? * (*D. glabella* Pursh ?).
D. lactea Adams (*D. Wahlenbergii* Hartm., *D. lapponica* DC.) and a form, possibly *D. lactea* × *fladnizensis*.
D. groenlandica E. Ekman or a hybrid (obs. folium caulinum).
D. oblongata R Br. and three forms, one approaching *D. Bellii*.
Eutrema Edwardsii R. Br.
Chrysosplenium alternifolium L.
Saxifraga aizoides L.
S. caespitosa L.
S. cernua L.
S. Hirculus L.
S. nivalis L.
S. oppositifolia L.
S. rivularis L.
S. stellaris var. *comosa* Retz.
S. tenuis (Wahlenb.) H. Sm.
S. tricuspidata Rottb.
Dryas integrifolia Vahl.
Potentilla alpestris Hall. f.
P. emarginata Pursh.
P. nivea L.
P. rubricaulis Lehm. ?
P. tridentata Soland.
Astragalus alpinus L.
Oxytropis podocarpa A. Gray.
Empetrum sp.
Epilobium alpinum L.
E. latifolium L.
Diapensia lapponica L.
Arctostaphylos alpina (L.) Spreng.
Cassiope tetragona (L.) D. Don.
Harrimanella (*Cassiope*) *hypnoides* (L.) Coville.
Pyrola rotundifolia var. *pumila* Hook.
Rhododendron lapponicum (L.) Wahlenb.
Vaccinium uliginosum var. *microphyllum* (Lange) Simm.
V. Vitis-Idaea L.
Statice Armeria L.
Bartsia alpina L.
Pedicularis lanata Pall. ex Stev.
Pedicularis spp.
Veronica alpina L.
Campanula cf. *rotundifolia* L.
Antennaria sp.
Chrysanthemum integrifolium Rich.
Erigeron uniflorum L.
Petasites sagittatus (Pursh) A. Gray.
Taraxacum spp.

* See note on this specimen on p. 442 " Contribution to the *Draba* Flora of Greenland. IV.," by Elisabeth Ekman, Svensk Bot. Tidskr. xxvi, 431–447 (1933).

NOTES ON TROPICAL AFRICAN UMBELLIFERAE.

BY C. NORMAN, F.L.S.

Pimpinella nyasica Norman, sp. nov. *Herba* circa 40 cm. alta superne pubescens inferne glabrata leviter ramosa. *Folia* omnia glabra; *basalia* petiolo usque 10 cm. longo suffulta trijugata pinnata; lamina $\pm 4 \times 2{\cdot}5$ cm. ambitu anguste oblonga foliolis petiolulatis sub-deltoideis $\pm 1 \times 1$ cm. basi truncatis margine profunde et grosse dentatis; *caulina* foliolis segmentis linearibus acutis dissectis. *Umbella primaria* (terminans) multiradiata, radiis 13–16 $\pm 2{\cdot}5$ cm. longis, sat æquilongis, pedicellis congestis ± 5 mm. longis, omnibus fructiferis; *umbellæ secundariæ* (laterales) flores masculos tantum gerentes radiis paucioribus et brevioribus. *Involucri* phylla nulla; *involucella* paucissima inconspicua. *Petala minuta*. *Ovarium* sparsissime pubescens, demum (ut videtur) glabratum. Styli mediocres.

Hab. N. Nyasaland; Nyika Mountains, 7000–8000 ft. *Sanderson* 58 (type), Herb. Mus. Brit.

Very distinct in the genus, owing to the peculiar cutting of the leaflets.

Caucalis incognita Norman, sp. nov. *Torilis Eminii* Engl. Vegetat. von Usambara, 58 (1894), *nomen nudum*. *Torilis gracilis* Engl. et f. *umbrosa*, Pflanzenwelt Ost.-Afrika, C. 301 (1895), excl. syn. Hook f. *Caucalis gracilis* f. *umbrosa* et f. *typica* Wolff, Notizbl. Bot. Gart. Berlin, ix. 1111 (1927), excl. syn. Hook. f.

Herba, sat alta, ad nodos et partes juniores præsertim hirsuta, rarius subglabra. *Caulis* ramosus foliosus aculeis minutis retrorsis scaber. *Folia* basalia ignota, caulina homomorpha ambitu deltoidea vel oblonga 3–4-jugata pinnatisecta vel bi-pinnatisecta, usque 10 cm. longa, petiolo basi usque 2 cm. vaginante laminæ subæquilongo vel multo minore: segmenta ultima quoad magnitudo et forma valde variabilia, nunc ovata basi acuta, nunc deltoidea basi truncata nonnunquam trisecta margine profunde incisa. *Umbellæ* simplices, pedunculos folio oppositos nudos sæpius longissimos terminantes; radii congesti brevissimi, fructiferi extus infertiles intus dispositi. *Involucri* phylla numerosa anguste lanceolata acuta usque 8 mm. longa margine ciliata. *Petala* albida. *Fructus* oblongus ± 5 mm. longus, juga primaria pilis sparse, secundaria setis glochidiatis dense obsita. *Vittæ* dorsales 4, sub juga secondaria, commissurales 2 sub sulcum seminis dispositæ.

Hab. Uganda; Ruchigu, *Bagshawe* 418 (type), Herb. Mus. Brit. Occurs also in the mountains of the Belgian Congo, Kenya, Tanganyika Territory, and Nyasaland.

A most variable species as to size and cutting of the leaf-segments and hairiness. I have not thought it worth while attempting to discriminate between the forms, since every gradation can be seen. Wolff suggested (*loc. cit.*) that the extremes are probably due to shade and moisture and their bsence.

I am indebted to Mr. B. L. Burtt for calling my attention to the fact that this common and well-known plant has hitherto been known by a name that was based on a misinterpretation of *Agrocharis gracilis* Hook. f. (1860). The type of this is at Kew, and it is certain that it cannot be separated from *Agrocharis melanantha* Hochst. (1844), as was noted by Hiern in Flor. Trop. Afr. iii. 27 (1877), when, following the 'Genera Plantarum,' he reduced *Agrocharis* to *Caucalis*. Consequently, *Agrocharis gracilis* Hook. f. is merely a synonym for *Agrocharis melanantha* Hochst. (*Caucalis melanantha* (Hochst.) B. & Hk. f., ex Hiern). Hence the necessity for a new name, and, in view of the confusion that has for so long prevailed, it was thought desirable to make an entirely new start.

Finally, there seems to be no necessity for regarding *Agrocharis* as distinct from *Caucalis*. The most obvious difference between the Tropical African species and those of the Mediterranean region lies in the inflorescence—a simple umbel terminating a (usually) very long peduncle in *C. melanantha* and *C. incognita*. But in *C. pedunculata* Bak. fil., a species that is certainly generically inseparable from both and specifically nearly related, the elongated peduncle remains, but the umbel is compound, so that this distinction breaks down. Moreover, the conformation of the fruit is so closely that of *Caucalis*, that such small differences as there are can be sufficiently recognized by sectional or subgeneric segregation within the genus.

The following new combinations are recorded :—

Angoseseli mossamedensis (Welw., ex Hiern) Norman, comb. nov. *Angoseseli Mazzochii-Alemannii* Chiov. Bull. Soc. Ital. 1924, 38. *Caucalis mossamedensis* Welw., ex Hiern, Cat. Welw. Afr. Pl. i. pt. ii. 432 (1898). *Meringogyne mossamedensis* Wolff, Pflanzenreich, iv. 228, p. 107 (1927). Unfortunately I have not been able to see Chiovenda's type-specimen.

Heteromorpha angolensis Norman, comb. nov. *Bupleurum angolense* Norman, in Journ. Bot. 1933, Suppl. 234. Gossweiler's most recent collection, no. 9781, proves this to be a *Heteromorpha* in spite of its extraordinary resemblance to *Bupleurum*. Only fruits never lie !

OBITUARY.

Robert Chodat

(1865–1934).

The death of Professor Robert Chodat at Geneva on April 29, at the age of 69, removes a stimulating teacher and an investigator who had gained distinction in several branches of botany. He will best be remembered for his work on the freshwater Algae, and we are indebted to Prof. F. E. Fritsch for the following brief appreciation :—

" At an early stage of his career Chodat took up the study of freshwater Algae, some of his earliest contributions being contained in the ' Matériaux pour servir à l'histoire des Protococcoidées ' (1894–96), while the ' Études de Biologie lacustre,' published in 1897, constitute an ecological and morphological research which is still of considerable importance. Chodat's name will, however, always be associated with 'pure culture ' work on algae, first started towards the end of the last century, and subsequently pursued with great vigour both by himself and by several of his pupils. In its earlier stages this work confirmed Chodat in his views as to the polymorphism of many of the lower Green Algae, his attitude at this time not only being apparent in his article 'On the Polymorphism of the Green Algae ' in the 'Annals of Botany ' (xi. 1897), but also being clearly evident in many of the pages of the 'Algues vertes de la Suisse ' (1902), rather to the detriment of an otherwise highly useful piece of work. As the methods of pure culture improved, however, Chodat gradually abandoned many of these views, and in the ' Monographie d'algues en culture pure ' (1913) there is little evidence of them. It was soon after 1910 that he began to study the gonidia of lichens, and the published papers dealing with them, apart from adding materially to our knowledge of the physiology of these forms, established the important fact that the apparently identical gonidia of diverse lichens constitute as many distinct races. Among his latest contributions to the knowledge of the lower green Algae was that demonstrating the origin in cultures of new forms by small mutations (micromutations)."—F. E. Fritsch.

Chodat's first serious work was taxonomic. He was attracted by the Polygalaceae, and his ' Contribution à la Flore du Paraguay. —III. Polygalaceae et Malpighiaceae,' published by the Société de Physique et d'Histoire Naturelle, Genève (1889–92), was followed by his 'Monographia Polygalacearum ' in the same series (1891, 1893). The family is admittedly a " difficult " one, and Chodat's work is not always easy to follow.

In his young days Chodat had visited Paraguay, and his most important floristic work was on the botany of that country, a large and botanically little-known area intervening between

the tropical American flora and the cool temperate regions in the extreme south. Encouraged by Chodat, Dr. Émile Hassler made very extensive collections, which were determined by Chodat and himself with the aid of numerous specialists. Under the title "Plantæ Hasslerianæ" the results were published in the 'Bulletin de l'Herbier Boissier,' 1898–1907. In 1914 Chodat conducted a "Mission Botanique Suisse" to Paraguay, with the assistance of a former pupil, Dr. W. Vischer. The results, entitled 'La Végétation du Paraguay,' seven fascicles of which appeared from 1916–27, are a valuable study of the vegetation both taxonomic and ecological.

Other fields of research were represented by his studies of the organisms of fermentation and of the palæozoic Pteropsida. His address on the conception of species in modern Botany and a text-book, 'Principes de Botanique' (1907), call for mention.

The stimulating effect of his teaching found expression in many papers published jointly with his students, working with him at Geneva and, in the vacations, at the alpine garden and laboratory, La Linnæa, at Bourg St. Pierre.

A tribute to his work, welcomed by his fellow-botanists, was the award of our Linnean Gold Medal last year, which, unfortunately, ill-health prevented him from accepting in person. Chodat had been elected a Foreign Member of the Society in 1914; he was also a member of many other scientific societies and a D.Sc. *honoris causa* of Cambridge.

Born at Montier-Grandral in the Bernese Jura, April 6, 1865, he was educated in Switzerland. In 1887 he became Docteur-ès-Science Naturelles of Geneva and successively Professeur Extraordinaire (1889), Prof. Ordinaire (1891), and since 1900 Prof. de Botanique at his own University. He was president at the first meeting of the Association Internationale des Botanistes at Geneva in 1901.

Geneva has a long botanical tradition, and Robert Chodat was one of many worthy successors of de Saussure and the de Candolles.—A. B. Rendle.

SOUTH-WESTERN NATURALISTS' UNION.

The Twelfth Annual Conference of the Union was held at Bath from May 18–21 by kind invitation of the local Royal Literary and Scientific Institution, under the presidency of Mr. C. W. Bracken, B.A., F.R.M.S., a well-known Plymouth entomologist.

The attendance of members was the largest since the formation of the Union, and nearly all the affiliated societies were well represented.

The visitors were welcomed at an evening Reception by Mr. W. Wace, President of the Bath Institution, and enjoyed

a tour of the well-arranged Museum of local objects. The herbarium formed by the Rev. Leonard Jenyns in the first half of the 19th century attracted attention, otherwise the collections were mostly illustrative of other branches of Natural History or Archæology.

An afternoon excursion was made on May 19 through the Limpley Stoke Valley. The vegetation on the banks of the river and canal was not very advanced, but *Ranunculus pseudofluitans* was showing its large cup-shaped flowers in the stream. Some plants of *Stellaria aquatica* were gathered with purple blotches on the leaves, a peculiarity recently noted by Mr. H. S. Thompson elsewhere, and thought to be due to traces of tannin in the plant through the action of iron.

Later the visitors were entertained to tea on the terrace of the Bath Pump Room before visiting the Roman Baths and the modern hot mineral ones under the guidance of the Spa Director. Some plants of *Senecio vulgaris* var. *radiatus* were noticed growing by the doorstep of a house near by!

May 20 was devoted to a motor coach tour of Avebury, Marlborough, and Savernake Forest. Mr. H. St. George Gray, of Taunton Castle Museum, met the party at Silbury Hill, the giant artificial mound which was possibly erected by the constructors of the pre-historic Avebury "Temple." *Polygala calcarea* and *Saxifraga granulata* were growing freely on its slopes, but *Jasione montana* was not yet in bloom and the same applied to *Cnicus tuberosus*, the special rarity on the ramparts of Avebury.

At Marlborough the beauties and antiquities of the famous College, together with the new science laboratories were visited, and also the library and natural history museum, where the extensive herbarium of British plants formed by Mrs. Wedgwood in memory of her son is preserved. A drive through the avenue of majestic beeches of Savernake Forest ended an enjoyable day.

Prof. O. V. Darbishire, Ph.D., F.L.S., of Bristol University, was elected President for 1935 and Miss I. M. Roper was re-elected Secretary.

The Conference in 1935 will be held at Ilfracombe.

Ida M. Roper.

SHORT NOTES.

Utricularia ochroleuca Hartm. in Kerry.—This rare or overlooked plant was first recorded as British in the 'Irish Naturalist,' 1910, 237, as gathered by G. C. Druce in 1875 near Kylemore, W. Galway. It was found in the same county by S. A. Stewart at Ballynahinch in 1877 and by H. N. Dixon in 1890 in W. Donegal; all these are vouched for by Dr. Gluck of Heidelberg (see *Journal of Botany*, 1912, 287). Dr. Gluck

himself gathered this plant in two other West Galway localities in the same year. In 1911 Dr. Praeger extended the range to W. Mayo, Irish Nat. 1912, 27, and has now confirmed gatherings of my own made in all three Killarney Lakes—Upper Lake, 1887; Mid. and Lower Lakes, 1888. I have little doubt that this little-understood plant has a much wider range in Ireland than the above records show.

It is worthy of note that all the six British members of this family are found within the Killarney district, *U. Bremii* having its only British station in the Gap of Dunloe. I doubt if any other area in the British Isles, inclosed in a circle with a diameter of seven miles, contains as many different species as does the Killarney district.—R. W. SCULLY.

ISOETES ECHINOSPORA Dur. IN CORNWALL.—This Quillwort occurs in Dosmary Pool, at 900 feet on the granite rocks of Bodmin Moor, 12 miles south-west of Launceston. Some plants and many leaves, probably uprooted by birds, had drifted to the shore when I visited the place on April 12, 1934; but the water, after heavy rain, was too turbid to enable me to see the bottom of the pool or to estimate the area or abundance of the plant. Some rooted examples, however, were dredged from the peaty bed at the southern end. The pale green leaves and the spreading habit suggested *I. echinospora*, and Professor E. J. Salisbury, to whom I submitted specimens, confirmed my surmise. I know of no authentic records of the occurrence hitherto of *Isoetes* in Cornwall or Devon.—CHAS. OLDHAM.

LATHRAEA SQUAMARIA.—The Toothwort grows at Glasnevin Botanic Gardens on flat bare dry ground under several trees (*Arbutus* and others). During the very dry spring of 1933, Mr. Parnell, the foreman, pointed out that each colony of the plant grew in the centre of a dark patch, which was not only damp but quite wet to the touch. He told me that he had observed this phenomenon during previous dry springs. March of the present year was almost rainless, and shortly before *Lathraea* appeared damp patches were again noticeable at the spots where flower-stems of *Lathraea* subsequently arose. Examination of the ground made it clear that these wet patches were not due to edaphic causes, but were connected in some way with the presence of the plant. I should be glad to know if this phenomenon has been observed before, and if any explanation has been offered.—R. LLOYD PRAEGER.

[Enquiry from several of our British botanists indicates that this has not been generally observed. In my time as lecturer in Botany at the Birkbeck College, I used to locate a patch of toothwort near the top of Pebble Hill, Walton Heath, by the premonitory exudation of water, which I thought was a well-known phenomenon.—A. B. RENDLE.]

REVIEWS.

Researches on Fungi. Vol. V. By A. H. REGINALD BULLER. 8vo, pp. xiii, 416, 174 text-figs. Longmans, Green & Co.: London, 1933. Price 25*s*.

IN the fifth volume of his 'Researches on Fungi' Professor Buller deals in the first part with some characters of the fungus-mycelium and in the second part with three special types of Basidiomycete. The method of presentation adopted by the author is well known, and in the volume under review leads to a much greater amount of historical introduction than in former volumes.

The first two chapters are on the familiar subjects of hyphal fusions and the streaming and translocation of protoplasm. Hyphal fusions have become of such great importance during recent years that it is valuable to have a full account of them and suggestions of the ways in which they may be of biological importance. The much-debated clamp-connexions are studied in detail, and the view is rejected that they are in some way concerned in the sexual process; they are regarded as of purely physiological significance, providing a two-way passage for the streaming of protoplasm.

The second chapter opens with an historical account of the streaming of protoplasm. The observations made by Robert Brown on the staminal hairs of *Tradescantia* are not mentioned, however. The author has investigated the streaming in four Ascomycetes and three Basidiomycetes. For three members of the Sordariaceae he uses the generic names *Pleurage* and *Fimetaria*, following some recent American systematists. There is no justification for the use of these names—and *Fimetaria* is a synonym of *Sordaria*, not of *Podospora*.

How does the streaming occur in the mycelium, for there are numerous septa? Apparently all fungi except Phycomycetes have a pore in each septum, which is left when the wall forms by annular ingrowth and provides continuity between the cells, being closed only when a cell is wounded. Wahrlich, in 1893, gave a long list of species in which pores occurred, and stated that the only exception he had found was *Oidium lactis*. It is surprising how this important work has been overlooked. The only reference to it I have seen in recent text-books is in A. Lorrain Smith's 'Lichens,' p. 51. "Wahrlich demonstrated that continuity of protoplasm was as constant between the cells of fungi as it has been proved to be between the cells of the higher plants." Buller gives a very full account of Wahrlich's work, and has supplemented it by his own investigations. He gives a strong lead in the interpretation of many puzzling problems, and it is likely that such a significant structure will now enter largely into mycological thought.

The second part of the volume is concerned with *Sporobolomyces*, *Tilletia Tritici*, and *Sphaerobolus*.

Sporobolomyces is a fungus of doubtful systematic position. Certain reddish yeasts shoot off spores into the air and give a " mirror image " on the lid of an inverted Petri dish culture. Kluyver and van Niels found that the yeast-cell puts out a sterigma, and that the spore is forcibly shot off by a water secretion mechanism, which Buller had described fully as characteristic of Basidiomycetes and Uredineae. They regarded *Sporobolomyces* as a Basidiomycete. Guilliermond found that the yeast-cell is uninucleate and that no nuclear fusion occurs, as is normal for basidia. Buller has confirmed the previous work, but adds the additional fact that the same sterigma may produce as many as four spores in succession—a phenomenon which is unknown in ordinary basidia. The method of spore discharge he regards as the important point, and therefore agrees with Kluyver and van Niel in considering the fungus as a Basidiomycete. The problem is a difficult one. It does not seem justifiable at present to go further than to say that *Sporobolomyces* is a yeast-like fungus which produces spores from a sterigma and shoots them off in the manner characteristic of the majority of basidiospores.

The second fungus specially considered also gives rise to problems of interpretation. The author, in collaboration with V. C. Vanterpool, has added greatly to our information about the germination of the chlamydospores of *Tilletia Tritici* and the factors influencing it. The terminology in general use for the results of the germination of the chlamydospore is that of Brefeld. The spore puts out a promycelium, from the end cell of which are produced numerous elongated primary conidia, which fuse in pairs by means of connecting bridges, and which produce sickle-shaped secondary conidia from sterigmata. It was shown by the authors (1925) that the sickle-shaped conidia are liberated by a water-drop mechanism and they regard them, therefore, as basidiospores. As the Smuts are Basidiomycetes the authors have a strong case. Working backwards it leaves the interpretation of the primary conidia in the air. Most investigators have considered these to be the true basidiospores. Buller proposes a new terminology. The basidium is regarded as composing the basidium body (promycelium), primary sterigma (primary conidium or basidiospore), secondary sterigma (sterigma), and primary basidiospore (secondary conidium).

The " primary sterigma " is something not met with except in a less developed form in closely allied genera. I find it difficult to regard it as a sterigma: it is unlike a sterigma in every way, *e.g.* it will germinate under suitable conditions. It is either a basidiospore produced by the promycelium (basidium) or it is something new. The promycelium of *Ustilago* and of the rusts forms basidiospores immediately, one from each

cell. The promycelium of *Tilletia Tritici* empties of its contents as the septa are formed, and the "spores" in question are produced from the tip. They fuse in pairs and their nuclei become associated. The primary basidiospore is binucleate. It would be better to give some new name altogether to these promycelial outgrowths than to misuse the term sterigma.

In the last chapter the author returns to ballistics and describes *Sphaerobolus* "the largest, the most powerful, and the loudest of all fungus guns." The projectile is the glebal mass, which in *S. stellatus* is shot over seven feet vertically and fifteen horizontally. The kinetics of the process have been investigated in detail.

The author is to be congratulated not only for continuing to make valuable additions to our knowledge of the living fungus but also for so clearly indicating the importance of certain facts, which can readily be observed by elementary students.—J. RAMSBOTTOM.

An Account of the Genus Meconopsis. By GEORGE TAYLOR, B.Sc. *With Notes on the Cultivation of the Introduced Species by* E. H. M. Cox. 4to, pp. xiii, 130, frontisp., 29 pls., 12 maps in text. New Flora and Sylva Ltd.: London, 1934. Price 20*s*.

BOTANISTS and gardeners alike will welcome Mr. Taylor's attractive and comprehensive account of the genus *Meconopsis*, which, as Sir William Wright Smith indicates in his Foreword, is much in the forefront in horticulture at the present time. To Sir David Prain, to whom the author appropriately dedicates his book, is owed the first detailed study of the genus; his latest revision, in 1915, included forty-three species, two less than the number recognized by Mr. Taylor, who has had the opportunity, by study of recent introductions from the Himalaya, Tibet, and China, especially those of the late George Forrest, and of species under cultivation in our gardens, to test the validity of various described species, their inter-relationships, and possibilities of hybridisation.

For a primary subdivision of the genus Mr. Taylor uses the expansion of the style into a basal disc, thus distinguishing two Tibetan and Himalayan species as the subgenus *Discogyne* from the remaining thirty-nine under *Eumeconopsis*. The main subgenus includes three sections, distinguished primarily by habit, flower colour, and pubescence characters:—(i.) *Cambricae* comprising the type-species of the genus, the Welsh Poppy; (ii.) *Eucathcartia* with four species, and (iii.) *Polychaetia* including the majority of species of the genus.

In his discussion on the affinities of the genus, the author accepts the view based on Miss Saunders's investigations as to

the commissural character of the stigmas in the majority of the subfamily Papaveroideae. He is unable to maintain *Cathcartia* as a distinct genus. Delimitation of the species has often proved difficult, and for some the author can only admit that he has done his best; many are "so highly polymorphic and unstable under cultivation that it may be permissible to treat the various forms merely as incipient taxonomic units which have not yet become sufficiently fixed to warrant nomenclatural recognition."

The type-species, *M. cambrica*, described by Linnæus in 1753 under *Papaver*, was separated as a distinct genus, *Meconopsis*, by Viguier in 1814, the distinguishing characters being the presence of a short style and the absence of a sessile stigmatic disc. *M. cambrica* is by no means representative of the genus and in its distribution (extreme western European) is far removed from the remaining species, which are confined to south-central temperate Asia, but the occurrence in Asia of species closely related to it prohibits separate generic status. The Californian species, previously included in the genus, have been removed to *Stylomecon*. Ten species recognized in Prain's synopsis have been reduced to synonymy, one, *M. auriculata* Stapf, is regarded as a hybrid; eleven new species have been described.

A comprehensive key to the species precedes the general systematic enumeration. In the latter full details of bibliography and synonymy are given for each species, followed by a concise description and notes of the geographical range, introduction to cultivation, &c. The range of each series is indicated on a half-page map.

Mr. Cox's notes on the cultivation of the introduced species will enhance the value of the book from the gardener's point of view.

The plates are good photographic reproductions, mainly of the growing plant; many have been taken in the natural habitat; a few represent type-specimens photographed from herbarium sheets.

The text is well arranged and printed, and the volume opens flat—a great advantage. There is also a good index.

Mr. Taylor's exhaustive presentation of our knowledge of the species will be a helpful incentive towards the study of this attractive genus.—A. B. R.

Huxley. By E. W. MACBRIDE. Great Lives Series. Sm. 8vo, pp. 143. Duckworth: London, 1934. Price 2*s*.

HUXLEY'S claim to be included in a list of botanists rests on his paper on the Gentians (published in the Linnean Society's Journal, xxiv. 1887), the outcome of a Swiss holiday, during which these beautiful little alpines "took hold of" him. But apart from the influence of his work and teaching on the scientific

outlook generally it is to Huxley that we owe the beginnings of modern botanical teaching in this country. Prof. MacBride tells the story, which may be unfamiliar to the present generation of botanists. On the organisation of the Royal College of Science at South Kensington in 1870, Huxley, who had been appointed Dean, initiated, with the help of Thistleton Dyer, a course in elementary botany based on the study of types, a method which he had introduced into his teaching of zoology. "He coined the new word 'biology,' intending, as he said, to emphasise the fact that there were general laws of life, entirely independent of classification, which applied to animals and plants alike, and that the study of these laws was the proper starting-point for a student of natural history."

Prof. MacBride, who has for many years ably continued the teaching in Zoology initiated by Huxley, provides a delightful companion volume and sequel to Major Hingston's 'Darwin,' noticed in the May number of the *Journal*. The reader will find not only an informative account of the early struggles, which were followed by a rapid accession to, and subsequent tenure of, high authority in the scientific world, but a well-reasoned critique of the character and effect of Huxley's work and teaching. In a final chapter the author discusses Huxley's "agnosticism" and its bearing on religious thought.—A. B. R.

Forestry for Woodmen. By C. O. HANSON, I.S.O., M.B.E. Edition 3. Sm. 8vo, pp. 237, 12 pls., 16 figs. Clarendon Press: Oxford, 1934. Price 6*s*. 6*d*.

As its name implies, this is essentially a book for the man who wants facts rather than theories. The scientific foundations of forestry are covered in an elementary but adequate fashion in the first chapter, which deals with the life-history of a tree. The author then launches straight into the practical exposition of his subject with an account of the sylvicultural requirements of the species likely to be found in British woods and plantations. This chapter is arranged so as to help the prospective planter in his selection of species according to circumstances which include the objects of the owner, the species which flourish in the neighbourhood, local climatic conditions, and the nature of the particular site which it is intended to plant. Throughout prominence is given to what are described as the really important trees in British forestry, namely: spruce, Sitka spruce, larch, Japanese larch, Douglas fir, Scots pine, Corsican pine, sycamore, ash, pedunculate and sessile oak, beech, and Spanish chestnut. The author passes on to discuss the relative merits of pure and mixed woods, the pros and cons of each system being clearly set forth, and the succeeding pages deal in logical sequence

with sowing, planting and nursery practice, the treatment of plantations, including protection against destructive pests, and the utilization of timber. Other chapters deal briefly with the Forestry Act and the Forestry Commission and the afforestation of waste land. This new edition has been brought up to date and partly re-written in accordance with the considerable experience that British Forestry has gained during the last twelve years.—B. J. R.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the Anniversary Meeting on May 24, the President, Prof. F. E. Weiss, F.R.S., in the Chair, the Treasurer and Librarian and Assistant Secretary presented their reports. During the previous year twenty-eight Fellows had been elected and the Society had lost thirty-six by death, withdrawal, or removal. The present number of Fellows is 737, and 7 have not yet qualified. The Treasurer asked the Fellows present to bring the work and claims of the Society before any friends whose accession to its fellowship would be welcomed.

The President handed the Linnean Gold Medal to Sir Sidney F. Harmer, K.B.E., F.R.S., recounting his eminent services to Zoology. He then gave his Address "On the Northward Extensions of the Mediterranean Flora," which was illustrated by a series of lantern-slides.

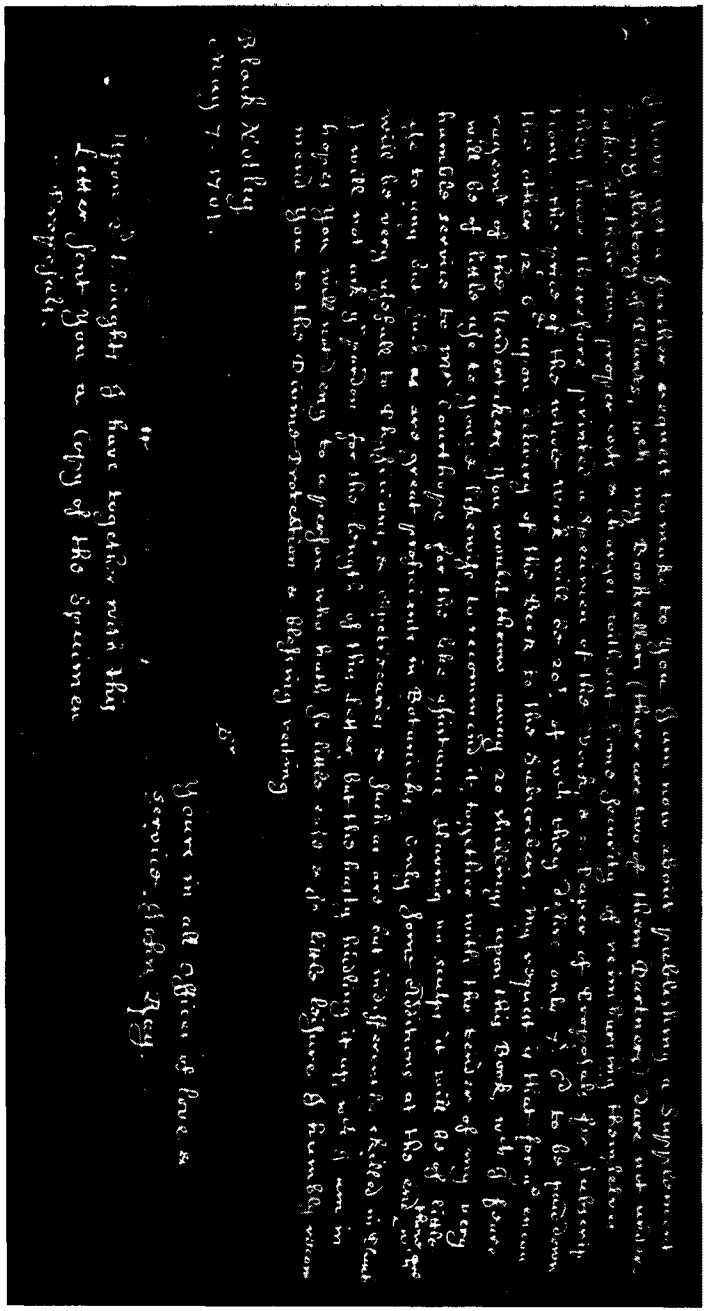
Dr. W. T. Calman, F.R.S., was elected President for 1934–35, and the other officers were re-elected. New Councillors are Dr. Eric Ashby, Mr. S. Garside, Mr. J. Hutchinson, Mr. Ashley G. Lowndes, and Dr. Macgregor Skene.

After the meeting Fellows and their guests dined together at the Trocadero Restaurant.

FLORA OF SARDINIA.—Emil Schmid gives (Mitteil. Botan. Museum Univ. Zurich, cxlvi.) a short analysis of the vegetation—a Mediterranean forest-area—and a list of the more interesting species collected by himself during a six months' stay in the island. A few novelties are described, including a new species of *Galium* and one of *Helichrysum*.

FLORA OF SOUTH AUSTRALIA.—To the 'Transactions of the Royal Society of South Australia,' lvii. (1933) J. M. Black contributes part no. 31 of additions to this flora. These include new species and varieties and notes on native and introduced species.

WE note with regret the announcement of the deaths of Mr. G. F. Scott Elliot, F.L.S., and Prof. Ethelbert Blatter, S.J., F.L.S., of St. Xavier's College, Bombay. Some account of their work will appear in a later number of this *Journal*.



I have very much ashamed that I should so long neglect (for we would be too nice a term) to return answer to your former very kind Letter. I have nothing to plead in excuse but that I have been severall times about to doe it, but that the Letter was unhappily either lost out of my pocket, or so misplaced that by my most diligent search I could not at any time retrieve it. You now lay a further obligation upon me before I have paid old scores, wch I must look upon as an effect of your constant good will & inclination to a person who is too slothfull in corresponding with you: to wch I hope you will rather impute this emission, than to any Disrespect or undervaluing of your kindnesse.

This Receipt You have sent me I very well approve of and know not but that it may doe me good. & I am the rather induced so to think, because I once used a decoction of Oak-bark dipping clothes therein & applying to my sores, wch took away ye pain, & I believe would have healed & dried them up, but that the clothes stuck so fast to them, that I could not by wetting or any other way get them off without hurting my legs. It may be thought that there is Difference between an old body & a young, & though in those the strength of nature may carry off the humor by the common emunctories, yet not so in those, who have need of such a relief & ease, & that it is not safe to lock up an intestine enemy but give him free egresse, for else he may machinate some mischief within in the more vitall parts. I have been a great while inclined to think that those vlcuscula are the effects of some insects, burrowing under the cuticula from their spawning in the spots before their eruption, which spots I take to be a heap of insects there nestling they being gregarious animalcula like Ants. I find latelyes Physitians of this opinion, & I was told by one who not long then a fortnight since came to visit that insects thus spreading & burrowing under the scurf skin were the cause of the itch, & that he could shew them to any man who doubted of it. If this opinion be true it may be so much the safer for me to drive up those eruptions, though I would be loath by this meanes to precipitate my self into the gout. I will advise with my friends & not proceed too hastily. However Sr I am highly obliged to You for being so solicitous for my ease & relief; for truly the pain I almost continually labour under renders my life very uncomfortable to me.

I have not long since, at the request of a friend published a small treatise intitled a Persuasive to a holy life &c. a Copy whereof I shall leave my Bookseller to have for you at any place you shall please to appoint.

I have not a further request to make to you, I am now about publishing a Supplement to my History of Plants, wch my Bookseller (there are two of them Partners) dare not venture at, there being very little out of some Journals of mine burnt therefore which have therefore I intend to insert in the Preface of the Supplement for Instance, the price of the whole work will be 20s, at wch they offer only 4 or 5 to be paid down then other 15s upon delivery of the Book to the Subscribers. My request is that for a recompense of the trouble You would then every 20 shillings upon this Book wch I doubt will be of little use to Him & likewise to recommend it together with the Sender of my very humble service to my Cousin hope for the like favour Having no scruple it will be of little use to any but such as are great professors in Botanicks. Only some Gentlemen at the Edinburgh will be very ready to Subscribe, & Gardeners & Farmers are but indifferently skilled in Plants I will not ask Yr pardon for the length of this Letter, but the Lady Bradley it will serve in lieu hopes You will not deny to a person who hath so little time & Humbly recommend You to the Divine protection & Blessing resting

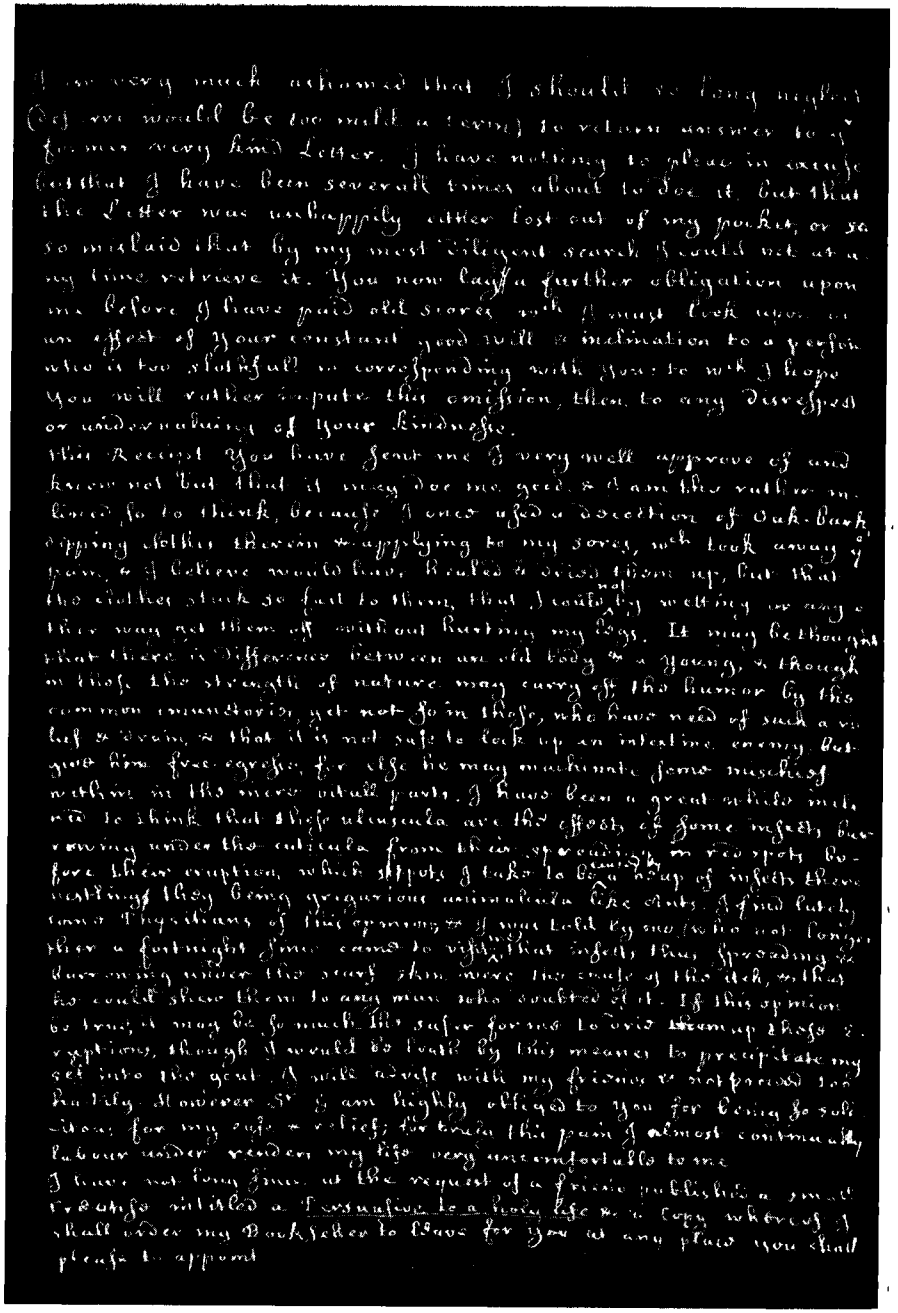
Black Notley
May 7. 1701.

Yours in all Offices of Love &
Service. John Ray.

Upon ye Knight of Have together with this
Letter Sent You a Copy of the Specimen
Proposed.

LETTER FROM RAY TO TIMOTHY BURRELL, ESQ., DATED 7 MAY, 1701.

(From rotograph of the original in the library of Trinity College, Cambridge.)



THY BURRELL, ESQ., DATED 7 MAY, 1701.
(in the library of Trinity College, Cambridge.)

LETTERS FROM JOHN RAY TO PETER COURTHOPE.

BY R. T. GUNTHER.

(PLATE 606.)

THE devotion of Ray and Willughby to one another is as far-famed in the chronicles of biology as that of David and Jonathan among the children of Israel, but their friendship with Peter Courthope of Danny is less widely known. Francis Willughby of Willaton and of Trinity College will always be remembered for his Histories of Birds and Fishes, both of which John Ray improved as a labour of love and published posthumously. Ray and Willughby both belonged to a small coterie of Trinity men with keen scientific interests, who accomplished such good biological work that their letters are of unusual merit. Their set included John Nidd *, John Wray †, Thomas Pockley ‡, John Mappletoft §, all of senior standing, and Francis Willughby ‖ and his cousin Peter Courthope ¶ of a rather younger generation. The two last, with Ray, became Fellows of the Royal Society.

Ray's correspondent Peter Courthope was born in the home of his ancestors at Cranbrook in Kent in 1639, some ten years before his grandfather, Peter Courthope, purchased the fine house and estate of Danny Park from George, Lord Goring. To this estate Peter the younger succeeded after his grandfather's demise on August 15, 1657, his father Henry being already dead. His mother, Anne, was the daughter of Ninion Burrell of Cuckfield, whose grandson, Timothy Burrell, became Ray's second pupil at Trinity about 1659. Anne Courthope had also five daughters; Jane, m. Henry Bill of Ryegate 1656, bur. at Lewes, Feb. 29, 1667; Frances, bur. Hurstpierpont, June 30, 1662; Elizabeth, bur. Hurstpierpoint, April 6, 1660; Dorothy, m. Dr. Benjamin White; Mary Anne, m. John Oliver of Lewes.

With this family circle Ray was intimate, having stayed at Danny in 1662 or earlier, and he mentions most of them in his letters.

Peter Courthope married at Patcham on Dec. 19, 1667, Philadelphia, daughter and coheiress of Sir John Stapley, Bart., who died in 1676, aged 25, having borne two sons and two daughters, of whom Peter, the youngest, baptised 1676, went up to his father's college of Trinity as a pensioner in 1694, died and was buried there in 1695.

On the marriage of the third child, Barbara, to Henry Campion the letters which we now print passed to the family of their present owner.

* J. Nidd of Kent, matric. Sizar 1640, Fellow 1647, Tutor 1650–5, Senior Dean 1657–8.

† Subsizar 1646, Fellow 1649, Tutor 1653–1660, Junior Dean 1658–9.

‡ Subsizar 1645–6, Fellow 1650, Tutor 1661.

§ Pensioner 1648, Fellow 1653, Tutor 1656, M.D. 1667.

‖ Fellow commoner 1652, M.A. 1659.

¶ Fellow commoner 1655, did not graduate.

Peter Courthope died at Danny in 1724.

Much previously unprinted material relating to John Ray was published in the 114th volume of the Ray Society publications issued under the editorship of the present writer in 1928 *. The earlier letters there printed were avowedly incomplete, for the originals were then inaccessible owing to their owner, Sir William Campion, being abroad and away from the family seat of Danny in Sussex, the seventeenth century home of Peter Courthope.

The earliest of these letters is also the earliest by Ray now extant. It was dated from Trinity College, Nov. 9, 1658, and gave his friend the latest news from Cambridge. It will be remembered that during the previous autumn Ray had been away on his first botanical tour, occupying nearly six weeks, from August 9 to September 18. The letter begins with a reference to an unnamed denizen of the downs at Danny being transplanted to Cambridge.

"For his honoured friend Mr. Peter Courthope at Danny in Sussex these

Leave this at the red Lyon in Thames street near Billingsgate to be dispatched as above directed.

London.

[Endorsed] "by Greene at the Bull." "

"Trin. Coll. Nov. 9, 1658.

Sr.

I thanke you for ye paines and care in searching out and sending the small plant growing on your downes. I received the box sometime since, and immediately committed the severall rootes to ye ground. They seemed to me more slender and jejune than when I dugg them up with you and I wonder much that you had the good luck to find them, the tops being quite withered and dryed up. Had not this been a busie time, and myself naturally much disposed to idleness, you had had an account of the receipt ere this time. I have no great matter of newes to tell you. Mr. Nid conflicts still with his ague, so truly I see little hopes of his shaking hands with it before the winter be past. Mr. Willughby staid not here long after his return from London which, as he acquainted me, did not prevent yours. Mr. Pockly is now here and presents his service to you, as doe likewise Mr. Nid and Mr. Lynnett. A little after your departure (it may be before) here was a libell in verse divulged upon Mr. Tracy and afterward a second contrived on purpose to abuse him, I guesse, by some of Sir Hills friends. All our speeches and jovialities at the beginning of this terme usuall, are now dispatcht and over, so that I doe rightly account five weeks since your departure to this day, a weeke more than the time you told us you designed to spend in the country, and yet we could be content to your exit and grant you the other three weeks upon good security that you would returne within that terme. It may perchance be newes to you that Dr. Bond is lately chosen Vice Chancellor of our University. There was a noteable contest and canvass between him and Dr. Dillingham of Emmanuel, which two were prick't by the heads. Dr. Bond carried it but by two voices; and, I believe, had fail'd of it had Dr. Dillingham's friends been as active to make votes, as his were. Mr. Corbyn hath recovered his ague again, and truly its but fitting he should have some

* 'Further Correspondence of John Ray,' edited by R. W. T. Gunther.

distemper or other alwaies to keep him doing, and the pipkin going. I pray present my service and respects, that I name no other, to the much honoured yr. mother, and let us here enjoy your company as soon as the urgency of your occasions and the bonds of duty will fairly admitt. I have no observations about plants or anything else in the history of nature but such as will well endure the barrelling up till yr. returne; though I must tell you that I have not been altogether idle in such enquiries, and have made together with Mr. Pockley some trifling experiments. I lately saw here at our Booksellers a boke of one Gulielmus Piso in folio which he calls *Historia naturalis et medica utriusque Indiæ*. They ask here unreasonably deare for it. If you return by London I pray search it out and cheapen it. It is the same Piso who put out Marggravius and wrote that piece before it *De medicina Brasiliensium*. Excuse my tediousnesse, wch proceeds from that delight which I have *qualiter cunq* to converse with you, whom I have had so many experiments of in all cases incident . . . most worthy especially from me of all honour, respect and dutiful affection, from whom having . . . so many testimonies of good-will I cannot but upon all occasions reciprocally declare my selfe.

Sr. Your most devoted svt. and orator,

J. WRAY.

Trin. Coll. Nov. 9, 1658."

John Nid, a brother fellow of Trinity, collaborated with Ray in his first botanical publication, the 'Catalogus Plantarum circa Cantabrigiam nascentium' (1660), and is frequently referred to in the following letters. He died before the Catalogue was published.

Ray continued to write to Courthope until 1676, although the present series ends in 1662–3. A letter, dated from Trinity College in July 1661, partly printed as No. 6 in the 'Further Correspondence,' contains botanical news of a more definite nature.

"We have this year made a more narrow search into the Countrey about Cambridge for plants, and have discovered in all about twenty-six that are not in our Catalogue—some such as I had not seen before, nor are mentioned to grow wild in England.

[Two Supplements were published, 1663, 1665.]

The names of them are Cardui polyacanthi prima species Ger. emac. Card. polyac. secunda species ejusdem [*Carduus acanthoides*], quorum descriptionis adduntur a Johnsono inter nomina. Ranunculus rectus non repens flo. simplici folio J. B. [*R. acris*]. Ranunculus rectus foliis pallidioribus hirsutus ejusdem [*R. hirsutus*] *. Gramen cyperoides spica pendula longiore Park. [*Carex pendula*] *. Hepatica umbellata Ger. Hep. stellata ejusdem. Hypericum Androsaemum dictum J. B. [*H. hirsutum*]. This we use to confound with Hypericum vulgare: it growes commonly almost in every hedge about this towne. Ruscus [*R. aculeatus*]. Alsine hirsuta altera viscosa C. B. [*Cerastium viscosum*]. Virga aurea [*Solidago Virgaurea*] at Gamlingay. Pulmonaria Gallorum ibidem [*Hieracium murorum*]. Lonchitis aspera ibidem [*Blechnum boreale*]. Gnaphalium Anglicum Ger. ibidem [*G. sylvaticum*]. Alcea vulgaris [*Malva moschata*] in Kingston wood. Orchis pusilla odorata Park. [*Herminium monorchis*]. Scabiosa vulgaris flore pleno [*S. Columbaria* ?]. Aparine semine laevi [*Galium tricorne*] *.

* The above-mentioned three plants are here named two years before the "first records" assigned by W. A. Clarke.

Helleboraster maximus [*Helleborus foetidus*]. Phyllitis Hieracii species [*Scolopendrium vulgare*]. Serpylli duo genera [*Thymus Serpyllum* and no doubt *ovatus*], v. Jo. Bauh. in descriptione Serpylli vulgaris. Plantaginela palustris C. B. [*Limosella aquatica* *]. Fontalis minor lucens J. B. [*Fontinalis squarrosa*]. Catanance leguminosa [*Lathyrus Nissolia*]. Calamintha pulegii odore sive Nepeta vera antiquorum [*Calamintha Nepeta*]. My garden I have in a great measure this yeare neglected, and have gotten in few or no new plants. I cannot look upon myself as settled here, and am therefore more regardless. By my next, God willing, I shall give you an account of our travels northward."

A second, partly botanical letter, dated Oct. 14, 1661, has been printed in part as No. 9 in the 'Further Correspondence.' It contains an expression of the writer's doubtful opinion concerning the efficacy of Peruvian bark, After summing up in the sentence "I should not promise you any great relief or advantage from such a medicament," the writer continues

"The plant wch you sent me enclosed was the *Gramen marinum spicatum* of Ger. and others [*Triglochin maritimum*], and is akin to the *Gramen triglochin* [*Triglochin palustre*]. We were, I think, mistaken about it in our Cambridge catalogue. This sort is much different from that which growes on Hinton and Teversham moores, and comes nearer to a rush, and the spike of seed to the head of a great plantaine. I have found both this and that we there mention, growing together in a salt marsh. This I wrote before I consulted my authors. Now I recant again, and resume my former opinion about the *Gramen marinum spicatum* Ger. et aliorum, wch, if either cut or description be exact, agrees better to the plant growing on Teversham more than to that you sent enclosed. I once thought that it was the *Gramen spicatum alterum* [also *Triglochin maritimum*, vide Smith], but that thereto they attribute round seed vessels which this hath not. I now thinke that they have jumbled together and confounded two plants, and am the rather induced because J. Bauhine gives his *Gramen marinum spicatum* stalkes a foot and a foot and halfe high, which cannot agree with our Cambridge plant; and others ascribe to it slender leaves whereas this you sent me hath fat and junceous. [We have . . . therewith. *Printed* in the 'Further Correspondence.']. The very same day that yours came to my hands I also received one from Mr. Willughby: who pursues many designes tending to the advancement of naturall philosophy. He tells me that the most of the time that I was abroad in Scotland, he spent at Oxford, but how he expends so much there he informes me not. I shall in my next acquaint him with your sicknesse, which I am sure he will be sorry to heare of." [I thought *etc.* to end *printed*.]

This last passage throws some doubt on Dr. Derham's account that Willughby was with Ray during the whole of this second journey from July 26 to August 30, 1661. The party must have travelled hard, for they visited Huntingdonshire, Northamptonshire, Lincolnshire, Yorkshire, going on to Glasgow and Stirling *via* Durham and Northumberland, and returning *via* Cumberland and Westmorland.

Another unpublished letter dated from Black Notley, March 19, 1662, is addressed:

* The above-mentioned plant is here named two years before the "first records" assigned by W. A. Clarke.

"These for the Wor^pfull Peter Courthope Eq at Danny in Hurst per point near Lewis in Sussex. Post pd. to London."

"Sr, I wrote a Letter to you to London wch I feare is lost because since I received no answer. I have now left Friston Hall, and am come to Black Notley in Essex, that I may settle my affairs and prepare for my journey. By the latter end of the next week I hope to be at London, and to meet Mr. Willughby there. It is now no time to deferre. In my last I acquainted you with my designe of putting out a sheet of *Addenda* and *emendanda* to our Cambridge Catalogue desiring your judgement, and that you would please to communicate such *errata* as you may haply have observed. I now again renew the same request to you . . .

My prayers and good wishes shall alway attend you, and wherever I am I shall glory in the title of Sr. Your most devoted servant,

JOHN WRAY."

No. 14, dated April 28, 1662, partly printed, was also a botanical letter. In the first ten lines (omitted) Ray wrote "I am as yet at Cambridge, but intend upon Wednesday May 7th to set out for Middleton. I believe we shall have Mr. Skippon's company."

Before *Gramen nemorosum hirsutum* [*Luzula pilosa*] add

"That sort of *Thlaspi perenne* which I brought with me out of the North like to ye common *vaccariaefolio* [*Lepidium campestre*]."

We can now also supply the lines missing after the sentence about the *Ranunculus* growing at Hurston. They are

"I saw not Dr. Morrison when I was at London, he not being at home, but his plants I saw. There are indeed many, and those no vulgar ones. I was at Edw. Morgan's and took an exact survey of his garden. I promised him a Cambridge Catalogue, but now I must rely upon you for performance. I wrote something to T. B[urrell] about 2 Drs. of Physick who enquired for me at London which to save me the trouble of repeating, I pray informe yrselfe of from him, if so you list. I have heard no more since of them, but that they desire correspondence by letter."

The succeeding paragraph about "Our new Master" is printed.

Letter No. 15 should be dated as from Cambridge, May 1662. The first hiatus, after line 7, should be filled as follows:—

"On Thursday next I resolve to set forth for Middleton, *Deo volente*. I shall have no company thither. I hope to dispatch that journey in two dayes . . . Since my letter to you I have been out again in pursuit of plants as far as Gamlingay; there I discovered some that I have elsewhere found in England, others that I never saw before. Of the first sort were *Anagallis aquatica surrectior* J. B. [*Veronica Anagallis, V. scutellata*, or *Samolus Valerandi*], *Chamaedrys spuria altera* [*Veronica Chamaedrys*] of your country, *Pilosella siliquosa* Thalij [*Sisymbrium Thalianum*], *Alsine fontana* credita Ger. [*Stellaria uliginosa*], *Graminis cyperoides* duæ species [*Scirpus* vel *Carex*], *Gnaphalium montanum flo. suaverubente* [*Antennaria dioica*]. Of the latter *Ranunculus hirsutus arvensis, flo. minimo* as I forme it [*R. parviflorus*], and *Trifolium pumilum supinum flosculis longis albis* nondum descriptum J. B. ut puto [*T. subterraneum*], a very pretty sort of trefoile, wch I intend to examine hereafter further and describe. I found there also one of those sorts of ferne which we observed about Danny, coming out at several seasons. I have a collection now of more than forty plants growing wild in Cambridgeshire, more than we have put down in our catalogue. . . ."

These three letters were therefore written immediately before Ray and Willughby left Cambridge on May 8, 1662, for the third or Welsh Journey from which Ray returned *via* Cornwall, Dorsetshire, Wiltshire, and Hampshire.

The remainder of the letter, dealing with Cambridge news, has been printed with the 'Further Correspondence,' wherewith is also letter of Nov. 3, 1662, in which is the well-known description of the famous Sea Pease [*Lathyrus maritimus*] growing by patches (not batches as printed) on the shingle bank between Aldburgh and Orford.

The last of the unpublished letters, dated "Friston, Feb. 16, 1662," is addressed:

"These ffor the Wor^{pfull} Peter Courthope Esqre at ye Sugar-loafe in Fleet street near the Conduit, London."

It begins with an account of the Curlew and Shoveler duck, but continues

"I am intending this spring before I goe over to prick a sheet by way of appendix to the *Catab*: *Cantabr*: [published 1663] which shall contain some addenda and emendanda: if you have observed any errours therein, I pray be pleased ingenuously to deale with me in communicating them. If you goe to Edw. Morgans, enquire of him concerning *Androsamum Hypericoides* [*Hypericum hirsutum*], for as I remember, he denied that plant which I called by that name to be rightly by me named. About this I have also written to Mr. Skippon more at large whom if you happen again to see, I pray Sr. conferre with him about it. I doubt not but he hath acquainted you with Dr. Merett's design of putting out a new *Phyt.* [*ographia*] *Britt* [*anica*]. I hope I shall get liberty to wait upon you before I goe 'tother side the channell, and enjoy a little of your society and converse, but cannot certainly promise myselfe so much happiness, because I foresee that I shall be straitened by time, being engaged here till Lady day next. I wish that your affairs could be settled with that expedition our hast requires, but that is a fond velleity. Your company would be worth staying for months and yeares, but that neither could we be secure of it if we should stay and a little delay now might possibly quite frustrate our design.

I am, Sr, Yours in all service most devoted,

Jo: Wray."

Mr. Skippon, afterwards Sir Philip Skippon, was one of Ray's first College pupils at Trinity. Most of the plants recorded in these letters were printed in Ray's 'Appendix ad Catalogum Plantarum circa Cantabrigiam nascentium continens addenda et emendanda,' published at Cambridge in 1663.

We gladly express our thanks to Sir William Campion for kindly permitting us to transcribe and print these extracts.

As an example of Ray's beautifully clear handwriting we reproduce a much later letter of which the original is preserved in the library of Trinity College, Cambridge. It is addressed to Timothy Burrell, Esquire, at his house in Cuckfield, Sussex, on 7 May, 1701, and it relates *inter alia* to the issuing of Specimen

Proposals for a Supplementary volume to the great History of Plants. (Plate 606.)

In conclusion, we print a letter from Peter Courthope to Timothy Burrell, dated Feb. 20, 1707, two years after Ray's death:

"Sr,

I am very glad to hear of the design of erecting a monument to the memory of our worthy friend Mr. Ray, who hath deserv'd it soe well of the public as well as his Friends, and that ye subscriptions to it are soe far advanc'd, that I doubt not that the sum propos'd will be easily and soon rais'd if not already done. My circumstances will not permit to contribute much to things of this nature, and at present suppose forty shillings from me will be sufficient to encourage the compleating soe good a work: but rather than it should sink, shall be willing to make some addition which if you please to undertake for me shall be punctually performed upon the first opportunity.

Yr. affectionate friend and kinsman,

P. Courthope.

I thought I should have had an opportunity of sending this by the same hand I recd. yrs. but I hear he hath been ill. The epitaph is not copied as I intend, and will return in some short time. My humble service to my cousins, your sister and daughter."

A note on the back states that Mr. Ray's friends propose to erect a monument for him of 50 li price, towards the charge of this has been contributed by Bishop of London £10, Dr. Gibbons £10, Dr. Sloan £10, T. Burrell £5, Mr. Middleton £1 1*s*. 6*d*., P. Courthope £2.

I am indebted to Mr. A. J. Wilmott of the British Museum for several of the identifications of Ray's species.

NOTES ON *SELAGINELLA*.

VI. The *Selaginellae* collected by Thaddeus Haenke and described by Karel Borewog Presl.

By A. H. G. Alston.

Through the courtesy of Dr. Ivan Klaštersky it has recently been possible to examine the type-specimens of certain of Presl's species from the National Museum of Prague.

Thaddeus Haenke was borne at Kreibintz near Leitmeritz in Bohemia, October 5, 1761; he took a degree in 1782. He was at this time acquainted with Mikan, von Born, and Jacquin. In 1789 it was arranged that Haenke should accompany Malaspina on his voyage of exploration, but Haenke arrived at Cadiz a day after the expedition had sailed. He followed (July 30, 1789) in the first ship bound for Montevideo, and was wrecked at the mouth of the Rio de la Plata, but managed to reach the shore with his "Linnaeus" and a collecting outfit. In February 1790 Haenke left Buenos Ayres, crossed the Pampas and Cordilleras, arriving at Mendoza March 17, and at Santiago, the capital of Chile, April 2. There he joined the other members of the

expedition and sailed from Valparaiso with Malaspina, visiting Coquimbo and the mines of Andacollo and Punatique, Copiapo, Arica, and the islands of San Felix in Chile, arriving, May 21, 1790, at Callao in Peru. From Callao Haenke travelled to Lima, Tarma, R. Guanuco, and the Huanaco region. It was probably on this journey that he collected the *Selaginellae* labelled "Luzon." The expedition left Callao September 20, 1790, and proceeded to Truxillo in Peru and Guayaquil in Ecuador. From Guayaquil Haenke visited Quito, Taura Mts., R. Daule, and Pichincha. In December they left Guayaquil for Panama, where *Lycopodium horizontale* Presl was no doubt collected, though labelled "Cordillerum Peruviæ."

From Panama they went to Acapulco in Mexico, and in August the expedition visited Nootka Sound and other places in North America. In December 1791 Malaspina returned to Acapulco, and Haenke visited Mexico City. The expedition left on the 21st, visiting Mulgrave Id. (Marshall Is.), Guam in the Mariannas, and on March 27, 1792, anchored in Manila Bay. Haenke travelled through the provinces of Ilocos, Cagayan, Pangasinan and Pampanga to Nova Segovia, visiting Laguna and Cavite and returning in July to Manila.

During the Philippine expedition Lt.-Col. Antonio Pineda, the chief naturalist, who was in charge of the non-botanical collections ('Novo y Colson,' p. 97), died at Badoc in Ilocos Norte, and Haenke wrote a Latin inscription for his monument which was to be erected at the garden of Malate (see Merrill, "The Pineda Monument," Philipp. Journ. Sc. vii. 363).

Early in 1794 the explorers came to La Concepcion de Chile, stopping at Dusky Bay (N.Z.), Sydney, Vau-vau (Tonga Is.), and Callao. Here Haenke parted with the other members of the expedition, and in April 1794 visited S. Miguel, etc., and Tucuman in Argentina, and proceeded northwards through Salta and Jujuy in Argentina and Potosi in Bolivia, arriving at La Paz in June. At the end of 1794 he reached S. Cruz de la Sierra, returning to Cochabamba in 1796. He seems to have remained in Bolivia till 1806, when he visited Cuzco in Peru. He returned later to Bolivia and died in the province of Cochabamba in 1817.

After September 23, 1794, Haenke sent no more collections to Europe, those from the Philippines being the last received at Prague; his diaries and later collections were apparently sent after his death to Lima, where they were lost (Safford, Contr. U.S. Nat. Herb. ix. 27). He sent twelve chests in all for the Government, together with a few specimens for his friend Hieke and certain specimens selected from Née's collection from Chile and Patagonia. Of these twelve chests two never reached Europe, and as the specimens in three of the remainder were greatly damaged Joseph Helmich selected only a few specimens from these. Novo y Colson states (p. 86) that Haenke collected

1400 plants between Buenos Aires and Santiago, and (p. 46) that the total botanical collections numbered 14,000 plants. The specimens are frequently wrongly localized, as stated by Merrill (Enum. Philipp. i. 49) and Hitchcock (Contr. U.S. Nat. Hb. xii. 210).

Haenke was sometimes accompanied by Luis Née, another botanist who went with the Malaspina expedition. Née's collections are at Madrid, and some of the new species have been published by Cavanilles. There are also a few papers by Née himself. A botanical artist, José Guiz, is said to have been attached to the expedition, and in Peru two local botanists, Tafallas and Pulgar, travelled with Haenke.

Specimens are found at the British Museum and Kew, besides the institutions mentioned by Merrill (Philipp. Journ. Sc. Bot. vii. 364).

This account is abstracted from those of Sternberg (in Presl's 'Reliquiæ Haenkeanæ'), Safford (Contr. U.S. Nat. Herb. ix. 25–28), and Novo y Colson ('La vuelta al mundo por las corbetas *Descubiera y Atrevida* al mando del Capitán de Navío Don Alejandro Malaspina, desde 1789 a 1794,' Madrid 1885). There is also a paper on Malaspina by E. Bona in Bull. R. Soc. Geogr. Ital. lxvii. 3–29 (1931).

1. LYCOPODIUM ANCEPS Presl. The type-specimen is labelled "Luzon," but was probably from the Huanaco region in Peru; there are duplicates at Vienna and Kew. It is the species usually called *S. gracilis* (Desv.) Hieron.; there are numerous recent collections from Peru at the British Museum; for example, Williams 6056, Spruce 4056, Killip & Smith 25,104, 22,671, 25,267, 23,605. This species was erroneously referred to *S. cupressina* (Willd.) Spring by Warburg ('Monsunia,' i. 129).

The synonymy is as follows :—

Selaginella anceps (Presl) Presl in Abh. Bohm. Ges. ser. 5, iii. 581 (1844).

Lycopodium anceps Presl, Rel. Haenk. i. 80 (1825).

L. gracile Desv. ex Poir. Encycl. Suppl. iii. 551, no. 83 (1814).

Selaginella gracilis (Desv.) Hieron. in Hedw. lviii. 292 (1917), non Moore (1886).

2. LYCOPODIUM ATROVIRENS Presl. The type is labelled "Cordilleras de Chile," but represents the Philippine *S. auriculata* Spring, which is found in the Provinces of Cagayan and Ilocos Norte in Luzon.

The synonymy is as follows :—

Selaginella auriculata Spring in Bull. Ac. Brux. x. 142, no. 47 (1843).

Lycopodium atrovirens Presl, Rel. Haenk. i. 79, t. xii. f. 2 (1825), non *S. atrovirens* Lojacono Pojero (1909).

S. campylotis A. Br. in Ann. Sc. Nat., sér. 5, iii. 274 (1865).

3. LYCOPODIUM DIFFUSUM Presl. The type-specimen is labelled "Panama," and cannot be matched exactly among modern material; there is a duplicate at Kew (ex Hb. Forbes Young). It is now known as *Selaginella diffusa* (Presl) Spring.

4. LYCOPODIUM GENICULATUM Presl. The type-specimen is labelled "In insula Luzon"; it, however, is a South American species, and probably came from Guayaquil in Ecuador or from the Huanaco region of Peru.

The synonymy is as follows :—

S. geniculata (Presl) Spring in Bull. Ac. Brux. x. 230, no. 132 (1843).

Lycopodium geniculatum Presl, Rel. Haenk. 80 (1825).

S. ferruminata Spring in Bull. Ac. Brux. x. 231, no. 135 (1843).

S. elongata Kl. in Linnæa, xviii. 522 (1844).

5. SELAGINELLA HAENKEANA Spring. The type-specimen is labelled "In Cordilleras de Chile." It is *S. leptoblepharis* A. Br., which has been collected in Peru by Killip and Smith (no. 25,843). Haenke probably found it in the Huanaco region. Spring's Guiana specimen is *S. radiata* (Aubl.) Bak.

The synonymy is as follows :—

Selaginella Haenkeana Spring in Bull. Ac. Brux. x. 225 (1843).

S. dimorpha Klotzsch in Linnæa, xviii. 523 (1844).

S. leptoblepharis A. Br. in Ann. Sc. Nat. sér. 5, iii. 279, no. 16 (1865).

Lycopodium plumosum "L.," Presl, Rel. Haenk. i. 79 (1825).

6. LYCOPODIUM HORIZONTALE Presl. The type-specimen is labelled "In vallibus Cordillerum Peruviæ." It is identical with *S. Fendleri* Bak., and was probably from Panama. A. Braun identified it with a specimen collected at Porto Bello by Billberg.

The synonymy is as follows :—

Selaginella horizontalis (Presl) Spring in Bull. Ac. Brux. x. 226 (1843).

Lycopodium horizontale Presl, Rel. Haenke. i. 78 (1825).

Selaginella Fendleri Bak. in Journ. Bot. xxi. 334 (1883).

7. SELAGINELLA PRESLIANA Spring. This species is based on *Lycopodium microstachyum* Presl (non Desv.), of which there is a Haenke specimen at Kew. It seems to be a form of *S. pteriphyllos* Spring.

8. LYCOPODIUM PALLESCENS Presl. The type-specimen is labelled "Mexico," no doubt correctly; it represents this species as currently interpreted.

The synonymy is as follows :—

S. pallescens (Presl) Spring in Mart. Fl. Bras. i. 2, 132 (1840).

Lycopodium pallescens Presl, Rel. Haenk. i. 79 (1825).

L. cuspidatum Link, Hort. Berol. ii. 161, no 8 (1833).

S. cuspidata (Link) Link, Fil. Sp. 158, no. 2 (1841).

VII. NEW SPECIES.

The following new species have been found among material recently sent in for identification. The abbreviations used for the different institutions are as follows :—

B.M.=British Museum (Natural History).
N.Y.=New York Botanical Garden.
W.=United States National Herbarium.
P.=Museum d'Histoire Naturelle, Paris.
K.=Royal Botanic Gardens, Kew.

1. **Selaginella procera,** sp. nov. Species heterophylla ex affinitate *S. magnificae* Warb., *caulibus* erectis, irregulariter compressis, usque ad 50 cm. altis; ramis lateralibus pinnatis, vel rariter plus-minusve bipinnatis, usque ad 10 mm. latis (foliis lateralibus inclusis), ambitu lanceolatis; ramulis ultimis usque ad 3 cm. longis; foliis caulinis distantibus subsimilibus; foliis in parte ramosa omnibus dimorphis; *foliis lateralibus* inæquilateralibus, margine serrulata; semifacie superiore semiovata vel semilanceolata; semifacie inferiore semioblonga; *foliis axillaribus* ovatis, circa 3 mm. longis; *foliis intermediis* rotundato-oblongis, leviter inæquilateralibus, apice subacutis; *strobilis* ramulorum apicibus singulis dispositis, tetragonis, circa 1·5 mm. latis; *sporophyllis* ovatis, acutis, leviter carinatis.

LUZON: CAMARINES SUR: Kolago River, *Edaño* 76,525 (type, B.M.); Kamugong River, *Edaño* 75,786 (N.Y.).

CATANDUANES: *Ramos* 30,449 (W.).

Closely allied to *S. magnifica* Warb. from Mindanao, but separated by its shorter leaves and acute (not aristate) sporophylls.

2. **Selaginella Kanehirae,** sp. nov. Species heterophylla e turma *S. arbusculae* (Kaulf.) Spring; *caule* erecto stramineo glabro terete usque ad 35 cm. alto; parte superiore ramosa, parte inferiore simplici; parte ramosa ambitu ovato-lanceolata; ramis ambitu anguste lanceolatis; foliis partis simplicis subhomomorphis, ceteris valde heteromorphis; *foliis lateralibus* usque ad 2·5 mm. longis 1 mm. latis inæquilateralibus, semifacie superiore semiovato-oblongo vel semioblongo-lanceolato, apice subacuto, margine sparse ciliolato; semifacie inferiore semioblanceolato, margine integro; *foliis axillaribus* obovato-oblongis, basi leviter ciliolatis; *foliis intermediis* leviter inæquilateralibus ellipticis, denticulatis, apice breviter aristatis, basi exteriore leviter auriculatis; *strobilis* apice ramorum ramulorumque singulis tetragonis; *sporophyllis* deltoideis, apice acuminatis, margine denticulatis.

CAROLINE ISLANDS: Ponape Island: Parkier, *Ryôzô Kanehira* 732 (type, B.M.).

S. Volkensii Hieron., which occurs on Yap Island, has broader, closely ciliate lateral leaves.

The species of this group are confined to the Pacific region. *S. arbuscula* (Kaulf.) Spring, from Hawaii, *S. Banksii* Alston, from Tahiti, *S. Reineckei* Hieron., *S. Hochreutineri* Hieron. (? *S. Vaupelii* Hieron.), *S. Christii* Hieron., *S. Whitmeei* Bak. (*S. scoparia* Christ), from Samoa; *S. firmuloides* Warb. (*S. Jouani* Hieron.), from New Caledonia; *S. firmula* A. Br., New Hebrides and Fiji; *S. distans* Warb., Fiji; *S. protracta* Warb. (*S. Jonesii* Schmidt, *S. Browneana* Schmidt, *S. Bishopiana* Schmidt), Marquesas; *S. Volkensii* Hieron., Yap; and *S. poperangensis* Hieron., from the Solomon Is.

3. **Selaginella dasyloma,** sp. nov. Species heterophylla insignis, e turma *S. jungermannioides* (Gaudich.) Spring; *caulibus* repentibus crassis siccitate sulcatis stramineis glabris, usque ad 25 cm. longis, rhizophoros axillares tenues gerentibus, foliosis, distante ramosis; ramis lateralibus alternis, distante ramosis; ramulis ultimis usque ad 1 cm. longis; foliis utrinque valde heteromorphis; *foliis lateralibus* crebre dispositis, usque ad 4 mm. longis, 2 mm. latis, late ovato-oblongis, albo-marginatis, semifacie superiore semiovata, basi longe villoso-ciliata, semifacie inferiore semioblongo basi villoso-ciliata; *foliis axillaribus* oblongo-ovatis, apice obtusis, basi villoso-ciliatis; *foliis intermediis* plus minusve imbricatis oblongis inæquilateralibus albo-marginatis, basi villoso-ciliatis, apice obtusis, nervis leviter scaberulis. [Cætera desunt.]

COLOMBIA: State of Popayan: Sombrerillos, *André* 343 (type K.; duplicates B.M., N.Y.).

Sombrerillos is marked on André's map in 'Le Tour du Monde,' xxxviii. 391 (1879); he also states (p. 315) that it is 1321 m. above sea-level.

4. **S. Rolandi-Principis,** sp. nov. *S. magnifica* "Warb."; Bonap. Notes Pterid. xiv. 192 (1923).

Species heterophylla e turma *S. atroviridis* (Wall.) Spring; *caulibus* basi ramosis, suberectis surculosis c. 2·5 mm. diametro, 20–40 cm. longis, basim versus rhizophoros crassos gralliformes usque ad 5 cm. longos, c. 1 mm. diametro, gerentibus; ramis primariis alternis, ramosis, c. 3 cm. inter se distantibus; ramulis ultimis c. 2 cm. longis, c. 10 mm. diametro (foliis lateralibus inclusis); foliis ubique valde heteromorphis contiguis vel leviter imbricatis; *foliis lateralibus* parallelogrammis, usque ad 6 mm. longis, c. 1·5 mm. latis, obtusis, semifacie superiore semilanceolato; *margine* basi minutissime serrulata, apicem versus denticulata, semifacie inferiore parallelogramma integra vel basi serrulata; *foliis axillaribus* oblongo-ovatis, basi plus-minusve auriculatis; *foliis intermediis* inæquilateralibus biseriatis contiguis vel imbricatis minutissime serrulatis apici subacutis vel minutissime apiculatis; *strobilis* tetragonis; sporophyllis ovatis, carinatis, leviter acuminatis denticulatis, c. 2 mm. diametro.

ANNAM: Massif de Ba-na, 1500 m., *Sallet* (holotype B.M., P.).

Also the following specimens:—

ANNAM: Ba-na, *Pételot* 4660 (B.M.), *Poilane* 1553 (P., B.M., K.).

TONKIN: Massif de Mau San, *Pételot* 4657 (B.M.); Qui Duc, *Polani* 4708 (B.M.).

HAINAN: Dungkato Wui Fa Shi, *Tso* & *Chun* 43,769 (B.M.).

5. **Selaginella spanioclema,** sp. nov. Species heterophylla ex affinitate *S. alopecuroides* Baker; foliis intermediis aristatis manifeste differt; *caulibus* suberectis, e basi breviter repente ascendentibus, basi distante pinnatis, usque ad 20 cm. altis, basin versus rhizophoros rigidos parvos gerentibus; parte ramulosa ambitu elliptico-lanceolata; ramis lateralibus plerumque simplicibus, usque ad 9 cm. longis, circa 17 mm. latis (foliis lateralibus inclusis); foliis ubique dimorphis; *foliis lateralibus* inæquilateralibus, margine subintegro basi et apice leviter serrulatis; semifacie superiore semilanceolata, basi cordato-rotundata, apicem versus sensim angustata; semifacie inferiore anguste semioblonga, apicibus cuneata; *foliis axillaribus* ovatis, usque ad 4 mm. longis; *foliis intermediis* ovato-ellipticis, circa 3 mm. longis, margine serratis, apice aristatis; arista aspera, fere ¼ laminæ æquantia; *strobilis* singulis vel binatis, ramulorum apicibus dispositis, tetragonis, plerumque circa 20 mm. longis, 3 mm. latis; *sporophyllis* elongato-triangularibus, apice acuminatis, margine serrulatis, carinatis, carina aspera.

SARAWAK: Dulit, under 300 m., by side of stream in secondary forest, *Richards* 365 (holotype K., B.M.).

Closely allied to *S. alopecuroides* Baker, but distinguished by the long aristate median leaves and more cordate, tapering lateral leaves.

6. **Selaginella ingens,** sp. nov. Species heterophylla ex affinitate *S. lonko-batu* Hieron. & v. A. v. R., foliis intermediis aristatis differt; *caulibus* repentibus, usque ad 25 cm. longis, usque ad 15 mm. latis (foliis lateralibus inclusis); applanatis, rhizophoros tenues hic et illic gerentibus, irregulariter ramosis; ramis lateralibus ultimis usque ad 2 cm. longis; foliis ubique dimorphis; *foliis lateralibus* leviter inæquilateralibus; semifacie superiore semioblongo-lanceolato, basi rotundata, serrulata, apice obtusa, integra; semifacie inferiore semioblonga apicibus obtusis; *foliis axillaribus* ovato-triangularibus, circa 4 mm. longis, margine serrulatis, apice aristatis; arista aspera, fere ½ laminæ æquantia; strobilis singulis, ramulorum apicibus dispositis, tetragonis, circa 2·5 mm. latis; *sporophyllis* elongato-triangulares, apice acutis, carinatis.

BRITISH NORTH BORNEO: Dallas, 3000 ft., *Clemens* 27,020 (B.M.).

VIII. Nomenclatural Notes.

The following nomenclatural changes are necessitated by the recent re-examination of the type-specimens of the species involved :—

1. Lycopodium delicatulum Desv. The examination of Desvaux's fragmentary type shows it to be *S. Pouzolziana* (Gaudich.) Spring, and not *S. brasiliensis* (Raddi) A. Br. as usually stated ; the synonymy of the two species is therefore as follows :—

Selaginella delicatula (Desv.) Alston in Journ. Bot. lxx. 282 (1932).
Lycopodium delicatulum Desv. ex Poir. Encycl. Suppl. iii. 554 (1814).
L. Pouzolzianum Gaudich. in Freyc. Voy. Bot. i. 287 (1826).
S. Pouzolziana (Gaudich.) Spring in Bull. Ac. Brux. x. 145 (1843).
Desvaux's type is labelled " Habitat in America ?—D. D. P. Beauv."

Selaginella muscosa Spring in Mart. Fl. Bras. i. 2, 120 (1840).
Lycopodium brasiliensis Raddi, Pl. Bras. Nov. Gen. 82, t. i. f. 1 (1825).
S. brasiliensis (Raddi) A. Br. in Ann. Sc. Nat. sér. 5, iii. p. 29 (1865), non Spring (1838).
L. crassinervium Desv. in Ann. Soc. Linn. Par. vi. 190 (1827), status morbosus.
S. crassinervia (Desv.) Spring in Mart. Fl. Bras. i. 2, 119 (1840).
S. polysperma Spring in Bull. Ac. Brux. x. 138 (1843).
S. Beyrichii A. Br. App. Ind. Sem. H. Berol. 1857, 13.
The epithet " *crassinervia* " has been rejected under Art. 51 of the International Rules because it was based on a diseased state.

2. **Selaginella sinuosa** (Desv.), comb. nov.
Lycopodium sinuosum Desv. ex Poir. Encycl. Suppl. iii. 558 (1814).
S. surculosa Spring in Bull. Ac. Brux. x. 144 (1843).
The type of *Lycopodium sinuosum* Desv. from Bourbon has been examined at Paris.

RUBUS " LATIFOLIUS " OF CORNWALL.

By W. C. Barton and H. J. Riddelsdell.

In 1908 W. Tresidder made several gatherings of a bramble which Rogers considered rather near to *R. macrophyllus* W. N., as well as (in panicle) to the S. Devon "*leucandrus*" ; and after doubtfully assigning it to *R. imbricatus* Hort he eventually called it a form of *R. latifolius* Bab. It is clearly rather closely related to the N. Wales plant formerly connected with *R. latifolius* Bab., *i. e.*, to *R. monensis* Bart. & Ridd. in Journ. Bot. 1932, 108 (see note, p. 109). The form has been sent to us several times by Mr. Rilstone, and one of us studied it *in situ* in 1930. We are also indebted to Mr. Rilstone for sending gatherings from a dozen bushes in various parts of Cornwall in 1932, with ample notes made in the field ; these have been valuable in drawing up and checking the following description.

R. stanneus, sp. nov.

Turiones humiles procumbentes vel suffulti adscendentes, canaliculati, sulcati, hirsuti glabrescentes, aculeis inæqualibus nec brevibus ad angulos dispositis e basi sat brevi patentibus vel reclinatis instructi. Stipulæ latitudine variæ. Folia mediocria quinata et ternata, digitata vel pedata, supra pilosa, subtus capillis sat densis vestita, dentibus compositis valde incisis. Foliola lata breviter petiolulata imbricata ; terminale late ovatum vel triangulari-ovatum, fundo cordatum. Inflorescentiæ plerumque foliosæ apicem versus decrescentis rami inferiores distantes vulgo sat longi, pars superior ultra-axillaris ramis brevibus adscendentibus dense conferta. Rachis hirsuta, ad apicem dense villosa, aculeis mediocribus munita. Flores mediocres pallide rosei vel albidi ; petala late obovata nec contigua ; stamina alba stylos virides paullo superantia ; sepala cano-tomentosa hirsuta, a fructu laxe reflexa ; carpella pilosa.

Stem low arching or prostrate, and climbing ; sharply angled and furrowed, striate, purplish red in exposure, *with many longish hairs*, glabrescent. *Stem-prickles unequal*, mostly on angles, *of moderate length from a rather short* compressed *base*, patent or declining, sometimes curved. Stipules narrow to rather broad. Petioles moderately armed and hairy. *Leaves of moderate size, quinate and ternate, digitate or pedate*, strigose above, hard with little hair or considerably hairy but not felted beneath. *Toothing* compound, deeply incised and fine-pointed, *coarse and sometimes lobate. Leaflets always imbricate, all broad and short-stalked*, with undulate margins. *Terminal leaflet* usually very *short-stalked, broadest below the middle, very broadly ovate or triangular-ovate, with* moderate or longish acuminate or cuspidate-acuminate point and *cordate* or sometimes truncate *base. Panicle very leafy*, with leaves similar to those of stem, the upper ones felted beneath ; *lax below, pyramidal* with patent-erect longish lower branches, sometimes cylindrical with shorter lower branches ; *the ultra-axillary part dense with short* ascending or erect-patent *many-flowered branches.* Rachis somewhat flexuose, with much longish white hair mixed with short crisp hair becoming dense toward the top ; pedicels felted and hairy ; prickles not numerous or stout, with moderately long base, declining or falcate (sometimes stronger and longer-based). *Flowers moderate, pinkish* or nearly white. Petals rather broadish obovate, not contiguous. *Stamens* white, *little longer than the green styles. Sepals* broadish,

often long-pointed, *whitish-grey felted and hairy*, loosely reflexed in fruit. Young carpels hairy.

A strong woody bush. The close connection with *R. monensis* is obvious. It differs from that species in the following characteristics :—Stem more hairy and stem-prickles longer ; leaves of moderate size, distinctly imbricate, digitate or pedate, a larger proportion ternate ; terminal leaflet broadest below the middle and often triangular-ovate, in this respect more corylifolian ; panicle usually pyramidal with usually much closer ascending or erect-patent upper branches, the ultra-axillary part much denser ; rachis prickles unequal, of moderate length ; flowers not large, pinkish or nearly white ; sepals not aciculate, clothed with lighter-coloured felt and usually with less and shorter hair, loosely reflexed in fruit.

In a few specimens we have seen, gathered on the higher ground, the stem is bluntly angled or roundish. The conspicuous reddish bracts so noticeable in the N. Wales plant are much less obvious in *R. stanneus*.

Distribution : v.c. 1 and 2, West and East Cornwall. Confined to an area of some 60 miles in length, from Cardinham Down near Bodmin to Lands End, the broad plateau-like ridge, 300–700 feet above sea-level, where tin has been mined ; the same is chosen with reference to this fact.

Exsiccata : (in Herb. Bart. & Ridd.) Ref. Nos. 4042 typus (holotype), 2535, 3617–8, 3621, 3624, 4037–4043.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

Thirty-ninth Annual Congress.

The Thirty-ninth Annual Congress of the Union was held at Reading, from July 11–14. Ample accommodation for the various meetings was provided in the University Buildings.

The Congress opened with a Reception by the Council and Senate of the University in the commodious University Hall, and the Vice-Chancellor gave a short address of welcome. This was followed by the Address of the President, Professor Herbert L. Hawkins, Professor of Geology in the University. The address, entitled "Fossils and Men," traced a parallel between evolution in the biological world and in the development and prospects of man as distinct from other living organisms.

In the Botanical Section the President, Dr. Macgregor Skene, of Bristol University, gave an interesting address on "Some Problems of Germination." Examples of the remarkable variation in the period of viability in seeds and fruits were instanced, and the probable factors in the variation were suggested and discussed ; also the occurrence of periodicity in germination.

A lecture by Dr. Somerville Hastings on "Plant Life in Alpine Switzerland" was illustrated by a long series of beautiful photographic lantern-slides of Swiss mountain scenery and of alpines in their natural homes.

Two resolutions were passed unanimously : the one approving the scheduling for protection of certain British plants, and the other condemning the practice of scattering seeds of alien plants in the country-side.

A report from Lt.-Col. Wolley-Dod indicated that his compilation of the Sussex 'Flora,' which was initiated at the Hastings and St. Leonard's Congress in 1927, was approaching completion.

Professor R. J. Tabor, of the Imperial College of Science, was elected President of the section for 1935–6.

A botanical excursion along the Kennet Valley and up through beech-woods to Greenham Common, where a bog still provided characteristic vegetation, was conducted by Miss M. A. Corry, and the botanists also visited, by invitation, Messrs. Sutton & Sons's seed-trial grounds. Other sectional excursions included a visit to Silchester by the archæologists, and to the Reading University Agricultural and Horticultural Farms.

On the Friday evening Prof. E. B. Poulton, F.R.S., gave the Public Lecture, entitled "The Power of Changing Colour as a Form of Protective Resemblance."

A very pleasant réunion was afforded by an evening Reception in the Town Hall by the Right Worshipful the Mayor, Miss Edith M. Sutton, J.P. A slight structural rearrangement gave easy access to the adjoining Museum, where the Members were shown, among other interesting exhibits, the old charters of the town from the earliest times, and a beautifully worked facsimile of the famous Bayeux tapestry.

The Congress closed with an informative lecture by Sir Lawrence Chubb on "The Rights of Way Act, 1932."

The 1935 Congress will meet at Bournemouth under the presidency of Professor A. C. Seward, F.R.S., Professor of Botany in Cambridge University.

OBITUARY.

George Francis Scott Elliot

(1862–1934).

Scott Elliot's name is well known to students of the tropical African flora, and the later volumes of the Kew 'Flora' contain many species that are due to his exploration of various parts of the continent. But apart from the working systematist, to many even of whom he was little more than a name, he was not a familiar person among contemporary botanists.

A natural diffidence and a feeling that his work had not been fully appreciated restricted his efforts to a more limited sphere. The eulogistic appreciations in the local press* of his work in southern Scotland, where he spent the greater part of a busy life, indicate that he was certainly not without honour among those who knew him best.

Scott Elliot belonged to a family that had long been associated with the Dumfries district. His father spent many years in India, and the son was born in Calcutta, January 6, 1862. He went up to Cambridge in 1879, and took the Mathematical Tripos in 1882. Proceeding then to Edinburgh University he graduated as Bachelor of Science ; at Edinburgh he assisted Professor Dickson, conducting a practical class in botany. Then followed a number of years of botanical exploration in Africa. He went to South Africa, and, purchasing an ox-waggon team, drove up through the Transvaal to Johannesburg, then in its infancy. Thence he went to Natal ; then to Madagascar, where he spent six months, traversing the south-eastern portion of the island, observing and collecting the plants. He returned home by way of Mauritius. Some results of his observations were described in two papers in the 'Annals of Botany'—"Note on Fertilisation of *Musa*, *Strelitzia*, and *Ravenala*" (1890) and "Notes on the Fertilisation of South African and Madagascar Flowering Plants" (1891) ; and, in the Linnean Society's Journal, "New and little-known Madagascar plants" (vol. xxix. ; 1891).

His next expedition was to North Africa ; starting from Tripoli he proceeded as far as the Second Cataract of the Nile in Egypt.

After his return to England he was appointed botanist to the French and English Delimitation Commission of the Sierra Leone boundary (1891–2). Though professedly disappointed with the results, he brought back 2200 numbers, representing 1170 species. His report on the botany of Sierra Leone, largely from an economic aspect, was issued by the Colonial Office, and an account of his collections in the Linnean Society's Journal (vol. xxx. ; 1894).

Scott Elliot's last and most productive African expedition was to British East Africa (1893–4), assisted by a grant from the Royal Society. He spent four months on Mt. Ruwenzori, ascending to nearly 11,000 ft. on a ridge of the mountain, which he was disappointed to find was not the main mass. Unfortunately his health broke down, and, his funds becoming exhausted, he was unable to accomplish as much as he had hoped. After many difficulties he returned by way of Lakes Tanganyika and Nyassa to the mouth of the Zambesi. His 'Naturalist in Mid-Africa' (1896) is an account of this expedition, and gives incidentally an insight into conditions in British East Africa forty years ago. Scott Elliot's collections on this journey included 2700 numbers of herbarium specimens. Some idea of their value may be obtained from the fact that they included thirty-nine new orchids which were described by the writer in this Journal in 1895. The first set of the collections went to Kew, and were worked up, as opportunity offered, with the material for the 'Flora of Tropical Africa.'

On his return to England the Royal Geographical Society awarded him the Cuthbert Peek Grant.

His wanderings over, except for a trip some years later to Chile and the Argentine, Scott Elliot married and settled down in Scotland. From 1896 to 1904 he was Lecturer in Botany at the Royal Technical College, Glasgow, and during the latter part of the time also Professor of Botany at the Glasgow Veterinary College. On the death of his mother he left Glasgow and went to live at Newtown, Dumfries. He took much interest in local affairs, and was president for some time of the Dumfries and Galloway Natural History and Antiquarian Society. In 1896 he had published a 'Flora of Dumfriesshire.' He was the author of several partly popular scientific books—'Nature Studies' (1903) ; 'Romance of Plant Life' (1906) ; 'A First Course in Practical Botany' (1906) ; 'Botany of To-day' (1911). He was also joint editor of the British Association Handbook, Glasgow, 1901, and contributed articles to various journals and reviews.

During the Great War he served in Palestine (1915–17) as captain in the King's Own Scottish Borderers, earning commendation for his work as intelligence and liaison officer, and receiving from the Khedive the Order of the Nile. In 1913 he had bought an estate at Drumwhill, Kirkcudbrightshire, where he lived until about five years ago, when for health reasons he removed to Wadhurst, in Sussex. He died at a nursing home in Dumfries, to which he had been brought in August last, on June 20.

Scott Elliot was elected F.L.S. in 1890. He resigned his fellowship in 1921, but was re-elected in 1932. He was also a Fellow of the Royal Geographical Society of Edinburgh.—A. B. RENDLE.

* 'Dumfries and Galloway Standard and Advertiser' and 'Dumfries and Galloway Courier and Herald,' June 23, 1934 (with portrait).

REVIEWS.

Die Naturlichen Pflanzenfamilien. Second revised and enlarged Edition, edited by the late A. ENGLER and H. HARMS. Vol. 16c. *Angiospermae: Series Centrospermae*, edited by F. PAX and H. HARMS. Roy. 8vo, pp. 599, text-figs. 224. Engelmann : Leipzig, 1934. Price 82 R.M.

WE congratulate Prof. Harms, who has succeeded to the editorship of this important presentation of systematic botany, on the progress of the work. The volume contains the account of

the following families:—Amaranthaceae by H. Schinz; Nyctaginaceae, Phytolaccaceae, Gyrostemonaceae, and Achatocarpaceae, by A. Heimerl; Aizoaceae, Portulacaceae, Dysphaniaceae, and Caryophyllaceae, by F. Pax and K. Hoffmann; and Basellaceae, Thelygonaceae (Cynocrambaceae), and Chenopodiaceae by E. Ulbrich. If the enlargement continues on the same scale throughout the work it will, when complete, form a small library. In the original edition, published in 1889 and 1893, the treatment of the families concerned occupied 188 pages with 87 text-figures; the increase is therefore about threefold. It is of interest to note that in spite of the lapse of more than forty years the original authors are still in great part responsible for the work; Dr. Ulbrich is a new contributor, Dr. Hoffmann now assists Prof. Pax, and Dr. Heimerl acknowledges the help of Prof. Harms for the completion and proof-reading of his manuscript, of which ill-health rendered him incapable.

In an introduction of six pages Prof. Harms gives an historical review of the limitation of the group by botanists from Linnaeus onwards. He defends the position of Chenopodiaceae at the beginning of the series rather than the end (after Caryophyllaceae, as suggested by Troll) with the statement that relations of affinity cannot be based only on comparison of floral diagrams: Robert Brown, in his 'Prodromus,' indicated the close relationship of this family with Amaranthaceae. However, for other reasons Chenopodiaceae appears at the end of the volume.

A valuable addition is the increased space devoted to an enumeration of the literature, including a list of the most important systematic and floristic publications in the larger families, and also, in special cases, in the genera—a great help to the student. The same remark applies to the introductory matter, which in Caryophyllaceae comprises twenty pages, while Dr. Ulbrich's introduction to the Chenopodiaceae forms a small text-book, occupying more than sixty pages. A departure from the original edition is the distinction of Gyrostemonaceae and Achatocarpaceae as families—the seven genera concerned were formerly included in Phytolaccaceae; and the separation of the Australian genus *Dysphania* from Caryophyllaceae. The additional illustrations, depicting especially habit or anatomy, are a great gain.

The number of genera included has increased considerably, but the increase is divided very unequally among the different families. Phytolaccaceae and Portulaceae have practically the same number in the two editions; Chenopodiaceae show an increase from 73 to 101, Amaranthaceae from 40 to 64, Nyctaginaceae from 18 to 30, Caryophyllaceae from 70 to 81 [including the recently published *Plettkea* Mattfield (*Pycnophylli* species Muschler) from Peru, which appears as an Appendix to the family], and Aizoaceae from 18 to 23. It is therefore obvious that the authors have not attempted to incorporate the almost innumerable new genera into which *Mesembryanthemum* has been segregated by recent workers. These are not, however, ignored. A key is included to the 74 subsections adopted by A. Berger in his Monograph (1908), which follows the system initiated in De Candolle's 'Prodromus' and adopted in the 'Flora Capensis.' A second key is given to N. E. Brown's system, representing new views on segregation, and comprising more than one hundred genera. The authors comment on the difficulty of correlating the work of recent, and to some extent rival, workers in this field. Several of Dr. Brown's useful habit drawings have been included in the text.

Enough has perhaps been said to indicate the value to the botanist of this new edition. The book is clearly printed and well bound (we refer to the form in half-leather).—A. B. RENDLE.

Grosses Garten-Lexikon. Reich illustrierter Ratgeber für Gärtner und Gartenfreunde. Edited by ROBERT ZANDER. 8vo, pp. iv, 686, 1250 text-figs., 16 coloured pls. Ullstein: Berlin, 1934.

DR. ROBERT ZANDER, "Gartenbaubotaniker" in the 'Reichsverband des deutschen Gartenbaues,' is well known among horticulturists, and especially for his work towards a stabilisation of nomenclature of garden plants. The second edition of his Handbook of plant-names and their meanings was noticed in this Journal last year (p. 172). In the production of the present weighty and informative dictionary he has had the assistance of Dr. Camillo Schneider, eminent for his work on trees and shrubs, and thirteen other colleagues. The work is not merely a dictionary of garden plants and operations—these are naturally included—but deals also with subjects of more purely botanical interest on which the intelligent gardener may desire information. To select a few examples—under Assimilation, five columns are devoted to an explanation of photosynthesis, and this is followed by a definition of the use of "Association" in ecology. Similarly Atavism, Darwinism (cross-referenced to Evolution), Lamarckism, Mendelism, the Nitrogen Cycle in plants, are defined and explained. The dictionary serves in fact also as a glossary of terms in general use among botanists. The plants are recorded under the genus-name, the gender of which is indicated, followed by the German popular name where such exists; the number and geographical distribution of the species are recorded, there is a brief description of the genus and reference to the species known in cultivation, with notes on culture. Many of the articles are illustrated by small but efficient text-blocks. The coloured plates deal with varieties of the different domestic fruits, plant diseases, injurious insects, etc. The book is a notable addition to horticultural literature.

Introduction to Cytology. Third Edition. By LESTER W. SHARP. 8vo, pp. xiv, 567, 230 text-figs. McGraw-Hill Publishing Co., Ltd. : London, 1934. Price 30*s*.

THE first edition of this useful work appeared in 1921. The present edition has been thoroughly revised, so that it contains not only a great deal of new material (567 pages as against 452) but also several new chapters, and it is fully up-to-date in the presentation of recent results. Notwithstanding the title, the book deals mainly with plant cytology, although the chapters on Golgi material, syngamy, and several others contain accounts of the conditions in animals On account of Wilson's classical work on the animal cell it is desirable that the present work should be concerned chiefly with the problems of plant cytology, but there is still room for another work which would deal entirely in a comparative way with the cell conditions found in the two kingdoms. Such a treatment is a necessary preliminary to a consideration of how far parallel evolution is necessary to account for the similarities and differences between animal and plant cells as regards such phenomena as mitosis, meiosis, and chromosome structure.

The present work contains twenty-six chapters, and in their arrangement considerable attention has evidently been paid to the principles of presentation from an instructional point of view. The earlier chapters are concerned with such topics as cells and tissues, protoplasm, the nucleus, plastids, chondriosomes, and ergastic substances. Then follow chapters on cell division, chromosomes, the achromatic figure, and cytokinesis. The recent work on chromosome structure is introduced here, as well as in the succeeding chapters on sporogenesis and meiosis. Still more is this the case in the various chapters on chromosome translocation, polyploidy, the cytogenetics of hybrids and related phenomena.

Certain new terms are introduced, such as *meiocyte* for any cell in which meiosis is initiated, and a number of other new terms are adopted; but as these are for the most part self-explanatory, there is no doubt of their utility in avoiding circumlocutions.

The chapter on cytoplasmic heredity is followed by a final "historical sketch" of 25 pages. A condensed but useful bibliography of 83 pages and an index complete the volume.

This work is not only a carefully arranged and sufficiently extensive introduction to the subject, but the botanist whose interests are mainly in other fields will find surprises in almost every chapter at the developments which have taken place.—R. RUGGLES GATES.

Cytological Studies in Primula, *with special reference to the Relation between the Karyology and Taxonomy of the Genus.* (Symbolæ Bot. Upsal. 1.) By H. G. BRUUN. 8vo, pp. 239, 37 figs. Uppsaler Lundequistska Bokhandeln, 1932. Price 12 kr.

DR. BRUUN'S work on the chromosomes of the genus *Primula* is already well known, and his results are fully set forth in the present dissertation. It is a careful and painstaking investigation of the numbers and morphology of the chromosomes—the karyotype—in some 183 species belonging to 35 sections of this large genus. This is followed by a full discussion of phylogeny in *Primula* and of the relation between the karyotype and the taxonomic relationships of the species. The results are too numerous to detail, but among them may be mentioned: (1) that the haploid numbers 8, 9, 10, 11, 12, and 13 occur in different sections of the genus; (2) that polyploidy based on one of these numbers occurs in various sections; (3) that the subsection *Stenocalyces* with 8 chromosomes (haploid) is probably derived from the *Eufarinosae* with 9, since the 8 pairs include one long one which has probably resulted from the end-to-end fusion of two; (4) that 11 was probably the fundamental number with which the genus *Primula* began, this number increasing to 13 in the Japanese *P. jesoana*, but forming a diminishing series in other sections, to 10, 9, and 8; (5) that at an early stage there was a differentiation between species with large and species with medium chromosomes. These and many other conclusions regarding the phylogeny of the genus are based on a correlation of the karyotype with the facts of distribution and with the taxonomic conclusions of Wright Smith and Forrest.

This is an excellent example of the additional light which may be thrown on the phylogeny of a genus by the study of its chromosomes.—R. RUGGLES GATES.

Botany for Matriculation. By F. CAVERS, D.Sc. Revised by L. C. FOX, M.A. Third Edition. 8vo, pp. viii, 516, with 176 text-figs. University Tutorial Press: London, 1934. Price 6*s*. 6*d*.

THE revised edition of Dr. Cavers's handbook was reviewed in this Journal in April 1932 (p. 118). The call for another edition indicates that the book is supplying a need. There is little to add to our previous notice beyond the statement that the additional eight pages represent an Appendix of about four pages on the grass family and some additions to the last chapter of the book which deals with the uses of plants. In the previous edition the Monocotyledons were represented only by the Iris and Lily families.

BOOK-NOTES, NEWS, ETC.

SOCIÉTÉ ROYALE DE BOTANIQUE DE BELGIQUE.—The Bulletin, xvi. fasc. 2, 1934, records the discovery of *Pirola uniflora* L. in Belgium. *P. secunda* L. was recorded in 1904 from two stations. *P. minor* L. and *rotundifolia* L. are common and widely distributed. G. Verplancke describes in detail a new form, "Bigarrure," of a virus disease of the potato, a species of acropetal necrosis; and Jeanne Terby communicates further observations on the spindle and polar vesicle in the somatic division in *Plasmodiophora Brassicae*.

ASTELIA AND PIPTURUS OF HAWAII.—Bulletin 117 of the Bernice P. Bishop Museum, Honolulu, 1934, is a critical study by Carl Skottsberg of these two genera of Liliaceae and Urticaceae respectively, as represented in Hawaii. It is based on the author's field observations and on the examination of material in most of the great herbaria. The history of the species in each genus is discussed in detail and the descriptions are amply illustrated by photographic plates and line drawings. The number and size of the seeds afford useful characters in *Astelia*, and in *Pipturus* the characters of the leaf-surface and its indumentum.

'ORCHID REVIEW.'—To the June and July numbers Dr. C. C. Hurst contributes notes on a trigeneric hybrid recently exhibited before the Orchid Committee of the Royal Horticultural Society. It is a *Sophrolaeliocattleya*, and is of peculiar interest to the hybridist and geneticist for two reasons. "Firstly, it is the product of two trigeneric hybrids representing a selfed trigener; and, secondly, it represents the fourth generation of Orchid hybridisation in which three genera and eight garden species are concerned." The genera represented by its sixteen original ancestors are *Cattleya* (11), *Laelia* (3), and *Sophronitis* (2). Botanically the hybrid appears to be a true *Cattleya*.

'SINENSIA.'—Nos. 6 and 8 of the Contributions from the 'Academia Sinica,' vol. iv. comprise "Notes on Hysteriales from China" by S. C. Teng (pp. 129–44), including new species of *Hysterium* and *Lophodermium*; "Notes on Chinese Fungi," IV. —a description of *Xylariopsis*, gen. nov. (*Xylariaceae*), and "A Species of *Choanephora* with Dichotomously Branched Conidiophore," by F. L. Tai; and "Observations on the Compositae of China" (new species and varieties of *Ainsliaea*), by Chao-Chien Chang.

OBITUARY.—We note with regret the announcement of the death of the eminent New Zealand Botanist, Dr. Leonard Cockayne, C.M.G., F.R.S. Also of Dr. Nathaniel Lord Britton, the founder and for many years Director of the New York Botanic Garden, which followed shortly on that of his wife Elizabeth Britton, well known for her work on the Mosses.

REGENERATION IN *POLYSIPHONIA NIGRESCENS* GREV.

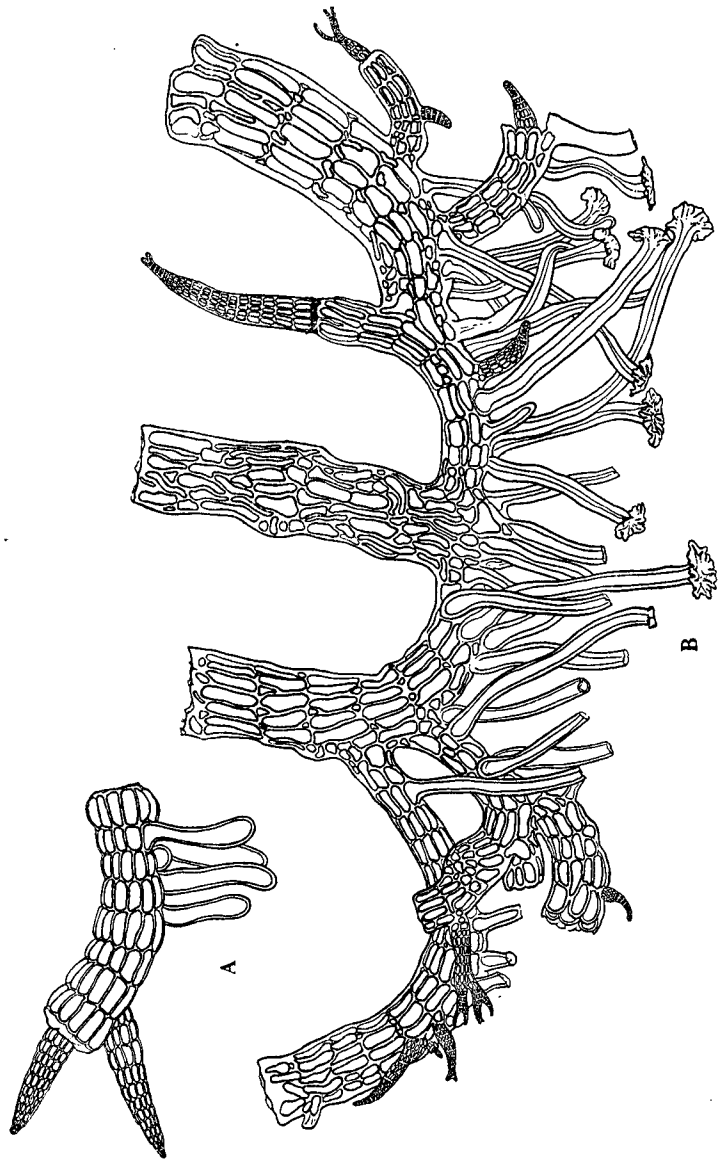
By MARGARET T. MARTIN, M.Sc.

(Westfield College, University of London).

THE perennation of marine algæ and regeneration from their basal parts is in general a comparatively well-known phenomenon. Oltmanns (1922) describes it and records its occurrence in *Dumontia* (described by Brebner, 1895), where there is a persistent basal disc which sends up new shoots early in the year, and also in forms such as *Furcellaria*, *Phyllophora*, etc., where new shoots arise from the margins of the older fronds. Specific examples of this regenerative process are, however, rare in algal literature. Knight and Parke (1931) mention a number of forms, e. g., *Chondrus*, *Gelidium*, *Gigartina*, *Rhodymenia*, which in autumn and winter are worn down to their small disc-like basal parts; these remain adhering to the substratum and are capable of sending up new shoots in the spring. *Laurencia hybrida*, in particular, was observed to perennate on limpet-shells by means of basal discs which sent up antheridia-bearing shoots from their margins in the early spring.

The above, however, are mainly thalloid forms with parenchymatous or pseudo-parenchymatous attaching discs, but the over-wintering of the basal parts of filamentous forms with rhizoidal attachments has apparently never been described in detail. An interesting example of this has recently been observed in an aquarium tank at Westfield College, and, in view of the scanty information available on such forms, seems worthy of record.

Plants of *Polysiphonia nigrescens* attached to large stones were collected from Swanage at the end of November 1933, and were transferred to a sea-water aquarium tank, where they have been kept under observation during the winter of 1933–34. The plants when collected were about 4–6 in. in height, but bore no reproductive organs. During the winter small pieces became broken off, and the plants were gradually worn away until only short stumps were left upon the stone, each attached by an interweaving mass of rhizoids formed from the pericentral and cortical cells at the base both of the main axis and the procumbent branches (*cf.* Batten, 1923). Such basal stumps were observed during December and January. At the same time small detached pieces of the *Polysiphonia* were found entangled in the débris on the surface of the stone; these generally consisted of from four to ten or twelve internodes, and were sometimes branched. From the pericentral cells nearest the substratum rhizoidal outgrowths had been put out, and seemed in some cases to have effected attachment with the substratum. It is possible



Polysiphonia nigrescens Grev. ×80.

A. Small detached portion regenerating. B. Basal stump attached to stone and sending up new shoots.

that some of these small detached pieces merely represented persistent portions of the procumbent branches, which are a feature of *P. nigrescens*, and which add by rhizoidal outgrowths to the main attaching organ of the plant; one of them, however, is shown in fig. A, and its young rhizoids and lack of cortication suggest that it was a piece of an erect shoot which had re-attached itself to the substratum after having been broken off from the parent plant.

When the material was examined again at the end of February it was found that proliferation had begun both from the basal stumps and from the small detached portions described above. Fig. A shows a detached fragment, with two new branches growing out, one laterally and also one from the broken end. In the same way the old stumps of plants which had remained attached to the stone throughout the winter were sending up new shoots (fig. B). These, when last examined in March, varied from ·1–·6 mm. long, and were apparently growing actively.

Knight and Parke (1931) record for the Isle of Man the occurrence of tetrasporic indivuduals of *P. nigrescens* in summer and autumn, and of sexual ones in winter and spring; observations in the south of England (Swanage and the Isle of Wight), however, seem to show that the two kinds of plants are by no means limited to these seasons, and it is possible to find cystocarpic and tetrasporic material both in the spring and autumn. Regeneration from old portions of the plant, as recorded here, must play an important part in its over-wintering in nature, and it is possible that it may offer some explanation of the overlapping of tetrasporic and sexual generations in spring and autumn.

References.

Batten, L. (1923.) "The Genus *Polysiphonia* Grev." Journ. Linn. Soc., Bot. xlvi.

Brebner, G. (1895.) "On the Origin of the Filamentous Thallus of *Dumontia filiformis*." Journ. Linn. Soc., Bot. xxx.

Knight, M., & Parke, M. W. (1931.) "Manx Algæ." L.M.B.C. Memoirs, xxx.

Oltmanns, F. (1922.) 'Morphologie und Biologie der Algen. II., III.' 2 Aufl. Jena.

VARIETIES OF *GALIUM MOLLUGO* Linn. IN BRITAIN.

By C. E. Britton.

It is well known that the genus *Galium* contains species notable for their extreme polymorphism, and among the number is *G. Mollugo* Linn. If this species is regarded in a restricted sense, *i. e.*, after the segregation of *G. erectum* Huds. and non-British forms such as *G. Gerardi* Vill. etc., there yet remain a number of forms having greater or less claims to recognition, besides

numerous minor forms difficult to associate with any of those described. The study of *G. Mollugo* in the field is complicated by the existence of these lesser forms, and further difficulty is experienced by the fact of authors extending names of earlier writers to include plants which differ in important details from those with which they are placed. Hitherto little has been attempted in the comparison of British forms with those recognized by Continental authors, and our standard is still approximately that adopted by Boswell Syme in 'English Botany,' ed. 3, which was as follows :—

Galium Mollugo L.

Subsp. I. *G. erectum* Huds.

Var. α. *genuinum* ; var. ? β. *aristatum* Bab.

Subsp. II. *G. elatum* Thuill.

Var. α. *genuinum* ; var. β. *insubricum* Gaud. ; var. γ. *Bakeri* Syme.

The 'London Catalogue of British Plants,' ed. 11 (1925), and the 'British Plant List,' ed. 2 (1928), have the following forms:—

'London Catalogue.'	'British Plant List.'
G. Mollugo L.	*G. Mollugo* L.
b. *insubricum* (Gaud.).	b. *insubricum* (Gaud.).
c. *Bakeri* Syme.	c. *Bakeri* (Syme).
	d. *dumetorum* (Jord.).
	e. *scabrum* (Stokes).
G. erectum Huds.	*G. erectum* Huds.

Heinreich Braun gave a rather elaborate study of the forms of *G. Mollugo* L. in the Oesterr. Bot. Zeitsch. xlii. 130 *et seq.* (1892), recognizing the following :—(*a*) *genuinum*, β. *pubescens* Schrader, β″. *pycnotrichum* H. Br. ; (*b*) *angustifolium* Leers, β. *nemorosum* Wierzb., β″. *Obornyanum* H. Br., γ. *subpubescens* H. Br. ; (*c*) *abietinum* H. Br., α. *calvifrons* H. Br., β. *decolorans* Gren. & Godr. ; (*d*) *elatum* Thuill., β. *brevifrons* Borbas & H. Br., β″. *Talenceanum* Gandog. ; (*e*) *tyrolense* Willd. ; (*f*) *erectum* Huds., β. *hirtifolium* H. Br. ; (*g*) *praticolum* H. Br., α. *genuinum* H. Br., β. *hypotrichum* H. Br. ; (*h*) *dumetorum* Jord., α. *levicaule* H. Br., β. *genuinum* H. Br.

Briquet (in Schinz und Keller, Fl. der Schweiz ; 1900) divided the species into subsp. *elatum*, with vars. *procurrens*, *Thuilleri*, and *tyrolense* ; subsp. *dumetorum* with vars. *levicaule* and *trichoderma* ; subsp. *erectum* ; and two Continental subspecies, *Gerardi* and *corrudifolium*.

A later arrangement was that of Rouy, who comprised within six subspecies the forms occurring in France (Fl. Fr. viii. 13 ; 1903), the subsp. *G. elatum* Thuill. having four varieties, the subsp. *G. erectum* including three varieties. The remaining four subspecies do not occur in Britain.

In the later survey by Hayek in Hegi's Ill. Fl. Mitt.-Europa, vi. Teil iv. 212, the forms of Braun and Briquet are rearranged in the following order :—

Subsp. 1. *Mollugo* (Linn.) Hayek.

Var. *latifolium* Thuill. (=subsp. *elatum* Briq. ; nec *G. elatum* Thuill.)—subvar. *procurrens* Briq.—subvar. *pubescens* Schrader (=var. *scabrum* DC.=var. *hirtum* Mayer=*G. elatum* var. *velutinum* Auerswald=var. *Thuillieri* Briq.)—subvar. *pycnotrichum* H. Br.

Var. *elatum* (Thuill.) H. Br.—subvar. *polyphyllum* Wirtg.—subvar. *scabrum* Beckm. (=var. *Talenceanum* Gandog.)—subvar. *brevifrons* Borbas & H. Br.

Var. *angustifolium* Leers—subvar. *subpubescens* H. Br.

Var. *dumetorum* H. Br.—subvar. *levicaule* H. Br.—subvar. *trichoderma* Briq.—subvar. *praticolum* H. Br.—subvar. *hypotrichum* H. Br.

Subsp. 2. *tiroliense* (Willd.) Hayek (=*G. insubricum* Gaud.).

Subsp. 3. *erectum* (Huds.) Briq. var. *nemorosum* (Wierzb.) Hayek—subvar. *Obornyanum* H. Br.

In considering the British forms of *G. Mollugo* L. great assistance has been derived from the views of H. Braun, supplemented by the series of *exsiccata* exhibiting the principal forms described by that author. It is proposed to deal with these forms and their relative synonymy.

G. Mollugo L. (a) *genuinum* H. Br.—*G. Mollugo latifolia* Leers Fl. Herbon. ed. 2, 52 (1789), without description.—*G. Mollugo* L. α. *latifolium* Roth, Tent. Fl. Germ. ii. 1, 183 (1789), defined as "leaves obovate-lanceolate glabrous."—*G. Mollugo.* α. *latifolium* Neilreich, Fl. Wien, 308 (1846) ; Fl. Nied. Oesterr. 461 (1859), "stem somewhat erect, leaves narrowed at the base, becoming broader towards the obtuse apex and about 6 mm. wide."—*G. elatum* Thuill. β. *polyphyllum* Wirtgen, Fl. Preuss. Rheinprov. 220 (1859), characterized by broadly lanceolate leaves in whorls of 10–14. A specimen issued by Wirtgen has a pubescent stem and oblong-lanceolate leaves.

Typically var. *genuinum* H. Br. is a plant ranging between 60 150 cm., with stem polished and glabrous, erect or prostrate, lower branches widely spreading or deflexed ; leaves ranging between 12–25 mm. long and 4–8 mm. wide, obovate, oblong, or broadly elliptical-oblong, usually broadest towards the rounded mucronate apex, glabrous, flat or margins slightly recurved, lateral veins anastomising. Panicle broad pyramidal, many-flowered, cymes shortly stalked, inflorescence compact, corolla white or cream-coloured. Fl. exsicc. Austro-Hung. no. 2206, *G. Mollugo* L. (a) *genuinum* H. Braun, from Lower Austria, is a large glabrous plant, with large congested panicle, and leaves oblong-linear,

suddenly acute, mucronate. The specimen in the Kew Herbarium has leaves which are 32×7 mm., dimensions which are probably exceptional, as the example of this no. in the British Museum Herbarium has much smaller leaves.—*β. pubescens* Schrader, Spicil. Fl. Germ. 16 (1794), as variety of *G. Mollugo* L., with the attributed characters, "stem and lower leaves pubescent."—*G. Mollugo* L. *β. pubescens* Wimm. & Grab. Fl. Siles. 123 (1827), has stem and branches pubescent, with short incurved hairs.—*G. Mollugo* var. *scabrum* DC. Fl. Fr. iv. 264 (1815), and Prodr. iv. 596 (1830), are both founded on *G. scabrum* With.—*G. Mollugo* L. c. *hirtum* Meyer Chl. Fr. Hannov. 368 (1836), with the descriptive designation "Kurzhaariges Vollblumiges Laubkraut." Fl. exsicc. Austro-Hung. no. 2207, contributed by Braun from the same locality as no. 2206, differs from the latter in being pubescent below.

β″. pycnotrichum H. Br. Stem usually hairy from base to summit; leaves all more or less distinctly hairy or almost felted; bracts usually hairy; otherwise resembles the preceding form. Fl. exsicc. Austro-Hung. no. 2208, *G. pycnotrichum* (H. Br.) Borbas has large oblong-linear leaves, strongly hirsute, and lower part of stem felted with stiff grey hairs. To this, should, in my opinion, be referred as synonyms *G. scabrum* With. Arr. Brit. Plants, ed. 3, 2, 190 (1796), and *G. elatum* Thuill. var. *velutinum* Auersw. in Wirtgen, Fl. Preuss. Rheinprov. 220 (1857). The descriptions of both authors indicate plants that are too hairy to be included in var. *pubescens* Schrad., as was done by Braun and Hayek. Inspection of a type-specimen of Auerswald's variety in the British Museum Herbarium supports this conclusion.

(b) *angustifolium* Leers, Fl. Herbon. 115 (1775), without description.—*G. Mollugo* Linn. *β. angustifolium* Roth Tent., "leaves lanceolate, scarcely broader towards the apex." Wirtgen (*l. c.*) improves on Roth's description: "stem prostrate, leaves narrow, lanceolate, acute, 1·5–2·5 mm. wide."

Stem erect, prostrate or ascending glabrous. Leaves lanceolate or linear-lanceolate, gradually narrowing towards the apex, with an abrupt point, 12–26 mm. long and 2–5 mm. wide. Panicle broad, branches elongated, divaricate or deflexed, pedicels short, 1–2 mm. long, cymes crowded. A connecting-link with *G. erectum* Huds., but distinguished by its longer and broader leaves and crowded inflorescence.

Fl. Stiriaca exsicc. nos. 1062 & 1063, *G. Mollugo* L. f. *angustifolium* Leers, collected by v. Hayek in Upper and Central Styria, have oblong-lanceolate acute leaves, 20×5 mm.

β. nemorosum (Wierzb.) H. Br. is said to be separable from the preceding by reason of the lanceolate-linear leaves with almost parallel margins and of a firmer consistency; the looser less-developed panicle with acutely spreading branches.

Reichenb. Fl. Germ. Novit. No. 1521, *G. nemorosum* Wierzb., has narrowly linear-oblanceolate leaves, 25×3·5 mm., and a well-developed panicle.

(c) *abietinum* H. Br., with vars. *calvifrons* and *decolorans* Gren. & Godr., are considered to represent hybrids between *G. Mollugo* L. and *G. verum* L.

(d) *elatum* Thuill. Fl. Par. 72 (1799). This name is often, perhaps generally, used in a sense that does not strictly accord with the description given in the work cited, where *G. elatum* is described as a large almost glabrous plant, with short obovate leaves, a broad panicle (*panicula vasta copiosiflora*), and whitish flowers. The name was never intended as a substitute for *G. Mollugo* L., which was independently described by Thuillier. Perhaps the wider application of the name may be due to the influence of Thuillier, who circulated examples named *G. Mollugo β. G. elatum* that depart from his description in being distinctly hairy and in having elongated oblong leaves. A plant marked by these characters, received by Gay from Thuillier, is in the Kew Herbarium. Presumably it was to such a form that Briquet applied the varietal name of *Thuillieri*, distinguishing the glabrous form as var. *procurrens*. Authorities quote Reichenb. Ic. Fl. Germ. t. 1188, fig. 1, and Schultz, Herb. Norm. no. 1264, as representing *G. elatum* Thuill. The figure cited shows a large panicled plant with widely spreading lower branches. The detached leaf is orbicular-obovate, apiculate. The plant of Schultz has a polished stem, glabrous, as are the oblong-oblanceolate obtuse mucronate leaves about 12×2 mm., and spreading or erect-ascending panicle-branches.

Authors mention the consistence and venation of the leaves. According to H. Braun the leaves are firm, in which case the venation would be obscure. Briquet, however, assigned the character of prominently veined leaves to his subsp. *elatum*, for which reason probably Hayek placed the plant of Briquet to var. *latifolium*=var. *genuinum* H. Br. Thuillier's description makes no mention of the substance or venation of the leaves, and the reason for this divergence of view is probably to be found in the following words of H. Br.:—"After having numerous specimens from France, particularly from the neighbourhood of Paris, before me, I find that *G. elatum* Thuill. can always be distinguished from *G. Mollugo* L. by reason of the broad short lower and median stem-leaves, which are of a more or less firm consistency. The panicle, whilst it agrees generally with that of *G. Mollugo* L., differs in being much broader, with branches more elongated, and mostly divaricate."

(e) *tyrolense* Willd. This is referred to later, in connection with the application of the name of var. *insubricum* (Gaud.) to certain British plants.

(f) *erectum* Huds. The present writer adheres to the usual practice of British botanists in according specific status to this, and it is not intended to deal at present with the various forms included under this name, beyonding recording that var. *hirtifolium* H. Br., with stem and lower and median leaves pubescent, is not infrequent in England.

(g) *praticolum* H. Br.—Distinguished by the light green or bluish green lanceolate or linear-lanceolate leaves, 8–15 mm. long, gradually narrowing towards the acute apex, and panicle well developed, cymes lax, pedicels usually 3–4 mm. long, and flowers medium-sized, resembling those of *G. erectum* Huds.

Ic. Fl. Germ. t. 1187, fig. 1, cited by Braun, represents a plant with linear-lanceolate cauline leaves, narrowed at the base, and tapering to the acute apex. The panicle is rather narrow, with suberect branches. Considered by the author of the name to be an intermediate between *G. Mollugo* L. and *G. erectum* Huds., a position also assigned to var. *dumetorum*, which, among other characters, is distinguished from var. *praticolum* by the short pedicels (1–2 mm.).

(h) *dumetorum* Jord. Pug. Plant. Nov. 78 (1852). After describing this Jordan stated that it was almost intermediate between *G. elatum* Thuill. and *G. erectum* Huds., differing from the first by the much narrower leaves and earlier period of flowering and separated from the second by the much more numerous flowers, which are smaller and on shorter pedicels, and by the smaller fruit. The stems are less erect, swollen at the nodes, and the branches are more spreading. Rouy reduced *G. dumetorum* Jord. to a variety of *G. elatum* Thuill., and among other synonyms cited *G. Mollugo* var. *latifolium* Leers, Fl. Herbon. 115, which appears inexplicable.

As understood by French botanists *G. dumetorum* Jord. shows little resemblance to *G. erectum* Huds. Exsicc. Soc. Dauphin. no. 4906, issued as *G. dumetorum* Jord., has linear-lanceolate leaves, 19×2 mm., panicle-branches suberect, fairly short, about 9 cm., distant, panicle consequently lax.

It is not the object of this paper to suggest what systematic grade should ultimately be given to most of the plants here enumerated as varieties, a position that is not altogether satisfactory, as subspecies or races (in the sense of the term as used by Rouy) would seem to be the more appropriate status.

Varieties of *Galium Mollugo* L. in Britain.

Var. *genuinum* H. Br.—Glabrous, leaves usually oblong or elliptical-obovate, rounded at the apex, mucronate, venation apparent, panicle pyramidal.

Var. *pubescens* Schrader.—Distinguished from the preceding by the pubescent stems, branches, and lower and median leaves.

Var. *pycnotrichum* H. Br.—A detailed description of the British plants referred to this is here given. Stem 100–150 cm., ascending, grey-felted with hispid hairs below, especially at the angles, indumentum decreasing in quantity above, but extending to the panicle-branches. Leaves flat, median oval-elliptical or oval, subacute or obtuse, apiculate or aristate, varying in length from 9 mm. to 17 mm. and in breadth from 3 mm. to 6 mm.; lower stem-leaves grey with hispid hairs, upper stem-leaves pubescent or subglabrous; mid-ribs and leaf-margins hispid, venation apparent. Inflorescence narrow, often strict, branches erect or ascending, only slightly exceeding the adjacent stem internodes; cymes shortly stalked, pedicels short, 1·5 mm. Corolla about 4 mm. in diameter, usually cream-coloured, often tinged yellowish, rarely white.

A well-marked form, distinguished by the yellowish-green foliage, grey-felted lower stem and lower leaves, by the erect or ascending panicle-branches, by the crowded shortly-pedicelled flowers, usually cream or ochraceous. Probably not infrequent.

Many gatherings made by the writer in Surrey, and similar plants seen in public herbaria from localities ranging from Kent in the south-east to Aberdeenshire in the north. Also occurs in the Channel Islands (Alderney: A. B. Jackson in Herb. Brit. Mus.). Distributed by the writer under the name of *G. Mollugo* L., Ref. no. 3180, through the Bot. Exchange Club in 1927.

Var. *angustifolium* Roth.—Will perhaps be found to be a frequent British variety. The *G. Mollugo* L. from Orkney, sent in 1926 to the Bot. Exch. Club by Col. H. H. Johnston, belongs here, as also does the plant from Headley, Surrey, distributed by myself through the same club in 1927, with Ref. no. 2679.

Var. *nemorosum* (Wierzb.) H. Br.—There are type-specimens of Wierzbicki's plant in the herbaria at Kew and British Museum. The leaves are either narrowly linear-oblanceolate or linear-lanceolate acute, 20–25 mm. by 2–3·5 mm. A plant growing at Warlingham, Surrey, appears identical with this variety, with which also I should place an Irish plant in the British Museum Herbarium labelled "*G. Mollugo* L., meadow, Cappogh, Co. Waterford, 9, 7, '99, R. Lloyd Praeger." It is curious that this latter plant is the only representative of *G. Mollugo* L. from Ireland that the Herbarium contains. A description of the Warlingham plant follows:—Stems very numerous, decumbent, radiating from a common centre, about 60 cm. in length, glabrous, 4-angled, nodes slightly enlarged, lower branches divaricate, upper branches ascending or suberect. Leaves glabrous, lower reflexed, upper spreading, 7–9 in whorls, about 15–17 mm.×3 mm., linear-oblong acute or cuspidate, margins revolute, with small forward-directed acute hairs, upper surface bright green, lower surface paler, mid-rib prominent, venation obscure. Panicle narrow, lower branches

14–16 cm., upper branches 1 cm.; pedicels 1–2 mm., spreading, slightly elongating, and becoming divaricate after the fall of the corolla. Flowers crowded, corolla white, 3 mm. in diameter, lobes oval, apiculate, apiculus ascending, margins becoming reflexed; anthers yellow becoming brown, styles 2, united below, becoming free at mid-length, then diverging. Under the name of *G. dumetorum* Jord. examples of the Warlingham plant were distributed in 1933 through the Bot. Exch. Club, Ref. no. 4091.

To associate *G. nemorosum* Wierzb. with *G. erectum* Huds., as was the view of Hayek (*ante*), seems to me to destroy the distinctive character of the second-named plant without demonstrating the relationship of both forms, and Hayek's opinion appears untenable.

Var. *elatum* (Thuill.) H. Br.—As described by Thuillier, this will probably be found to be an infrequent variety in Britain.

Var. *praticolum* H. Br.—To this I refer a plant in Herb. Mus. Brit. labelled "*Galium Mollugo* L. (? var.), near Chiddingfold, Surrey, 24, 7, 1894, E. S. M." This was noted by the collector to have very narrow petals and deep green shining coriaceous leaves. The chief features of Marshall's plant are the linear-lanceolate leaves, 9×2·5 mm., the diffuse panicle, pedicels 3–4 mm. long, and corolla 3·5 mm. in diameter. Another plant in the same collection gathered by W. Fawcett for *G. erectum* Huds. at Gouffre, Guernsey, July 1883, is also, in my opinion, var. *praticolum* H. Br.

Var. *dumetorum* (Jord.) H. Br.—When better understood by British botanists this is likely to be found to be well spread in Britain. In the British Museum Herbarium are several plants labelled *G. Mollugo* L. that, in my opinion, should be placed to this variety. The labels give the following particulars:—Ex herb. W. K. Campbell, Four Mile Hill, near Corstorphine, 7 June, 1833; Dirleton, Haddington, July, 1836, coll. Prof. A. H. Balfour; roadside, between Stroud and Pitchcombe, E. Gloster, coll. E. S. Marshall. A plant labelled "*Galium Bakerii*" from Upton Wood, Warwickshire, Aug. 1876, coll. H. Bromwich; another, collected by E. S. Marshall, 11 June, 1914, between Somerton and Kingsweston, N. Somerset, and named *G. Mollugo* L. var. *Bakeri* are also var. *dumetorum*. Finally, there is an example of *G. dumetorum* Jord. (so named on the label) from Cleves, N. Yorks., coll. J. G. Baker, July 1863.

It probably may have been noticed that "var. *insubricum*" of British authors has not been included among the preceding varieties. This name has been omitted on the ground that the occurrence of the plant of Gaudin has not been satisfactorily established in Britain. Three plant-names considered by authorities as synonymous are *G. tyrolense* Willd. Pl. Hort. Reg. Berol. 153 (1809); *G. insubricum* Gaudin, Fl. Helv. i. 421 (1828); and *G. elatum* Thuill. β. *umbrosum* Gren. & Godr. Fl. Fr. ii. 22 (1850). Braun stated that examples of *G. tyrolense* from Lower Austria agree completely with Willdenow's type-specimens, and further observed that *G. insubricum* Gaud. so closely resembles *G. tyrolense* that the two cannot be kept apart.

Fl. exsicc. Austro-Hung. no. 2209, issued by Braun to represent *G. tyrolense* Willd., consists of small plants about 24 cm. in height, with thin oblong-oblanceolate leaves, 12×3·5 mm. The panicle branches are short, ascending, and few-flowered. On the other hand, plants from Switzerland, named *G. insubricum* Gaud., look to me so unlike the former that I am loth to include them with *G. tyrolense* Willd. Schultz Herb. Norm. nov. ser. Cent. 20, no. 1992, *G. insubricum* Gaud. from Capalago, Tessin, Helvetia, has thin elliptical-obovate leaves, about 16×5·5 mm., panicle very reduced, cyme few-flowered, and large bracts. Reichenbach's Ic. t. 1189, fig. 1, accepted as depicting *G. insubricum* Gaud., represents a plant with a narrow panicle consisting of rather lax cymes bearing long-pedicelled flowers and elliptical-oblanceolate upper stem-leaves.

The British plants referred to var. *insubricum* that have come under my notice appear to be individuals in which an unusual vegetative activity has invaded the region of the panicle that has failed to attain its usual dimensions. A similar state may occasionally be seen in *G. erectum* Huds.

It should perhaps be made clear that where leaf-dimensions have been given these have been derived from the median stem-leaves.

To the custodians of the herbaria and libraries at the British Museum (Nat. Hist.), the Royal Botanic Gardens, Kew, and the South London Botanical Institute the writer is under obligations.

NEW MALAYAN RUBIACEAE.

By H. N. Ridley, C.M.G., F.R.S.

In looking over the Ixoras of the Malay region I find that some alterations of nomenclature of those of the Malay peninsula are necessary. The plant named *I. stricta* Roxb. in my 'Flora' (p. 94), as also in King's 'Materials'* (p. 80), is very distinct from *I. stricta* Roxb., which is also *I. chinensis* Lam., wild in China, but very doubtful as a native plant in India or Malaya, though largely cultivated. I herewith describe it.

Ixora aurorea, sp. nov. Species ab *Ixora javanica* (Bl.) DC. cui affinis, foliis lanceolatis subrigidis acuminatis, stipulis basi in tubo connatis cuspidibus longis, corymbis laxioribus sæpe paucifloris, calycis lobis ovatis, corolla pallide aurantiaca, lobis ellipticis subacuminatis obtusis, stylo longiore, stigmatibus brevibus recurvis differt.

* "Materials for a Flora of the Malay Peninsula" (Journ. Asiatic Soc. Bengal, 1904).

Frutex ramosus. *Folia* tenuiter coriacea, lanceolata acuminata acuta, basibus angustatis, 9–11·5 cm. longa, 2·5–3 cm. lata, nervis 7-paribus gracilibus intra margines inarcuantibus, reticulationibus laxis, petiolis 2–3 mm. longis. *Stipulæ* in tubo connatæ 3 mm. longæ, cuspidibus setiformibus 3 mm. longis. *Corymbi* in pedunculis 1 cm. longis, ramis tribus, parce puberulo-furfuraceis. *Bracteæ* minutæ ovatæ acutæ. *Flores* 6–24 in corymbo. *Calyx* 1 mm. longus campanulatus lobis ovatis subacutis. *Corolla* pallide aurantiaca, tubo gracili 2·5–3 cm. longo, lobis 4 ellipticis 8 mm. longis 4 mm. latis. *Antheræ* recurvæ lineares obtusæ. Stylus 5 mm. productus glaber, stigmatibus 1 mm. longis. *Bacca* subglobosa biloba, 6 mm. longa (in sicca), rubra.

Hab. Malay peninsula, chiefly on the east coast along sandy river-banks ; Pahang, banks of Pahang River, abundant, flowers apricot-orange (*Ridley*) ; Temerloh (*Hamid* 4767, 5176) ; Kwala Tekam (*Evans*, type) ; Kelantan, Pehi river-bank, Chaning : large shrub, flowers orange (*Ridley*) ; Tringanu, Bundi (*Rostado* 11,971). Malacca (*Maingay* 846/2), a small shrub ; Selangor : Klang Gates, on sandstone rocks (*Ridley* 13,408) ; Perak, Upper Perak (*Wray* 3448), fruit dull red ; Temengoh (*Ridley* 14,312) ; Setul (*Ridley* 14,998), small form.

Var. **major.** *Folia* 13–14 cm. longa, 4 cm. lata ; floribus paucis. *Corollæ* tubo 3·5 cm. longo, lobis lanceolato-ellipticis acutis 1 cm. longis, 5 mm. latis.

Johor, Sungei Pelepah (*Nur* 20,007).

I. javanica (Bl.) DC. occurs also in the Malay peninsula in Kelantan at Kota Bahru (*Ridley*) ; Adang Islands, Pulau Rawei (*Ridley* 15,890) ; Pulau Rumpia (*Seimund*) ; Kedah Peak, Gurun (*Robinson* 6161) ; Lankawi Isles, Dayong Bunting, flowers salmon-red (*Robinson* 6298).

The leaves are broadly elliptic and comparatively thin textured ; stipule-tube much shorter and stipules often nearly free to base ; calyx-lobes rounded, not acute ; corolla-lobes shorter, quite rounded, bluntly ovate ; style much shorter and flowers orange-red to salmon-red.

I. BARBATA Koorders, 'Baum-arten,' t. 548.

The plant identified with Roxburgh's *I. barbata* by the Dutch botanists is certainly not that species ; the foliage and habit are totally different, the branches of the corymb are pubescent, flowers smaller, and corolla mouth only obscurely bearded. It appears to me nothing more than *I. paludosa* Kurz, somewhat pubescent on the corymb. It may be called *I. paludosa* Kurz var. nov. **Koordersii.**

I. STENOPHYLLA (Korth.) Kuntze. *Pavetta stenophylla* Korth. Korthal's description of the plant he found on the banks of the Tewe, Sakumbang, is a good one for the plant usually referred to this species, except that he says of it "faux *barbata*," but though there are a number of short processes at the mouth of the corolla of some specimens, it can hardly be said to be bearded.

It is a handsome plant about 5 feet tall. *Leaves* coriaceous lanceolate, rather abruptly acuminate and narrowed to the base, 8 cm. long and 2 cm. wide, drying dark ; nerves ten, anastomosing near the edge ; petiole 5 mm. long. Stipules connate, with long subulate points 4 mm. long. *Cyme* terminal, about three branches, each with three flowers, branches 5 mm. long. Flowers almost or quite sessile. *Calyx* urn-shaped, with four triangular acute pale brown lobes, 2 mm. long. *Corolla* bright red, tube very slender, with short processes in the mouth, 3–5 cm. long ; lobes oblong-lanceolate to oval-acute, 7 mm. to 1·5 cm. long, 5 mm. wide. *Stamens*, filaments short linear, decurved, anthers linear acuminate. *Style* 2 mm., exserted, lobes short recurved at length. *Fruit* as big as a cherry, leaden-colour.

Hab. Sarawak, Kuching (Haviland & Hose 3436) ; Matang (*Ridley*) ; Sepudang (*Haviland* 693) ; Lundu (*Mjöberg*) ; Puak (*Ridley* 12,443). The fruit is the biggest I know in the genus.

The plant I described from the Malay peninsula under the name *I. stenophylla* appears to be distinct from the Borneo plant in several ways. The leaves are narrower and long-acuminate, with more nerves, the flowers rather smaller, orange, the corolla-lobes lanceolate acute, and the fruits much smaller—only as big as a pea, about 7 mm. long. The plant is allied to *I. aurorea* Ridl. I propose the name of **I. salicina** for it.

Ixora lancisepala, sp. nov. Species ab *Ixora salicifolia* (Bl.) DC., cui affinis, sepalis longis late lanceolatis differt.

Frutex. Folia anguste lineari-lanceolata longe acuminata basibus angustatis, subcoriacea, 14·5 cm. longa, 1 cm. lata, costa utrinque elevata, nervis gracilibus 16-paribus in intramarginali inarcuantibus, inconspicuis, secundariis similibus, reticulationibus laxis, petiolis 5 mm. longis. *Stipulæ* triangulares cuspidatæ 3 mm. longæ. *Cymæ* laxæ trichotomæ pauciflorae, ramis 3 patentibus, 1·5 cm. longis 3- vel 4-floris. *Bracteæ* et bracteolæ lanceolatæ acuminatæ angustæ 2 mm. longæ. *Flores* sessiles speciosi. *Calyx*, tubo brevissimo vix 2 mm. longo, lobis 4 lanceolatis acutis 2 cm. longis, 2 mm. latis. *Corolla*, tubo gracili 4 cm. longo, lobis 4 lanceolatis 2·4 cm. longis, 5 mm. latis, ore tubi et marginibus loborum pubescentibus. *Stylus* 2 mm. exsertus gracilis, stigmatibus brevibus linearibus 1 mm. longis. *Bacca* (sicca) biloba 8 mm. longa, lobis calcycis coronata, seminibus 2.

Hab. Borneo (*Motley*) ; Sarawak, Limbang (*Haviland* 694, type).

The extraordinarily large calyx-lobes distinguish this from any of the allied species of the *I. stenophylla* group. The flowers appear to have been red.

Ixora matangensis, sp. nov. Species ab *Ixora Lobbii* Hook. fil., cui affinis, panicula laxa, foliis sessilibus, corolla haud barbata, differt.

Frutex. Folia chartacea sessilia elliptico-lanceolata acuminata basibus late rotundatis 18 cm. longa, 6·5 cm. lata, nervis gracilibus 12-paribus inter se inarcuantibus, secundariis pluribus, anastomosantibus. *Stipulæ* ovatæ triangulares cuspidatæ 5 mm. longæ. *Corymbus* laxus 8 cm. longus, 11 cm. latus, ramis 7-gracilibus 1·5–6 cm. longis. *Flores* terni, pedicellis 2 mm. longis. *Calyx* infundibuliformis, margine integro 2 mm. longo. *Corolla*, tubo gracili 3·5 cm. longo, lobis 4 oblongo-rotundatis 5 mm. longis, 4 mm. latis. *Stamina*, antheris oblongo-linearibus apiculatis. *Stylus* gracillimus, 2 mm. extrusus, stigmatibus brevibus linearibus recurvis.

Hab. Sarawak, Matang, 1600 feet alt. (*Haviland* 675).

This is allied to *I. Lobbii* Hook. fil., but the corymb is laxer and the leaves are sessile and almost amplexicaul.

Ixora fulgida, sp. nov. Species ab *Ixora fulgenti* Roxb., cui affinis, lobis corollæ rotundatis haud acutis, nervis folii pluribus parallelis differt.

Frutex. Folia lineari-oblonga ad elliptica subabrupte acuminata basibus angustatis, coriacea (sicca flavidula-nitentia) 10–14 cm. longa, 3–4 cm. lata, costa utrinque elevata, nervis 12-paribus gracilibus horizontalibus parallelis in apicibus inarcuantibus, petiolis 5 mm. longis. *Stipulæ* elongato-triangulares cuspidatæ 4 mm. longæ. *Cyma* breviter pedunculata, ramis brevibus. *Flores* ad 20 congestæ sessiles vel subsessiles. *Bracteæ* lanceolatæ acutæ 1 mm. longæ. *Calyx* urceolatus 3 mm. longus, lobis 4 ovatis acutis. *Corolla* rubra, tubo 4 cm. longo gracili, lobis 4 ellipticis obtusis, ad bases pubescentibus, 12 mm. longis 5 mm. latis. *Stamina*, antheris linearibus, longe appendiculatis, basibus divaricatis. *Stylus* 3 mm. exsertus, stigmatibus brevibus basi incrassatis haud recurvis vix 1 mm. longis. *Bacca* biloba 6 mm. crassa, semina 2.

Hab. Brit. N. Borneo, East Coast, Port Myburgh, Sandakan, Tanjong Batu (*Creagh*, type); Banggi (*Fraser* 221).

This is allied to *I. fulgens* Roxb., but differs in the more rigid smaller leaves, usually quite narrow with more numerous parallel nerves, and blunt oblong corolla-lobes. In some specimens the leaves are broader oblong or even ovate, but the nervation exactly resembles that of the narrow leaves.

Ixora Curtisii, sp. nov. Species ab *Ixora apoda* Val., cui affinis, calycis lobis lanceolatis haud subulatis, foliis ellipticis differt.

Frutex glabra. *Folia* membranacea obovato-elliptica abrupte acuminata 11–12 cm. longa, 4·5–5 cm. lata, nervis 8-paribus gracilibus cum nervulis et reticulationibus subtus conspicuis, petiolis 5 mm. longis. *Stipulæ* basi connatæ truncatæ, carina in cuspide acuminato 3 mm. longo producta. *Cyma* quam petiolus brevior ad 5-flora. *Flores* 4–5, pedicellis 3 mm. longis. *Calyx*, tubo brevi, lobis 4 lanceolatis acuminatis acutis, 5 mm. longis. *Corolla*, tubo cylindrico 7 mm. longo, lobis 4 lineari-oblongis, 6 mm. longis, 1 mm. latis. *Stamina* exserta 4, antheris linearibus 3 mm. longis. *Stylus* exsertus, stigmatibus filiformibus patentibus. *Ovula* solitaria pendula.

Hab. Sumatra; no specific locality: a shrub (*Curtis*).

This is certainly nearest to *I. apoda* Val. Ic. Bogor, iv. pl. cccxxiv., a native of Obi Island near Ternate, but the elliptic leaves and the lanceolate, not subulate, sepals distinguish it.

Ixora Havilandii, sp. nov. Species ab *I. elliptica* Wall., cui affinis, tubo corollæ multo longiore, foliis minoribus crasse coriaceis, differt.

Arbor, ramis cortice albido, crassiusculis. *Folia* crasse coriacea elliptica vel oblonga-obtusa vel subacuta, basibus obtusis vel paullo attenuatis, 7–15 cm. longa, 3–3·5 cm. lata, nervis inconspicuis 8–10-paribus intra margines inarcuantibus, subtus sæpe invisis, reticulationibus obscuris, petiolis crassis 3–5 cm. longis. *Stipulæ* liberæ ovatæ haud cuspidatæ coriaceæ 5 mm. longæ. *Cymæ* tres, foliis breviores, pedunculis 3 cm. raro 5 cm. longis. *Flores* plures in ramorum apicibus dense congestæ sæpe sessiles, aut cum pedicellis brevissimis crassis. *Calyx* urceolatus 1 mm. longus, lobis 4 ovatis obtusis brunneis. *Corolla* alba, tubo 1·2 cm. longo, lobis oblongis obtusis 4 mm. longis. *Stamina* antheris angustis linearibus acuminatis. *Stylus* 4 mm. exsertus superne abrupte dilatatus, stigmatibus brevibus crassiusculis. *Bacca* globosa, 5 mm. longa, pedicello brevi.

Hab. Borneo (*Teysmann* 11,292); Sarawak (*Beccari* 3156); Kuching, corolla white, slightly scented, tree (*Haviland* 1791, type, and 995), also Sarawak River; no specific locality (*Haviland & Hose* 436).

This is allied to the Singaporean *I. elliptica* Wallich, but the corolla-tube is much longer, the leaves smooth, often nerveless, small, and more thickly leathery.

Ixora Marsdenii, sp. nov. Species ab *Ixora grandifolia* Zoll. & Mor., cui affinis, tubo corollæ gracillimo elongato, stylo longo exserto, differt.

Arbor vel *frutex* cortice pallido. *Folia* subcoriacea lanceolata obtusa basibus angustatis, 25 cm. longa, 10 cm. lata, nervis 12-paribus gracilibus, nervulis parallelis dissitis, petiolis crassis ·5–2 cm. longis. *Stipulæ* triangulares basi 5 cm. lato, apice

subulato, 1 cm. longæ. *Panicula* trichotoma 15 cm. longa 11 cm. lata hirto-pubescens. *Flores* plurimi pedicellis gracillimis 3 mm. longis. *Calyx* urceolatus pubescens lobis 4 brevibus ovatis obtusis, 1 mm. longus. *Corolla*, tubo gracillimo 2·5 cm. longo, lobis 4 linearibus angustis 9 mm. longis, 1 mm. latis. *Stamina* 4, antheris linearibus acuminatis 4 mm. longis. *Stylus* gracillimus 12 mm. longus, lobis brevibus linearibus.

Hab. Sumatra (*Marsden*).

Ixora lancifolia, sp. nov. Species ab *I. arborescenti* Hassk., cui affinis, foliis tenuioribus lanceolatis, cymis laxioribus, differt.

Arbor. Folia chartacea lanceolata acuminata subacuta, basi angustata, 15–22 cm. longa, 5–5·5 cm. lata, nervis 10-paribus gracilibus subtus elevatis ad apicis inarcuantibus laxis, petiolis crassis 2 cm. longis. *Stipulæ* triangulares subulato-cuspidatæ 5 mm. longæ. *Cymæ* 3, pedunculis 5 cm. longis, ramis 3 terminalibus 2 cm. longis, ramulis ·5 mm.–1 cm. longis. *Flores* parvi tenues, sessiles vel brevissime pedicellati. *Calyx* campanulatus 1 mm. longus, lobis 4 brevissimis ovatis brunneis. *Corolla*, tubo gracili 8 mm. longo, lobis lanceolato-oblongis acutis, 3 mm. longis, 2 mm. latis. *Stamina*, filamentis linearibus, antheris linearibus acuminatis 3 mm. longis. *Stylus* 4 mm. exsertus gracilis, stigmatibus brevissimis linearibus. *Bacca* globosa (uno semine) vel biloba 8 mm. longa.

Hab. Sarawak, Rejang Belaga (*Haviland* 2157, type); Baram (*Haviland & Hose* 3461).

Tarenna oblanceolata, sp. nov. Species a *T. glaberrima* Ridl. (v. infra), cui affinis, foliis oblanceolatis, sepalis elongatis, differt.

Frutex metralis glabra. *Folia* pergamacea oblanceolata vel oblongo-lanceolata longe acuminata vel cuspidata, basi attenuato in petiolo decurrente, 15–23 cm. longa, 7–9 cm. lata, nervis 12–13-paribus, subtus elevatis in margine inarcuantibus, secundariis gracilibus brevibus mox anastomosantibus, reticulationibus laxis, petiolis 1·5 cm. longis, ad bases alatis. *Stipulæ* coriaceæ ovatæ cuspidatæ carinatæ ferme ad bases liberæ, 5 mm. longæ. *Cymæ* 1 vel 2 breves congestæ hirtæ densifloræ 2 cm. longæ, ramis 1 cm. longis. *Bracteæ* anguste lineares acutæ recurvæ hirtæ 3 mm. longæ. *Flores* sessiles. *Calyx* urceolatus, lobis 5 lanceolatis acuminatis hirtis, 4 mm. longis. *Corolla*, tubo cylindrico 4 mm. longo, ore pubescente, lobis 5 oblongis obtusis æquilongis. *Stamina*, antheris linearibus 4 mm. longis. *Stylus* crassiusculus apice fusiformi, basi hirta, 5 mm. exsertus. *Bacca* globosa sessilis 1 cm. longa. *Semina* oblonga angulata rugosa 3 mm. longa.

Hab. Sarawak (*Beccari* 1523); foot of Matang, small shrub 2–3 feet high (*Haviland* 1032, type).

This plant seems to be unbranched, and is quite glabrous except the inflorescence, which is hairy, and shortly condensed at the apex.

T. SUMATRANA Hassk. & Boerl. *Hab.* Sarawak, Baram, Miri River (*Hose*). New to Borneo.

T. GLABRA Ridl. in Journ. Fed. Mal. States Mus. x. 141 (1920), from the Malay peninsula. The name is antedated by Merrill (Philipp. Journ. Sc. Bot. lx. 149; 1914) for a plant from the Marianne Isles. I therefore substitute the name **Tarenna glaberrima** for my *T. glabra*.

Tarenna crassifolia, sp. nov. Species a *T. corymbosa* Willd., cui affinis, petalis angustis acuminatis, cyma glabra, lobis calycis brevioribus, differt.

Arbor parva glabra ramis angulatis. *Folia* subcoriacea sicca griseo-brunnea elliptica subabrupte acuminata, basi breviter cuneata, 13–22 cm. longa, 6·5–9 cm. lata, nervis 16-paribus superne depressis subtus cum costa elevatis 4 mm. a margine arcuantibus, nervulis et reticulationibus parum inconspicuis, petiolis 1·5 cm. longis. *Stipulæ* connatæ lanceolatæ acutæ coriaceæ 7 mm. longæ. *Cyma* glabra, 5·5–6 cm. longa. *Flores* in ramis cymosi vel singuli sessiles. *Calyx* oblongus angulatus, limbo campanulato, dentibus 5, 2 mm. longus. *Corolla*, tubo cylindrico 3 mm. longo, ore hirto, lobis lanceolatis acutis 4 mm. longis, intus ad bases et in ore tubi hirtis, in alabastris contortis. *Stamina*, antheris exsertis oblongo-linearibus 3 mm. longis. *Stylus* cylindricus exsertus 4 mm., stigmate incrassato cylindrico. *Ovarium* biloculare, ovulis in loculis singulis. *Drupa* globosa 4 mm. longa, calyce coronata.

Hab. Sarawak, near Kuching. Small tree (*Haviland* 1053).

(To be continued.)

OBITUARY.

DR. LEONARD COCKAYNE

(1855–1934).

THE announcement from Wellington of the death, in his 80th year, of Dr. Leonard Cockayne has been received with deep regret by his friends at home and by all who are interested in the botany of his adopted country, New Zealand. Cockayne was born in Derbyshire in 1855 and received part of his education at Owen's College, Manchester. In 1879 he went to Australia and in 1880 to New Zealand. He was at first engaged in teaching, but from 1887 onwards his chief interest was the exploration and explanation of the New Zealand flora. Botanical science has known no more devoted student nor one who has done more to increase our knowledge of the vegetation of his country. He persistently refused invitations to revisit England, where he would have been welcomed by his fellow-botanists: life was short and there was so much to be done in the investigation of the problems presented by the, in some ways, remarkably

peculiar flora of New Zealand. My personal acquaintance with him was restricted to a few days in September 1914. He met the boat on its arrival in Wellington and in his quiet, modest, informative manner taught me, during my brief stay, something of the vegetation of the wonderful gulleys, still unspoiled, across the Harbour and within easy reach of the city. He was a delightful companion and from his talk one learnt something of the risks and hardships attending his exploration of outlying parts of the Dominion and the difficulties in procuring the beautiful series of photographs with which he illustrated his publications.

New Zealand has been fortunate in the exponents of its botany. Hooker's 'Handbook of the New Zealand Flora' (1864–7), bringing together in a masterly manner the results of previous work, formed a foundation for future systematic work. Thomas Cheeseman's 'Manual' of 1906 carried to completion the work begun by Thomas Kirk, and supplied a basis for Cockayne's intensive critical observational and experimental work. Cockayne was primarily an ecologist, but was deeply interested in species, and taxonomy for him was a necessary and helpful servant of ecology. His address entitled "A Consideration of the Terms 'Species' and 'Variety' as used in Botany, with special reference to the Flora of New Zealand" (Trans. New Zeal. Inst. xlix.; 1917), indicates his interest and his views.

In 1904 Cockayne was invited by Prof. Adolf Engler to prepare a volume on the vegetation of New Zealand for the 'Vegetation der Erde' (Engler and Drude) series. From 1904 to June 1913, he tells us in his preface, he worked to acquire a first-hand knowledge of at least typical examples of the vegetation of each botanical district. The book was finished in 1914, but the Great War postponed publication until 1921. The second edition, published in 1928 (the first was disposed of within a year of its appearance), was a new book, largely rewritten and revised, owing to his having re-explored much of the region in the interior. Much of this preparatory work of exploration is embodied in a series of "Reports on Botanical Surveys" published by the New Zealand Government (1907–11), and comprising detailed accounts of the vegetation of selected areas—Kapiti Islands, Stewart Island, Tongarivo National Park, Waipoua Kauri Forest, and the New Zealand Sand Dunes—and embodying critical remarks on many of the species. The report on "The Dune Areas of New Zealand, their Geology, Botany, and Reclamation" illustrates another phase of his botanical work—namely its application to economic problems, such as those of forestry and agriculture. His contribution to the "Report" of the Imperial Botanical Conference of 1924, records the history of Economic Plant Ecology in New Zealand, with references to much of his own work, which, especially in relation to grassland, has been continued by his son Mr. A. H. Cockayne, Biologist to the Department of Agriculture.

Cockayne's study of the remarkable variation which characterises many species of the New Zealand flora, including the striking prevalence of juvenile forms and their behaviour under experiment, led him to considerations of problems of evolution. Some "Observations concerning Evolution derived from Ecological Studies in New Zealand" were published in the 'Transactions of the New Zealand Institute' in 1912. He regarded hybridisation as an important factor in the polymorphism shown by many species. Some idea of his detailed knowledge of the vegetation of the country may be gained from his 'New Zealand Plants and their Story'—a small book, but an eminently readable and instructive account of the plant-life of the Dominion. The second, enlarged edition (1919) (the first edition was published in 1910) appeared under Government Authority as Manual No. 1 of the New Zealand Board of Science and Art. It will well repay persual by any serious student of botany.

Cockayne's work received acknowledgment both in New Zealand and abroad. The New Zealand Institute, in whose Transactions much of his work was published, conferred on him their Hector and Hutton Memorial Medals, and in 1918–19 he was President of the Institute. In 1912 he was elected F.R.S.; his nomination had been strongly supported by Sir Joseph Hooker, who held a high opinion of his work. In 1928 he was awarded the Darwin Medal of the Royal Society, and in 1932 the Veitch Memorial Medal of our Royal Horticultural Society. He was elected F.L.S. in 1910 and many European and American Societies had conferred on him their Honorary Membership. He was Ph.D. (Munich) and Hon. D.Sc. (New Zealand). In 1929 he was created C.M.G.

His memorial is his work. He began a new chapter in New Zealand botany and stimulated others to continue it.—A. B. Rendle.

SHORT NOTES.

Isoëtes in Devon.—Mr. C. Oldham concludes his note in the June and July issues of the *Journal* with the following sentence:—"I know of no authentic record of the occurrence hitherto of *Isoëtes* in Cornwall or Devon."

The late W. P. Hiern recorded *Isoëtes lacustris* L. from Devon, v.c. 3, Botanical District 8 (Tavistock), in 1909 (see "First Report of the Botany Committee," Trans. Devonshire Assoc. 1909, 114). I called at the R.A.M. Museum, Exeter, and renewed acquaintance with the specimens in the Hiern Herbarium, which were collected on July 17, 1909.—F. A. Brokenshire.

ABNORMALITY IN HELIOPSIS HELIANTHOIDES (L.) Sweet.—The aggregation of the flowers of the Compositae into capitula is a character very rarely affected in any of the numerous instances of abnormality recorded for the family. Penzig (Pflanzen-Teratologie, ed. 2, ii. 465; 1921) records the occurrence of solitary flowers as an abnormality only in *Chrysanthemum Leucanthemum* L., *Centaurea Jacea* L., and *Catananche lutea* L. A specimen of *Heliopsis helianthoides* (L.) Sweet, sent to the Botany Department of the British Museum by Miss A. M. Turpin of Battle Abbey, Sussex, is a remarkable example of this abnormality, at least five of the stem-leaves bearing in their axils shortly peduncled, solitary, bright yellow ray-florets. The stem terminates in immature, apparently normal, flower-heads.—A. W. EXELL.

REVIEWS.

Recent Discoveries in the Newfoundland Flora. By M. L. FERNALD. (Reprinted from 'Rhodora,' nos. 409–420, January–December 1933.) Pp. 403, with 42 plates and numerous distributional maps.

THE present work is mainly the result of two botanical expeditions to Newfoundland in 1926 and 1929, and is of quite exceptional interest. When Prof. Fernald was visiting this country in 1930 he remarked some similarity between the physical features of Newfoundland and the Scottish Highlands, but what strikes a British botanist on perusing these notes is the infinitely richer flora of the former country, although it is approximately only one third larger than Scotland.

The first part of the work deals largely with the geographical and geological features of the regions visited, and demonstrates the remarkable fact that on the peaty tablelands of Western Newfoundland a flora of pronounced austral affinities prevails, while close to sea-level on the outer coast there is an abundance of arctic and arctic-alpine species. The causes of this are fully discussed, and another interesting phenomenon to which Prof. Fernald draws attention is the irregular occurrence of annual arctic plants under the varying climatic conditions of different years.

The principal part is occupied with a series of notes running through the whole phanerogamic flora. Many new groups are described, and the numerous illustrative plates are excellent. Among the genera and species to which special attention has been given are *Festuca rubra* agg., *Agropyron*, *Agrostis*, *Carex alpina*, *Euphrasia*, *Antennaria*, and *Taraxacum*. *Festuca fallax* Thuill., treated as a subspecies by many European authors, is reduced to a variety of *F. rubra* L., while the viviparous fescue of the highest Newfoundland mountains is raised to specific rank

as *F. prolifera*. The Agropyrons of eastern North America are reviewed in considerable detail, as are also *Agrostis borealis* Hartm. and *A. scabra* Willd. Under *Carex alpina* Prof. Fernald points out that the earlier name *C. Halleri* Gunnerus is a *nomen confusum*. The pages devoted to *Euphrasia* deal chiefly with the American species *E. Oakesii* Wettst., *E. Williamsii* Robinson, and *E. purpurea* Reeks, but Prof. Fernald writes at length on his reasons (answered in this Journal, 1933, 303) for retaining the name *E. arctica* Lange for *E. latifolia* Pursh ex Wettst. "The Genus *Antennaria* in Newfoundland" is practically a monograph of the group, as represented in the island; and six new species are described and figured. Of the Dandelions of eastern North America, which consist, as in Europe, of common aggressive weeds and a series of indigenous forms for the most part local and non-aggressive, eleven species only are admitted, of which seven inhabit Newfoundland. The specific values of the innumerable recent Scandinavian splits in this genus are with reason strongly criticised, but it may be doubted whether Prof. Fernald's reduction of our common weed, *Taraxacum officinale* Weber, to a variety of *T. palustre* (Lyons) Lamk. & DC. will commend itself either to European specialists in the genus or to critical students of the general British flora.

The work, as a whole, is of the highest value, and notable for its wealth of detail and illustration.—H. W. PUGSLEY.

Studien über die Morphologie und Systematik der nicht-Lichenisierten inoperculaten Discomyceten. By J. A. NANNFELDT. Nov. Act. Reg. Soc. Scient. Upsaliensis, ser. iv. viii, no. 2, 1932. Pp. 368, 47 text-figures, and 20 plates.

THIS important work on inoperculate Discomycetes, which was a thesis for a doctorate, has only recently come to hand for review.

The first seventy pages deal with different systems of classification of the Ascomycetes and their phylogeny, and with the sections of Discomycetes. This introduction gives a very useful critical summary of the general problems. The special part treats of the Ostropales and Helotiales, the second of which includes Dermatiaceae, Phacidiaceae, Orbiliaceae, Hyaloscyphaceae, Helotiaceae, and Geoglossaceae. The families are further subdivided and critically circumscribed.

The monograph is not set out in the usual form, but is more in the style of a commentary on genera and species, the structural details being based both on specimens of the author's own collecting and on *exsiccatæ*; it is not restricted to European species, though chiefly concerned with them.

The text-figures are line-drawings giving microscopical details, and the plates are photomicrographs of microtome sections.

The work is full of valuable information, and will need to be consulted by all mycologists interested in Discomycetes. It contains six new genera (and two new names), thirteen new species, and one hundred and six new combinations.—J. R.

Pflanzen-thermodynamik. By KURT STERN. Cr. 8vo, pp. xi, 412, 20 figs. Springer : Berlin, 1933. Price R.M. 32.

THERE is abundant evidence that the fundamental principles of thermodynamics are difficult to grasp. To mention a few instances : in the past physical chemists used the heat of reaction as a measure of the work that could be performed ; at the present time the heat of combustion of glucose is often used (though not in the book under review) as a measure of the energy required for the synthesis of the sugar from carbon dioxide and water ; a discussion is now proceeding between eminent scientists in a weekly scientific periodical as to what is the precise value for the change of entropy in a specific case. Such being the state of affairs it is obvious that a book which would put the plant physiologist in the way of acquiring a right understanding of thermodynamic principles would be invaluable. This is the task which our author sets himself.

His book is divided into two parts : the first is pure thermodynamics (as the author puts it " keine leichte Lektüre für den Biologen "), while the second consists of applications to plant physiology. We presume that the author did consider the possibility of intermingling the two parts, a procedure which seems to us to have many advantages, since the only way to learn the right and avoid the wrong uses of principles and methods is to apply them.

The first part is a good exposition. With such an example as the text-book of Lewis and Randall, which the author obviously had before him, there would be no excuse for a bad exposition. The second part, where the real test of the book is to be made, might be clearer in places. In discussing the problem of raising water in trees the author shows that the decrease of free energy when one gram of water is evaporated into an atmosphere which is 90 per cent. saturated, the temperature being 17° C., is 1450 metre-grams (the unit of work is unfortunately indicated as gm.), and so arrives at 1450 metres as the maximum height to which the cohesion mechanism can lift water. We think a better presentation would have been as follows. In a saturated atmosphere the vapour pressure at a height of 1450 metres is 90 per cent. of that at ground level and water vapour at this partial pressure is in equilibrium with water at the top of a column 1450 metres high and exposed to the tension of this column. As the author presents it, the reader might get the idea that the evaporation did the work of raising the water, whereas there is actually no difference between the free energy of the water at the top and bottom of the column. On p. 261 the muddle about osmotic pressure is perpetuated by the statement that osmotic pressure lowers the vapour pressure of a solution. There are some errors ; 4 cal. for 4 Kal. on p. 278, " Nitrit " and " Nitrat " should be interchanged on the middle of p. 307.

On the whole, the book goes a long way towards fulfilling the aim of its author.—G. E. BRIGGS.

SIXTH INTERNATIONAL BOTANICAL CONGRESS.

AMSTERDAM, SEPTEMBER 2–7, 1935.

(Secretary : Dr. M. J. SIRKS, Wageningen, Holland.)

THE Organizing Committee announces that the following topics have been chosen preliminarily for discussion in the sections :—

AGR., Agronomy.—(1) Interactions between roots and soil ; interactions between plants. (2) Virus diseases. (3 *a*) Weed flora as an indicator of soil conditions in agriculture. (3 *b*) Grassland associations. (4 *a*) Genetics and breeding of immune varieties. (4 *b*) Inbreeding. (5) Importance of microbiological investigations in the study of agricultural problems. (6) Effect on the cycle of development in plants.

CYT., Cytology.—(1) Structure of chromosomes. (2 *a*) Crossing-over *versus* conversion. (2 *b*) Terminology of cytology and genetics. (3 *a*) Pairing of chromosomes in polyploids. (3 *b*) Reduction division in Fungi. (4) Chain- and ring-formation of chromosomes. (5 *a*) Submicroscopical structure of the cell-wall. (5 *b*) Vacuome, chondriome, plastids. (6) Colloid chemistry of protoplasm ; vital staining.

GEN., Genetics.—(1 *a*) Experimental mutations. (1 *b*) Genetical basis of size and form. (2 *a*) Crossing-over *versus* conversion. (2 *b*) Terminology of cytology and genetics. (3 *a*) Sexuality in Fungi. (3 *b*) Reduction division in Fungi (4 *a*) Genetics and breeding of immune varieties. (4 *b*) Inbreeding. (5) Taxonomy and genetics. (6 *a*) Plasm and genotype in their mutual relations. (6 *b*) Letal factors.

GEO., Geobotany, ecology, and phytogeography.—(1) Climax associations in N.W. Europe and N. America. (2) Cartography : (*a*) Vegetation maps ; (*b*) Area maps. (3) Flora and vegetation area. (4) Plant geography in younger formations. (5) The halophyte problem. (6 *a*) Classification and nomenclature of vegetation units. (6 *b*) Miscellaneous papers.

MOR., Morphology and anatomy.—(1 *a*) Size and form. (1 *b*) Genetical basis of size and form. (2 *a*) Phyto-hormones ; general paper. (2 *b*) Leaf-arrangements. (3) Flower morphology. (4) Female fructification and phylogeny of Conifers. (5 *a*) Wood anatomy. (5 *b*) Relations between anatomy and external morphology. (6) Morphology of Bryophytes.

MYC., Mycology and bacteriology.—(1) Differential characters in Hymenomycetes. (2) Nomenclature of Fungi. (3 *a*) Sexuality in Fungi. (3 *b*) Reduction division in Fungi. (4) Biologic forms of Fungi. (5) Importance of microbiological investigations in the study of agricultural problems. (6) Phylogeny and taxonomy of Phycomycetes.

PATH., Phytopathology.—(1) Biological basis of plant quarantine. (2) Virus diseases. (3) Various papers. (4) Biologic forms of Fungi. (5) Immunisation. (6) Physiologic diseases.

PB., Palæobotany.—(1) Geobotanical provinces in the older formations. (2) Caytoniales and Pteridospermae and the evolution of Angiosperms. (3) Flower morphology. (4) Plant geography in younger formations. (5) Synchronism and uniformity in palæozoic and mesozoic floras. (6) Various papers.

PH., Plant physiology.—(1) Photosynthesis. (2 *a*) Phyto-hormones; general paper. (2 *b*) Phyto-hormones; various papers. (3) Oxidation, reduction and metabolism. (4) Permeability and the accumulation of mineral elements. (5 *a*) Sub-microscopical structure of the cell-wall. (5 *b*) Translocation of plastic materials. (6) Influencing the cycle of development in plants.

SYS., Taxonomy and nomenclature.—(1) Various papers. (2) Caytoniales and Pteridospermae and the evolution of Angiosperms. (3) Flower morphology. (4) Female fructification and phylogeny of Conifers. (5) Taxonomy and genetics. (6) Phylogeny and taxonomy of Phycomycetes.

Motions dealing with Nomenclature for consideration by the Congress should be sent, before January 1, 1935, to Dr. T. A. SPRAGUE, The Herbarium, Royal Botanic Gardens, Kew, Surrey, England, who has undertaken to collate and report on them at the request of the Executive Committee of the Congress and the Executive Committee for Nomenclature, no Rapporteur général having been appointed at Cambridge.

Motions must be presented in the form of additional articles (or amendments) to the International Rules, ed. 3, the English text * of which may be obtained from Messrs. TAYLOR and FRANCIS, Red Lion Court, Fleet Street, London, E.C. 4, at the price of 2*s*. They must be drafted as briefly as possible in Latin, English, French, German, or Italian. At least 100 printed copies must be presented.

Only motions relating to new points which were not settled at previous Congresses can be presented. Motions not complying with these conditions will not be discussed unless the Amsterdam Congress, 1935, decides to take them into consideration.

In accordance with the decision of the Cambridge Congress, the changes in the Rules made by that Congress will be considered at Amsterdam for confirmation, amendment, or rejection.

* The edition in three languages (English, French, German) is in print, and will shortly be published, with examples and lists of names, by GUSTAV FISCHER, Jena.

MYCOLOGICAL NOTES.—VII.

BY W. B. GROVE, M.A.

(Continued from vol. lix. p. 315.)

UROMYCES FESTUCAE Syd.

IN the *Journal of Botany*, 1921, 314, I described under the name ? *Uredo Festucae* DC. a Rust which I had found repeatedly in the Midlands and elsewhere on three species of *Festuca* (*ovina*, *rubra*, and *duriuscula*), but only in the uredo-stage and in small quantity. It was, therefore, uncertain to which genus (*Uromyces* or *Puccinia*) it should be assigned, although my inclination was to refer it to *Uromyces Festucae* Syd.

Since then Mr. John Rees, of the University College of Cardiff, has found the same Rust, so I am informed, in the years 1924, 1925, and 1926, on the same three hosts. But he did not, apparently, meet with the teleutospores until the extraordinary hot summer of 1933; then he found them on the lower parts of a few leaves of *Festuca rubra* on the Experimental Farm of the College at Cardiff. These he sent to Miss Wakefield, and she very kindly passed them on to me. It was at once evident that the Rust was a *Uromyces*, and it agreed very well with Sydow's species.

But it also became apparent that the teleutospores bore a striking resemblance to those of *Uromyces Poae* Rabenh. (1866), and, as is well known, these latter are exceedingly similar to those of *Uro. Dactylidis* Otth (1861). I suggested in my 'Rust Fungi' (1913, 126) that these two were really nothing but forms of the same species, and to these we must now add *Uro. Festucae* Syd. (1900) as at any rate a close ally. About these similarities no definite conclusion seems so far to have been attained.

There is one point, however, on which an ambiguity may have delayed agreement. I remarked (1913, *l. c.*) that, in speaking of the occurrence or absence of paraphyses in the uredosori of *U. Poae* and *U. Dactylidis*, "the various authorities flatly contradict one another." Now, in these species, and also in several Puccinias, the pedicels of the uredospores frequently remain still standing erect when the spores have fallen off, and even seem to grow longer after losing the spore. It would be easy to mistake these pedicels lingering among the still-unshed spores for paraphyses, and in not a few of these cases which I have personally examined I am convinced that such a mistake is the cause of the disagreement as to whether paraphyses are present or not.

The one peculiarity which might be thought sufficient to form a distinctive mark of *U. Festucae* is, as I stated in 1921, that each of its groups of uredosori is often seated on a conspicuous yellow blotch much larger than itself. This arrangement gives to the leaf a strange look which is never seen in the leaves infested by

either of the two other forms, viz., a brindled appearance after the style of *Eulalia zebrina*, with alternate transverse bands of green and yellow. But I am not sure that this mark is constant, and it may be due in part to the narrowness of the leaf.

With regard to the finding of the teleutospores of *U. Festucae* in this country only in the year 1933, it may be permissible to refer here to some other curious effects of the weather upon Rusts during that year, which I have recorded in the 'Transactions of the British Mycological Society' for 1934 (xviii. 265–270).

Another point worthy of notice is that Bubák proved that *Uromyces Festucae* Syd. has its æcidial stage upon *Ranunculus bulbosus*, and Klebahn has proved that *Uromyces Ranunculi-Festucae* Jaap has its æcidial stage upon the same host. Therefore, when it is remembered that both *Uro. Dactylidis* and *Uro. Poae* also have their æcidial stages on *R. bulbosus* (among other *Ranunculi*), it is clear that these "species" of *Uromyces* agree closely in their life-cycles, and are best envisaged as forms of one species which, like all species, varies slightly according to its environment.

This species will take the name UROMYCES DACTYLIDIS Otth, emend. Grove.

Æcidia in foliis Ranunculorum habitant, præsertim *R. bulbosi*, *R. repentis*, *R. acris*, *R. Ficariae*, habitu et forma æcidiis Pucciniacearum normalium simillima.

Uredosporæ subglobosæ v. ellipsoideæ, echinulatæ, haud paraphysibus interspersæ; teleutosporæ ±obovoideæ, læves, episporio tenui vix apicem versus leviter incrassato instructæ, paraphysibus stipatis obtusis brunneis oblongis obvallatæ; ambæ in culmis et foliis graminum (Poacearum e tribu Festucearum) habitant.

Varietates extant—α. **Dactylidis.** β. **Poae.** γ. **Festucae.**

All these three forms have the same peculiar dark-brown paraphyses interspersed in their teleutosori, which is another sign of their near relationship and practical, but not complete, identity. For it is true that they all differ in the way in which they affect their host-plants. The teleutosori of *U. Dactylidis* are larger, darker, and more abundant, and, therefore, much more conspicuous, on the leaves of *Dactylis* than those of the other two on their host-leaves, and, moreover, they often occur in great quantity on the culms—an occurrence not yet observed on *Poa* or *Festuca*. Neither of the others, besides, shows any brindling effect of the uredosori upon their host, such as is noticed on *Festuca*. But, obviously, all these differences might arise simply from the nature of the host, *i. e.*, from the differences in the structure and tissues of the three genera of Grasses. Nothing but experiments, conducted upon *ad hoc* lines, can allay these doubts, and, in any case, these differences are worthy only of varietal rank.

The reference given above to the abnormal spring of 1933 may be supplemented by two recent observations. The wonderful æcidium of *U. sparsus* has been found again this year on *Spergularia* at the same locality (Scolt Head, Norfolk); it occurs on seedlings or on the lower parts of more mature plants. Furthermore, Mr. E. A. Ellis's brother has found three leaves of *Rumex Acetosa* on the highest part of the Ringland Hills, Norfolk, each affected by the rare æcidia of *U. Acetosae*, and he remarks that that locality is similar in character to Boniface Down, Ventnor, where the few affected leaves were found last year.

UROMYCES GENISTAE Fckl.

In August 1933 Dr. P. G. M. Rhodes sent me a specimen of *Uromyces* on *Genista tinctoria*, which he had found at Rous Lench, Worcestershire, and in the following month he took me to the locality so that I might gather specimens with my own hands. This species may be included under the title *Uromyces Genistae* Fckl. (1869), but is now separated by some authors, under the name *U. Genistae-tinctoriae* Winter, because it was classed by Persoon under *Uredo appendiculata* as var. *Genistae-tinctoriae*. It has been found also on *Genista sagittalis* and, it is said, on various species of *Cytisus* and *Sarothamnus*; it is spread all over Europe and as far east as Siberia and Japan. Its teleutospores, which have not yet been seen in England, are distinctly striated like those of *U. striatus* on *Medicago*, and, like that, it is said to have its æcidial stage on *Euphorbia Cyparissias* (Dietel, in Ann. Mycol. 1919, 108–9).

SEPTORIA GLADIOLI Passerini.

This Coelomycete has been found on the Continent and in the United States on wild and cultivated *Gladiolus*, and in due course (about 1925) was imported on the corms into this country, where it has since been observed in Devon, Cornwall, Scilly Isles, Lancashire, etc.

By the courtesy of Mr. E. W. Mason, of the Imperial Mycological Institute, Kew, I have been enabled to examine a fungus growing in April on leaves of *Gladiolus* which had been sent from Cyprus by Mr. Nattrass. On examination by the unarmed eye it could be seen that there were on the leaves two different-looking species of parasitic growth: (1) small black pycnidia in great numbers, arranged more or less in lines lying between the veins, and occupying somewhat quadrate areas which were tinged with a dusky, cloudy hue; of these there were many on each leaf; and (2) a few slightly larger and blacker pycnidia forming a cluster in the centre of a distinct, nearly round "spot," which was pallid in the middle and surrounded by a broad, bright brown border; of these "spots" there were only a few on a leaf.

The contents of no. 1 were *Ascochyta*-like spores, linear-fusoid in shape, about 24–30×3·5–4 μ, mostly with a distinct

septum in the middle; some of these were marked with the suspicion of another septum dividing each half, but this appearance was uncertain, and might have been illusory. The contents of no. 2 were *Septoria*-like spores of an elongated curvilinear shape, often somewhat broader at the upper end than at the other, and furnished with an irregular row of guttules down the middle line, but so far without any distinct sign of a septum. They measured 40–60×2–3·5 μ.

All the spores were quite colourless, and the pycnidia had the structure usual in both the two genera *Ascochyta* and *Septoria*. It should be noted especially that in the U.S.A. the spores of *Septoria Gladioli* are said to be ultimately triseptate.

No. 2 is evidently what was called by Passerini, more than fifty years ago, *Septoria Gladioli*, but no. 1 is so much like it, and is so intermixed with it, that one could not help conjecturing that they are both stages of the same fungus, not merely because they are associated (which in itself goes for nothing), but because all the forms of spores intermediate between the two extremes could be found mixed together in *some* of the pycnidia.

Some time previously I had received from my friend the Rev. P. G. M. Rhodes a similar fungus growing in July on the dying stems and leaves of an early-flowering yellow *Gladiolus* in a cliff-garden at Polperro, Cornwall (? *G. Colvillei*). This fungus appeared rather to be saprophytic, while the other, from Cyprus, was, presumably, parasitic. Yet the *Septoria*-like spores from the pycnidia on its stems were the same as those of no. 2, and the pycnidia were arranged on them on pallid spot-like areas, but without the bright brown border. On the leaves the pycnidia were in short lines, occupying greyish, cloudy, quadrate areas like those of no. 1 from Cyprus, but the spores were wholly *Septoria*-like and many of the pycnidia were empty. In this Cornish fungus there were no *Ascochyta*-like spores in either form of pycnidia.

The conclusion which one would draw from these phenomena is that the fungus passes through a stage which, if it were found alone, would be called *Ascochyta*, on the way to its full development as a *Septoria*.

Instances of a similar transformation are well known. Among others *Septoria Armoraciae* and *S. Chenopodii* both pass through states which for a long time had in books been called *Ascochyta*: see my article on this subject in the *Journal of Botany*, 1917, 346 ff. Furthermore, several species of the similar genus *Stagonospora* show the same transition, e. g., *Stagonospora compta* Died., on *Trifolium*, has been called in its early state by many authors *Ascochyta Trifolii*; and the young 1-septate state of *Stagonospora Sparganii* (Sacc.) is loudly, but erringly, proclaimed by Kabát and Bubák, with great emphasis, to be entitled to be called *Ascochyta quadriguttulata*.

More about Fusidomus.

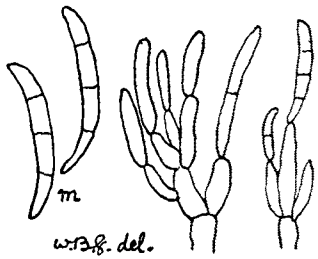
After the note on *Fusidomus* (a pycnidial stage of *Gibberella*) in this Journal (1929, 201) had been put in type, but just before it was printed, my friend Mr. E. W. Mason, with great kindness, brought to my notice the fungi referred to below, which undoubtedly bear a close relation to what was in 1929 called *Fusidomus*, and yet are not quite identical with it. In fact, the only reference in the older mycological literature to the state of things to which the name *Fusidomus* was designed to call attention is, perhaps, to be found in the following words of the omniscient Saccardo (Syll. ii. 554): "Conidiis in mycelii ramulis solitariis *vel in receptaculis minutis carnosis*, fusiformibus" (italics not in the original). As will be seen, all the fungi to be mentioned in this connection are stated to have their spores supported on pedicels quite differently from those of *Fusidomus*, viz., more or less like those of *Hendersonia*. I cannot but fancy, however, that in some cases these supposed pedicels were nothing but germination-tubes given off from the base of the loose spores, which readily germinate and become tailed.

Taking the references so aptly unearthed by Mr. Mason in order of time, we begin with the famous Frederic Currey, who (in Trans. Linn. Soc. Lond. xxii. 330; 1859) states that, on examining a specimen in the Hookerian herbarium, labelled by Berkeley *Sphaeria* (*Hendersonia*) *Zeae* Schwein. (Fr. Syst. Myc. ii. 527), he could find no asci in it; but afterwards, in his "Supplementary Observations" (Linn. Trans. xxv. 259; 1866) he records that, on re-examining a quite different specimen in the same herbarium so named by Schweinitz himself, he found asci and sporidia besides the fruit of *Hendersonia Arcus* B. & Br., and is, therefore, "quite convinced that *Sphaeria Zeae* Schw. is nothing more than *Sph. pulicaris* Fr., and that *Hendersonia Arcus* B. & Br. is a stylosporous state of the latter *Sphaeria*." Had he been writing at a later date it is probable that he would have cited *Gibbera Saubinetii* Mont. instead of *Sphaeria pulicaris* Fr.

Diedicke, in Krypt. Flor. Brandenburg, Pilze, vii. 561 (1914), instituted a new pycnidial genus *Stagonostroma*, which has a stroma bearing on its summit a conceptacle, or several such botryosely aggregated, closely resembling in colour and texture those of *Gibberella*, and furnished with hyaline fusoid pluriseptate spores on inconspicuous pedicels. In this genus he placed *Stagonostroma Dulcamarae* (Passer.) Died. with curved fusoid 3–5-septate spores, 30–40×4–7 μ, on dry stems of *Solanum Dulcamara* in Germany. This he assigned as a pycnidial stage to *Cucurbitaria Dulcamarae* (K. & Sch.), a guess which is very dubious or, indeed, incredible. It is clear that this fungus of Diedicke's cannot be quite the same as *Fusidomus*, since the latter has its spores on conspicuous and persistent pedicels of

a special character, yet it must be closely allied (see text-figure of *Fusidomus Arcus* below).

In Annal. Mycol. xv. 259 (1917), in "Zur Kenntnis der Pilzflora der Philippinen-Inseln," Sydow described a new genus, *Botryogene*, in which he placed a new species, *B. Visci*, on leaves and stems of *Viscum Opuntia*, Luzon, Philippine Islands, and illustrated it by fig. iii. 1–4. The pycnidia are botryosely aggregated on a stroma and resemble the conceptacles of *Gibberella*; spores fusoid (like those of *Fusarium*), 1–3-septate, 45–60×7–9 μ; pedicels cylindric, 15–30 μ long, each bearing at its apex a single or 2–4 spores.



Fusidomus Arcus Gr. Mycelium bearing immature and nearly mature spores within a pycnidium; *m*, two mature spores. All ×600.

Von Höhnel, however, in 'Hedwigia,' lx. 157 (1919), after investigating the original specimen, says: "This is an undeveloped *Gibberella*, misconceived by its author." It is, in fact, obviously a state resembling what I call *Fusidomus*. Von Höhnel then added that *Gibberella* has three kinds of pycnidia:—

(1) *Cyanophomella* v. Höhn., with small hyaline one-celled conidia;
(2) *Cyanochyta* v. Höhn. (Fragm. no. 107, Mitth. xvii; 1915), with hyaline two-celled conidia; and
(3) *Stagonostroma* Died., with hyaline, fusoid, pluriseptate conidia.

In that case, he says, *Botryogene* Syd. (1917)=*Stagonostroma* Died. (1914), and, therefore, Sydow's species should be called *St. Visci* (Syd.) v. Höhn. To the same group belong, he continues, *Stagonospora Euonymi* Sacc. Syll. iii. 447, and *Hendersonia Arcus* B. & Br. on *Buxus* (which are pycnidial forms, respectively, of *Gibberella Euonymi* and ? *G. pulicaris*), and also, perhaps, *Lisea Buxi* (Fckl.) Sacc., which appears to be merely a young state of the *Gibberella* on *Buxus*.

It is clear from these remarks that *Gibberella* possesses several pycnidial stages, and that Currey found at least one on *Zea*, though the other, with *Diplodia*-spores (*Sphaeria Zeae* Curr. Simpl. Sphaer. no. 358, f. 128), which he likewise found there, has

apparently nothing to do with the *Gibberella* (for this see *Diplodia Maydis* Sacc. Syll. iii. 373). In view of the fact that *Gibberella Saubinetii* Sacc. has been lately showing itself as a pest of cultivated Wheat and Maize, these records of mycologists in the past may have some interest for present workers.

I myself have to record finding recently a *Fusidomus* on old dead stems of *Solanum Dulcamara* at Hadzor, near Droitwich, and also a *Stagonostroma* on *Prunus*.

Now "let us hear the conclusion of the whole matter."

The genus *Gibberella*, as I have seen it, is distinguished from most other Fungi by having a peridial tissue (both pycnidial and perithecial) composed of soft pseudoparenchymatous, subtranslucent, thin-walled cells which tend for some time to be of a beautiful bluish or violaceous tint, but may afterwards fade at times to a rather pale fuscous-brown, either wholly or in part. The mycelium usually produces, on its surface, curvulous fusoid conidia, eseptate or provided with one or three or more transverse septa, which spores have been classed by authors under the multivorous genus *Fusarium* (or its section, *Selenosporium*). But these conidia, or spores closely resembling them, can also be produced within pycnidial conceptacles, and these pycnidia can grow, according to circumstances, either singly on the host or in botryose aggregations on a stroma, probably or presumably in any species of the genus. Besides these there are in other pycnidia spores resembling those of *Ascochyta* and *Phoma*, if von Höhnel is correct. At another time sporidia are produced in asci within a perithecial chamber whose walls are similar in all respects to those of the before-mentioned pycnidia; moreover, these conceptacles can, in one and the same species, stand singly or a few together on the host or be botryosely aggregated on a stroma. The sporidia resemble the first-mentioned conidia to some extent in being fusoid and 1–3-septate, but they are never so curved or so acute at the ends as are the spores in *Fusarium* and *Fusidomus*.

NEW MALAYAN RUBIACEAE.

By H. N. Ridley, C.M.G., F.R.S.

(Concluded from p. 257.)

Tarenna arborescens, sp. nov. Species a *T. Wallichii* (Hook. fil.), cui affinis, floribus pluribus majoribus, calycis et corollæ lobis haud sericeis, corollæ lobis longioribus, stylo longiore et graciliore, differt.

Arbor parva glabra ramulis angulatis. *Folia* pergamacea, sicca olivacea, elliptica cuspidato-acuminata acuta, basibus longe attenuatis, 15–16 cm. longa, 6 cm. lata, nervis 11-paribus gracilibus ad apices inarcuantibus, costa subtus elevata, petiolis

1·2–2 cm. longis. *Stipulæ* connatæ, tubo 3 mm. longo, cuspidibus acutis 1 mm. longis. *Cymæ* 3 ramosæ glabræ 4 cm. longæ. *Bracteæ* lanceolatæ acutæ 3 mm. longæ. *Flores* fragrantes, plures in apicibus congestis sessilibus. *Calyx* 3 mm. longus, tubo obconico, lobis 5 ovatis cuspide brevi in dorso decurrente, glabris. *Corolla*, tubo cylindrico, in ore hirto, 3 mm. longo, lobis 5 oblongis apiculatis 5 mm. longis. *Stamina* 5, filamentis exsertis, antheris oblongo-linearibus apiculatis curvis. *Stylus* 5 mm. exsertus superne incrassatus fusiformis. *Ovula* 4.

Hab. Sarawak, Kuching. Small tree, flowers sweet-scented (*Haviland* 2979, type); (*Beccari* 1173).

Certainly allied to *T. Wallichii* (Hook. fil.), but the leaves do not dry black, the cymes are denser and shorter and glabrous, the lobes of calyx and corolla are not fringed with silky hairs, and the plant is a tree.

T. WALLICHII (Hook. fil.) Ridl. *Hab.* Banjermasin, 10–12 feet; flowers white, ovules 1 in each cell (*Motley* 338). New to Borneo.

T. STELLULATA Hook. fil. *Hab.* Sarawak, Baram, Miri River (*Hose* 535). New to Borneo.

Tarenna Hosei, sp. nov. Species a *T. Wallichii*, cui affinis, lobis corollæ rotundatis differt.

Frutex glabra. *Folia* pergamacea (sicca superne nigra subtus brunnea), lanceolata longe acuminata acuta, basi attenuata cuneata, 14–14·5 cm. longa (acumine 2 cm. longo), 3·7–4 cm. lata, costa nervisque 8-paribus subtus appresse pilosis, nervis et reticulationibus invisis, petiolis ·5–2 cm. longis. *Stipulæ* lanceolatæ acuminatæ glabræ, basi connatæ, 4 mm. longæ. *Bracteæ* lanceolatæ acutæ 2 mm. longæ. *Cymæ* 3 terminales, pedunculis 1–2·5 cm. longis hirtis, ramis 1 cm. longis. *Flores* in cymula 7; pedicellis 3 mm. longis. *Calyx* urceolatus hirtus 2 mm. longus, limbo distincto, dentibus 5 brevibus ovatis subacutis. *Corolla*, tubo pubescente 4–5 mm. longo, superne dilatato, ore hirto, lobis 5 rotundato-oblongis 3 mm. latis. *Stamina*, antheris linearibus 4 mm. longis. *Stylus*, basi hirto pubescente, cylindricus 8 mm. exsertus, stigmatibus terminalibus recurvis brevissimis.

Hab. Sarawak, Baram, Mount Trekan (*Hose* 636).

This is remarkable for its broad rounded corolla-lobes.

Tarenna debilis, sp. nov. Species a *T. fragranti* (Bl.), cui affinis, foliis tenuioribus, nervis sæpe subtus pubescentibus paucioribus, cymis et calycibus hirtis, floribus brevioribus, corolla tubo breviore pubescente, ore barbato, stylo breviore, differt.

Frutex vel arbor, ramulis appresse hirtis mox glabris. *Folia* pergamacea glabra elliptica vel elliptico-lanceolata acuminata vel cuspido-acuminata basibus attenuatis, 10·5–14 cm. longa, 3·5–7 cm. lata, costa superne canaliculata subtus elevata appresse-hirta, nervis 6–7-paribus subtus appresse hirtis, reticulationibus laxis, sæpissime invisis, petiolis 2 cm. longis hirtis. *Stipulæ* lanceolatæ acuminatæ liberæ, extus et intus hirtæ, 1 cm. longæ. *Cymæ* ramosæ multifloræ corymbiformes hirtæ 5 cm. longæ. *Bracteæ* lineari-lanceolatæ acuminatæ hirtæ. *Flores* pedicellati, pedicellis 3 mm. longis. *Calyx* urceolatus pubescens 2 mm. longus, lobis 5 brevibus triangulatis. *Corolla* pubescens, tubo cylindrico 1 cm. longo, ore albo-barbato, lobis 5 oblanceolatis obtusis subtruncatis extus pubescentibus intus ad bases hirtis, 3 mm. longis, 2 mm. latis. *Stamina*, antheris oblongis obtusis 2 mm. longis. *Stylus* cylindricus fusiformi-clavatus, 4 mm. exsertus. *Ovarium*, ovulis 3–9 in loculo. *Bacca* globosa 7 mm. longa. *Semina* 4 mm. longa, dorso rotundato, ventre acuto, testa brunnea rugosa.

Hab. Sarawak (*Beccari* 3187); Baram (*Haviland & Hose* 3427; 3428, type); Kuching (*Haviland* 2974; *Haviland & Hose* 3430); Mount Merapok (*Merrill's collector* 14).

This is allied to *T. fragrans* (Bl.), but the leaves are thinner, the branches more slender and weaker, and it is altogether a more hairy plant.

Tarenna Bartlettii, sp. nov. Species a *T. fragranti*, cui affinis, foliis tenuibus lanceolatis acuminatis, panicula laxa pauciflora, pedicellis longis, differt.

Frutex ramosa. *Folia* pergamacea glabra lanceolata subabrupte longe acuminata, basi angustato, 10–11 cm. longa, 3–4 cm. lata, nervis 6-paribus gracilibus, reticulationibus inconspicuis, petiolis 1·5–1·8 cm. longis gracilibus. *Stipulæ* lanceolatæ ad bases connatæ. *Cymæ* laxe ramosæ, pedunculis 1 cm. longis, ramis 2·5 cm. longis puberulis. *Bracteæ* anguste lanceolatæ acuminatæ 2 mm. longæ. *Flores* pauci, pedicellis 5 mm. longis. *Calyx* pubescens campanulatus 2 mm. longus, lobis 5 brevibus ovatis. *Corolla* pubescens, tubo 5 mm. longo in ore hirto, lobis oblongis obtusis extus pubescentibus intus glabris, 3 mm. longis. *Stamina* 5, antheris oblongo-linearibus, basibus bilobis. *Stylus* 5 mm. extrusus glaber clavatus. *Drupa* grisea globosa 7 mm. longa.

Hab. Sarawak, Kuching (*Bartlett*, type). Labuan (*Lobb*).

Tarenna axillaris, sp. nov. Species a *T. pallida* Franch., cui affinis, paniculis axillaribus, floribus minoribus et foliis majoribus, differt.

Arbor parva glabra. *Folia* coriacea, sicca nigricantia, lanceolata vel elliptico-lanceolata abrupte acuminata, basi attenuata, 15–20 cm. longa, 6·5–9·5 cm. lata, costa superne depressa, nervis 10-paribus utrinque elevatis subtus crassioribus, nervulis transversis undulatis elevatis remotis, petiolis validis 1–2 cm. longis. *Stipulæ* ad bases connatæ, superne triangulares, acutæ 1 cm. longæ.

Paniculæ axillares puberulæ, 12 cm. longæ demum patentes, ramis 4–5 cm. longis, pedunculis 1 cm. longis. *Flores* breves, pedicellis 2 mm. longis. *Calyx* campanulatus, margine undulato obscure dentato 2 mm. longo. *Corolla* 5 mm. longa, tubo cylindrico in ore piloso, lobis 5 flavis lanceolatis subacutis 1 mm. longis. *Stamina* 4, filamentis brevibus erectis exsertis, antheris ovatis apiculatis. *Stylus* exsertus, stigmate crasso ovoideo costato. Ovarium biloculare, ovulis horizontalibus planis in placentis spongiosis. *Discus* paullo elevatus orbicularis. *Bacca* pisiformis 5 mm. crassus.

Hab. Sarawak (*Beccari* 3176, 3186); Kuching, Sarawak River; small tree, corolla-segments pale yellow (*Haviland* 213, 940, 965, 1692; 2973, type). Matang (*Ridley*).

I have been dubious as to the genus of this plant, which is very distinct from most species in the genus in its axillary elongate panicles and its conic ribbed stigma, but I find that *T. pallida* Franchet, of Yunnan, has similar panicles and stigma, though its inflorescence appears to be always terminal.

Gardenia longituba, sp. nov. Species a *G. longiflora* Vidal, cui affinis, calyce haud dentato, stigmatibus hirtis, differt.

Arbor glabra resinosa. *Folia* coriacea obovata vel oblanceolata cuspidata, basi cuneata sæpe inæquilatera, 12–18 cm. longa, 5–8 cm. lata, nervis elevatis 11–12-paribus, nervulis transversis parallelis copiosis, petiolis 1 cm. longis. *Stipulæ* connatæ tubiformes dentatæ 5 mm. longæ. *Flores* terminales singuli sessiles. *Calyx* infundibuliformis, haud costatus 2·5 cm. longus, margine undulato 1 cm. lato. *Corolla*, tubo cylindrico 7–10 cm. longo, lobis in alabastro contortis 6 oblongo-lanceolatis obtusis 4 mm. longis 1·4 cm. latis. *Stamina* 5, antheris apicibus extrusis linearibus apiculatis. *Stylus* crassus extrusus. *Stigma* clavatum hirtum 6 mm. longo.

Hab. Sarawak (*Beccari* 3250); Baram, Miri River (*Hose* 506). Brit. N. Borneo (*Fraser* 164, type).

This species is allied to *G. longiflora* Vidal of the Philippines, but the calyx is not toothed at the edge and the stigmas are unusually hairy.

Gardenia costulata, sp. nov. Species a *G. carinata* Wall., cui affinis, calyce vix carinato, costis paullo elevatis, bacca haud costata, differt.

Arbor ? glabra. *Folia* oblanceolata breviter cuspidata basi attenuata 10·5–12 cm. longa, 5·5 cm. lata, nervis gracilibus 12-paribus in margine inarcuantibus, secundariis brevibus 12-paribus, nervulis et reticulationibus subtus æque conspicuis, petiolis 1 cm. longis. *Stipulæ* connatæ tubiformes marginibus undulatis. *Flores* terminales sessiles singuli. *Calyx* cylindricus 2 cm. longus, 5-costatus, margine undulato breviter dentato.

Corolla, tubo cylindrico 5 cm. longo, lobis 5 oblongis obtusis 2 cm. longis 5 mm. latis. [*Stamina* non visa.] *Stylus* crassus, stigmate oblongo glabro. *Bacca* globosa 2 cm. longa 2·5 cm. lata, irregulariter rugosa, pericarpio lignoso 3 mm. crasso.

Hab. Sarawak (*Beccari* 1986).

This plant belongs to the section with elevated ribs on the calyx, and is nearest to *G. carinata* Wall., but the ribs are very much lower and hardly wing-like, as in that species. The fruit is not winged, but has faint traces of irregular ribs.

Geophila Matthewi Ridl., sp. nov. Species *G. humifusæ* King proxima, sed foliis hirtis floribusque multo majoribus differt.

Herba longe repens, caulibus gracilibus elongatis hirtis. *Folia* herbacea utrinque hirta ovata obtusa, basibus in petiolis decurrentibus, 2·5–3 cm. longa, 1–1·7 cm. lata, nervis gracilibus subtus elevatis 4-paribus, petiolis 5–10 mm. longis. *Stipulæ* lanceolatæ hirtæ 2 mm. longæ. *Flores* albi singuli terminales sessiles. *Sepala* 5 linearia hirta 4 mm. longa. *Corolla* alba, tubo hirto superne dilatato 1·5–2 cm. longo, intus hirto, capillis brevibus flavis in ore, lobis 5 ellipticis acutis extus parce hirtis, trinerviis 1·5 cm. longis 5 mm. latis. *Stamina* 5 breviora e basi orta, glabra, filamentis filiformibus 7 mm. longis, antheris anguste lanceolato-linearibus acuminatis, basibus bifidis 3 mm. longis. *Stylus* filiformis 5 mm. longus, stigmatibus 2 capitatis. [*Fructus* non visa.]

Hab. Sumatra, Bunut, Asahan (*Yates* 2042, type). Fort van der Capellan, Padang; flowers white (*C. J. Matthew*).

Matthew's small specimen is a tufted one on a short woody rhizome. Yates's is a long, slender, creeping, rooting, branched stem over a foot long. The plant is named after Fleet-Surgeon C. J. Matthew, who collected the first specimen. It is very unlike most species of the genus in the long, creeping, filiform stem, but in this resembles *G. humifusa* King, though the flowers and leaves are very much larger. The whole plant is very hairy.

REVISION OF THE SOUTH AFRICAN SPECIES OF *BARLERIA*. ADDENDA AND CORRIGENDA.

By A. A. Obermeijer, M.Sc.

A revision of these species appeared in the 'Annals of the Transvaal Museum,' xv. (1933). After this was published opportunity arose in which to study the material in various European herbaria. Many specimens and types were examined, and as a result the following corrections and additions have become necessary.

I am indebted to the following for allowing me to study the specimens entrusted to their care :—The Keeper, Department of Botany, British Museum (Nat. Hist.); Professor Dixon, Trinity College Herbarium, Dublin; and the Directors of the Botanical Gardens at Kew, Berlin, Brussels, and Zürich.

SECTION PRIONITIS.

* 3. B. PRIONITOIDES Engl. Bot. Jahrb. x. 262 (1889). [6.] *B. namutonensis* Obermeijer in Ann. Trans. Mus. xv. 142 (1933).

Before publishing I had seen only one specimen of the type-collection (*Marloth* 86, Karibib), which had reached the fruiting stage, and which probably grew in dry surroundings. The type of *B. namutonensis* is in the flowering stage, and appears to have come from a more shaded and moist situation. The ample collection of the Marloth number preserved in the Berlin Herbarium shows the two species to be identical.

62. B. EENII S. Moore in Journ. Bot. 1907, 229. [9.] *B. spathulata* N. E. Brown in Kew Bull. 1909, 128; [64.] *B. petrophila* Lindau in Engl. Bot. Jahrb. xliii. 353 (1909); [60.] *B. albida* Lindau, *op. cit.* lvii. 22 (1920).

After having compared the types of these species I have come to the conclusion that they all belong to one widely spread species.

B. sinensis Klotzsch is very similar to this species, and with more material from Portuguese East Africa may perhaps prove to be the same.

SECTION SOMALIA.

63. B. LUGARDII C. B. Clarke in Dyer, Fl. Trop. Afr. v. 161 (1899). [21.] *B. quadriloba* Obermeijer in Ann. Trans. Mus. xv. 150 (1933); [22.] *B. Breyeri* Obermeijer, *tom. cit.* 151 (1933).

The two species *B. quadriloba* and *B. Breyeri* appear to be extreme geographical forms of *B. Lugardii*.

65. B. REHMANNII C. B. Clarke in Dyer, Fl. Cap. v. i. 53 (1901).

This species belongs to the Section *Somalia*, and with *B. Lugardii* shares the character of a 4-lobed corolla. It may be distinguished from *B. Lugardii* as follows :—

i. Capsule pubescent. Leaves attenuate at base. Outer sepals ovate, anticous not deeply notched. Young leaves, bracts, and sepals strigose, but not with hispid-ciliate margins ..... *B. Lugardii.*

ii. Capsule glabrous. Leaves rounded at base. Outer sepals lanceolate, anticous deeply notched. Young leaves, bracts, and sepals with hispid-ciliate margins ..... *B. Rehmannii.*

* The numbers correspond to those used in the original revision.

SECTION EUBARLERIA.

66. B. JASMINIFLORA C. B. Clarke in Dyer, Fl. Cap. v. i. 50 (1901).

This species would come under the Section *Eubarleria-Pungentes*. The bracts and sepals are very much like those of *B. pungens*, but the leaves are narrowly oblong and not broadly ovate. (*Cape Province*; Uitenhage or Humansdorp div., between Galgebosch and Melk River, *leg. Burchell* 4759 (Herb. Kew).

26. B. BECHUANENSIS C. B. Clarke, *tom. cit.* 48. *B. bechuanensis* C. B. Clarke var. *espinulosa* C. B. Clarke, *loc. cit.*

Holub's specimen, the type of *B. bechuanensis*, is identical with Nelson 151, the type of the variety. Clarke probably mistook the bracts in the former case for leaves. In both specimens the leaf-margin is entire, white-cartilaginous, and slightly sinuate.

B. CRASSA C. B. Clarke in Dyer, Fl. Trop. Afr. v. 151 (1899). [43.] *B. venosa* Obermeijer in Ann. Trans. Mus. xv. 164 (1933).

The type of *B. crassa* (in Herb. Kew) collected by Baines (South African Goldfields) is similar to *B. venosa*.

54. B. AFFINIS C. B. Clarke in Dyer, Fl. Cap. v. i. 50 (1901). [52.] *B. cordata* Obermeijer, *tom. cit.* 172, non *B. heterotricha* Lindau in Engl. Bot. Jahrb. xxxviii. 69 (1905).

The type of *B. affinis* was collected by Holub in the Marico district, Transvaal. It is identical with *B. cordata* from Southern Rhodesia. *B. heterotricha* Lindau is a nearly related but distinct species, not identical with it. Having only the short description to rely on, I had considered *B. heterotricha* to be synonymous with *B. affinis*.

56. B. VARIABILIS Obermeijer in Ann. Trans. Mus. xv. 175 (1933).

Page 176, line 6 from the top, *for* 13,309 *read* 13,309 *a*. (This specimen bears another date than the type-specimen, and is somewhat different.)

67. B. PAPILLOSA T. Anderson in Journ. Linn. Soc., Bot. vii. 31 (1864). Section *Eubarleria—Pungentes*.

SOUTH-WEST AFRICA; Namaqualand, *leg. A. Wyley* (Herb. Trin. Coll., Dublin), *type*!

The species is near *B. rigida* var. *ilicina*. It may be distinguished from that species by the flowers being arranged in a terminal, more or less unilateral spike, and the outer sepals, which are thin, somewhat herbaceous, glandular-pubescent (like the bracts), and larger than those of *B. rigida* (*i. e.*, $\pm 1{\cdot}5$ cm. long and 1 cm. broad).

Persistent spinous bracts of some solitary, axillary flowers are found below scattered along the stem. The bracts of the spike are broader than the lower persistent ones and resemble the outer sepals. The spike has a greyish-brown colour.

The conspicuously raised cystoliths found on the leaf-surface constitute the " papillae " mentioned by Anderson.

The species was overlooked by Clarke in the ' Flora Capensis.'

61. BARLERIA DAMARENSIS T. Anderson, *tom. cit.* 29. [30.] *B. Marlothii* Engler, Bot. Jahrb. x. 262 (1889).

The type of *B. damarensis* was received on loan from the Trinity College Herbarium, Dublin, by courtesy of Professor Dixon. It was found to be identical with the type-specimen of *B. Marlothii* kindly lent by the Berlin Herbarium.

NEW VARIETY OF *VERBASCUM NIGRUM* L.

By H. W. PUGSLEY, B.A., F.L.S.

WHILE staying in September 1933, at Fowey, in South Cornwall, my attention was attracted to a form of *Verbascum nigrum* which grew in some quantity near the outskirts of the town. The plants that I saw were in good flower and all alike, and at first I doubted whether they did not belong to some species or hybrid with which I was not acquainted. They had the radical leaves, the indumentum, the simple raceme, and the yellow flowers with purple-bearded stamens of ordinary *V. nigrum*, but their stems were crowded with spreading, long-cuspidate or acuminate leaves or bracts almost to the apex, which gave the plants quite an unfamiliar aspect.

Typical *V. nigrum* appears to be absent from the district, and the peculiar form noticed was seen in different spots and seemed to be constant. Mr. Rilstone, of Polperro, informs me that he regards such a plant as the normal Cornish form.

I was unable to match the new plant in Herb. Brit. Mus., but at Kew there is a Swiss specimen (*Favrat*, Roche, Vaud, 1872, as *V. nigrum*) that is somewhat similar, though more luxuriant with a few small branches in the lower axils. One British specimen there (*Metcalfe*, South Creak, Norfolk, 1819, as *V. nigrum*) also approaches the Fowey plant to some extent.

The only described variety of *V. nigrum* that resembles this Cornish form seems to be var. *cuspidatum* Wirtgen in Fl. Preuss. Rheinprovinz, p. 318 (1857), where it is briefly distinguished as " Bracteen sehr lang u. haarfg.-zugespitzt." No material of this variety can be traced at Kew or in Herb. Brit. Mus., but through the kindness of Prof. Diels I have been supplied with a description and drawing of an authentic specimen at Berlin (Wirtgen, Herb. Plant. Select., Fl. Rhenan. no. 10). The label

is annotated " Mit langzugespitzten, oft haarspitzigen, verlängerten blüthenständigen Blättern und Brakteen." This plant has numerous cauline leaves more or less acuminate or cuspidate, with a few short axillary branches. Its lowest bracts (about 3 cm. long) are ascending, long-acuminate, and much exceed the flowers ; and the bracts are apparently longer than the flowers throughout the lowest quarter of the inflorescence. The variety evidently approaches the Fowey plant, but it is very much less extreme, its lower bracts being much less crowded and spreading, and only about one-fourth as large. The Fowey form is not included in Murbeck's recent exhaustive Monograph of the genus, and in view of its distinctive habit it is proposed to describe it as a variety, thus :—

β. **bracteosum,** var. nov. *Exsicc.* Pugsley, no. 504 (Fowey, Cornwall, 1933).

Caulis viridis, vix purpureo-tinctus. Folia caulina referta, acuta ad acuminata. Racemus vulgo simplex, elongatus, densus sed inferne interruptus, pedicellis maximis usque ad 12 mm. longis præditus. *Bracteæ* (usque ad 50) *foliaceæ*, integræ, apice sursum curvato *patentes, fere omnes floribus longiores* ; *infimæ maximæ, ad* 13 *cm. longæ, ovatæ*, cordatæ, subsessiles, *in apicem longe cuspidatum abrupte angustatæ* ; mediæ et superiores sensim decrescentes, minus cordatæ, et apice longe acuminato angustiores ; summæ lineari-lanceolatæ vel fere lineares. Corolla satis parva, c. 15 mm. diam. Aliter ut in typo.

The Linnean Herbarium contains a specimen of *Verbascum nigrum* that was placed there before 1753 and may be regarded as the specific type. It is practically identical with the form prevalent in the south-east of England and elsewhere, which is generally regarded as representing the typical species.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

Cleome Welwitschii Exell, sp. nov. (*Cleome hirta* (non Oliv.) Hiern, Cat. Afr. Pl. Welw. i. 28 (1896), pro parte quoad spec. Welw. 953, 954, et coll. carp. 206 ; *Cleome rubella* (non Burch.) Gilg & Benedict in Engl. Bot. Jahrb. liii. 157 (1915), pro parte quoad spec. Welw. 953.)

Herba suffruticosa basi ramosa. *Caules* glanduloso-pubescentes. *Folia* inferne petiolata, petiolo ad 2 cm. longo, glanduloso-pubescenti, 5–7-foliolata, foliolis lineari-oblongis, 7–14 × 1–1·5 mm., sparse glanduloso-puberulis vel nonnunquam fere glabris, superne minora sessilia vel subsessilia trifoliolata. *Flores* violaceo-purpurei luteo-variegati graciliter pedicellati, pedicellis ad 13 mm. longis glanduloso-pubescentibus, in racemos laxos vel subdensos dispositi. *Sepala* 4 lineari-lanceolata, 4 × ·6 mm.,

dense glanduloso-pubescentia. *Petala* 4 parum inæqualia anguste elliptica basi graciliter unguiculata, 9–18×2–5 mm., glabra. *Stamina* 10 omnia fertilia filamentis demum ad 18 mm. longis. *Capsula* anguste elongato-cylindrica glanduloso-puberula, gynophoro gracile ad 10–18 mm. longo. *Semina* glabra 1·5 mm. diam.

Hab. ANGOLA: littoral region near the town of Benguela, fl. and fr. June, *Welwitsch* 954 (type in Herb. Brit. Mus.), coll. carp. 206; near the R. Bero, Mossamedes, *Welwitsch* 953.

This species differs from *C. hirta* in having a relatively longer, more slender gynophore, in being much less strongly glandular-pubescent, and in having distinctly smaller seeds. *Welwitsch* 953, though apparently conspecific, has much smaller flowers than the type, and is quoted by Gilg and Benedict under *C. rubella* Burch. Possibly there has been some confusion, since this specimen is clearly not *C. rubella*, while *Welwitsch* 952, not quoted at all by Gilg and Benedict, is probably referable to that species. *C. Welwitschii* seems to be a littoral species confined to the coastal regions of Benguela and Mossamedes very nearly related to *C. hirta*, but in some respects intermediate between it and *C. Iberidella* Welw.—A. W. EXELL.

Xylopia Mendoncae Exell, sp. nov. (Annonaceae). *Frutex* ?, ramulis primo fulvo-tomentosis demum glabrescentibus. *Folia* petiolata, petiolo 3–5 mm. longo, primo fulvo-tomentoso, lamina subcoriacea anguste elliptica, elliptico-oblonga vel oblonga, 2–6×1·2–3 cm., supra sparse puberula nitidula subtus albida et appresse pubescenti, apice plerumque rotundata et nonnunquam breviter emarginata basi rotundata, costis lateralibus utrinque circa 8 fere inconspicuis. *Flores* in axillis foliorum 3–6-fasciculati vel in paniculas breves axillares congesti. *Pedicelli* 3–10 mm. longi apicem versus et medio bracteati, bracteis parvis late ovatis fulvo-tomentosis. *Sepala* late ovata 2·5×3 mm. fulvo-tomentosa. *Petala*, 3 exteriora crassiuscula lanceola a basi concava dorso carinata, 9–10×4–5 mm., fulvo-sericea, 3 interiora breviora crassa basi concava dorso carinata, 7×3·5 mm. *Stamina* numerosa, antheris 1 mm. longis. *Carpella* circa 10 sericea 1–1·2 mm. longa. *Monocarpia* ellipsoidea, 2·5×1 cm., primo fulvo-tomentosa demum glabrescentia, seminibus parum oblique dispositis haud arillatis, 9×6 mm., glabris.

Hab. ANGOLA: Lunda, Vila Henrique de Carvalho, fl. Sept., *Carrisso & Mendonça* 506 (type in Herb. Brit. Mus.; Herb. Coimbra Univ.); Lunda, Ma-Chinge and Ma-Lunda, fr. June, *Marques* 165 (Herb. Coimbra Univ.).

This species is close to *X. odoratissima* Welw., but differs in the much shorter petals and the very densely fascicled flowers. I have much pleasure in naming it after my friend Sr. Francisco d'Ascensão Mendonça, who collected it in 1927 with Dr. Carrisso. —A. W. EXELL.

Enneastemon nigritanus (Bak. f.) Exell, comb. nov. (*Popowia nigritana* Bak. f. in Cat. Pl. Talbot: 4 (1913)). (Annonaceae.)

Hab. S. NIGERIA: Oban, *P. A. Talbot* 1550 (typus in Herb. Mus. Brit.).

Robyns and Ghesquière recently suggested that this would prove to be a species of *Enneastemon* (see Ann. Soc. Sci. Brux. liii, B: 166; 1933), and an investigation of the type shows that this is correct.—A. W. EXELL.

Banksia (*Orthostylis*) **Ashbyi** Bak. fil., sp. nov. *Frutex* circa 4-pedalis. *Rami* glabri vel tenuiter tomentosi. *Folia* 19–23 cm. longa, 3–3·5 cm. lata, elongato-linearia, lobis late triangularibus acuminatis utrinque glabris, venis numerosis transversis convergentibus. *Spicæ* oblongæ circa 12 cm. longæ, ±7 cm. latæ. *Flores* hermaphroditi regulares. *Perianthium* erectum sericeum. *Antheræ* 4 lineares. *Stylus* rigidus basi incurvus. *Stigma* 2·5–3 mm. longa. *Conus fructifer* oblongus cylindricus apicem versus attenuatus ±15 cm. longus, 5·5 cm. latus. *Folliculi* lignei spicæ rachi incrassatæ semi-immersi bivalves 10–14 mm. lati pubescentes. *Semina* 2·5 cm. longa, 1 cm. lata, 2·5 mm. crassa; alæ circa 3 mm. latæ.

Leaves divided more than half way to the midrib into broad, triangular, acute or acuminate lobes, 10–12 mm. long, 12–16 mm. wide. Perianth erect, sericeous, the tube 2·5 cm. long, the limb 5–6 mm. long, apex subacute. Style rigid, incurved at the base, then erect, with narrow, furrowed, stigmatic end.

Hab. WEST AUSTRALIA: Yuma Sand Plain, about 40 miles inland from Geraldton, *Edwin Ashby*, Albert Morris Herb. no. 2537. "This is extremely local and the most beautiful old gold colour, 4 ft. high and 4 ft. wide." (Herb. Mus. Brit.)

Allied to *B. Victoriae* Meissn., but differing in the absence of the ferruginous hairs on the stems, also by the smooth, sericeous pubescence on the perianth.—E. G. BAKER.

Banksia (*Cyrtostylis*) **Burdettii** Bak. fil., sp. nov. *Frutex* 4–8-pedalis ad *B. Baueri* R. Br. accedens. *Rami* tomentosi. *Folia* linearia 8–15 cm. longa, 1·5–2 cm. lata, truncata basi cuneata regulariter ± profunde serrata subtus albo-tomentosa. *Petioli* 1–1·5 cm. longi. *Spicæ* crassæ obovatæ 10–11 cm. longæ, 7 cm. latæ. *Bracteæ* deltoideo-acuminatæ tomentosæ. *Perianthium* villosum basi glabrum incurvum erectum, tubo 22–25 mm. longo, lamina villosa obtusa 6–7 mm. longa. *Stylus* curvatus demum sursum curvatus. *Conus fructifer* obovatus 6–7 cm. longus, ±5 cm. latus. *Folliculi* tomentosi ± prominentes 2–2·5 cm. lati, 10–12 mm. crassi. *Semina* 20–22 mm. longa, 6–7 mm. crassa, 1·7–2 mm. lata, alæ 7–8 mm. latæ.

The leaves have parallel transverse veins, are glabrous or sparsely tomentose above and more or less pilose on the midrib.

The style is arched and turns upwards after flowering; it is not hooked. The stigmatic end is small, not striate.

Hab. WEST AUSTRALIA: Watheroo, about 120 miles N.E. of Perth, *W. Burdett*, sine no. "The flowers when open are a rich buff-orange with a pink tinge due to the red central line; the unopened flowers are fringed with white hairs, with a red mid-line very conspicuous." (Herb. Mus. Brit.)

The specimen was grown at "Blackwood" from seeds collected at Watheroo.

Near *B. Baueri* R. Br., differing by the obtuse or subacute perianth-laminæ, which are without the awn-like ends; it also differs in leaf-characters. Also near *B. prionotes* Lindl. and *B. Menziesii* R. Br., but differs from both in characters of the style and of the fruiting cone.—E. G. BAKER.

THE BRITISH ASSOCIATION.

ABERDEEN gave a warm welcome to the Members of the Association for the meeting held in their beautiful city from September 5–12. The attendance numbered nearly 3000. Members were welcomed by the Lord Provost and the Principal of the University, Sir George Adam Smith, one of the two surviving officials of the previous meeting in Aberdeen, forty-nine years ago. Sir James Jeans's presidential address, "The New World Picture of Modern Physics," has been widely reported. The address was fittingly described by Mr. Walter Elliot, President of the Board of Agriculture, in moving the vote of thanks, as a high compliment to the intellectual atmosphere of Aberdeen.

The Botanical Section met in the Botany Department at King's College under the presidency of Prof. A. W. Borthwick, O.B.E., who was congratulated on his recovery from a recent serious illness. The members appreciated the arrangements made by Professor J. R. Mathews for their convenience and comfort during the meetings.

The following is Professor Borthwick's address in a somewhat abbreviated form:—

The forest with its associated flora and fauna is a highly complex and delicately balanced community.

In early times whatever trees seemed suitable to supply any requirement were utilised without any thought as to reproduction and maintenance of supplies. Thus began the system of forestry which at the present day, under more organised methods, is known as the selection forest: only trees of a certain diameter may be removed, the number and volume of the trees to be felled annually or periodically being regulated by measurements of rate of growth in the forest. The regeneration is a natural one. Seedlings in due course take possession of the spots from which the mature trees have been removed. We

have thus all ages and kinds of trees in irregular mixture singly, or in very small groups, scattered throughout the forest. This system preserves, more closely than any other, the conditions which prevail in and characterise the primeval forest. It has many advantages, but the main disadvantage is that the volume, and perhaps the quality of the timber as a whole, is not so high as that which can be obtained under more artificial systems of forestry. It is here that the main problems in regard to success or failure arise. When man interferes too much with Nature, she inevitably replies by countering his efforts, unless they comply within certain limits to natural laws. The endeavour to grow pure forests of trees on wide areas, in dense, uniform, even-aged masses, irrespective of changes in soil conditions and climate, is not in accordance with natural laws. In converting the virgin forest or the selection forest into the modern artificial forest, the principal aim was to secure uniformity, and that branch of forestry known as forest management came into existence. The principal aim was to obtain the highest yield in the shortest time. For the sake of ease in regularity of yield or utilisation, the forest was subdivided into working units called compartments, and, for the sake of uniformity in working, these compartments were made as large as possible, with little or no regard to local variations in soil, climate, and exposure. To a large extent the laws which govern tree growth and the possibilities of silviculture were ignored in favour of artificial formulæ. This trend in forest management naturally led to a preference for pure stands—that is, large timber stands of the same species.

The variation in species and age differences which characterise the primeval forest disappeared on its conversion into artificial forest, and much of the naturally associated flora and fauna was destroyed. It was easy enough to get so far, but difficulties arose when the questions of sustained permanent yield, conservation of soil fertility, and the reproduction of this kind of artificial forest came to be faced. It is here that the inseparable connection between botany and forestry becomes all-important. . . .

To obtain the best results in the cultivation of any species we must study its growth and habit and form throughout its entire range of natural distribution. This brings us to the question: Is there such a thing as acclimatisation, or do trees possess the property of adapting themselves to climatic conditions which are new or different from any climate within their natural geographical limits? This is a question of considerable scientific and economic importance, and concerns both the botanist and the forester. A complete survey of the form, habit, and growth of a tree within the limits of its natural range shows undoubtedly that each species can and does react to different environmental conditions, but opinion is by no means unanimous that these external conditions can bring about

permanent change of an hereditary character. Attempts have been made to obtain frost-resistant trees by collecting seed from the higher and colder elevations in the mountains, or from the northern and colder limits, but all such attempts have not yet solved the problem so far as frost-hardiness is concerned. A short consideration of the behaviour of young plants transferred from a colder to a warmer climate, and *vice versa*, may serve to bring out some points of interest in this connection. The four seasons vary in relative duration and climatic character according to latitude and elevation. This determines the length of the active period of vegetation. The critical seasons are spring and autumn. A certain amount of heat acting for a certain time is required to awaken the plant into vegetative activity, while the fall in temperature at the end of the vegetative season controls the rapidity and completeness of ripening and preparation for the resting season in winter. As regards the length of the active period of vegetation, the controlling factor seems to be the average temperature during that period. Further investigation concerning the commencement of vegetation and meteorological data are required, but so far as available information exists it would seem that each species of tree has an average temperature-constant which is necessary during its seasonal vegetative period. This period of average temperature is longer or shorter according as the tree is on its southern or northern limit. The effect of climate merely lengthens or shortens the period of vegetative activity, but the specific average constant of the tree is in no way altered. This has been called the vegetation therm by Prof. H. Mayr, who states that 14° C. is the constant for the larch, and probably also for the spruce. If such a figure could be fixed for all trees its value would be great, but this investigation necessitates further meteorological data and phenological observation.

To return now to the question of the transference of a living tree from a warmer to a colder climate, or from a sheltered nursery to bare exposed planting ground. The chances are that if the transference takes place in autumn, the plant will suffer from early and winter frost. The plant has ripened off and prepared or attuned itself during the previous summer for the approaching winter conditions in general balance with the warmer climate, and it is not prepared for the earlier and more rigorous winter of the colder climate. On the other hand, if the transference takes place in spring after the winter resting period in its accustomed warmer climate, it has all the growing period in front of it in which to adjust itself to the new conditions of the changed colder climate. This cannot be called acclimatisation, since the changes in the plant itself are not constitutional and hereditary. The tree will react to changed climatic conditions within its natural limits of distribution, but that is all. If a tree

could be got to grow normally up to full maturity, and to produce fertile seed, in a climate warmer or colder than that of any climate in which it is found within its natural range of distribution, then and then only it would seem that we could speak of acclimatisation. Trees have a certain amount of plasticity and can alter their form, rate of growth, and stature to a surprising extent in response to external growth factors, but such reaction changes are not permanent and hereditary. . . .

In forestry the long period which must elapse between the establishment of a crop and its final harvesting at maturity makes it imperative that we should use every endeavour to secure the best types of trees suitable for the concrete conditions of the localities in which they are to be grown. If a wrong species is chosen at the start—that is, a species unsuited to the soil or climate—and in mixed woods, if a wrong combination of species is adopted in their formation, then no amount of skill, care and attention on the part of the forester can remedy the defect or make full use of the productivity or growth factors of the locality. In cultivating his crops the forester must always keep in mind that the ultimate success of his efforts is determined by rate of growth combined with the usefulness and volume of the timber produced. This again brings him into close contact with the botanist. Among species of trees, apart from varieties and sports or mutations, no two individuals are absolutely identical, in spite of all outward resemblance. There are differences in rate of growth; commencement and duration and finish up of seasonal vegetation; flower, fruit and seed production. Although the characteristic individuality remains constant throughout the life of each single tree, it does not follow that its seedlings will all possess the same characteristics. Rate of growth and tendency to late or early vegetation become apparent early in the life of the seedling. It is then that the first choice can be made in the selection of growing stock. But no matter how perfect the young tree may be, it is still subject to the influence of external growth factors, and climate, soil, and silvicultural treatment can influence its form and growth. A plant with individual tendency to slow growth in the colder limits of its distribution will be stimulated to more rapid growth in the warmer climate; and, on the other hand, a rapid-growing individual of the warmer climate, if transferred to the colder climate, will suffer check to its rate of growth, and individuals of normal growth will show the same tendency. In a community of trees of different species growing on the same soil and in the the same climate, some may be in their optimum, while others may be on the colder or warmer limits of their natural habitats, and the soil may suit some species better than others. Some species are quicker to re-establish themselves than others. That is, they are more easy to transplant. Then, again, trees are not

uniform in their rate of growth at all ages. We must, therefore, be careful in coming to conclusions regarding the growth-behaviour of trees. We must seek the aid of plant physiology and plant geography if we wish to arrive at reliable and useful conclusions. Climate is after all the main controlling factor, and each country must collect its own data. Hitherto, in forestry, we have had to rely too much on data applicable to the continent of Europe. But with a well-selected series of representative sample plots established throughout Britain by the Forestry Commission, the arrears of our knowledge in this respect are being made good rapidly.

Let us now consider the importance of these fundamental biological facts to silviculture. For convenience, let us divide the life of the forest into three stages: the juvenile stage, the pole or stage of most rapid height growth, and the adult or tree stage; and, in order not to obscure the main points by unnecessary detail, let us assume that the trees have been artificially planted. In all recent plantations there is bound to be competition by weed and grass growth; it may be also woody scrub, stool shoots, or interloping and unwanted light-seeded invaders. Cleaning and weeding must not be delayed. Careful tending of the young trees should begin early. Now is the time to remove and replace trees of inferior growth-habit, which they begin to show at this early stage. Trees which naturally tend to fork cannot be improved by pruning off one of the leaders: forking will be repeated later on, as this natural individual tendency persists throughout the life of the tree. The same thing applies to all trees with faulty stem and crown formation. A certain amount of thinning may be advisable before the pole stage is reached, but such operations should be confined to completely suppressed, back-going, and dead trees, and aggressive malformed trees. For various species under average conditions the period of the pole stage falls between the twentieth and the fortieth year. This should be the time of greatest density in the life of the stand. The trees have reached the stage of their most rapid annual growth in height, and this is further stimulated by the density of the stand, which also leads to lateral branch suppression and the cleaning of the stems. The density must not be too great, otherwise the trees are liable to become too long and attenuated to carry their own weight. It is here the skill of the forester is put to the test. Up to this stage, which will occupy as a general rule the first half of the rotation, the main endeavour is to secure a good growing stock of tall, straight, clean-stemmed trees. In the second half of the rotation, which we have called the tree stage or adult stage, the problem in tending should resolve itself into obtaining the greatest volume production and quality of timber by encouragement and control of diameter increment. The quality of timber

depends to a large extent upon uniformity in breadth of the year rings and the texture and fibre of the wood. This can only be obtained if the growth of the tree itself is uniform and sustained. Hence in this latter half of the rotation attention must be directed to the crowns and roots of the trees. A gradual removal of certain trees and opening up of the canopy gives the crowns of the remaining trees more light and room to expand, and this means increased food production. These cuttings may be called "light increment cuttings," in contradistinction to "thinnings," from which they differ in regard to their influence on the biology of the stand. The more open growth under light increment treatment means fewer trees at maturity, but individually they are of greater volume and collectively of not less volume than would have been produced by a larger number of trees in closely crowded crown competition. The more open stand necessitates the retention of some kind of undergrowth or, more commonly, underplanting for soil cover and preservation. This method has been successfully practised in Denmark in the case of beech, oak, pine, and spruce. . . .

All the problems which arise in regard to the care and treatment of young, middle-aged, and maturing stands of trees are subjects of the study of stand biology, and that system of silviculture which makes the fullest use of the external factors of growth, in combination and individually, will achieve the best results in the end. The old system of preserving dense, uniform, unbroken canopy was unnatural and made it impossible to utilise to its full advantage the important growth factor, light.

In the primeval forest, loss and replacement is constantly going on. As each veteran disappears it is replaced by hundreds of seedlings which strive and struggle among themselves and against surrounding hindrances to reach the light. The struggle is a prolonged one, and many seedlings and saplings are killed off in the process. Still, Nature works cheaply if slowly, and if we can make use of the free gift she offers in the way of natural regeneration, it would be an obvious gain. Nature has produced and maintains the forest for her own purposes. On the other hand, man exploits the forest for his comfort and well-being, but if he oversteps certain limits in his treatment of the forest for the sake of extra gain or profit to himself, Nature revolts, with the result that man defeats his own ends.

If we are to make use of Nature's free gifts, in the natural regeneration of the forest, we must study the natural biological laws under which the process can take place. As we have seen, Nature works slowly but surely in her conservation of the primeval forest, irrespective of what the utility and value of the species may be to man. Man's idea is to grow certain species only in massed, even-aged assemblages, in order to

obtain the maximum amount of timber of the kind, size, and quality he wants, and if he expects Nature to help in the quick and certain regeneration of these artificial woods, at the end of what he considers the most advantageous age or rotation, he must make certain provisions in accordance with natural laws. This can be done by appropriate silvicultural treatment. The trees must be of a suitable seed-producing age, the forest floor must be in a suitable condition for the reception and germination of the seed, and the conditions of light, moisture, and temperature must be suitable for the future growth and development of the seedlings. These three things are of fundamental importance. In most of the mature and maturing woods which have been treated under the strict artificial rules of so-called forest management, the question of quick and certain natural regeneration often presents insurmountable difficulties. At the time required by the working plan the trees may not be in a suitable condition for flowering and seeding ; the forest floor, under light demanders, may be long past the best conditions for the reception and germination of seed, owing to weed growth, and under shade bearers an over-abundance of humus, especially raw humus, is equally unfavourable. Many years are required to bring the trees and the forest floor into a suitable condition for natural regeneration, and if this is attempted over a whole compartment simultaneously, the result is seldom satisfactory. In dense-canopied, even-aged stands a series of preliminary fellings, called preparatory fellings, must be gradually carried out to allow more light and room for the selected seed trees, in as even distribution throughout the stand as possible, and also gradually to prepare those trees for their more isolated conditions and resistance to wind. Under shade bearers this opening up of the canopy leads to the disintegration of over-abundant humus by allowing more direct access of precipitations and light, and also by increased aëration due to the freer circulation of the air. Under light demanders it means costly artificial surface and soil preparation. In either case, when the soil is in its most suitable condition, a further felling is made either immediately before or during a seed year, if one should happen to occur at the right time ; if not, it means delay and the soil gets past its best condition, for seed germination. Even if a seed year should occur at the right time, there are many climatic and weather conditions which may prevent complete and uniform regeneration over the whole area : only patches of seedlings may occur here and there. This means waiting for a second seed year, which may be five or ten years hence—meantime, further deterioration in soil conditions and risk of storm damage to the seed trees, which were isolated so late in life. The only alternative in such cases is to complete the process by clear cutting and artificial planting, and this is what generally occurs. If, as sometimes happens,

by good luck the regeneration is sufficiently complete to provide a new crop, then the old trees are gradually removed in a series of falls, called the final fellings. But the whole process known as the uniform or compartmental system is slow, uncertain, and risky. To lessen the risks of failure and loss by opening up large areas at one time, numerous modifications have been introduced into the practice of forestry. The underlying idea was to confine natural regeneration to smaller areas, in the shape of groups or strips, with peripheral extensions of these as they became regenerated. By selecting the shape, breadth, line and direction, and sequence in time of the strips, a considerable amount of success has been achieved. Strips or groups may be clear felled or a certain number of trees may be left to provide seed and to protect the young seedlings. In the former case, protection is supplied by the adjacent stand of mature trees, and seeding takes place from the side. Various and numerous combinations of the uniform, group, and strip methods have been tried, with more or less success, under certain favourable locality conditions.

The main trouble is that in the past the woods have not been managed with a view to natural regeneration ; under light increment treatment, the more open canopy and crown room enables the trees to respond almost immediately to the influence of the seed felling. The under planting which has kept the soil in a favourable condition for seed reception can be dealt with easily, and after the seedlings have appeared the old trees may be removed at one felling instead of gradual removal over a protracted series of years, as a certain amount of undergrowth can be left to provide shelter and protection to the young trees.

The biology of the large pure stands of timber must obviously differ from that of large mixed stands, consisting of two or more species, as generally prevail in the primeval forest. . . .

The problem may be stated : How are we to manage and develop our woods so that the demand for different species of timber, sorts and sizes of the highest quality possible, may be met, and adequate provision made for the regeneration of these woods, without loss of time and without deterioration to the productive capacity of the soil, and at the same time make as full use as possible of all growth factors, without interfering too much with the natural laws of forest growth ? The solution suggested by Prof. Heinrich Mayr of Munich seems to fulfil all these requirements. It is a compromise between the economic objects of man, the user, and the natural laws which govern the designs of Nature, the producer. He suggested that the forest should be made up of small compartments, 1 to 8 acres, each compartment to consist of one species. These small pure compartments would be scattered as much as possible, so that adjacent compartments would differ in age and species. We

would thus have a forest of mixed small compartments differing in age and species. Due attention would be given to assigning each species to its most suitable soil and exposure. Where conditions were such that only one species would grow satisfactorily, owing to physiographical conditions, such as in the mountains, pure sand, wet soils, cold climate, the compartments may be larger, about 14 acres, if desired, and the same species may adjoin each other, but the age difference between adjoining compartments should be varied. The present division of the forest into large compartments need not be done away with, but each large compartment should be subdivided into sub-compartments—small compartments—which would become permenent units of management. Each small compartment treated from its earlest stages with a view to natural regeneration would, under later light increment treatment, always be in such a condition that natural regeneration could be imitated without long and costly preparation. The process could be completed within five years, and the risks of failure would be small compared with those of large contiguous areas, where ecological and biological conditions vary. In the small stand, the more open stand of the trees under the light increment treatment and the shelter afforded by adjacent stands would eliminate the necessity of the risky and lengthy preparatory fellings—a seeding felling and one final felling would suffice. Thus, as Prof. Mayr claims, natural regeneration could be made easier, speedier, and safer. The danger and risks from wind, fire, insect, and fungus epidemics would be lessened ; the varied demands for different kinds, sorts, and sizes of timber could be more easily met. The forest community as a whole would approximate that of the primeval or natural forest, and the productivity of the soil would at least be preserved, if not improved.

To turn now to another aspect of the forest as a living community of plants and animals. The forest is perennial, and less subject to seasonal changes than other forms of massed vegetation. The tree stems raise their crowns of branches, twigs, and leafy canopy high above the forest floor, and this has a marked influence on the light, temperature, and moisture conditions within the forest. Light is subdued, but temperature and moisture are both increased, and this, combined with a relatively still atmosphere, render the conditions within and under the crowns of the trees quite different from those of open country. Under the leafy canopy the soil surface vegetation consists mainly of shade-loving shrubs, herbs, ferns, and mosses. The leaf-fall from the trees and the general organic remains, along with that of the undergrowth, produce a soil covering of disintegrating organic matter, generally referred to as the humus layer. This layer acts like a mulch and ameliorates and conserves soil moisture and temperature. The tree roots penetrate

more deeply into the substratum than most forms of other vegetation, thus increasing its aëration, permeability, and water holding capacity. Although it has not been definitely decided whether forests increase the rainfall or not, it can be claimed with every justification that the forest is of great importance as a conservator of water and as an equaliser in the drainage of the land. . . .

Where forest exists in the upland districts or collecting ground of the water, rivers are more uniform in their flow, year in year out, and carry much less silt and debris. The crowns of the trees break the force of the falling rain ; the humus layer on the forest floor has an enormous water-absorbing capacity, and when saturated it allows the water to percolate slowly into the deeper loosened layers of mineral soil, from which in turn it gradually finds its way into springs and watercourses. Further, the influence of the forest is such that the melting of snow is more gradual and water is slowly absorbed and held, thus again avoiding floods. The forest regulates the off-flow of water after heavy rains or melting snow. This water is fed into springs and watercourses more gradually throughout the year, thus preventing floods at one season and equally serious drought at another. . . . I do not claim that afforestation or forest conservation in the high ground and valley slopes will entirely prevent floods and drought, but what the forester is doing or leaves undone in the remote hinterland will go a long way to check or ameliorate the evil effects of both. I have referred to these facts because the biological influence of the forest is so important and widespread in regard to drainage and water supplies.

As a form of vegetation which rises high above the surface of the ground, the value of the forest in breaking and tempering the effects of the cold winds has long been recognised and appreciated by the agriculturist. An adjacent sheltering strip or even clump of trees exercises a marked influence on farm crops and pasture lands ; stock also thrive better in the shelter afforded. In spring the pasture is earlier and more abundant, while in the autumn it remains longer green. The question of a reasonable balance between forest and grazing land is one of considerable biological and economic importance.

In the time available it is obviously only possible to refer to a few aspects of forest biology. Many biological problems of first-class importance in silviculture have still to be tackled, and it is to botany that the forester must look for their ultimate successful solution.

(To be continued.)

OBITUARY.

DAVID MCARDLE
(1849–1934).

DAVID MCARDLE, who died at Ilford, Essex, on June 2, 1934, in his eighty-fifth year, was for half a century a familiar figure at the Royal Botanic Gardens, Glasnevin, Dublin, where he was born, the son of a foreman-gardener, November 28, 1849. Having had some early training in gardening, he entered the service of the Gardens in January 1869 as plant-collector, and subsequently this was combined with the duties of clerk. These appointments carried no pension, and his retirement, with a very moderate gratuity, on September 29, 1923, ushered in a period of reduced circumstances for himself and his wife, his companion for forty-eight years, who survives him.

Mr. J. W. Besant, Superintendent of the Gardens, to whom I am indebted for details as to dates, states "there is no record of his being absent through sickness during his whole service of over 54 years."

At an early age, under the guidance of Dr. David Moore, he began the study of the Mosses and Hepatics of Ireland, and contributed a number of papers to the Royal Irish Academy and the 'Irish Naturalist' on the Bryophyta, more especially the Hepaticae, of various localities. The most important was "A List of the Irish Hepaticae" (Proc. Royal Irish Academy, xxiv. Sec. B, pp. 387–502; 1904), based on the lines of the "Cybele Hibernica," of which it was intended to form Part II. There are a large number of his specimens and microscopic slides in the Dublin Museum, and his own herbarium was purchased some years ago by the Department of Botany, British Museum.

He was a member of the Dublin Microscopical Club, serving as Vice-President 1912, 1913, and President 1914, 1915.—A. B. RENDLE.

SHORT NOTES.

PUBLICATION OF THE GENERIC NAME VITALIANA.—The following note may complete Dr. T. A. Sprague's paper on the nomenclature of the genus *Douglasia* Lindley (Internat. Bot. Congress, Cambridge, Proposals by British Botanists, pp. 58, 88; 1929). In this paper, as well as in Dr. J. Briquet's 'Recueil Synoptique' (105; 1930) and in 'Index Kewensis' (Suppl. 8, 249; 1933), in the synonymy of *Douglasia* Lindl., the following citation is given: "*Vitaliana* Sesl. in Donati, Ess. Hist. Nat. Mer Adriat. 69, t. 11, fig. A–I (1758)."

As Pritzel ('Thesaurus,' ed. 2, 89; 1872) rightly points out, Donati's work on the natural history of the Adriatic has been published in three editions, as follows: 1750, Italian edition (Venezia); 1753, German edition (Halle); and 1758, French edition (La Haye). All three editions contain a good description and an excellent figure of the genus *Vitaliana* by Sesler. The Italian translation being pre-Linnean, the second (German) edition, which Dr. Sprague seems not to have seen, has to be considered as decisive for the publication of the name *Vitaliana* Sesler.

The correct citation of this name is consequently:—

Vitaliana Sesler ap. Donati, Auszug seiner Natur-Geschichte d. Adriat. Meers, 66, t. [2], fig. x, A–I (1753).

A. BECHERER (Geneva).

MISTLETOE ON HOLLY.—There is a bough of Mistletoe on a dying Holly on Moraston Farm, 3 miles north of Ross, Herefordshire. The tree has now lost nearly all its leaves; this has revealed the mistletoe, which was discovered by my sister Miss Cecilia Armitage. So far as I can ascertain, the occurrence of Mistletoe on this host is unknown in Britain.—ELEONORA ARMITAGE.

[Holly is not included in Mr. Nicholson's list of host-plants of Mistletoe in the 'Gardener's Chronicle' (Feb. 1932), but J. E. H. Stooke, writing from Hereford to the 'Chronicle,' April 16, 1932, states that *Ilex Aquifolium* as a host other than artificially is reported in the Pyon district (some distance from Ross), but writes "I have not been able to confirm this."—EDITOR, Journ. Bot.]

REVIEWS.

Tropische und subtropische Weltwirtschaftspflanzen, ihre Geschichte, Kultur und volkswirtschaftliche Bedeutung. Von Dr. ANDREAS SPRECHER VON BERNEGG. Teil III. Genusspflanzen. Band 1. Kakao und Kola. Roy. 8vo, pp. xi, 264, text-figs. 48. Ferdinand Enke: Stuttgart, 1934. Price R.M. 18.70.

THOUGH it deals largely with cultural and technical details, botanists will find much matter of interest in Dr. Sprecher von Bernegg's monograph of these two useful plants. The Cacao-tree, as by far the more important, occupies the greater portion of the volume. In each case the author traces the history of the plant in its relation to Man. Nine-tenths of the Cacao-products are from *Theobroma Cacao* L., the home of which was placed by Humboldt in the forests of the Orinoco. Its widespread occurrence in tropical and Central America may be traced to the wanderings of the Indians. Columbus in his last journey to Central America (1502–4) found cocoa-beans in use as money by the Indians, and some years later Cortes learned of the Cacao from the Aztecs of Mexico, and writes of the bean as used for money, and of the drink from a single husk sufficing a man for a day's march.

Odoardo López in 1591 refers to the use of the Kola-nut by the negroes in his description of the Congo country, and about the same time Clusius received nuts from correspondents in London and Middelburg.

Detailed botanical descriptions of the plants are given and a taxonomic review of the species and varieties. Hybridism and mutation are responsible for many of the forms now in cultivation. The size, form, and ribbing of the fruit vary considerably in Cacao, two main types of which are distinguished, Criollo (*Th. Cacao* L.) and Forastero (*Th. leiocarpa* Bern.). The Colas have been studied by A. Chevalier, and a *résumé* is given of the five species and subspecies of the *Eucola* section. The "Cola-nut" is the embryo, consisting in *Cola nitida* of two or in other species three to seven fleshy cotyledons, which vary in colour, red or white, also yellowish-red and greenish, not only in seeds of the same fruit but even in one and the same seed.

As indicated, the greater part of the volume is devoted to methods of cultivation, consideration of pests and diseases, preparation, uses, and other technical details. Succeeding volumes will deal respectively with Coffee, Tea, and Tobacco.

THOSE interested in the genus *Boletus* will welcome the long-delayed continuation of Kallenbach's illustrated Monograph, "Die Röhrlinge," which forms the first part of 'Die Pilze Mitteleuropas' (Leipzig, Werner Klinkhardt, 5 M.). It is satisfactory to learn that the future parts are to appear every six months, but even if this is carried out the time necessary for the remaining eight to thirteen parts means that it will be several years before the whole can be made readily usable as a bound volume. Meanwhile, Band II. is announced which is to deal with 'Die Michlinge' (*Lactarius*) by B. Knauth and 'Die Gallertpilze' (Tremellineae) by W. Neuhoff. It is to be hoped that this volume will equal the first volume in merit, but that the publication will be more rapid.

The part of Band I., now under notice, is the twelfth, and deals with the two species *Boletus miniatoporus* Secr. and *B. appendiculatus* Schaeff., illustrated by two excellent plates, though that of the latter, as is stated, is a trifle too reddish. *Boletus miniatoporus* is the species usually known as *B. erythropus* (Fr.) Quél., whereas *B. erythropus* Pers. is *B. Queletii* var. *rubicundus* of our British books. This section of the genus is rather perplexing taxonomically, and the differentation of the species is not made easier by confusion in nomenclature. Whether Kallenbach's names are legal or not, his plates are likely to be the standards by which the specific identities are stabilised. *B. appendiculatus*, on the other hand, is unlikely to cause confusion, as it has been clearly understood since the time of Schaeffer.—J. R.

Bibliotheca Botanica. Edited by Prof. Dr. L. DIELS. Heft 109. *Orchidaceae Novæ Brasilienses*, I.–VII. By W. ZIMMERMAN. 4to, pp. 20, 4 pls., 12 figs. E. Schweizerbart'sche Verlagsbuchhandlung, Stuttgart, 1934. Price 12 M.

THIS is a detailed description of seven new species or varieties of Orchids collected by Prof. B. v. Freyberg, in 1928, on the Pico do Conceição near Itabira do Matto Dentro in the State of Minas Geraes. They were brought back alive and have flowered in the botanic gardens at Tubingen. The flowers have been the subject of the author's investigations on the flower-movement in Orchids ('Beiträge zur Kenntnis der Georeaktionen,' iv. Jahrb. Wiss. Bot. lxxvii, 393; 1933). The novelties comprise a new species of *Galeandra*, and new varieties of species of *Epidendrum*, *Laelia*, *Oncidium*, and *Bifrenaria*. The descriptions are supplemented by admirable text-figures illustrating floral structure and arrangement and photographic reproductions of plant, inflorescence, and flower. The living plant has given opportunity for the study of the position of the flower and of lip-movements; in several resupination of the flower does not occur. The author refers to the variation in floral-type in *Epidendrum*, which he has discussed in his former paper; the relative position of lip and inflorescence-axis, he decides, cannot be regarded as a character of value for a natural grouping of the species.

Three additional species or varieties have also been studied. One is styled *Oncidium barbatum*, var. nov., Guatemala; the typography suggests a geographical form (it was brought from Guatemala to Hamburg, where it flowered in the Botanic Garden). There is some lack of uniformity in the form of the new names; one *Oncidium flexuosum*, var. nov., lacks a varietal epithet.

Field Studies in Ecology. By R. BRACHER, M.Sc., Ph.D., Lecturer in Botany in the University of Bristol. Sm. 8vo, pp. 100, text-figs. 10. J. W. Arrowsmith: Bristol, 1934. Price 2*s.* 6*d.*

MISS BRACHER'S useful little introduction to the study of vegetation in the field is a reproduction of a scheme of out-of-door instruction for classes in Plant Ecology in the Botany Department of the University of Bristol. A definition of plant communities and associations is followed by a synopsis of British Plant Communities—Maritime, Peat, Aquatic, Grassland, and Woodland. Description of field-methods is given in some detail—mapping, determination of plant associations in the area, and measurement of ecological factors. Plant succession is noted, and attention is drawn to observation of morphological and anatomical features. A final chapter is devoted to ecological equipment.

BOOK-NOTES, NEWS, ETC.

THE GARDENS' BULLETIN: STRAITS SETTLEMENTS.—Vol. vii, part 3, issued June 1, 1934, completes the volume; a title-page and index are included. Part 3, "The Ferns of Mt. Kinabulu," is a taxonomic account of all ferns known to have been collected on the mountain, with the exception of the latest Clemens collections. It is the joint work of Carl Christensen and R. E. Holttum. Mr. Holttum, who spent three weeks on the mountain in November 1931, contributes an interesting account of the fern vegetation from the foot up to 10,000 feet. The greater part of the critical and descriptive section of the paper is due to Dr. Christensen, but Mr. Holttum has added field and occasional critical notes, and descriptions of four new species. A considerable number of new species and varieties are included in the list, but Dr. Christensen is of opinion that, though the number of species known only from Kinabulu is rather large, many of them will be found to occur on the mountains in other parts of Borneo, especially in the mountainous region between Sarawak and Dutch Borneo; he thinks that the number of species really endemic is not very large. The fern flora is intimately related to that of the Malay Peninsula and Sumatra, and in a lesser degree to that of the Philippines. It is less nearly related to that of Java, and still more remote from that of New Guinea, though a number of species are common to both. The twelve plates represent photographs of herbarium specimens of new species.

Volume viii. (subscription £1 outside the Malay Peninsula) will contain about 350 pages and be issued at irregular intervals.

BOTANICAL SOCIETY OF JAPAN.—The 'Botanical Magazine,' May and June 1934, contains a number of papers on the Japanese flora. N. Fukuyama contributes the first instalment of his "New and Critical Orchids from Formosa," including nine new species. S. Miki's paper "On Freshwater Plants new to Japan" includes two new hybrid Potamogetons, and new species of *Vallisneria* (with two varieties), *Nuphar*, and *Myriophyllum*. K. Sakurai continues his observations on the Japanese Moss flora, including a number of new species, and R. Kanehira ("New or Noteworthy Trees from Micronesia," vi.) describes several new species, mainly from Pulau Is., including two of *Boerlagiodendron* and a *Calophyllum* very near the well-known *C. Inophyllum* L. N. Hiratsuka gives an account of his physiological studies on *Uromyces Fabae* f. sp. *Viciae-Fabae*. Articles in Japanese include parts ii. and iii. of Y. Emoto's enumeration of the Japanese Myxomycetes.

Correction.—On pages 278 and 280 Herb. Brit. Mus. should read Herb. Mus. Brit. The latter has long been recognized as the form of citation for the British Museum Herbarium. Mr. Pugsley is not responsible for the error.

THE BRITISH ASSOCIATION.

(Concluded from p. 291.)

THE President's Address was suitably followed by a paper by Mr. J. Ramsbottom, O.B.E., on "Fungi and Forestry." The speaker emphasized the need for a clear understanding of the part that fungi play in forestry problems. A forest is an organism, the constituent groups should be carefully studied: every group plays a part and may entail the existence of the forest. Most of the larger fungi are typically woodland; different types of woodland have their characteristic species, even though there may be no herbaceous vegetation. The fungus-flora of the pine-plantations of Surrey have much in common with that of the natural pine-forests of Scotland.

The continuance of the forest depends on the destruction of dead leaves and trees by fungi; saprophytes are necessary, and fungi are by far the most important. Their work as scavengers and fertilisers has not been studied in this country: a competent systematist and physiologist is needed—a rare combination.

The soil of the forest is permeated by mycelium and mycelial cords, indications of Basidiomycetes. We have no precise information as to their work in obtaining food from the leaves and in reducing their substance. Thom and Lathorp have studied the fermentation set up in "bagasse"—sugar-cane refuse—by the mycelium of a *Psilocybe*, and suggest the need of intensive study of the habits of mushrooms as agents of decomposition, especially in the soil.

Lignicolous species are responsible for breaking down of tree-stumps etc.: there is often a sequence of saprophytic species. Is the tidying up of the forest in its best interest as removing material which would enrich the soil? The bad condition of wind-swept hillside woodlands is due partly to removal of the leaves—the fungus-flora is always poor.

Information as to mycorrhiza is too indefinite to be of practical value to the forester. Is a fungus-association necessary? If not, is it beneficial under all circumstances, and under what conditions does it occur? Various points require investigation, such as the effect of different mycorrhiza on seedling development. Certain fungi are found associated with certain trees, but it is not easy to trace a connection with the root-mantle, and it is usually impossible to recognise the fungus from the mantle; almost invariably the attempt to obtain a culture from the mantle fails. It is better to start with the fungus and make tissue-cultures. So far as we know, no fungus has an effect on the germination of the seed of any tree, but the

association may begin at the earliest stage of root-formation. It would seem advisable to infect the soil in nurseries with the fungi most beneficial to development. Is it necessary when transplanting to take soil with the trees, and, if so, why ?

Practical work on mycorrhiza must entail study of the basidiomycetous flora of the forests and also of the microfungi of the soil. The whole forms a complex, differing from sterilized soil or agar-medium. A combined study by physiologist and expert taxonomist is necessary.

Lignicolous species are mainly purely saprophytic. Some can also live as parasites, e. g., *Armillaria mellea* and *Stereum purpureum*. The dividing line is very fine. All these lignicolous species may be grown in pure culture. Why are some wholly parasitic, others wholly saprophytic, while others may be either ? Certain saprophytic fungi can grow on dead branches and then pass to the living part of the tree and act as weak parasites in a way which suggests a kind of acclimatisation. It is doubtful whether any fungus can penetrate the unbroken cork-layer of a tree-trunk ; all fungi which parasitise trunks and branches are wound-parasites. Some fungi can penetrate healthy roots : *Armillaria mellea* is reported as doing so, and there are various experimental records of attack by rhizomorphs. The fact that the mycorrhizal fungus is restricted to certain regions of the root suggests a definite balance between benefit and harm.

The consideration of *A. mellea* as a parasite raises many points, and illustrates our imperfect knowledge of tree diseases and relevant problems. It seems going too far to suggest that a tree must be already in an unhealthy condition before any attack by *A. mellea* can occur. Field observations show that this species can kill trees and remove them when they are dead. It is one of the commonest species in natural woodland.

Different strains or races doubtless exist in the larger fungi, and it would be illogical to regard *A. mellea* as a simple entity always behaving in the same way. It is one of the most variable of British species, and occurs in all temperate and subtropical climates. Rea, in his 'British Basidiomycetes,' records ten varieties. Are these of equal status or are most of them growth forms, and are these obvious differences connected with differences of parasitism ? One variety, var. *tabescens*, a ringless form, is distinct. Owing to the stress laid on the ring as a generic character, it is of interest to determine whether this is really a variety of the species with a very distinct ring. In its proper Friesian form-genus it is a *Clitocybe* (*C. tabescens*). It is not uncommon in Europe, and usually appears earlier than the typical species, but in 1932 was common in Epping Forest in late autumn, was equally variable with the type, and occurred with it. Miss F. L. Stephens cultured both forms ; the ringless

fruited after several months, but in only one tube ; the other has not yet fruited. The fruit was quite typical, though the fruits which were used for the culture were poorly developed. There is only one previous record of the fruiting of *tabescens* in culture (in America). No record exists of the production on agar media of the fruit-body of *A. mellea*.

Observations on fruit and rhizomorphs by two American workers (A. S. Rhoades and H. R. Totten) suggest that *A. mellea* and *C. tabescens*, while very closely related, are distinct. All that can be said at present with certainty is that *tabescens* comes true in culture and is not a mere growth form of *A. mellea*. The two are certainly distinct—are they related ?

It is necessary to consider certain psychological aspects of first records before making a chart showing the origin and spread of a disease. Factors controlling the disease in one country may be absent in another. Excess or defect in temperature may be a controlling factor. Team work is required for working out some of the problems of forest pathology : it is at least as important to prevent damage to timber as to recognize and treat it. The team of workers at the Forest Products Research Laboratory afford an excellent example.

The session concluded with a paper by Mr. J. Bryan on the preservation and preparation of timber for industrial purposes. Toxic chemicals supply the most important means for preservation, and the different types of chemicals and the method of applying were described for the different industrial purposes for which wood is used.

The various phases of the science were represented in the following sessions. Dr. Edith P. Smith gave an account of the ecology of the small island of South Rona, which lies between Skye and the mainland. It consists of rocky ridges of worn Lewisian Gneiss, with a sparse, mainly woodland vegetation merging into cotton-grass bog on upland valleys and marsh on the west coast. There is no natural woodland except scrub birch and willow, but remains of *Pinus sylvestris* wood in a peat bog and a submerged forest (mainly alder and birch) were located at Dry Harbour, a large inlet on the west side. The present population is 3, but the island once supported a population of 159. The abandoned arable land has become a pure society of *Juncus communis*.

Miss O. D. Dickinson described the disjointed distribution of 140 species of the flora of Bas-Languedoc which appears impossible of explanation by dissemination under existing conditions. The majority are distributed through the Mediterranean basin, and all are species of clearly defined, often very isolated, systematic position, indicating their ancient character. They occur in colonies, chiefly in the south, in warm

valleys, in places difficult of access to man, and generally on pre-Quaternary strata, and would appear to represent remnants of a more thermophile Tertiary flora which, in a few favoured places, has been able to survive vicissitudes of climate during the Quaternary epoch.

"Pollination in the Conifers, particularly in the Abietineae" was the subject of a paper by Prof. J. Doyle. The pollination-drop mechanism is the commonest, occurring in the Cupressineae, Callitrineae, Sequoiineae, Taxineae, and probably most of the Podocarpineae except *Saxegothea*, in which the pollen germinates on the scale. Germination of the pollen on the scale is also well known as characteristic of the Araucarineae. The Abietinean mechanisms are, however, much more varied. In *Tsuga* the pollen falls on the scales, the long tubes growing like fungal hyphæ to the ovules in a manner similar to that of the Araucarineae. In *Cedrus* the pollen, caught by a micropylar flap in the autumn, is held there till spring, when the nucellus, rather stigmatic at the apex, grows up to make contact with the pollen *in situ*. The mechanism in *Pinus*, paralleled apparently in *Picea* and to some extent in *Abies*, is associated with an exudation of fluid. The micropyle in *Pinus* is extended into two long narrow arms, to which pollen readily adheres. At night fluid is secreted, filling the micropylar tube, but in most species this fluid is to be found rarely, if at all, in the day period, being reabsorbed in the early morning hours. On reaching the level of the arms the fluid is drawn out as a film by surface tension up to about half their length. The pollen grains, being easily wetted, are quickly drawn into the fluid. Immediately after the pollen has been so drawn in the fluid is reabsorbed by the ovule, the pollen being lodged on the nucellus, and the whole micropyle becoming dry internally within five or, at most, ten minutes. The wings on the pollen facilitate its neat lodging on the nucellus. Dichogamy seems characteristic of certain species. *Picea orientalis* appears to be intermediate between the normal *Pinus-Picea* type and the *Larix-Pseudotsuga* type with the large stigmatic swelling of the micropyle edge.

There are thus in the Abietineae at least four main types of pollination mechanism, with additional variations in these.

Prof. J. H. Priestley (on vessel differentiation in Angiosperms) stated that the "strip method" of studying cambial activity makes it possible to follow the course of a vessel for a comparatively long distance in microscopic preparations. A study of vessel differentiation by this method directs attention to the rapidity of expansion of the vessel segments and of the perforation of the more or less transverse cross-walls. These processes take place when the wall of the future vessel

is very thin. Vessel segments have been separated by maceration in this stage as extremely thin-walled elements without signs of pitting. By plasmolysis under suitable conditions it has been possible to show the presence of protoplasts in the segments of the vessels after expansion and after the cross-walls are perforated. In many vessels sheets of pectin are present across the region of perforation after the cellulose cross-walls have perforated. The study of vessel differentiation and vessel structure continues to emphasize the distinction between ring porous and diffuse porous hardwood types.

Dr. G. Bond described the influence of illumination on the development of the Casparian strip. Observations of Priestley and his collaborators suggest that the deposition of Casparian strips in the shoot is influenced by illumination. This matter has been further investigated in members of the Leguminosae. The above authors' statements for *Vicia Faba* and *Pisum sativum* have been confirmed and extended to a number of related types. In the normal shoot a primary endodermis is present in the basal internodes only, while in the etiolated shoot the endodermal cylinder extends to shortly below the apex, and probably develops continually behind the latter. Priestley's opinion is supported that in these plants, although the shoot is potentially endodermis-forming, the deposition of the layer is mostly suppressed by the illumination to which the shoot is normally exposed; the development of the basal internodes below soil level allows, however, of the formation of endodermis in this part of the shoot. Experiments indicating a suppression of the basal endodermis when the plumule is exposed to light from the commencement of its development support this view. A less marked response to etiolation was obtained with the other types investigated, although certain species, e. g., *Acacia dealbata*, displayed a definite approach to the above.

Dr. S. Williams described his work on regeneration in the Lycopodiales. Regeneration of various organs has been observed in all the genera of the Lycopodiales. The author has experimentally induced regeneration in *Selaginella grandis*, *Lycopodium Selago*, and *Isoëtes lacustris*. In *Selaginella grandis* regeneration of the shoot can be induced by removing the stem apices; rhizophore rudiments then become transformed into leafy shoots. In other species regeneration of roots from decapitated rhizophores has been recorded. Such results have a bearing on the interpretation of the rhizophore. In *Lycopodium Selago* various types of regenerative growths have been induced on the stems and leaves of young plants grown from bulbils. The facts relating to these have a bearing on various problems, such as the nature of the normal bulbils, the significance of the protocorm, and the factors underlying vascular tissue formation.

Similar adventitious growths have been recorded by Holloway and Goebel for other species of *Lycopodium*. Osborn has described regenerative growths from isolated leaves of *Phylloglossum* which show features of interest for comparison with those described for *Lycopodium* spp.

Prof. R. J. D. Graham gave an appreciation of Laurence Baxter Stewart's brilliant work on vegetative propagation by means of cuttings. His success was achieved through careful observation and ingenious experiment.

Palæobotany was also represented. Prof. T. M. Harris described the reproductive organs of some fossil Ginkgoales hitherto known only in a few resembling those of *Ginkgo biloba*, none of which have been investigated in detail. Comparison of the cuticles of all the isolated fructifications and leaves in the Lower Jurassic flora of Greenland has, however, provided reasons for referring to the Ginkgoales certain reproductive organs which differ greatly from those of *G. biloba*; among the male organs *Bernettia*, hitherto regarded as the female cone of a Cycad, and *Leptostrobus*, hitherto regarded as the female cone of a conifer; among female organs *Staphidiophora*, a new genus with the appearance of a bunch of currants. The bearing of these fossils on Gymnosperm morphology was discussed.

Dr. T. Johnson gave an account of some collections from the leaf-beds of Ardtun, Canna, and Skye, preserved in various institutions and mostly unnamed The examination of this Hebridean flora supports the view of the origin of the flora from an earlier circumpolar flora which radiated southwards. The volcanic activities which gave us Staffa with Fingal's Cave and the Giant's Causeway, followed by the Ice Age, destroyed many types, like *Onoclea* and *Libocedrus*, still thriving in N. America (Atlantic side more especially) and E. Asia, or like *Sequoia* (Pacific N. America) and *Ginkgo* (E. Asia) in one region only. Certain forms, such as *Cupressus*, *Platanus*, and *Quercus*, had already migrated further southwards, and are now to be found in S.E. Europe or the Near East. Others like *Podocarpus* and *Araucaria* had gone still further afield. A detailed exploration of the fossil sites in Canna and Skye would be amply repaid. The flora so far revealed strengthens the view of the former existence of a land-bridge between Greenland and Britain.

Dr. Margaret Benson criticised adversely some of the results of Prof. Halle's work on the structure of some fossil spore-bearing organs believed to belong to Pteridosperms, and claimed that what have been regarded as spores are either epidermal cells freed from their cuticle or in some few cases embryo-sacs.

A session devoted to physiological problems was opened by Prof. W. Seifriz, of the University of Pennsylvania, Philadelphia, a guest of the section, in an address on the structure

of protoplasm. Mr. T. A. Oxley described his experiments on the influence of light and temperature on the growth of *Lemna minor*. From the results obtained the interaction of light and temperature on plant growth has been analysed and conclusions drawn which may be applicable to green plants generally. Notably, evidence has been obtained to show that light does not control growth solely, or even chiefly, by limiting the amount of assimilate formed, but that there is some photochemical reaction other than assimilation which controls growth.

Dr. R. E. Chapman described the absorption of water vapour by the aërial parts of Egyptian desert plants. His experiments indicate that some of these plants can, in an atmosphere of high humidity, increase in weight (presumably by the absorption of water vapour by their aërial organs). In the Egyptian desert, owing to the great difference between day and night temperatures, it is often found that during the night the air humidity approaches saturation even in summer, and hence may be the source of an appreciable part of the water-supply in plants like *Reaumuria hirtella*, which have salt crystals on their leaves. These crystals apparently form part of the mechanism of absorption of water vapour, as without them the plants do not increase in weight in atmospheres of high humidity. In this way about one-sixth of the plant's loss by transpiration may be replaced by absorption of water vapour at night.

Mr. W. A. Clark described the effects of carbon monoxide in causing abnormal developments in tomato plants and potato tubers.

Dr. J. Burtt Davy (in the Forestry Department) reported the occurrence of male trees of the cricket-bat willow, *Salix alba* var. *caerulea*. The opinion is widespread that there is no male of this variety. In East Anglia Dr. Davy has found staminate trees which clearly belong to this variety, having similar characters of inflorescence, leaf, bark, and branching. Smith did not himself say that the staminate sex was unknown, and in 1829 a male specimen was figured in 'Salictum Woburnense,' a book produced by the authority of the Duke of Bedford, who was in close touch with Smith, by whom, probably, the plates were seen.

No evidence has been produced, so far as we are aware, to indicate that good or bad quality of timber is associated with sex; it is certain that bat-willow timber of poor quality is obtained from both female and male trees, but we lack evidence as to the quality of timber produced by well-grown male trees. This is an important point, for several of the phenomenally vigorous seedlings being grown from seed obtained by the author in 1932 prove to be males.

Dr. Kathleen Blackburn and Mr. J. Wilkinson indicated the possibility of distinguishing the true cricket-bat willow from hybrids between *Salix alba* and *S. fragilis* by means of chromosome characters.

Dr. J. K. Spearing (Cell-structure of the Blue-Green Algæ) emphasized the homology of the so-called "central body" with the nucleus of higher plants. This conclusion is based upon its structure, its behaviour during cell-division, and upon micro-chemical work. In *Oscillatoria tenuis* proper chromosomes are formed and apparently divide normally, although the appearances produced are unusual. In other related species nuclear division is essentially similar. In no case has a nuclear membrane been observed; but in *Stigonema mamillosum* one or more nucleolus-like bodies are found in each cell of the older parts of the thallus. In some species the nucleus never reaches a resting stage during periods of active growth—the chromosomes persisting throughout the interphase. In other cases a well-marked reticulum characterises this stage. The small size of the nuclei, the absence of a nuclear membrane, and the presence of other substances which stain like chromatin have been responsible for much of the confusion concerning the cytology of these plants.

Dr. J. Caldwell discussed some aspects of virus diseases in plants. The effect of one virus on another in plants has been investigated in some detail, and evidence has been obtained which shows that three possible interactions may take place—the presence of the first virus may (*a*) affect (often making more severe) the symptoms induced by the second virus, (*b*) prevent the appearance of symptoms characteristic of the second virus, which nevertheless multiplies in the tissues, or (*c*) prevent the multiplication of the second virus in the tissues.

Dr. Mary J. F. Gregor described a disease of Bracken and other ferns caused by *Corticium anceps*. The disease occurs almost exclusively upon the frond of the Bracken; it does not attack the rhizome. The fungus creeps over the lower surface of the pinnæ and rachis and is at first superficial. Soon, however, penetration of the host is effected, mainly by means of infection cushions, though individual hyphæ often enter through the stomata. The external mycelium continues to spread and ultimately forms a whitish felt-like covering over the lower surface of the frond. The infected tissues become brown and brittle, and in severe cases the pinnæ break off, leaving only the bare discoloured rachis. In the later stages of the disease sclerotia and basidia are developed upon the superficial mycelium. The parasite grows readily in culture and forms typical sclerotia, but no basidia. The basidiospores germinate in culture by means of a germ tube, but when germinating *in situ* on the hymenium they sometimes form secondary spores.

In the Forestry Department a morning was given to a general discussion on tree-planting in towns and their neighbourhood, with special reference to general amenity planting. The discussion was opened by Lord Provost Henry Alexander, and among those who took part were Sir John Stirling Maxwell, Mr. W. Dallimore, and Col. J. D. Sutherland.

Joint discussions were held with Physiology on Biological problems of fresh water, and with Agriculture on Soil and ecological studies in relation to forestry and grazing.

The semi-popular lecture was given by Prof. V. H. Blackman on "Botanical Work on the Cold Storage of Fruits and Vegetables."

An afteernoon excursion was made to the Hazlehead woods and the Macaulay Research Institute, and whole days were devoted to excursions respectively to Dinnet Moor, returning by the beautiful Dee River Valley, and to the cliffs, sand-dunes, and salt-marshes at St. Cyrus.

An interesting exhibition of specimens, microscopical preparations, and photographs had been arranged in the Botany Department. These included a series of plants from Lochnagar collected in August by Prof. Matthews, who supplies the following note:—

"Lochnagar (3786 feet), though not the best of our Scottish hills for Alpine plants, has a relatively rich "Arctic-Alpine flora. Ascending from Glen Muick one passes through Pine wood with such characteristic plants as *Trientalis europaea* and *Listera cordata*. The lower slopes of the hill are dominated by *Calluna vulgaris*, which ascends to over 2500 feet. The moorland provides a variety of characteristic plants whose distribution is determined largely by local edaphic factors. Reaching the sub-Alpine zone, *Vaccinium* becomes sub-dominant and *Alchemilla alpina* and *Arctostaphylos Uva-Ursi* are abundant. The more interesting species are to be found on the rocks and ledges in the great corrie which encircles the loch and rises precipitously for about 1000 feet from an elevation of 2700 feet to the summit. The wind-swept summit, consisting of mountain-top detritus, bears a dwarf vegetation, of which *Rhacomitrium*, *Salix herbacea*, *Loiseleuria procumbens*, *Gnaphalium supinum*, *Juncus trifidus*, and *Carex rigida* are conspicuous components."

The sectional dinner, followed by a dance, provided an enjoyable social evening.

Thanks are due to Prof. Matthews, who extended the hospitality of his Department for the meeting, and to his assistant Dr. Dorothy Downie and the efficient Local Secretary, Miss E. C. Barnett, who carried out the local arrangements.—A. B. RENDLE.

NEW SPECIES FROM BRITISH GUIANA, CAMBRIDGE UNIVERSITY EXPEDITION, 1933.

By T. G. Tutin, M.A.

The species described here were all collected in the valley of the Potaro River, a tributary of the Essequibo, the flora of which appears to differ considerably from that of other parts of the colony. The savanna at the top of Kaietuk Fall (often misspelt Kaieteur) is of small extent, and is probably due to the rapid drainage and shallow soil preventing the growth of rain-forest rather than to low rainfall. The flora shows many striking similarities with that of Roraima, and is evidently very incompletely known, since many of the plants described were abundant at the time of our visit and do not appear to have been previously collected. Many of them, for example the species of *Utricularia*, are ephemerals appearing only at the beginning of the dry season, and have remarkably limited distributions on the savanna, each species being common in one small area and absent from other apparently similar areas only a short distance away.

A key to the five species of *Genlisea* known from the colony has been included with the descriptions of two of them. Some time was devoted to examining the species of *Utricularia* in the field, and it was found that such characters as the direction of the spur and the colour of the flower were very constant, and these characters have therefore been used extensively in the following descriptions, although they are difficult, if not impossible, to see in herbarium material. Consequently any tendency to "lump" species described from Tropical America as a result of the examination of herbarium material alone is probably unjustified, and the wide ranges attributed to some species (e. g., *U. juncea*) may well prove to be wrong when more field-work has been done. The species described have been referred as far as possible to the genera (here treated as sections) into which Barnhardt has segregated *Utricularia*, although this could not always be done with certainty, as no descriptions of the genera appear to have been published.

My thanks are due to Mrs. Agnes Chase, Messrs. N. Y. Sandwith, and E. F. Warburg for much help, to the Keeper of the Department of Botany, British Museum, and the Director of the Royal Botanic Gardens, Kew, for facilities for working out the collection, and the Director of the Botanical Museum, Stockholm, for the loan of specimens.

Clidemia (section *Sagraea*) **pycnaster,** sp. nov. (Melastomataceae). Affinis *C. ciliatae* D. Don ex Venezuela sed foliis non ciliatis, reticulo nervorum laxiore, foliis subtus nusquam non stellato-tomentosis, bracteis brevissimis in pilis stellatis sepultis, lobis calycis haud apice longe mucronatis, differt.

Frutex c. 1 m. altus, ramis patentibus satis numerosis, juvenilibus dense brunneo-stellato-tomentosis et sparse glanduloso-pilosis. *Folia* 3·5–5·5 cm. longa, 1·8–3·0 cm. lata, late ovata, apice acuta vel acuminata, basi subcordata, 5–7-nervosa, supra primo sparse brunneo-stellato-tomentosa, demum scabrida, costa paulum impressa tomentosa, subtus dense brunneo-stellato-tomentosa, versus marginem integrum etiam glanduloso-pilosa; petioli 4–6 mm. longi, 1 mm. crassi, dense stellato-tomentosi et sparse glanduloso-pilosi. *Inflorescentia* thyrsoidea dense brunneo-stellato-tomentosa et sparse glanduloso-pilosa brevipedunculata pauciflora, in axillis foliorum vel raro in ligno vetere; pedunculi 1–4 mm. longi; bracteæ solitariæ parvæ obtusæ. *Flores* plerumque terni, subsessiles; bracteolæ breves setaceæ; hypanthium c. 2 mm. long., 1 mm. diam., cylindricum, apice passim contractum; sepala 4, dentibus exterioribus anguste triangularibus acuminatis, interioribus brevissimis rotundatis; petala 4, 2 mm. longa, anguste oblonga obtusa rosea; stamina 8, 5·5 mm. longa, glabra, antheris luteis introrsis, per foramen unicum apicale dehiscentibus, connectivo vix deorsum producto, filamentis geniculatis; ovarium semi-inferius glabrum, stylo filformi, 3·5 mm. longo. *Fructus* c. 6 mm. diametro, niger, calyce persistente; semina c. 0·5 mm.

Hab. Kaietuk savanna, Potaro River. Rocky ground; alt. c. 1100 ft.; no. 684; August 31, 1933. Typus in Herb. Mus. Brit.

Bush c. 3 ft. high. Petioles and young stems ferruginous tomentose. Fruit black, flowers pink.

Clidemia (section *Sagraea*) **charadrophila,** sp. nov. Species distinctissima affinis verisimiliter *C. minutiflorae* (Triana) Cogn. quacum omnibus partibus fere glabris, fasciculis florum parvorum axillaribus fere sessilibus, hypanthio costato congruit, sed ramulis valde compressis, foliis subsessilibus in quoque jugo valde inæqualibus, altero multo minore caduco, differt.

Frutex c. 2 m. altus, ramis primo lepidotis mox glabris, inferne plus minusve teretibus, superne valde compressis et biangulatis. *Folia* in quoque jugo valde inæqualia, alterum minus 1·0–1·5 cm. longum, 0·3–0·4 cm. latum, sessile glabrum trinerve, nervis primo lepidotis demum glabris, alterum majus 12–17 cm. longum, 4–5 cm. latum, elliptico-lanceolatum longe et obtuse acuminatum, basi subito contractum et in petiolum inæqualiter auriculato-rotundatum, quintuplinerve, primo lepidotum demum præter nervos subtus glabrum, margine integrum vel ciliolato-serrulatum, petiolo compresso 2–3 mm. longo. *Inflorescentia* axillaris vel sub foliis e ligno vetere exoriens, 5–10-flora, brevissima, fere sessilis vel pedunculo crasso c. 1 mm. longo. *Flores* tetrameri; hypanthium 2 mm. longum lepidotum 8-costatum; sepala brevissima acuta sparse ciliata, ciliis sursum directis; petala 1 mm. longa viridi-albida; stamina glabra subæqualia, antheris

1·75 mm. longis flavis, per foramen unicum terminale dehiscentibus, connectivo producto, appendiculis reniformibus, parvis, filamentis c. 2·0 mm. longis; stylus filiformis. *Fructus* 2·5 mm. longus cylindricus ad apicem patens, lepidotus parum 8-costatus.

Hab. Kaietuk, Potaro River, in the Gorge half a mile below the Fall. On a steep boulder-strewn slope in shade; alt. c. 300 ft.; no. 512; August 21, 1933. Typus in Herb. Mus. Brit.

Shrub c. 5–7 ft. high. Flowers small, in axillary clusters, petals small, greenish white, anthers large, very pale yellow.

Ernestia cataractae, sp. nov. (Melastomataceae). Species distinctissima, affinis potest *E. rubrae* Pulle ex Surinam, sed caule lignoso, ramulis quadrangularibus, inflorescentia parva, bracteis majoribus, pedicellis longioribus, calcaribus appendicularum staminum majorum glabris acutis, inter alia differt.

Frutex parvus c. 50 cm. altus, multum ramosus; rami juveniles dense et breviter glanduloso-pilosi quadrangulares, veteres teretes glabrescentes, cortice per lacinias decidente. *Folia* 1·5–2·5 cm. longa, 0·5–1·5 cm. lata, oblonga usque elliptica acuta, basi rotundata, quinquenervia tenuia pubescentia bullata, tandem subglabra, nervis utrinque plus minusve prominentibus, subtus persistenter puberulis, margine superne denticulato breviter glanduloso-piloso; petioli 3–7 mm. longi, 0·25–0·5 mm. crassi, glanduloso-pilosi. *Inflorescentia* racemiformis plerumque 5-flora, c. 4 cm. longa, glanduloso-pilosa, nodis breviter barbata. *Flores* oppositi; bracteæ 2 caducæ, c. 2 mm. longæ, lanceolatæ; pedicelli c. 7 mm. longi, bracteolis lanceolatis 2, 0·75–1·0 mm. longis, circum medium præditi; hypanthium 5 mm. longum, 2 mm. latum, cylindricum, circum medium satis contractum; sepala 4, 3–4 mm. longa, 1 mm. lata, linearia acuta suberecta vel plus minusve patentia, marginibus glanduloso-ciliata, utrinque breviter pilosa; petala 4, 1 cm. longa, rosea, ovata, obtusa, apice pilis marginalibus paucis induta, filamentis 3 mm. longis, appendicula anteriore basi rotundata et in calcaria subulata duo prolongata, appendicula posteriore robuste conica acuta, 0·5 mm. longa; ovarium glabrum, stylo filiformi 2 cm. longo. *Fructus* 5 mm. longus, 3 mm. latus, apice contractus, brunneo-luteus, sepalis persistentibus patentibus paulum accrescentibus rubris.

Hab. Kaietuk savanna, Potaro River. Dry ground covered with stones; alt. c. 1100 ft.; no. 637; August 28, 1933. Typus in Herb. Mus. Brit.

Small shrub, leaves bright green, bullate. Flowers pale magenta, filaments and style pink, anthers purple with yellow appendages. Fruit yellowish brown.

Gleason (Bull. Torr. Bot. Club, lii, 330; 1925) pointed out that Krasser's separation of *Pseudoernestia* as a genus was probably not justifiable, since it was based on the 5-merous flowers and glabrous 3-locular ovary of *E. cordifolia* O. Berg, while the species

there described combined the ovary of *Pseudoernestia* with the 4-merous flowers of *Euernestia*. The present species supports this view, since it has a glabrous ovary and 4-merous flowers. Towards the end of Gleason's remarks there is what is evidently a misprint when he refers to the "5-merous flowers of *Euernestia*" instead of the 4-merous flowers.

Key to the Species of Genlisea *occurring in British Guiana.*

1. Leaves large, exceeding 2 cm. in length	*guianensis* N. E. Br.
Leaves small, not exceeding 1 cm. in length	2.
2. Stems stout, dark purple-brown, pedicels strict, capsule glabrous	3.
Stems slender, pale greenish brown, pedicels spreading, capsule puberulous	4.
3. Spur obtuse, pedicels glandular, hairy, corolla 4 mm. long	*roraimensis* N. E. Br.
Spur acute, pedicels glabrous, corolla 2 mm. long.	*pulchella*, sp. nov.
4. Inflorescence zigzag, style short, woolly	*anfractuosa*, sp. nov.
Inflorescence straight, style longer, glabrous ...	*filiformis* A. St. Hil.

Genlisea pulchella, sp. nov. (Lentibulariaceae). (Fig. 1.) Affinis *G. roraimensi* N. E. Br. sed squamis obtusis, pedicellis glabris, floribus minoribus, calcare acuto discedit. Affinis etiam *G. luteoviridi* Wright ex Insula Cuba sed foliis minoribus angustioribus, pedicellis sepalisque glabris, floribus majoribus, stigmate capitato, discedit.

Herba perennis, 3–7 cm. alta. *Folia* dense rosulata glabra spathulata, 3–7 mm. longa, e caudice crassiusculo emergentia. *Scapi* unici vel 2–3, erecti rigidi purpurascentes, parte inferiore pilis satis sparsis brevibus prædita. *Radices* numerosæ paulum ramosæ albidæ ad 1 cm. longæ. *Utriculi* uniformes 3–8 mm. longi, lobis tortis 2–3 mm. longis. *Squamæ* 4 ovatæ obtusæ vel truncatæ, c. 0·5 mm. longæ, basifixæ satis patentes. *Inflorescentia* rhipidium formans; flores 1–5; bracteæ 3, æquales vel subæquales, 0·5–0·75 mm. longæ, triangulares acutæ; pedicelli glabri stricti sub anthesim 2–4 mm. longi, sub fructu ad 8 mm. longi; sepala 5 glabra, 1 mm. longa, triangularia acuta; corolla flava labio superiore et calcare caeruleo-tincto; labium inferius versus basin papillosum, 2·0–2·5 mm. longum, leviter trilobatum, ad calcar retroflexum eique adpressum, lobis obtusis, marginibus crenatis, lobo medio longissimo; labium superius 1·5–2·0 mm. longum, erectum obovato-oblongum crenatum extra sulcatum, intus obtuse carinatum; calcar 3·0–3·5 mm. longum conicum acutum supra versus basin ventricosum; stamina incurva, filamentis satis crassis, antheris paulum superantibus, glabris; ovarium glabrum globosum, stylo brevi, stigmate capitato. *Capsula* glabra globosa, 1·5–2·0 mm. diametro, stylo persistente coronata.

Hab. Kaietuk savanna, Potaro River. Moist sandy and gravelly places; alt. c. 1100 ft.; no. 667; August 30, 1933. Typus in Herb. Mus. Brit.

Leaves in a basal rosette, persistent. Stems more or less hairy, stiff, purplish. Flowers pale yellow with a tinge of blue in the upper lip and spur. Spur straight, broadly conical, extending horizontally. Growing in association with *Drosera pusilla* H. B. K., scattered plants of *Syngonanthus umbellatus* (Koern.) Ruhl., and *Abolboda grandis* Griseb.

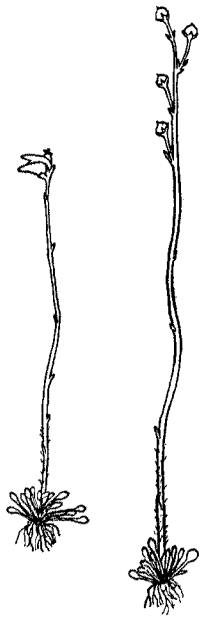


Fig. 1.—*Genlisea pulchella* Tutin. Plants in flower and fruit. Nat. size.

Genlisea anfractuosa, sp. nov. (Fig. 2.) Affinis *G. filiformi* A. St. Hil. quæ statura minore, habitu robustiore, inflorescentia recta, foliis majoribus, squamis pubescentibus, pedicellis brevioribus, calyce pubescente, calcare labium inferius æquante, stylo longiore glabro, differt.

Herba perennis 8–18 cm. alta. *Folia* dense rosulata glabra spathulata purpureovirentia, 4–9 mm. longa e caudice crassiuscula emergentia. *Scapi* erecti rigidi olivacei, basi sparse hirsuti, superne glabri. *Radices* albidæ c. 1 cm. longæ. *Utriculi* 1·0–1·3 cm. longi, lobis tortis c. 3·5 mm. longis. Utriculi abortivi sparsi c. 3 mm. longi lobis brevibus non tortis inter folia occurrunt. *Squamæ* 5–6 ovato-lanceolatæ acutæ glabræ, 0·75–1·0 mm. longæ, basifixæ. *Inflorescentia* rhipidium anfractuosum simplicem præter post vulnus formans; flores 2–7; bracteæ 3

ovato-lanceolatæ acutæ subæquales, c. 0·5 mm. longæ; pedicelli 4–8 mm. longi, erecto-patentes glanduloso-hirsuti; sepala 5, 0·8–1·0 mm. longa, glabra acuta; corolla citrina; labium inferius c. 3·5 mm. longum, ad calcar adpressum, basi minute glanduloso-pubescens, lobis lateralibus minimis obtusis, lobo

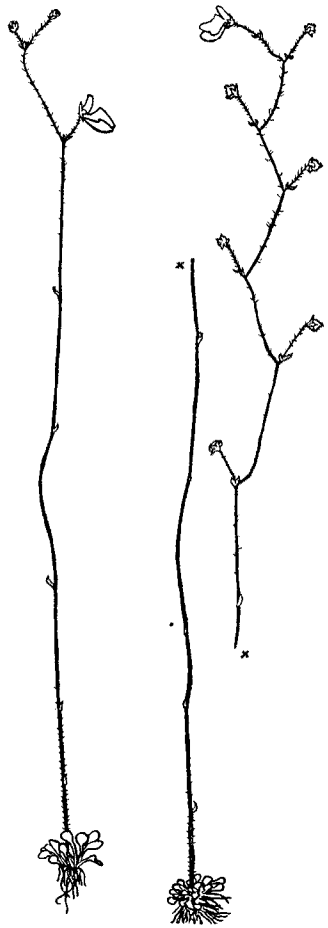


Fig. 2.—*Genlisea anfractuosa* Tutin. Nat. size.

medio multo majore obtuso; labium superius 2 mm. longum erectum trilobatum, lobis lateralibus rotundatis et patentibus, lobo medio obtuso concavo; calcar 3·5–4·0 mm. longum crassissimum obtusissimum, versus basin supra ventricosum, glabrum; stamina parva incurva, antheris albis; ovarium apice circa stylum

brevem lanatum, pilis brevibus uncinatis albis præditum. *Capsula* globosa stylo persistente coronata, indumento ovarii; semina badia levia hexahedralia.

Hab. Kaietuk savanna, Potaro River. Moist sandy places with sparse vegetation; alt. c. 1100 ft.; no. 673; August 30, 1933. Typus in Herb. Mus. Brit.

Leaves purple-green, spathulate. Stems greenish brown, more or less hairy. Flowers chrome-yellow. Spur short, very stout, obtuse. Pedicels glandular, hairy.

Utricularia (*Stomoisia*) **rubricaulis,** sp. nov. (Fig. 5.) Ab *U. rubricaule, U. adpressa* A. St. Hil. ex Brasilia habitu tenuiore, floribus minoribus, sepalis longe acuminatis capsulam multo superantibus, *U. Peckii* Blake ex colonia brittanica hondurense, sepalis longioribus, floribus minoribus, calcare breviore, crassiore, et magis obtuso, labio inferiore vix reflexo, squamis scapi latioribus, *U. virgatula* Barnh. ex insula Cuba, sepalis capsulam includentibus, sepalo superiore longo et acuto, floribus minoribus, labio inferiore angustiore, differt.

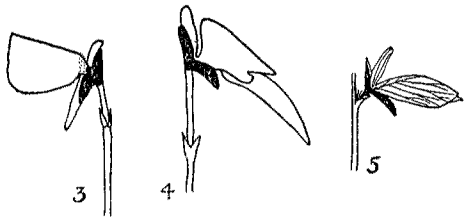
Herba annua 5–15 cm. alta sub anthesim aphylla. *Scapi* erecti simplices, rarissime 1 vel 2 ramos laterales emittentes, satis flexuosi rigidi, læte porphyrei in sicco brunnescentes; squamæ 4–6 inferiores 0·5 mm. longæ, triangulares appressæ, superiores 1 mm. longæ ovatæ acutæ satis patentes. *Inflorescentia* racemum spiciformem formans; flores 2–12, sæpissime 4–5; bracteæ 3; media ovata obtusiuscula, margine versus apicem anguste scariosa; laterales lineares acutæ; pedicelli 0·75 mm. longi, stricti; sepala c. 1·5 mm. longa, superius acutum, inferius obtusum, paulum superans; corolla lutea; labium inferius late obovatum vel fere orbiculare, 4·5 mm. longum, 3·5 mm. latum, valde convexum vel fere conduplicatum; labium superius 2 mm. longum, obovato-oblongum; calcar 4·5–5·0 mm. longum, conicum acutum; stamina ad basin tubi corollæ inserta, filamentis 2 mm. longis, glabris, antheris ovoideis; ovarium piriforme glabrum, stylo filiforme, 1·5 mm. longo, stigmatibus 2 puberulis. *Capsula* fusca, 2·0 mm. diam., breviter apiculata, quam sepala paulum longiora; semina obscure brunnea, tuberculata, fere sphærica.

Hab. Kaietuk savanna, Potaro River. Patch of white sand, rather dry, and very sparsely covered with plants; alt. c. 1100 ft.; no. 669; August 30, 1933. Typus in Herb. Mus. Brit.

Leafless. Stems very stiff, Indian red, sepals red. Flowers rich yellow, lower lip convex, upper lip with reflexed margins. Stems and sepals yellow-green in a few plants (669 *a*).

Utricularia (*Stomoisia*) **arenicola,** sp. nov. (Fig. 3.) Proxime affinis *U. nanae* A. St. Hil. sed pedicellis longioribus, forma bractearum, calcare recto deorsum directo, sepala duplo superante non ea æquante, labio superiore minore, inter alia differt.

Herba parva, 0·5–1·5 cm. alta, probabiliter perennis. *Folia* pauca purpureo-virentia ligulata obtusa in arena semisepulta; partes subterraneæ lobos rotundatos, qui verisimiliter utriculi abortivi sunt, in marginibus ferentes. *Scapi* erecti satis crassi olivacei; squamæ late triangulares basifixæ 0·5 mm. longæ, 1 vel 2 sæpe nullæ. *Inflorescentia* uni- raro biflora; pedicelli erecti, 2–3 mm. longi; bracteæ 3, exterior triangularis, interiores duo fere scariosæ, 1 mm. longæ; sepala triangularia patentia, 1·5–2·0 mm. longa, subæqualia, inferius basi satis cordatum, circum calcar plicatum, superius ad dorsum labii superioris valde adpressum; corolla lutea, magnitudine satis variabilis; labium inferius latum horizontaliter patens, 3–6 mm. longum, 3–5 mm. latum, basi pilis rigidis brevibus erectis præditum; labium superius oblongum fere erectum, 2 mm. longum; calcar conicum subobtusum deorsum directum, 2·5 mm. longum; stamina satis brevia versus basin tubi corollæ inserta, filamentis latis planis, antheris magnis, ovoideis; ovarium piriforme, stylo breve, stigmate infundibuliforme. [*Capsula* mihi ignota.]



Figs. 3–5.—3, *Utricularia arenicola* Tutin. 4, *U. alutacea* Tutin. 5, *U. rubricaulis* Tutin. All × 2½.

Hab. Kaietuk savanna, Potaro River. Open savanna, in wet fine sand, free from stones, with few other plants; c. 1100 ft.; no. 666; August 30, 1933. Typus in Herb. Mus. Brit.

Stems short, stout, olive-green. Leaves few, purplish green, half-buried. Flowers yellow, lip spreading horizontally, spur pointing downwards. Scarce, and plants very scattered.

Utricularia (*Calpidisca*) **alutacea,** sp. nov. (Fig. 4.) Affinis *U. amethystinae* Salzm. quæ foliis sæpissime magis distincte petiolatis, squamis paulum minoribus et lanceolatis, lobis bractearum magis subito acutis, sepalis 1·25–1·5 mm. longis, flore violaceo, minute præcipue pagina labii inferioris superiore glanduloso-pubescente, labio superiore ovato, labio inferiore leviter trilobato lobis æqualibus et lobo medio obtuso vel emarginato, calcare breviore, obtuso vel obtusiusculo crassiore et fere horizontali, filamentis staminum tenuioribus, antheras superantibus, capsula fere sphærica, seminibus maturis levibus, discedit.

Herba verisimiliter annua, 4–17 cm. alta. *Folia* spathulata vel anguste obovata, satis crassa, 1–2 cm. longa in petiolum brevem obsoletum sensim attenuata. *Scapi* erecti; radices satis extensæ utriculis instructæ; squamæ sæpissime 4–6, 0·75–1·0 mm. longæ, oblongæ cuneatæ obtusæ brunneæ basifixæ. *Inflorescentia* racemosa; flores 1–4 raro plures; bracteæ 1·0–1·25 mm. longæ parte inferiore amplexicauli, parte superiore trilobata, lobis ovatis acutis, lobo medio maximo; pedicelli erecto-patentes, 0·5–1·0 cm. longi; sepala 1·75–2·0 mm. longa, patentia conduplicata, superius late obovatum margine scariosum, inferius anguste obovatum non vel vix scariosum; flores glabri, albi, ad os corollæ et bases labiorum alutacei; labium inferius 3·8–4·0 mm. longum, trilobatum, lobo medio longissimo acuto, ad calcar retroflexo et adpresso, lobis lateralibus planis patentibus obtusis; labium superius 3·0–3·5 mm. longum, anguste oblongum erectum; calcar 5·5–6·0 mm. longum, deorsum directum tenue conicum acutum; stamina ad basin tubi corollæ inserta, filamentis antheris oblongis subæquantibus; ovarium ovoideum, stylo brevissimo, stigmatibus 2 planis plicatis erectis. *Capsula* matura 3·0–3·5 mm. longa, ovoidea apiculata; semina papillosa.

Hab. Kaietuk savanna, Potaro River. Wet sandy place with little vegetation; alt. c. 1100 ft.; no. 674; August 30, 1933. Typus in Herb. Mus. Brit.

Leaves rather thick, stems pale green. Flowers white with a yellow centre, spur long, downward pointed, acute. Bladders fairly abundant.

(To be continued.)

THREE NEW SPECIES OF *GREWIA* FROM TANGANYIKA TERRITORY.

By A. W. Exell, M.A., F.L.S.

The following were contained in some collections recently presented to the British Museum by Mr. B. D. Burtt.

Grewia Burttii Exell, sp. nov. *Frutex* subscandens, ramulis primo dense stellato-pilosis tandem pubescentibus. *Folia* petiolata, petiolo 2–3 mm. longo stellato-piloso, lamina elliptica, oblongo-elliptica vel oblanceolata apice acuta acuminata margine serrata, basi trinerve paullo cordata leviter inæquale, 2·5–8 × 1–3 cm., supra subtusque primo tomentosa tandem dense stellato-pilosula, costis lateralibus utrinque 2–4, stipulis subulatis ad 6 mm. longis. *Inflorescentia* normaliter triflora, pedunculis 2–3 mm. longis in foliorum axillis solitariis vel geminatis vel 3-fasciculatis, stellato-pilosis, pedicellis 3–5 mm. longis stellato-pilosulis. *Sepala* anguste oblonga, 9 × 1·5 mm., extus stellato-tomentella intus fere glabra. *Petala* anguste oblonga, 5·5–6 × 0·6–0·9 mm., fere glabra, basi paullo expansa puberula glanduligera. *Stamina* numerosa, filamentis circa 4·5 mm. longis glabris, antheris subglobosis ·5 mm. diam. *Androgynophorus* 1 mm. longus, glaber, supra nodum vix elongatus. *Ovarium* albo-pilosum, 1·5 × 1·2 mm., plerumque biloculare, loculis 8-ovulatis. *Fructus* oblique obovoideus vel oblique ellipsoideus, 2–4-pyrenus, vix lobatus, 8–10 × 3·5–8 mm., stellato-puberulus.

Hab. Dodoma Distr.: at 4500 ft. along the Dodoma–Kondoa road, fl. March, *B. D. Burtt* 1433 (typus in Herb. Mus. Brit.). Kondoa–Irangi Distr.: at 4500 ft., near Kiswaga, *B. D. Burtt* 1132, fl. Feb., *B. D. Burtt* 1587; at 4300 ft., near Mangoloma, fl. March, *B. D. Burtt* 1583. Singida Distr.: Ndindi, *B. D. Burtt* 1596.

A scrambling shrub forming a constituent of the great thicket areas.

This species belongs to Sect. *Pluriovulatae* Burret Subsect. *Apodogyne* Burret, and comes nearest to *G. Holstii* Burret, from which it differs in having much shorter peduncles and relatively longer, narrower leaves.

Mr. B. D. Burtt sends the following note about the species:—"*Grewia Burttii* is mostly found in the great deciduous thicket areas of the Manyoni, Singida, Kondoa, and Dodoma Districts, where it is associated with *Combretum Trothae*, *Bussea massaiensis*, *Croton polytrichum*, *Burttia prunoides*, and *Craibia Burttii*. It produces abundant fruit, coated with a sweet layer tasting of apricot. These fruits are much eaten by the natives, pigeons, doves, civet-cats, and elephants. The latter spend a considerable time in the thickets during the dry season, consuming vast quantities of these *Grewia* fruits."

Grewia dumicola Exell, sp. nov. *Frutex* robustus, 3–5 m. altus, ramulis primo fulvo-stellato-tomentosis demum glabrescentibus. *Folia* petiolata, petiolo fulvo-stellato-tomentoso, 3–6 mm. longo, lamina obovata vel late oblonga apice obtusa vel rotundata margine serrulata basi subcordata trinerve valde inæquale, 6–12 × 3·5–7 cm., supra primo rugosa stellato-pubescente tandem glabrescente subtus dense albo-tomentella, costis lateralibus utrinque 3–5, stipulis lineari-lanceolatis 5 mm. longis. *Inflorescentia* axillaris, pedunculo 2–3-floro, 1·5–2·2 cm. longo, fulvo-stellato-tomentoso, pedicellis 2–3 cm. longis, fulvo-stellato-tomentosis. *Sepala* lineari-oblonga crassiuscula, 25 × 4·5–5 mm., extus stellato-tomentosa intus glabra. *Petala* suborbicularia, 9 × 9 mm., basi unguiculata crassa glanduligera. *Androgynophorus* 2 mm. longus, supra nodum elongatus. *Stamina* numerosissima, filamentis 12–17 mm. longis, antheris subglobosis 1 mm. diam. *Ovarium* biloculare albo-pilosum, loculis circa 10-ovulatis, stylo 12 mm. longo glabro. *Fructus* bilobatus, obis globosis, 6–10 mm. diam., stellato-pilosis.

Hab. DODOMA DISTR.: at 3500–4000 ft., Godegode, fl. Feb., *B. D. Burtt* 4536 (typus in Herb. Mus. Brit.); at 3000–3500 ft., Mpwapwa, fr. Dec., *B. D. Burtt* 4809, fl. Dec., *B. D. Burtt* 5005; at 3500–4000 ft., Tabugwe, Mpwapwa, fl. Nov., *B. D. Burtt* 4811.

A robust shrub, 10–15 ft. in height, with large yellow flowers, growing in *Commiphora–Cordyla* thickets and also among *Acacia spirocarpa*.

This species belongs to Sect. *Axillares* Burret, and seems to be nearest to *G. fallax* K. Schum., from which it differs in having much larger flowers and leaves. According to the collector it is easily distinguishable from *G. fallax* both by its form and from the habitat in which it is found.

Grewia utilis Exell, sp. nov. *Frutex* 4 m. altus, ramulis primo stellato-tomentosis demum glabrescentibus. *Folia* petiolata, petiolo 1·5–3 mm. longo, stellato-tomentoso, lamina elliptica vel late elliptica vel oblanceolata apice acuta nonnunquam paullo acuminata margine serrata basi trinerve rotundata inæquale, 1·5–4 × 0·7–1·7 cm., supra sparse subtus densius stellato-puberula, costis lateralibus utrinque 3–5, stipulis linearibus 3–5 mm longis. *Inflorescentiæ* axillares, pedunculo trifloro stellato-tomentoso, 4–7 mm. longo, pedicellis stellato-pubescentibus 5–7 mm. longis. *Sepala* lineari-elliptica, 6·5 × 1·5 mm., extus stellato-puberula intus glabra. *Petala* oblongo-elliptica, 3 × 1 mm., glabra. *Androgynophorus* brevissimus. *Stamina* numerosa, filamentis circa 4 mm. longis glabris, antheris subglobosis 0·7 mm. diam. *Ovarium* bilobatum albo-pilosum biloculare, loculis 2-ovulatis, stylo 4·5 mm. longo glabro. *Fructus* (immaturus) normaliter bilobatus juventute albo-pilosus.

Hab. MOROGORO DISTR.: Kisaki, at about 1500 ft., near the Hot Springs "maji ya moto," fl. Dec., *B. D. Burtt* 4990 (typus in Herb. Mus. Brit.).

A shrub 12 ft. high, with masses of yellow blossom, common in savannah bordering the river and in forest-margin. The bast is used for string by the natives.

This species belongs to Sect. *Axillares* Burret, and comes near *G. microcarpa* K. Schum., from which it can be distinguished by the extremely short androgynophore.

OBITUARIES.

NATHANIEL LORD BRITTON

(1859–1934).

WE are indebted to Dr. Marshall A. Howe for a copy of his appreciation of the life and work of his former chief and colleague, which appeared in the 'Journal of the New York Botanical Garden,' August 1934.

Born in Staten Island, where his forbears had settled in 1695, Britton was educated at the School of Mines, Columbia College, New York. Graduating in 1879, he was connected with the teaching work of the College in geology and botany until 1896. In 1885 he married Elizabeth Gertrude Knight, who was not only a constant helper through an association of nearly fifty years, but also achieved a world-wide reputation as a bryologist. She died in February, just four months before her husband. Dr. Howe refers to a description by Mrs. Britton of the Royal Gardens at Kew, after a visit to England, at a meeting of the Torrey Botanical Club in 1888, as the immediate impetus which gave rise to the New York Botanical Garden. A committee of the club obtained powers to collect funds for maintenance, and in 1896 Dr. Britton became Director-in-Chief of the proposed garden, for which 250 acres in Bronx Park were allotted; this was increased in 1915 to 400 acres. The development of the Herbarium and Garden occupied Dr. Britton and his assistants for the next thirty-three years. The spacious gardens, with their beautiful buildings, an herbarium of more than 1,700,000 specimens, and a library of 43,500 volumes are a noble monument to the skill, energy, and organizing capacity of their founder.

Britton had joined the Torrey Botanical Club in 1877, and contributed several papers to its 'Bulletin' while still an undergraduate; numerous other papers, mainly floristic, followed in succeeding years, and from 1888 to 1898 he was editor. His floristic work found expression in Britton and Brown's well-known 'Illustrated Flora of the Northern United States and Canada,' in three volumes (1896–98), "the first sustained attempt in the United States to describe its plants, with a text illustration of each species." It was followed by a one-volume non-illustrated handbook: Britton's 'Manual of the Flora of the Northern States and Canada.'

A much larger enterprise with which Dr. Britton was associated was the publication of the 'North American Flora,' including the vast area from Greenland in the north to Panama and the West Indies in the south. Thirty-four volumes were contemplated, but up to the present only one has been completed; seventy-four parts in all have been published.

The botanical exploration of the West Indian region was one of the earliest activities in research of the New York Botanical Garden, and Dr. Britton participated personally in no less than thirty botanical visits to Jamaica, Porto Rico, and other islands. He was the prime organizer of 'The Scientific Survey of Porto Rico and the Virgin Islands,' five of the projected eighteen volumes of which have been issued. With the late C. F. Millspaugh he published 'The Bahama Flora' (1920); his 'Flora of Bermuda' had appeared in 1918.

His most important publication was the great four-volume 'Monograph of the Cactaceae,' with the late Dr. Rose, issued by the Carnegie Institute of Washington (1919–23). Britton's tendency to segregation in genera is here especially notable.

The principle of priority in plant nomenclature, which became a burning question among botanists towards the close of the last century, found a vigorous supporter in Dr. Britton, and he was one of the prime movers in framing the "Rochester" and "American" codes of botanical nomenclature, for the adoption of which he made a valiant but unsuccessful fight at the Vienna Congress in 1905.

The Foreign Membership of our Linnean Society, to which Dr. Britton was elected in 1925, was one of many tokens of recognition of his work. The periodical 'Brittonia,' devoted chiefly to papers in systematic botany, was inaugurated at the New York Botanic Garden by his successor, Dr. E. D. Merrill, in 1930.

For an adequate appreciation of Dr. Britton's services to New World botany the reader must consult Dr. Howe's communication. The present writer would pay a tribute to a friendship initiated many years ago in the British Museum Herbarium, and fostered since by rare visits, correspondence, and especially by help given in connection with the compilation of the 'Flora of Jamaica,' in which Dr. Britton took special interest. There are also pleasant memories associated with the Vienna Congress, and kind hospitality at the beautiful Botanical Garden and the home in New York.—A. B. Rendle.

Ethelbert Blatter, S.J.

(1877–1934).

Though a Swiss by birth and education, and ever proud of his nationality, Father Blatter was well known to British botanists. He had spent some years in England, had worked in the herbaria at Kew and the British Museum, and since 1913 had been a Fellow of our Linnean Society. His reputation as a botanist rests on his numerous contributions to our knowledge of the botany of British India and the near East. By the courtesy of Father J. Dühr, S.J., his close friend since 1918, his successor as Principal of St. Xavier's College, Bombay, and the writer of an appreciation in 'The Examiner' of June 9, 1934, I have a list of Blatter's contributions, 72 in number, and mainly taxonomic in character. In a proportion of these he collaborated with others whom he he had trained or had inspired with a love of botany.

The list has been prepared for the Bombay Natural History Society, in the 'Journal' of which many of his papers were published. His more important work includes the "Flora of Aden" (Rec. Bot. Surv. India, vii.; 1914–16); the "Flora Arabica" (ibid. viii.; 1919–23); 'The Palms of British India and Ceylon' (Oxford University Press, 1926), a monograph of 600 pages, with 106 plates; a "Revision of the Flora of the Bombay Presidency," which appeared in the volumes of the Journal of the Bombay Society, 1926–34; 'Beautiful Flowers of Kashmir' (Bale, Sons, and Danielsson, London; 1927–8), in two volumes, with 64 coloured plates; and 'The Ferns of Bombay,' with J. F. D'Almeida (Bombay, 1932). There are also numerous floristic papers dealing with various parts of Northern India, Baluchistan, Waziristan, and others, and descriptive lists of Flowering Plants, Ferns, Mosses, and Fungi.

Blatter was born at Rebstein, Canton Appenzell, on the Upper Rhine, December 15, 1877, and educated in several Swiss schools. A much-gifted, athletic, but somewhat undisciplined youth, he surprised his friends by his decision to become a Jesuit. When a student at Valkenburg in Dutch Limburg he became an enthusiastic botanist, and in 1903 went to St. Xavier's College, Bombay, where he taught botany till 1908. During a course of theology at Ore, near Hastings, 1908–13, he was a frequent visitor at Kew and the British Museum. In 1915 he returned to St. Xavier's College, of which, to the detriment of his botanical work, he later became Principal. Overwork and lack of exercise undermined his health, and in 1926 he left Bombay and became chaplain at Panchgani. A botanical trip to Waziristan was followed by a collapse from which he only partially recovered. He died at Poona, May 26, 1934.

Father Dühr's appreciation is an interesting account of his life-work from the point of view of a close friend, who stresses especially his astounding power of work, his fearlessness and selflessness, associated with an irrepressible joviality and ready wit.—A. B. Rendle.

SHORT NOTES.

Convolvulus arvensis L. with Quinquepartite Corolla.—The continued drought has left the Bryonies and Convolvulus easy winners in the hedgerow competition. The latter are in their thousands in all dry places, both pink and white. I noticed a number of plants for about twenty yards continuously along the grassy side of a road; they were bearing divided instead of bell-shaped corollas. Sometimes the lobing did not reach quite down to the corolla-tube. The starry shape attracted the eye at once. The flowers are rather smaller than the normal ones. I measured a number of the pink and the white flowers growing near, and the diameter varied between 2·5 cm. and 3·5 cm., mostly 3 cm. The divided form bears white flowers only; diameter from 1·8 cm. to 2·3 cm. I take it the sport originated in one plant, which has travelled this long distance by means of the very deep underground branching rootstock.

There are now some hundreds of trailing flowering shoots. Specimens will be deposited in the British Museum Herbarium. Has this form been observed before ?—ELEONORA ARMITAGE.

[There is a specimen of this form in the Sloane Herbarium sent to Isaac Rand by Adam Buddle before 1715. For other records, see this Journal, 1915, 359, and 1916, 37, and references in Penzig, Pflanzen-Teratologie, ii, 168 (1894).—ED. *Journ. Bot.*]

MYOSOTIS SYLVATICA Hoffm. IN NORTH SOMERSET.—The only record for this species in Somerset is Marshall's, viz., "By the Barle, a little above Dulverton Station, 1905." This is in the extreme west of v.c. 5 (designated S. Somerset by Watson). In May 1934 I collected specimens in N. Somerset from two widely separated localities on the banks of the River Chew between Chew Magna and Pensford, and more abundantly by a tributary stream which feeds Chew Magna Reservoir and enters the Chew just below that village with several large gardens. This disused small reservoir was partly cleared and nearly emptied of water last winter. It is possible this plant may have escaped from cultivation, for during the past nine years I have fished those few miles of the river so often between April and September that it is difficult to believe so attractive a plant (in blossom a month earlier than *M. palustris*) could have escaped observation, though it might not have been noticed by botanists walking more directly through the valley.

In my herbarium is a shoot of *M. sylvestris* which I gathered 23 May, 1924, among *Vicia sylvatica* and other dense herbage in a plantation of young Larch, Sweet Chestnut, Spruce, etc. at the west end of Lime Breach Wood, above Tickenham, N. Somerset; but I thought it was introduced with young trees which came from the north. This is in a totally different watershed. It may be well to place on record these widely separated and very different localities, notwithstanding the somewhat suspicious nature of both.—H. S. THOMPSON.

LEMNA MINOR L. FLOWERING IN CHESHIRE.—As the duckweeds are rarely seen in flower in this country, it may be of interest to record the recent flowering of *Lemna minor* L. in Cheshire, v.c. 58. Flowering specimens were found in plenty in a shallow exposed ditch in a pasture-field at Stoak, Wirral. This was pointed out to the party at a field-meeting of the Liverpool Botanical Society on August 11 by Mr. H. S. Marsh, of Birkenhead, who had detected the plant in flower earlier in the same week. It was thought that probably the dry warm summers of the last two years had favoured the development of flowers.

In the material I examined I found the flowers were mainly protandrous, the two stamens usually present successively developing and shedding their pollen before the gynæcium matures.

Many fronds were, however, found with protogynous flowers, the style with its funnel-shaped stigma protruding from the spathe and reaching well above the surface of the water before the stamens had emerged from the spathe. The vegetative and sexual modes of reproduction did not apparently seem to affect each other, as commonly an inflorescence was present in a pocket at one edge of the posterior part of the frond, while a young frond was being budded off in the usual way from a pocket at the opposite edge. It is not yet known whether seed will be matured in this Cheshire locality.

I may mention that it would appear from a note in Lord de Tabley's 'Flora of Cheshire' that *Lemna minor* was observed in flower in the Liverpool district many years ago by F. M. Webb, but no particulars are given.—W. G. TRAVIS.

REVIEWS.

Zur Abstammung einiger Angiospermen durch Gnetales und Coniferae. By O. HAGERUP. Kgl. Danske Vidensk. Selsk. Biol. Meddel. xi. 4. Levin & Munksgaard: Copenhagen, 1934.

DR. HAGERUP has published a second instalment of the results of an investigation into the structure of the flowers of the Gymnosperms and of certain Angiosperms, with a view to establishing a phylogenetic connection between the Cryptogams and the Angiosperms. By means of a continuous series of transverse and longitudinal sections he has studied the organogeny of the flowers in the Gnetales and in the Piperaceae and Juglandales. He maintains that such a study has never before been adequately undertaken, and gives this as the prime reason why wrong conclusions and interpretations have been made, and why so much difference of opinion has existed with regard to the nature of various important structures.

In the Gnetales all the various envelopes of the flower can be referred to one fundamental organ, the leaf. The origin and position of the various "leaves" of the flower are identical with what obtains in the vegetative shoot—an important point. In all cases the secondary axis first produces a pair of transversely placed leaves or "prophylls," which are succeeded by a second pair in the median position.

In *Ephedra* the organogeny of the male flower has never been discussed, and its diagram is unknown. In *E. likiangensis* Florin the prophylls and the anterior of the two median "leaves" unite to form an envelope; the posterior "leaf" becomes the large microsporophyll, which almost completely occupies the apex of the shoot. Goebel is therefore in error in regarding it as a filamentous continuation of the axis. In *E. distachya* the study of the female flower is of much interest; there is no

complete picture of its organogeny in the literature; the latest diagram of it is Goebel's, which, in the author's opinion, is false. The lack of agreement in the views held about the structure and morphology of the flower is due to ignorance of the earliest developmental stages. The prophylls form a fleshy sheath of the flower. The median "leaf" unites by its margins to form the bottle-shaped envelope with its oblique "micropyle." The macrosporangium occurs at the base of the upper side of the "leaf" and on the apex of the axis; hence the development is the same as in Coniferae. The median "leaf," usually called the "integument," is, according to these facts of organogeny, a macrosporophyll. *In both male and female flowers the same median "leaf" becomes a sporophyll.*

In *Welwitschia* the development of the female inflorescence is in many features identical with that in *Ephedra*. The posterior median "leaf" becomes the so-called "integument," *i. e.*, the megasporophyll. Careful observation of all the developmental stages shows Goebel to be in error in supposing that the transverse pair of "leaves" or prophylls are suppressed and that the "integument" is formed of *two* median "leaves." The male flower is composed of seven "leaves" and their arrangement is the same as in the vegetative shoot. The prophylls become the outer envelope or calyx, the median leaves succeeding them form the inner envelope or corolla, while the remaining leaves up to the sixth constitute the andrœcium, and the seventh becomes the macrosporophyll bearing the sterile macrospore. The great divergence of the views which have been held with regard to the andrœcium are due to failure to study the development by means of transverse sections; the present study shows that Strasburger held the correct view, namely, that there is a lower 2-merous and an upper 4-merous whorl of stamens; Goebel's diagram of the male flower is erroneous.

In *Gnetum Rumpheanum* the development of the male flower proceeds on much the same lines as in that of *Ephedra*. There is no account of its organogeny extant. The author's account of the development of the various parts of the female flower of *Gnetum* (of which no statements as to their mutual positions exist in the literature) is very important and interesting. The species *G. Gnemon* was chosen for the purpose. The transverse pair of prophylls unite to enwrap completely the ovule in the centre of the flower. The anterior of the two median "leaves" unites by its margins to form the so-called "outer integument." The posterior median "leaf," arising higher on the axis, becomes the flask-shaped macrosporophyll, the so-called "inner integument," bearing the nucellus. These two "integuments," therefore, form a whorl of two "leaves" on the axis alternating with the prophylls; the phyllotaxis is thus the same as that of the male flower, and about the same as that of the vegetative shoot. The fact that in the male flower the posterior median "leaf" becomes the stamen and that the same "leaf" in the female flower becomes the "inner integument" proves that the latter is no integument but an entire "leaf"—a macrosporophyll. [This hardly differs from Čelakovsky's view that in the Gnetales the carpel has become reduced to an ovule with its integuments.]

In the female flower of Gnetales the sterile prophylls serve to protect the ovule and have the same function as the fleshy leaves in the female flower of *Juniperus*, and, like these, are "false carpels." The development shows that the median anterior "leaf" is an entire foliar organ and not an aril; most authors regard it as an "outer integument."

The flowers of the Piperaceae have been studied along the same lines. In *Peperomia* the two first-formed transversely placed "leaves" become microsporophylls. The two medianly placed "leaves" unite to form a pitcher-like envelope surrounding the apex of the axis, and are usually called carpels. The apex is quite free between these false carpels. A third "leaf" arises on the axis, at a higher level, surrounding it as a ring-shaped swelling which becomes the macrosporophyll and encloses the nucellus in the centre, and eventually develops into a pitcher-shaped envelope.

As regards *Piper*, the author acknowledges the excellent account of the early stages of development given by Schmitz, but states that he failed to follow the development of the integument. In this genus not only the first pair but also one or two subsequent pairs of "leaves" became stamens, followed by two or three false carpels forming the envelope. The two highest "leaves" on the axis become the outer and inner integuments respectively, the latter constituting the macrosporophyll on whose base the macrospore arises. The above-described mode of development holds good for all species.

A study of the floral diagrams reveals a striking similarity between the ovary of *Ephedra* and *Welwitschia* and that of *Peperomia*, and between that of *Gnetum* and *Piper*.

Passing on to the Juglandales, the floral development has been investigated by numerous authors, but that of the integument has been missed. In *Myrica Gale* the author states that the female flower is perhaps the most primitive among Angiosperms and, geologically, very old.

The organogeny is very similar to that of the plants described above: the same prophylls, false carpels, and the later primordium arising on or near the stem-apex which becomes the integument, whose united margins form a sheath around the apex, and on this last the macrosporangium arises. In Juglandaceae the flower produces more numerous "leaves" than in *Myrica*, but the gynœcium is similarly formed, and all genera are alike in this respect, the development is a replica of that in Piperaceae.

In the discussion of the phylogenetic results of the whole investigation the author points out the great resemblance which exists in the floral structure between certain forms of Coniferae, such as *Juniperus* and the Gnetales, and primitive Angiosperms. One of the most important questions is this: Does the integument arise on the false carpel or on the axis? If the seed is inserted on a "leaf," then it is comparable to that of *Cycas* or *Pisum*; but if on the axis, then it represents an entire "leaf" and cannot be an integument in the usual morphological meaning of that term. In all these plants the integument is found to be an entire "leaf," with a nucellus at its base, and it is therefore a macrosporophyll. In the case of *Gnetum* the long tube of the inner integument protruding beyond the false carpels is the only feature which determines it as a Gymnosperm; if the tube were closed the plant would be an Angiosperm and belong to Piperaceae, which it in practically all respects resembles in its gynœcium. The main result of comparing the "flowers" of Coniferae, Gnetales, and the Angiosperms selected for the purpose is this: that the essential characters are common to all the three groups which have usually been regarded as distantly related, the gaps between them being due to small differences which are never recognized in systematic botany as of importance. The author would refer the gynœcium of all Angiosperms, with the exception of those with free carpels, to an origin from that of the Gnetales and *Juniperus*-like Conifers, and he states categorically that these three groups belong to the same phylum.

In this thesis the author provides a mass of interesting and valuable data connected with the ontogeny of the flowers of the two main groups dealt with, and he has filled many gaps in their developmental history. While admiring the originality and independence of outlook displayed in this research, it must be insisted that the author over-emphasizes the importance and essential value of these facts of ontogenetic development. As Čelakovsky and others have pointed out they cannot always be relied upon to yield clues to the phylogenetic history and origin of the structures concerned; they frequently point in the opposite direction. The author appears to have lost sight of the possibility that all these structures, which he has so minutely examined, have been greatly reduced and modified from their original primitive condition; and it is probably as a result of the very restricted spatial relations occurring in these modified "flowers" (the result of this reduction) that integuments, nucelli, and ovary partition-walls are now frequently found to arise, apparently, on the axis instead of on the carpel; but this does not necessarily prove that the integument is of the nature of an entire leaf, even if it arises in the corresponding position of a stamen in the male flower; for this is merely due to exigencies of space along with the necessitated readjustment of the various organs therein.

One might just as well conclude that the ovules situated on a free-central placenta represent entire leaves on account of their apparent axial position; yet abnormal ovaries of *Primula* clearly show that the normal one is a greatly reduced and modified structure. The Piperaceae and Myricaceae may be relatively primitive families, but their flowers have been almost certainly much reduced and modified. The same is no doubt true of the Gnetaceae. The real facts are, in my opinion, that the Coniferae, Gnetales, and the Angiospermous families investigated, far from being in any way phylogenetically related, have evolved along *parallel* lines to form floral structures which in many respects greatly resemble one another, *e. g.*, the female flower of *Piper* and of *Gnetum*; but these are analogous, not homologous, resemblances. The same laws of floral reduction and modification have held sway in each great group, with, so to speak, the same great end in view, and in each group the primary aim has been more perfectly achieved.

In conclusion, it may be stated that, for the solution of phylogenetic problems, all methods of investigation must be pursued, namely, those of organogeny, comparative morphology, teratological study, and anatomy. It seems to me to be especially dangerous to rely entirely on the method of organogenetic study.—W. C. Worsdell.

Les Bois de la Guyane Française. By R. Benoist. Reprinted from 'Archives de Botanique,' v. Memoire no. 1. Pp. 1–292, 10 text-figs., 58 pls. Caen: 4 Rue des Carmelites, 1933.

Described in the author's introduction as an enumeration of the forest-trees of French Guiana, this work is in fact more in the nature of a forest flora. The number of species included is admittedly far from being representative of the total arborescent flora of the colony, since botanical exploration has not yet been carried far beyond the coastal region. Considering that the list is further restricted by the exclusion of small trees with a diameter of less than 20 cm., the total of approximately 450 species is some indication of the varied nature of the flora. A key to the families precedes the descriptive portion, which follows the system of Engler and Prantl. Under each family are given the principal morphological characters and a key to the genera. Similarly, the description of each genus is followed by a key to the species. Full specific descriptions are given only where both herbarium material and wood specimens of attested authenticity were available for study. In these cases, to the number of 120, the descriptions are fairly comprehensive, consisting of botanical and vernacular names, morphological features, and notes on the habit of the tree, general properties, and

microscopic structure of the wood. The microscopic descriptions are somewhat sketchy; the method of describing the structural features as seen in transverse and tangential sections is insufficient for accurate diagnosis; none the less the scientific value and practical utility of the work is materially increased by their inclusion. It is a matter for regret that the practice of combining anatomical and morphological descriptions of timber trees is not more general. A key to the identification of the woods and 54 photomicrographs are useful additions.—B. J. RENDLE.

The Flora of Iceland and the Fäeroes. By C. H. OSTENFELD and JOHS GRÖNTVED. Sm. 8vo, pp. xxiv, 195, 2 maps. Levin & Munksgaard: Copenhagen. Williams & Norgate, Ltd.: London, 1934. Price 6*s*.

THE premature death of Prof. Ostenfeld in 1931 deprived floristic botany of a continuance of the work on the extreme northern floras in which for many years he had shown special interest. For several years before his death he had had in preparation a 'Flora of Iceland and the Fäeroes,' chiefly based on the rich collections in the Botanical Museum at Copenhagen of which he was in charge and which he had done so much to augment. At the time of his death he had completed the descriptive part as far as the family Leguminosae—that is, rather more than half of the main portion of the work. The work has been completed by Mr Johs Gröntved, of the Botanical Museum, with the assistance of fellow botanists at home and abroad, especially in the elaboration of the more critical genera. Their help is duly acknowledged in the preface.

The little volume will supply a useful guide to the determination of the flowering plants and ferns native in the islands; it also gives information as to their habitats, geographical distribution within the area, and times of flowering. For the analytical keys, the glossary of terms, etc. Mr. Gröntved is responsible.

The ultimate test of such a handbook is its value in field-work, but the elaborate keys to the genera and species and the generic descriptions should be adequate.

Botanists who are not familiar with these northern islands may be surprised at the extent of their flora; it would be of interest to know how many genera and species are represented, but there is a running number only for the families, fifty in all. The index, which does not include species, contains nearly 240 genera. The arrangement is that of the familiar German system. In addition to the index of families and genera, and a comprehensive glossary, there are lists of the popular plant-names used respectively in the Fäeroes and Iceland. The text is clear and well arranged, and is, it should be added, in English.

An Introduction to Plant Biochemistry. By CATHERINE CASSELS STEELE, M.A., B.Sc., Ph.D. (St. Andrews). 8vo, pp. viii, 356, 12 text-figs. G. Bell & Sons, Ltd.: London, 1934. Price 15*s*. net.

THE increasing attention which is being paid to the chemical aspects of plant metabolism is reflected in the number of books dealing with this branch of knowledge which have appeared during the last few years. The latest addition to this number is the volume under review. The aim of the book is to provide students of botany with an introductory account of the chemical nature and relationships of the substances produced by plants. The author further states that to make the book useful to students who have had no training in organic chemistry the subject has been developed logically from the start according to the modern theories of organic structure. The material is an elaboration of a series of lectures given to students in biochemistry, and a parallel elementary course of practical instruction is provided by the description of a few simple experiments. The author has made a very wise selection from the large field to be covered, and has succeeded in producing a readable and well-balanced account of the subject which should prove of considerable value to students.

Annales Bryologici. Supplementary Volume III. *A Revision of the Genus* Acromastigum. By A. W. EVANS. 8vo, pp. viii, 178, text-figs. 40. M. Nijhoff: The Hague, 1934. Price 6 guilders.

THE genus *Acromastigum* was founded by the author in 1900 on specimens from the Hawaiian Islands characterized by the peculiarity of terminal branching from both lateral and ventral segments—a distinguishing feature from other genera of Hepaticae. In his introduction the author discusses an *Acromastigum* type of branching in sections of the genera *Bazzania* and *Mastigobryum*. This feature "is accompanied by certain histological peculiarities in the axial organs which yield further differential characters of importance." Hence the emended genus *Acromastigum*, the very detailed revision of which is the subject of the present volume. Twenty-eight species are recognized, most of which are known only in the sterile condition. They include a few new species as well as transferences from the two genera mentioned above. Twenty-one of these are, so far as at present known, restricted to a single country or island. Ten occur in Borneo, six endemic. The main area of distribution includes Malacca, Amboina, the Philippines, Australia, New Caledonia, New Zealand, and Chile. Single species occur in Nepal, South Africa, and the Pacific Islands

Since many of the species are small and easily overlooked undescribed species doubtless await discovery, and those already described will be found in new localities. Ten of the latter are at present known only from the type-collections.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—The new session opened on October 18, when a large number of Fellows and their friends dined at the Hotel Washington, the President, Dr. William Thomas Calman, F.R.S., in the Chair. Sir Richard Gregory, Bart., the President's guest, proposed the toast of "Prosperity to the Linnean Society." The dinner was followed by a Reception by the President in the Rooms of the Society, Burlington House. A number of interesting exhibits had been arranged in the library, and Dr. J. F. G. Wheeler, Director of the Bermuda Biological Station, gave a lecture, illustrated by lantern-slides, on the Marine Biology of Bermuda.

ROYAL HORTICULTURAL SOCIETY.—The October number of the 'Journal' (which is now issued monthly) contains a report of the Masters Lectures, 1934, given by Dr. W. F. Bewley, on "Health and Disease in Plants." Conditions governing the health and susceptibility of the plant were discussed, the conclusion being that if a plant is grown in such a manner that it conforms to its natural habitat it is resistant to most troubles. Relation of host to parasite, prevention of disease, especially methods of soil sterilization by heat, electricity, or chemicals, were dealt with, and attention was drawn to the increased efficiency of certain fungicidal sprays and dusts. Dr. Bewley's work at the Experimental and Research Station, Cheshunt, supplied good illustrations of his subject.

THE ROYAL SOUTH LONDON FLORICULTURAL SOCIETY.—To the 'Journal of the Royal Horticultural Society,' lix. pt. 2, Mr. W. Roberts contributes an article on this Society, which flourished in Lambeth under distinguished patronage in the middle of last century. Its decline and extinction were due to the gradual urbanisation of the area.

WATSON BOTANICAL EXCHANGE CLUB.—Mr. Geo. Goode (63 De Freville Avenue, Cambridge) will be glad to supply partial sets or separate Reports of the Club, so far as the remaining stock allows, on payment of postage. No copies are in stock of vols. i. (1884), xxi. (1905), or xxxiii. (1917).

DR. O. V. DARBISHIRE.—We note with much regret the death of Professor Otto Vernon Darbishire, M.A., Ph.D., Melville Wills Professor of Botany in the University of Bristol, on October 17, after a short illness.

CORRECTION.—On p. 229 under *Selaginella spanioclema* the collector should be Synge not Richards.

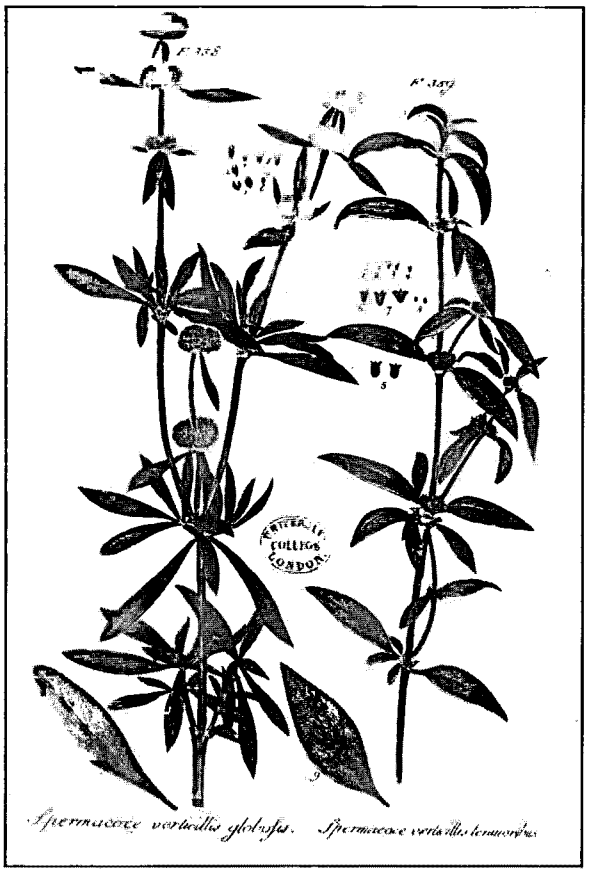


FIG. 1.

FIG. 2.

LINNÆAN SPECIES OF *SPERMACOCE*

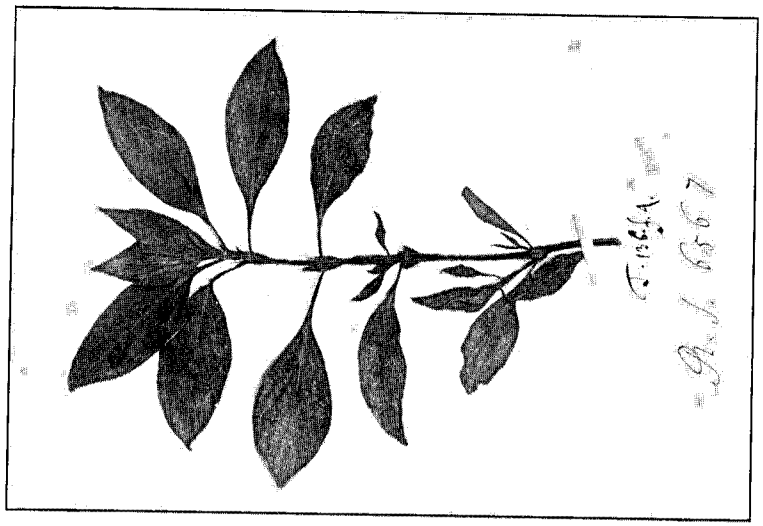


FIG. 4.

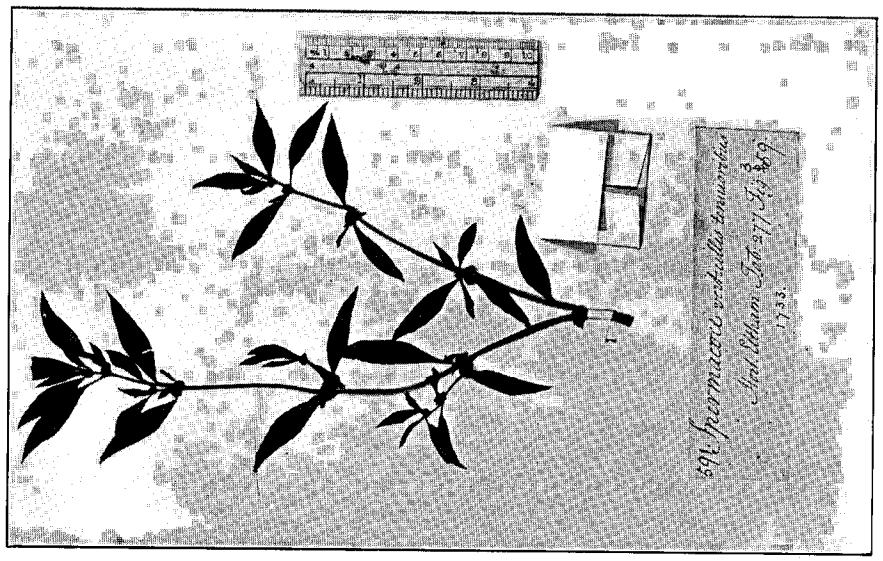


FIG. 3.

LINNÆAN SPECIES OF *SPERMACOCE*.

BY A. B. RENDLE.

(PLATES 607 & 608.)

THERE has been some confusion in herbaria in the determination of species of *Spermacoce* and allied genera of Rubiaceae. The distinction between these genera depends on the character of the fruit, and careful examination is necessary. Failure to consult original specimens has also added to the confusion.

Linnæus founded the genus *Spermacoce* (Sp. Pl. 102; 1753) on three species—*S. tenuior*, *S. verticillata*, and *S. hispida*. The name *S. tenuior* has been generally applied to a species widely spread in the West Indies and extending into equatorial America and northwards to Florida, Georgia, and Louisiana. It is a small annual herb with lanceolate to linear-lanceolate somewhat scabrid leaves, few-flowered unilateral sessile axillary inflorescences, and almost subglobose, somewhat tumid hirtellous fruits surmounted by the persistent sepals.

A closely allied species which has been referred by K. Schumann (in Martius, Flor. Brasil.) and Urban ('Symbolæ Antillanæ') to *S. glabra* Michx. (Fl. Bor. Am. i. 82, 1803), native of the South-Eastern United States, is a glabrous perennial herb with lanceolate to oval-lanceolate leaves with many-flowered unilateral sessile inflorescences and smooth glabrous obovate fruits with a flat top surmounted by short sepaline teeth.

To judge from herbarium material it is a less common species in the West Indies; it is also fairly widely distributed in tropical America. It was described by Chamisso and Schlechtendal (Linnæa, iii. 355; 1828) from South Brazil as *Spermacoce riparia*, and I agree with Britton and Wilson (Sci. Survey Porto Rico and the Virgin Is. vi. 256) that it is distinct from the North American species, *S. glabra* Michx.

Linnæus describes *S. tenuior* as follows:—

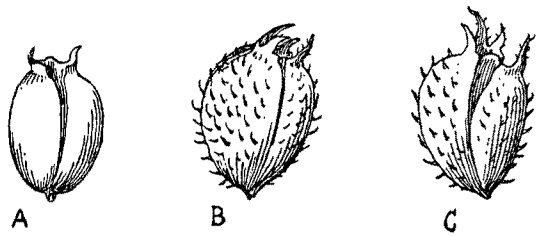
S. tenuior glabra, staminibus inclusis.
Spermacoce verticillis tenuioribus Dill. Elth. 370, t. 227 [277], f. 359.
Roy. lugdb. 258.
Anonymos americana, fol. &c. Pluk. Alm. 33, t. 136, f. 4.
Habitat in Carolina.

There are two specimens in the Linnean Herbarium on the sheet labelled (by Solander) *Sp. tenuior* 1, and indicated in Linnæus's hand as from Patrick Browne. But as Linnæus did not receive Browne's specimens until 1758 they have no bearing on the identity of the species described in 1753 otherwise than indicating an uncertainty at a very early date as to that identity. The right-hand specimen is *Hemidiodia ocimifolia* K. Sch., the left-hand *Borreria spinosa* Sw.

We come therefore to the references given by Linnæus.

(1) *Spermacoce verticillis tenuioribus* Dill. Elth. This has been generally regarded as representing *S. glabra* Michx.—for instance, by Asa Gray (Synopt. Flor. N. Am. i. 2, p. 34; 1884), K. Schumann (Mart. Fl. Bras. vi. 6, p. 35), Grisebach (Fl. Brit. W. Indies, 349).

This opinion has presumably been based solely on Dillenius's figure and description. So far as I know, no one had consulted the herbarium at the Oxford Botanic Garden, and in the list of specimens described in the 'Hortus Elthamensis' given by Druce in "The Dillenian Herbaria" the two species of *Spermacoce* are indicated as not found. Dillenius's figure, T. cclxxvii. f. 359 (see Plate 607, fig. 1), is a very fair representation of *S. glabra* of authors (*S. riparia* Cham. & Schl.), but there is a discrepancy in the description; that of the fruit as "subhirsuta" suggests "*S. tenuior*." The discrepancy probably led Asa Gray (*loc. cit.*) to quote the reference to Dillenius as perhaps including *S. tenuior* in part.



A, fruit of *Spermacoce tenuior* L. from the Dillenian specimen at Oxford. B, C, fruit of the specimen from Catesby on the same sheet; C, dehiscing and showing the membrane attached to the larger coccus. All ×8.

It occurred to me that the original specimens might have been overlooked, and I have to thank Prof. Tansley for permission to examine the Dillenian Herbarium, and especially the Acting Curator, Mr. H. Baker, who found several sheets of *Spermacoce* bearing Dillenius's writing in the Sherard Herbarium. One of these was written up by Dillenius "*Spermacoce verticillis tenuioribus* H. Elth." It is a plant with scabrid oval leaves and softly villous four-angled stem, and bears no flowers or fruit. It is certainly not the plant figured by Dillenius, and some one has queried (in pencil) Dillenius's determination. It bears a label in an earlier hand in faded ink:

> Mollugo Americana, folio Parietariae Vaill. Boerh. Ind. alt. 148. Anonymos Americana, foliis, &c. Pluk. Almag. 33, Tab. 136, f. 4.

Dillenius wrote his determination at the bottom of the original label. This certainly was not the specimen from the Eltham

Garden figured and described by Dillenius. There is no indication as to the origin of the plant, which was evidently an earlier specimen in Sherard's Herbarium. In the absence of flower and fruit its determination is difficult, but it bears no relation to the species under discussion.

A second sheet (fig. 2) bears three specimens, all with fruit. The two right-hand are *S. tenuior* as generally understood, the left-hand (put on after the others, as it slightly overlaps) is *S. riparia* and bears a label in Dillenius's hand "Eltham." The sheet also bears a label, evidently referring to the original right-hand specimens, "Mr. Catsby, Carolina, 1722." The Eltham specimen corresponds with Dillenius's figure except that the leaves are a little narrower. It bears the fruit (text-fig. A, p. 330) of *S. riparia*, which differs from that of the restricted North American *S. glabra* Michx. in the shorter persistent sepals which become ultimately almost obliterated. The 'Hortus Elthamensis' was published in 1732, and it is of interest to note that we have in the British Museum Herbarium a specimen from the Chelsea Botanic Garden (one of the annual contribution of fifty specimens sent to the Royal Society as an acknowledgment of tenure) dated 1733 and referred to the species of the 'Hortus Elthamensis' (Pl. 608, fig. 3). It is an excellent representative of the same species, which was evidently in cultivation at the time.

There is no doubt that the Eltham or a similar specimen is the origin of the figure. Dillenius remarks that the plant has flowered and fruited for several years: "æstate nobiscum pluribus annis floruit et semina perfecit." He adds, "we have dried specimens collected in Carolina in which the leaves are narrower rather than broader," obviously Catesby's specimen, and he also tentatively refers to the same species a plant *Anonymos Americana* &c. Pluk.; *Mollugo Americana* &c. Boerh., "the dry leaves of which besides being broader than ours are noticed to be rougher," presumably the broad-leaved plant written up by him to which I have referred above.

Dillenius's description of the fruit of his species as "subhirsuta" (a character not borne out by the figure) suggests a reference to Catesby's specimen (see text-figs. B & C, p. 330).

On the same plate Dillenius figures another species "*Spermacoce verticillis globosis*." This is a type of Linnæus's second species *S. verticillata*, and is the species known as *Borreria verticillata* (L.) Meyer. Linnæus also refers to the 'Hortus Cliffortianus,' the corresponding specimen to which is in the British Museum Herbarium. There is also a later specimen from Patrick Browne in the Linnean Herbarium, written up *Spermacoce verticillata* by Solander. We found also in Sherard's herbarium the original specimen, labelled by Dillenius "*Spermacoce verticillis globosis* H. Elth." There is therefore abundant and irrefutable evidence for the identity of this species.

To return to *Spermacoce tenuior* of the 'Species Plantarum.' The second reference is Roy. lugdb. 258. This is easily disposed of, as Royen merely quotes both figures of Dillenius, including therefore "*S. tenuior*" and *S. verticillata*. The third reference, to Plukenet, Alm. 33, t. 136, f. 4, has been regarded, for instance by Asa Gray (*loc. cit.*), K. Schumann (*op. cit.*), as referring to the species known as "*S. tenuior*," and therefore as representing the only reference by Linnæus to this—the type, in fact, of the species as generally understood. But no one seems to have looked up the plant, two specimens of which are preserved in Plukenet's Herbarium in Herb. Sloane (xcv. fol. 53; xcix. fol. 77) in the British Museum Herbarium. Both are *Borreria laevis* (Lam.) Griseb., a common West Indian weed (it is also one of the commonest plants in Bermuda). (See Pl. 608, fig. 4.)

I have followed recent workers on New World botany (Schumann, Urban, N. L. Britton, and others) in regarding *Borreria* as a distinct genus. It was separated from *Spermacoce* by G. F. W. Meyer (Prim. Fl. Essequib. 83; 1818) on the character supplied by the mode of dehiscence of the fruit, a character which is useful in distinguishing other genera of the subtribe *Spermacoceae*. Of the three species included by Linnæus (Sp. Pl. 102) *S. tenuior* and *S. hispida*—a Ceylon species the original of which is in Hermann's Herbarium in the British Museum—belong to *Spermacoce* as restricted by Meyer, while *S. verticillata* is a *Borreria*.

The references to *Spermacoce tenuior* cited by Linnæus include therefore *S. riparia* (with perhaps a slight indication of *S. tenuior* auct. in the description of the fruit), *Borreria laevis*, and, in the citation of Royen, *B. verticillata*; the last presumably an oversight, as the second figure of Dillenius cited by Royen is included by Linnæus under his second species *Spermacoce verticillata*. Linnæus's brief description, "glabra, staminibus inclusis," excludes the reference to *Borreria laevis*, which is distinguished by exserted stamens. Included stamens are characteristic of the two species of *Spermacoce*. "Glabra" is a character of *S. riparia*, not of *S. tenuior* auct. The locality Carolina was regarded by Grisebach (*loc. cit.*) as excluding *S. tenuior* auct., which does not extend north to Carolina as now limited; Linnæus presumably adopted the locality from Dillenius's reference to Catesby's plant. But a reference to Catesby's 'Flora Carolinensis' defines "Carolina" as understood originally, a much more extensive area, between latitudes 36° 30′ N. and 29°, and including the northern portion of Florida. *S. glabra* Michx. is recorded as far north as Ohio and Illinois.

Gaertner ('De Fructibus,' i. 122, t. 25, fig. 9; 1788) restricts *S. tenuior* L. to the species generally known by that name, and gives an excellent figure of the fruit. Lamarck (Tab. Encycl. i. 273; 1791), describing the same plant, from S. Domingo, as

S. tenuior L., copies Gaertner's figure of the fruit and the upper portion of Dillenius's figure of the plant. The species has been very variously quoted as *Spermacoce tenuior* L., or L. emend. Lam.," or "Lam. (non L.)," or "Gaertn.," or "(L. partly) Gaertn.," but it is, I think, clear that the type of *S. tenuior* L. must be regarded as the figure and specimen of Dillenius which is not *S. tenuior* auct. but *S. riparia* Cham. & Schlecht.

The earliest valid name for *S. tenuior* auct. non L. would seem to be *S. remota* Lam. Encycl. vii. 313 from S. Domingo. The description would fit it, and it is quoted as a synonym by Urban (Symb. Antill. viii. 690) and also by K. Schumann (in Mart. Fl. Bras. vi. 6, p. 33).

It may be noted that Linnæus misquotes the number of the plate in the 'Hortus Elthamensis' (227 for 277). It is somewhat remarkable that this erroneous citation has been followed by several subsequent authors, Adamson ('Familles des Plantes'), and Gray and K. Schumann in the references given above. Plate 227 represents a Cactus, *Pereskia aculeata*.

The first description of the genus is in the 'Genera Plantarum,' 1745, p. 44: "*Spermacoce* Dill. elth. 277." This includes, of course, the later separated genus *Borreria*.

I am indebted to Mr. E. H. Ellis, of the Department of Botany, for the photographs illustrating this article.

Explanation of the Plates.

Plate 607.

Fig. 1. Dillenius Hortus Elthamensis, i. tabl. 277.

Fig. 2. Photograph of sheet in the Dillenian Herbarium at Oxford. The left-hand specimen, labelled "Eltham," is *Spermacoce tenuior* L., the two right-hand specimens are *S. remota* Lam.

Plate 608.

Fig. 3. *Spermacoce tenuior* L.; photograph of specimen from the Chelsea Garden in the British Museum Herbarium.

Fig. 4. *Borreria laevis* Griseb. Photograph of specimen in Plukenet's Herbarium (Herb. Sloane, xcv. fol. 53) in the British Museum Herbarium.

NEW SPECIES FROM BRITISH GUIANA, CAMBRIDGE UNIVERSITY EXPEDITION, 1933.

By T. G. Tutin, M.A.

(Concluded from p. 314.)

Utricularia sciaphila, sp. nov. (Fig. 6.) Affinis *U. Regnelli* Sylvén, sed rhachi recta, squamis majoribus, bracteis anguste triangularibus, pedicellis longioribus tenuioribusque, sepalis triangularibus, calcare robustiore, plerumque obtusiusculo, labio inferiore majore integro, labio superiore angustiore, calcare

cum labio superiore collineato, nec cum eo angulum rectum efficiente, tota planta hispidula, differt.

Herba tenuis, sub anthesi aphylla. *Scapi* tenues erecti, 3–9 cm. alti, satis hispiduli, utriculis nullis; squamæ paucæ raræ hispidulæ, 1·0–1·25 mm. longæ, lanceolatæ acutæ basifixæ. *Inflorescentia* racemosa 1–5-flora; bracteæ 3 anguste triangulares, 0·75–1·25 mm. longæ, subæquales hispidulæ; pedicelli 3–4 mm. longi, sub anthesi stricti postea satis patentes; sepala inæqualia sub anthesi inferius 2 mm. longum ovatum apice bifidum, superius 2·75 mm. longum lanceolatum hispidulum, sub fructu inferius 3 mm. longum valde costatum costis tantum hispidulum, superius 3·5 mm. longum vix costatum; corolla pallide cærulea, labio inferiore macula lutea annulo purpureo circumclusa prædito; labium superius lineare vel spathulatum, 3 mm. longum, apice 1 mm. latum; labium inferius orbiculare, 4 mm. longum, 3·5–4·0 mm. latum; calcar 7–8 mm. longum, 1 mm. crassum, conicum obtusiusculum, versus apicem papillosum; stamina glabra, filamentis satis crassis, 1 mm. longis, antheris 1 mm. longis; ovarium glabrum piriforme, stylo brevi, stigmate compresso, bilobato, lobo altero quadruplo majore. *Capsula* 1·75 mm. longa, cylindrica, stylo atque stigmate persistente.

Hab. Kaietuk savanna, Potaro River. Wet rocks in shade of *Brocchinia cordylinoides*; alt. c. 1100 ft.; no. 646; August 28, 1933. Typus in Herb. Mus. Brit.

Stems bright green. Flower pale blue, with a purple ring enclosing a yellow spot on the lower lip. Spur long upward pointing, white at the base, pale lilac at the tip.

Utricularia tenuissima, sp. nov. (Fig. 7.) Non valde affinis aliæ speciei hodie descriptæ.

Herba annua tenuissima aphylla. *Scapi* erecti purpurei capillacei haud flexiles, 3–5 cm. longi; squamæ 2–3 minimæ oblongæ; bracteæ 3 ovato-lanceolatæ obtusiusculæ, c. 0·25 mm. longæ. *Inflorescentia* uni- vel biflora; pedicelli 1 mm. longi; sepala purpurea c. 0·75 mm. longa, obtusa paulum emarginata, superius ovatum, inferius angustius; flores albi, labio inferiore pallide flavo maculati; labium superius c. 1·5 mm. longum, erectum obovatum vel oblongum, integrum vel leviter emarginatum; labium inferius c. 3 mm. longum, horizontale plus minusve orbiculare, integrum vel leviter emarginatum vel serratum; calcar cylindricum obtusum, versus basin constrictum, labium inferius subæquans et in eadem directionem directum; stamina filamentis brevissimis, antheris magnis; ovarium glabrum, ovoideum, stylo breve. [*Capsula* mihi ignota.]

Hab. Kaietuk savanna, Potaro River. Wet sandy ground, with little other vegetation; alt. c. 1100 ft.; no. 644; August 28, 1933. Typus in Herb. Mus. Brit.

G. S. Jenman, no. 1276, Sept.–Oct. 1881, in Herb. Kew, is a rather meagre specimen from the same locality.

Stems purple, wiry. Flowers white, with a pale yellow spot on the lip. Lip broad, entire, shallowly notched, or serrate. Spur about equalling the lip and nearly parallel to it. The plants grow singly, but in such numbers that the purple colour of their wiry stems is quite conspicuous.

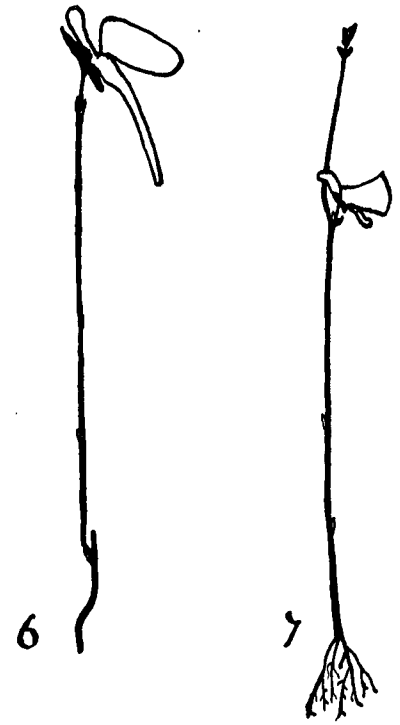


Fig. 6.—*Utricularia sciaphila*, ×2. Fig. 7.—*U. tenuissima*, ×2.

Growing with this species were some plants (no. 665) with smaller flowers with a narrower lower lip without the yellow spot on it, and with the spur often downward-pointed. This may be a distinct species, but further specimens, and particularly field observations, are required. It is not clear to which section the above species belongs.

Orthaea pendula, sp. nov. (Ericaceae). Affinis *O. apophysatæ* (Griseb.) A. C. Smith ex insula Trinitatis sed habitu non epiphytico, petiolis brevioribus et robustioribus, foliis crassioribus, marginibus valde recurvis, corolla minore (1·3 cm. non 2·3 cm.) lobis acutis,

intus arachnoideo-tomentosa, stylo longe exserto, stigmate capitato, filamentis puberulis, discedit.

Arbor parva, c. 11 m. alta; rami longi satis tenues penduli glabri, ramulis paucis; cortex ramorum veterum rubro-brunneus levis, juvenilium cinereus. *Folia* 3·5–4·0 cm. longa, 2·0–2·5 cm. lata, ovata, basi rotundata vel subcordata, plerumque obtuse acuminata coriacea, marginibus recurvis; costa supra impressa, subtus prominente, nervis supra inconspicuis, subtus plus minusve prominentibus, utrinque 4–5; juvenilia marginibus ciliolata, adulta glaberrima; petioli 4–5 mm. longi, 1·0–2·5 mm. lati, satis compressi et rugosi. *Flores* axillares solitarii vel gemini; pedunculi 1·0–1·5 cm. longi, c. 1·5 mm. lati, superne non, vel vix incrassati, bracteolis duabus fere oppositis late triangularibus glabris c. 1 mm. longis, c. 4 mm. supra basim præditi; calycis tubus 1 mm. longus, basi 3·0–3·5 mm. apice 2 mm. latus; limbus 2 mm. longus patens, 6·0–6·5 mm. latus, brevissime quinquelobatus vel fere integer, glaber; corollæ tubus 10–13 mm. longus, basi 4 mm. apice 3 mm. latus, sensim angustatus, lobi c. 3 mm. longi acuti intus minute arachnoideo-tomentosi rubri cerei; stamina 10, longiora 5·25 mm., breviora 4·0 mm. longa, filamentis longiorum 2·25 mm., breviorum 1·0 mm. longis, antice puberulis, antheris 2·0 mm. longis; tubuli 1·0 mm. longi, poris per fere totam longitudinem antice extensis præditi; ovarium glabrum, stylo filiformi 2·0–2·4 cm. longo, stigmate capitato. [*Fructus* non visus.]

Hab. Amatuk, Potaro River. Among boulders at the brink of the Fall; only one tree seen; alt. c. 300 ft.; no. 475; August 19, 1933. Typus in Herb. Mus. Brit.

Tree c. 35 ft. high. Leaves coriaceous. Flowers red, tubular, waxy. Branches pendulous, young leaves red.

Paepalanthus leucocyaneus, sp. nov. (Eriocaulaceae). *P. tortili* (Bong.) Mart. affinis sed foliis latioribus, capitulis globosis non cylindricis, bracteis involucri apice cuneatis et valde barbatis, pilis albis numerosissimis inter flores sicut capitula alba purpureo-cæruleo-tincta sunt, discedit. *P. Lamarckii* Kunth affinis sed statura majore, foliis pedunculisque glaberrimis et foliis rigide mucronatis, distinguitur.

Herba perennis. *Caulis* usque 5 cm. longus, parte basale sæpe in terra sepulta et radices ex axillis foliorum mortuorum emittente, irramosus vel versus apicem ramis 1 vel 2 præditus. *Folia* 1·5–2·0 cm. longa, 2·5–5·0 mm. lata, multinervia glabra satis rigida plana, apice subito in mucronem rigidum contracta, basi lata plus minusve amplexicaulia, ad apicem caulis dense aggregata inferne sparsa. *Pedunculi* numerosi ex apice caulis emergentes, 7–14 cm. longi, 0·5 mm. diam., torti 6-costati glabri. *Vaginæ* 1–2 cm. longæ, ore obliquæ inflatæ glabræ; laminæ erectæ vel paulum recurvæ, acutæ. *Capitula* globosa 3·0–3·5 mm. diam.; bracteæ exteriores oblongæ apice cuneatæ, fasciculo pilorum alborum præditæ, mox occultæ, ceteræ obtriangulares pilosæ. *Flores masculi* pedicellati; sepala 3 ovata glabra; stamina 3, antheris magnis ovoideis. *Flores femini* sessiles; sepala 3 spathulata postice pilosa; petala 3 ovata quam sepala paulum breviora, glabra; stylus appendiculis tribus præditus. *Fructus* 0·25 mm. longi, truncato-ellipsoidei, quam *P. tortilis* duplo majores.

Hab. Amatuk, Potaro River. Shallow sandy pools on the river-bank; alt. c. 300 ft.; no. 481; August 19, 1933. Typus in Herb. Mus. Brit.

Leaves pale green, crowded at the summit of a short erect stem. Flowers white tinged with purplish blue.

Ichnanthus dasycoleos, sp. nov. (Gramineae). (Fig. 8, *a.*) Affinis *I. leiocarpo* Kunth (fig. 8, *b*) qui habitu majore et robustiore, foliis latis glabris, panicula patente, glumis obtusis et cucullatis, lemmate floris hermaphroditici 4 mm. longo, alis 2 mm. longis, differt.

Fig. 8.—a, *Ichnanthus dasycoleos*; b, *I. leiocarpus*. Spikelet in fruit, ×5.

Herba perennis, satis tenuis, caule basi decumbente. *Vaginæ* folium inferiorum internodiis breviores, pilis longis crispulo-sericeis vestitæ, quam culmi hirsutiores, nodis barbatis. *Folia* 10–15 cm. longa, 1·0–1·5 cm. lata, linearia acuminata, subtus pilis brevibus erectis dense vestita, supra pilis paulum longioribus

erectis satis sparse vestita; ligula brevis ciliata. *Panicula* stricta, plus minusve nutans, 20–30 cm. longa, parum ramosa, ramis primariis partis inferioris fasciculatis, in axillo fasciculum pilorum ferentibus, ramis ceteris solitariis. *Spiculæ* 5·0 mm. longæ, pedicellis longis tenuibus strictis; glumæ inæquales, inferior 2·5 mm. longa, longe subtus superiore emergens, basin spiculæ includens, trinervis, marginibus ciliata, carina scabrida, basi lata, apice acuta, incurva; superior 4·5 mm. longa, angusta acuminata 5-nervis, versus apicem paulum hirsuta; lemma floris masculi 4·5 mm. longum, lanceolatum acuminatum dorso rotundatum 5-nerve, glabrum; palea 3 mm. longa, lanceolata plana tenuissima, enervis; lemma atque palea floris hermaphroditici 2·3 mm. longa, oblonga obtusiuscula enervis indurata, alis lemmatis distinctis, 0·5 mm. longis; lodiculi 0 in floribus masculis, 3 in floribus hermaphroditicis, duo flabellati 0·2 mm. longi, tertius rectangularis minimus; stamina 3, antheris 2 mm. longis satis crassis; ovarium parvum ovoideum glabrum, stylis 2 satis compressis. [*Fructus* non visus.]

Hab. Kaietuk savanna, Potaro River. Shady place, rather damp, near the top of the Fall; alt. c. 1100 ft.; no. 642; August 28, 1933. Typus in Herb. Mus. Brit.

First glume purple, second glume green, purple-tipped.

Paspalum scandens, sp. nov. A **P. subfalcato** (Doell sub *Panico*) comb. nov. statura majore nodis glabris foliis longioribus inflorescentiis axillaribus magis numerosis spiculis minoribus, differt.

Herba perennis caulibus altis tenuibus satis scandentibus ramosissimis. *Folia* caulina 8–10 cm. longa, 2–4 mm. lata, glaucescentia; vaginæ satis compressæ et carinatæ, marginibus ciliatæ, alibi glabræ; ligula c. 1·5 mm. longa, ovata ciliata. *Inflorescentia* solitaria raro duæ, 4·5–6·5 cm. longa, terminalis vel axillaris, curva, rhachide anguste alata, glabra. *Spiculæ* 2 mm. longæ, pedicellis 0·5 mm. longis; gluma prima minuta truncata, secunda 0·7–1·3 mm. longa, acuta uninervis tenuissima fragillima; floris sterilis lemma 1·75 mm. longum, trinerve obtusiusculum tenue, palea membranacea quam lemma aliquanto brevior; floris hermaphroditici lemma 2 mm. longum, ovatum obtusiusculum induratum, marginibus involutum, enerve, palea tenuis lemmati subæquans. *Fructus* juvenilis brunneus obtusus.

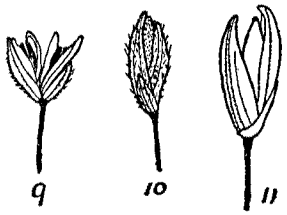
Hab. Kaietuk savanna, Potaro River. Dry places covered with bushes; alt. c. 1100 ft.; no. 631; August 28, 1933. Typus in Herb. Mus. Brit.

Scrambling. Sheaths somewhat compressed, ciliate on the margin. Leaves glaucescent.

"Readily falls into the group I call *Decumbentes* (N. Am. Sp. *Paspalum*, p. 91), having a minute first glume and axillary inflorescences. No 631 is quite distinct from any species I have seen."—A. Chase, *in litt.*

Panicum tropidoblephare, sp. nov. (Fig. 9.) Affinis *P. eligulato* N. E. Br. quo foliis congruit sed spiculis multo minoribus glumis angustioribus carina ciliatis differt.

Herba perennis cæspitosa, culmis rigidis erectis, 50–70 cm. altis. *Folia* plerumque radicalia 30–40 cm. longa, usque 1 cm. lata sæpissima angustiora, involuta glaucescentia distincte costata rigida pungentia; vaginæ indistinctæ quam laminæ aliquanto latiores, pro ligula pilos longos raros paucos ferentes; folia caulina 1–2, lamina 4–7 cm. longa, vagina 10–15 cm. longa, nodis pilis appressis sericeis præditis. *Panicula* 10–11 cm. longa, sub anthesi stricta, c. 3 cm. lata, sub fructu patula c. 12 cm. lata; rami solitarii vel bini vel terni, rigidi flexuosi, basi satis incrassata, inferiores in axillis pilos longos paucos ferentes, semel vel bis ramosi. *Spiculæ* 2·5 mm. longæ, pedicellis tenuibus rigidis flexuosis, 3–7 mm. longis; gluma prima 1·0–1·5 mm. longa



Figs. 9–11.—9, *Panicum tropidoblephare*, spikelet in flower. 10, *P. pycnoclados*, 11, *P. kaietukense*, spikelet in fruit. All ×5.

anguste lanceolata acuta uninervis, nervo minute ciliata, secunda 2 mm. longa, lanceolata acuta aliquanto cucullata valde trinervis, nervis ciliata; floris masculi lemma 2·0 mm. longum, ovatum, acutum trinerve, nervis ciliatum, palea aliquanto brevior lanceolata membranacea; floris hermaphroditici lemma 2·25 mm. longum lanceolatum obtusiusculum, satis membranaceum, nervis obsoletis, palea similis; stamina 3, obscure purpurea. *Fructus* 1·5 mm. longus, plano-convexus ovatus acutus nitidus.

Hab. Kaietuk savanna, Potaro River. Damp stony ground; alt. c. 1100 ft.; no. 685; August 31, 1933. Typus in Herb. Mus. Brit.

Tufted. Leaves glaucescent and inrolled. Forming a large patch near the Rest House, but very little flowering.

This species is of interest as it belongs to the small *loreum* group, the only other member of which so far known to occur in the Colony is *P. eligulatum* N. E. Br. The latter has only been found on the summit of Roraima, so the present species provides yet another instance of the occurrence of two closely allied and very local plants on Roraima and the Kaietuk savanna.

Panicum pycnoclados, sp. nov. (Fig. 10.) Affinis *P. cordovensi* Fourn. et *P. ovulifero* Trin. a quibus panicula minore ramis paniculæ densius fasciculatis flexuosis, pedicellis aliquanto longioribus et magis patentibus, spiculis pubescentibus gluma prima breviore, differt.

Herba perennis, caulibus longis tenuibus multo ramosis supra frutices parvos scandentibus. *Folia* 4·5–8·5 cm. longa, 0·5–1·3 cm. lata, lineari-lanceolata, basi subcordata, semi-amplexicaulia plana marginibus basi longe alibi breviter ciliata; vaginæ quam internodi breviores, longe ciliatæ; nodi barbati; ligula brevissima ciliata. *Panicula* 6–9 cm. longa, 5–7 cm. lata; rami fasciculati rigidi flexuosi, sæpissime semel ramosi. *Spiculæ* 3·5 mm. longæ, pedicellis tenuibus, plerumque 1–1·5 cm. longis nonnunquam brevioribus; gluma prima 1 mm. longa, triangularis, acuta, basi amplexicaulis, trinervis, nervis breviter et appresse pilosis; gluma secunda 2·5 mm. longa, lanceolata acuta multinervis, tota breviter et appresse pilosis; floris sterilis lemma 2·5 mm. longum, late lanceolatum acutum multinerve, appresse pilosum, palea 2 mm. longa, anguste oblonga membranacea, apice pilosa; floris hermaphroditici lemma 2·25 mm. longum, ovatum acutiusculum, marginibus involutum, apice pilosum, nervis obsoletis, palea 2 mm. longa, ovata acutiuscula marginibus involuta glabra; stamina 3, antheris purpureis 1·5 mm. longis; styli ramis numerosis hirsutis præditi; lodiculæ 3 obcuneatæ. [*Fructus* non visus.]

Hab. Kaietuk savanna, Potaro River. Damp shady place near the top of the Fall; alt. c. 1100 ft.; no. 508; August 20, 1933. Typus in Herb. Mus. Brit. Also no. 651, August 29, 1933, from the same locality.

Stems long and straggling over low bushes. Leaf-sheaths and margins of the leaves ciliate. Inflorescence contracted before flowering, spreading later. The species in this group exhibit two phases, the second of which is cleistogamous. This description refers to the early phase only, as no material of the cleistogamous phase was found.

Panicum kaietukense, sp. nov. (Fig. 11.) Valde affinis *P. gramulifero* H. B. K. sed foliis brevioribus angustioribus magis patentibus, culmis plerumque irramosis, panicula minore minus ramosis, spiculis majoribus acutis, discedit.

Herba annua caulibus tenuibus, plerumque solitariis raro ramosis, 10–14 cm. altis. *Folia* 1–2 cm. longa, 1·5–3 mm. lata, acutiuscula glauca glabra; vaginæ quam internodi breviores, valde amplexicaules, nonnunquam basi et in ore pilis longis paucis præditæ; ligula brevis ovata. *Panicula* 1–3 cm. longa, 1–2·5 cm. lata, ramis solitariis, alternatis, patentibus, vel reflexis, irramosis, vel nonnunquam semel vel bis ramosis. *Spiculæ* 1·5–1·75 mm. longæ, pedicellis tenuibus, 3–8 mm. longis; gluma prima 1 mm. longa, triangularis obtusa obsolete trinervis, basi subiter contracta, secunda 1·5 mm. longa, ovato-lanceolata acuta, 5-nervis; floris sterilis lemma glumæ secundæ simile, palea membranacea obtusa quam lemma aliquanto brevior; floris hermaphroditici lemma ovatum obtusiusculum nervis obsoletis, 1 mm. longum, palea membranacea quam lemma aliquanto brevior. *Fructus* albidus, nitens, 1 mm. longus, acutus.

Hab. Kaietuk savanna, Potaro River. Damp sand with a good deal of humus, in open places; alt. c. 1100 ft.; no. 688; August 31, 1933. Typus in Herb. Mus. Brit.

Leaves glaucous, stems purplish red, panicle few-flowered.

NOTES ON *COLCHICUM*.

By William T. Stearn.

During the preparation of an account of *Colchicum* it has become evident that there are several species in cultivation which have not been botanically described. Two of these, grown at the Cambridge Botanic Garden, are dealt with below. They belong to Stefanoff's subgenus *Eucolchicum*, an autumn-flowering group with unilaterally stigmatose falcate-tipped styles. *C. callicymbium* is noteworthy for its subsynanthous leaves and small purplish-lilac flowers with black anthers, thus furnishing a transition from *Eucolchicum* to the subgenus *Archicolchicum*, while *C. atropurpureum* has unusually dark magenta-red flowers. Both are attractive garden plants.

Colchicum atropurpureum Stapf MS., sp. nov. Inter species gregis *C. autumnalis* quoad flores *C. turcico* Janka simillima et forsan hujus varietas sed foliis suberectis 3–5 (haud 5–9) longioribus latioribusque marginibus haud aculeolato-ciliatis satis distincta videtur. In hortis anglicis et batavis hæc species sub nomine *C. autumnalis* var. *atropurpurei* Bowles p.p. (an Weston, an Loudon ?) colitur sed a *C. autumnali* L. floribus atrorubris, perianthii tubi parte epigæa limbo breviore, capsulis brevioribus, foliis minoribus atroviridibus specifice differt.

Cormus subglobosus, 2–4 cm. diam., *tunica* brunnea in collum 2·5–6 cm. longum producta. *Folia* hysteranthia vernalia, 3–5, plerumque 4, suberecta, anguste lanceolata ad linearia, canaliculato-concava, vix undulata, apice acutiuscula, glabra, atroviridia et glaucescentia, 16–25 cm. longa, 1 cm. (in folio intimo) —4 cm. lata. *Flores* autumnales, primum pallide rosei, demum atrorubri, haud tessellati, plerumque 2 raro 3. *Perianthii tubus* albus vel demum apice ruber, 6–10 cm. longus sed parte superiore supra terram limbo breviore; *segmenta* oblanceolata vel anguste oblongo-elliptica, apice obtusa vel acutiuscula, 10–18-nervia, intus ad basim leviter papillosa, extus carinata, *exteriora* 3·8–4 cm. longa, 10–11 mm. lata, *interiora* 3·2–3·5 cm. longa, 6–8 mm. lata. *Stamina* inæqualia, *antheris* versatilibus luteis anguste oblongis post dehiscentiam 6–7 mm. longis, *polline* luteo, *filamentis* roseis inferne lutescentibus, *exterioribus* 1–1·3 cm. longis, *interioribus* 1·5–2 cm. longis. *Styli* pallide rosei, apice curvati

et incrassati, unilateraliter stigmatosi, facie papillosa 2 mm. longa. *Capsula* (viridia, fere matura) oblongo-elliptica; demum (sicca, matura) 2–2·5 cm. longa, 1–1·5 cm. lata, carpellis dorso fere planis superne non-attenuatis; *semina* 2 mm. diam. Floret Septembri–Octobri.

Hab. Patria incerta. Typus in Herb. Kew.; specim. authent. in Herb. Univ. Cantab.

The dark magenta-red comparatively short-tubed flowers readily distinguish this from the other cultivated species. In *Colchicum* the total length of perianth-tube depends largely on the depth at which the corms are situated, but the amount of tube produced above ground is fairly constant and usually much exceeds the perianth-segments, whereas in *C. atropurpureum* the tube is shorter than the segments and holds them scarcely 2 cm. above the soil. This species is often considered a variety of *C. autumnale*, but the leaves are smaller and darker in colour than in that species and its white- and double-flowered forms grown under the same conditions; moreover, their capsules differ. A much closer ally of *C. atropurpureum* seems to be *C. turcicum* Janka, a native of Turkey and Bulgaria, with more numerous, somewhat procumbent, undulate, smaller leaves, often ciliated along the margin. The origin of *C. atropurpureum* is uncertain. The name *C. autumnale* var. *atropurpureum*, under which it is well known in gardens, appeared first in Weston's 'Universal Botanist,' ii. 209 (1771), and later, and perhaps quite independent of this earlier publication, in the 'Second Additional Supplement,' 622 (1839) to J. C. Loudon's 'Hortus Britannicus,' where it was inserted on the authority of "J. Cree of the Addlestone Nursery"; but whether the present plant is that to which these authors refer cannot now be ascertained. Mr. E. A. Bowles's 'Handbook of *Crocus* and *Colchicum*,' 161–2 (1924), identifies it with the *C. atropurpureum* of Parkinson's 'Paradisi in Sole,' 157 (1629). Parkinson's description of the flower, which "after it hath stood in flower two or three dayes, it beginneth to change, and will after a while become to bee of a very deepe reddish purple colour, as also the little foote-stalke whereon it doth stand," seems at first to fit our plant very well, but Parkinson then goes on to say that the flower "is of the bignesse of the Hungarian purple," *i. e.*, his *Colchicum Pannonicum purpureum*. The latter is the *C. autumnale* f. *pannonicum* (Griseb. & Schenk) G. Beck of modern authors* and larger in flower than Parkinson's *C. Anglicum purpureum*, the British *C. autumnale* L. Our *C. atropurpureum* has a flower smaller than *C. autumnale*, and its identity with Parkinson's plant is therefore questionable. The name *C. atropurpureum* was proposed by the late Dr. O. Stapf, who was the first to distinguish it as a species and to recognize its affinity with *C. turcicum*.

* See K. Domin in Magyar Bot. Lapok, viii. 330 (1909).

Colchicum callicymbium Stearn & Stefanoff, sp. nov. Species amabilis habitu *C. neapolitano* Tenore haud absimilis est sed propter antheras atras ab hac specie ac a ceteris affinibus floribus mediocribus vel parvis et foliis hysteranthibus gaudentibus, facile distinguitur.

Cormus subglobosus, 3–4 cm. diam., *tunica* brunnea subcoriacea in collum 1–4 cm. longum producta. *Folia* hysteranthia vel subsynanthia (tempore florendi vix vel jam præterito crescere incipiunt, expandentia tamen ad maturitatem haud ante ver insequens adolescunt), 3–5, suberecta, subcultrata ad linearia, canaliculato-concava, plana vel interdum secus medium longitudinaliter plicata, haud undulata, apice obtusa, glabra, 25–40 cm. longa, 1 cm. (in folio intimo) –5 cm. lata. *Flores* autumnales, pallide violaceo-lilacini, colore in faucibus fusciore, haud tessellati, 2–4. *Perianthii tubus* pallidus, 9–13 cm. longus, parte superiore supra terram limbo ±2plo longiore; *segmenta* oblanceolata vel anguste elliptica, apice obtusa, 9–16-nervia, intus ad basim superciliis duobus papillosis exiguis instructa, *exteriora* 3·5 cm. longa, 8–13 mm. lata, *interiora* 3 cm. longa, 7–9 mm. lata. *Stamina* inæqualia, *antheris* versatilibus nigris anguste oblongis 7 mm. (ante dehiscentiam)–4·5–6 mm. (post dehiscentiam) longis, *polline* luteo, *filamentis* purpureis inferne nigris, *exterioribus* 6 mm. longis, *interioribus* 1·2 cm. longis. *Styli* purpurei, apice curvati et incrassati, unilateraliter stigmatosi, facie papillosa 1·5–2 mm. longa. *Capsula* (viridia, fere matura) anguste ovoidea, vix supra mediam in conum longum acutum attenuata; demum (sicca, matura) 2–3 cm. longa, 1–2 cm. lata, *carpellis* corrugatis superne abrupte longe rostrato-attenuatis; *semina* 3 mm. diam. Floret Septembri. In Horto Academiæ Cantabrigiensis per multos annos sub nomine erroneo *C. montani* (haud Linn.) crescit.

Hab. Græcia orientalis (Thessalia) et Bulgaria australis (Macedonia); vide infra. Typus in herb. Hort. Kew.; specim. authent. in herb. Univ. Cantab.

For many years this plant has grown at the Cambridge University Botanic Garden, and in 1902 and 1903 the late Director, R. Irwin Lynch, sent flowers and leaves to the Kew herbarium. Lynch's letter accompanying these states that the corms were obtained from "T. Smith of Newry, he having got them from Max Leichtlin . . . Leichtlin says that this *Colchicum* must have come from the habitat of *C. Sibthorpii*, viz., 'the monastery of Hagios Dionoysis next to Kraterino, Gulf of Salonica' . . . he had not observed this plant himself, and apparently it was imported in a consignment of *C. Sibthorpii* without any knowledge it was not that plant." The monastery mentioned is presumably that of Hagios Dionoysis (Ajos Zionisios) on the eastern slope of Mount Olympus in Thessaly, not far from Letokhori (Litohoron), and about 10 miles south of Kraterini; but, probably because the

plant flowers at a season when collectors are rarely in the field there, no specimens have been found in the British Museum, Cambridge, or Kew herbaria to confirm this locality. Since there is no species described in Stefanoff's 'Monographie der Gattung *Colchicum*' (1926), or in Hayek and Markgraf's 'Prodromus Floræ Balcanicæ,' iii. (1932), with which this plant can be identified, the type material was sent to Mr. Stefanoff at Sofia. He agreed that it represented a new species, and determined it as conspecific with a plant which had come up unexpectedly in the Royal Gardens of Sofia among corms of *C. Sibthorpii* collected only last season in the valley of the Struma, Bulgarian east Macedonia! The species is accordingly published in collaboration.

The leaves being subsynanthous, *i. e.*, beginning to shoot with or soon after the flowers instead of waiting for the next spring, and the anthers being black, *C. callicymbium* has erroneously been referred to "*C. montanum* L." *, but by the sum of its characters, notably its large leaves and curved unilateral stigma, it must be placed among the small-flowered hysteranth species of subgenus *Eucolchicum*, such as *C. umbrosum* Steven, *C. laetum* Steven, and *C. neapolitanum* Tenore, although distinguished from these by its black anthers and other features. The flowers when living are a pale lilac deepening to purple in the throat. Mr. Bowles, in his 'Handbook of *Crocus* and *Colchicum*,' 163 (1924) accordingly mentions it under *C. autumnale* var. *algeriense*, but *C. algeriense* Batt. & Trabut (*C. Bivonae* Battandier, Fl. Alger. 143; 1884) is a species with large chequered flowers very close to *C. lusitanum* Brotero. The name is from καλός, beautiful, κυμβίον (latinized as *cymbium*), a little cup.

Colchicum trigynum (Adam) Stearn, comb. nov.

Bulbocodium trigynum Steven ex Adam, Decades Nov. Sp. Caucas. no. 11 in F. Weber & D. M. H. Mohr, Beiträge zur Naturkunde, i. 49 (1805).

Merendera caucasica M. Bieberstein, Fl. Taur.-Cauc. i. 293 (1808); Hooker in Bot. Mag. t. 3690 (1838); Boissier, Fl. Orient. v. 168 (1882).

C. caucasicum (M. Bieb.) Sprengel, Linn. Syst. Veg. ed. xvi. *a*, ii. 143 (1825); Stefanoff, Mon. Gattung *Colchicum*, 43, no. 24 (1926), in Sborn. B'lgharsk. Akad. Nauk. xxii.

M. trigyna (Steven) Stapf, Bot. Ergeb. Polak'sch. Exped. i. 18 (1885), in Denksch. Math.-nat. Cl. Akad. Wiss. Wien, l. pt. 2.

The identity of *Bulbocodium trigynum* with the later *Merendera caucasica* has long been realized; the fusion, following Stefanoff, of *Merendera*, *Bulbocodium*, and *Colchicum* necessitates the above transfer.

* See C. C. Lacaita in Nuovo Giorn. Bot. Ital. n. s. xxxii. 107 (1925), or Journ. Linn. Soc., Bot. xlvii. 172 (1925); Stearn in Journ. Roy. Hort. Soc. lix. 67 (1934).

SOME OBSERVATIONS ON THE SAPROLEGNIACEAE OF THE SOILS OF WALES.

By W. R. Ivimey-Cook, Ph.D., and Enid Morgan.

Investigations on the fungus flora of the soil have been made by various biologists, with the result that a considerable number of species of both fungi and bacteria are known to occur regularly, and sometimes exclusively, in such situations, forming an important factor in its fertility; but the fungi usually recognized as contributing to this flora are members of the Zygomycetes, Ascomycetes, and Fungi Imperfecti.

In a brief study made by Harvey (5) in 1925 it was found that members of the Saprolegniales also occur in the soil. Butler (1) had previously found in 1907 that various species of the genus *Pythium* could be obtained from the soil, and this was further brought out by the more extensive study made by Mathews (7) in 1931; but our knowledge of the occurrence and distribution of species of Saprolegniaceae, which occur in the soil, is restricted to the observations made by Coker and his assistants (2) (3) (6) in North Carolina.

Since, as a result of this work, it became obvious that not only did members of the Saprolegniaceae occur regularly in the soil, but also that many very interesting species could be obtained from it with comparative simplicity, it was decided to carry out an extensive study of the distribution and periodicity of the species of Saprolegniaceae occurring in various types of soils in South Wales. The locality selected was the south part of Glamorganshire, which is especially suitable because of the variety of vegetation and altitude which is easily accessible within a reasonably small area. A series of preliminary collections was first made to determine roughly the distribution of species in the various localities. Both soils which were relatively moist and those which were relatively dry were compared, as well as soils collected from under different types of phanerogamic vegetation and at different altitudes. In this way it was hoped to gain some idea of the relative distribution of species in different kinds of soils. At the same time a definite series of places was selected from which soil samples were collected at definite intervals throughout the year, so that a comparison of the periodicity of different species could be made. The preliminary survey was begun in the summer of 1933, and it is still too early to give any definite information regarding the problems of either distribution or periodicity, though, so far as can be judged, there is every indication that distribution is affected by the locality and that different species appear and disappear at regular periods during the year. It will be obvious, however, that the determination of the factors which really influence these questions will take a long time.

In the present investigation some two hundred collections have been made, which were obtained according to the following scheme :—

Station number.	Number of substations.	Type of soil.	Number of samples collected.
A	6	Running stream beds.	28
B	4	Vertical banks beneath hedges.	16
C	7	Coniferous woodlands.	30
D	3	Deciduous woodlands.	9
E	4	Dry pastures.	36
F	4	Wet pastures.	42
G	3	Garden soils.	22

Samples were taken from all these localities at varying intervals during the autumn and winter of 1933, in order to determine which localities were likely to yield the best results. About forty collections were made during this preliminary survey, two samples being taken from the same station at each visit. In the spring of 1934 it soon became evident that it would be impossible to maintain a simultaneous study of all these stations, and it was decided to restrict the work to a comparison of the dry and wet pastures and of the garden soils. At the same time it was arranged to increase the frequency of visits to the localities. In the subsequent study now in progress these eleven stations are being visited every month, and on each occasion two samples are collected.

The soil samples were collected in a way similar to that suggested by Harvey (5) at a depth of 2 inches below the surface, and in each instance the soil, after being brought into the laboratory, was placed in a wide glass dish and covered with about an inch of distilled water. Sterilized hemp seeds, which had been cut in half, were placed in the dish for a few days, and as soon as a growth appeared on them the seeds were removed, washed in a stream of distilled water, and placed in a dish of distilled water to develop. Despite these precautions it was found, especially in warm weather, that a certain amount of bacterial growth developed. Where this was extensive the fungus was plated out in 2 per cent. maize agar. On this medium the fungus grew much more rapidly than the bacteria, and it was easy to cut out pieces of agar containing the fungus which were completely free from the contamination of bacteria. These were placed in fresh dishes of distilled water with sterilized hemp seeds, and clean cultures of the fungus were thus obtained. Where more than one species occurred on the same hemp seed separation on maize agar was possible after microscopic examination,

and in every case a pure culture on hemp was obtained before examination was attempted. Moreover cultures of each identified species were maintained in the laboratory, and these were studied at intervals to observe any alterations in the appearance of the fungus while in cultivation. All descriptions and identifications have been carried out with hemp seeds as the substratum in order to obviate differences due to the medium used.

As a result of the work so far completed a considerable number of species, many of them previously regarded as of rare appearance, have been found, and some of them are apparently new British records, which were not recorded in Ramsbottom's (8) list of British Phycomycetes published in 1916. Up to the present time the following species have been isolated, those marked * being new British records, while those in italics have not been previously recorded as soil-inhabiting species in America :—

*Pythiopsis cymosa de Bary.
*—— intermedia Coker.
*Saprolegnia asterophora de Bary.
*—— *monoica* Pringsheim.
*—— *glomerata* (Tiesenhausen) Lund.
*—— *crustosa*, var. I., Coker.
**Isoachyla unispora* Coker & Couch.
*—— eccentrica Coker.
*—— *monilifera* (de Bary) Kauffman.
*Achyla imperfecta Coker.
*—— *radiosa* Maurizio.
—— racemosa Hildebrand.
*—— flagellata Coker.
—— apiculata de Bary.
—— *polyandra* Hildebrand.
*—— caroliniana Coker.
Thraustotheca clavata (de Bary) Humphrey.
Aphanomyces stellatus de Bary.
*—— laevis de Bary.
*—— scaber de Bary.

It will be seen that of these species few of the common water forms occur. *Saprolegnia ferax* is entirely absent, although it is by far the commonest in water samples. Of the twenty species isolated fifteen are new to this country while seven have not been found previously in the soil. What is probably the most striking feature which has so far emerged from this work is the frequency with which certain species occur in the soil which are regarded as rare in the water. In a previous study of the water-inhabiting species occurring in the neighbourhood of Bristol twenty-three species were isolated (4) † ‡. Of these six have not been found in the soil during the present investigation,

† A fuller account of this work is in process of publication by Miss E. J. Forbes in a paper which will appear shortly.

‡ *Brevilegnia diclina* Harvey was isolated from soil at Bristol, and not from a water sample.

while, on the other hand, fifteen species have been found during the present study which have never been isolated from water samples.

Of more general interest is the fact that it appears from the present work that the Saprolegniaceae are more widely distributed in the soil than in water, and it seems probable that a revision of our conception of the group will have to be made, and that the old term "Water Moulds" will have to be given up. At the present time the balance of evidence appears to be in favour of regarding the group as primarily a terrestrial one, some of whose members have subsequently taken to a total aquatic existence, culminating in total parasitism, as in the case of *Saprolegnia parasitica*. The comparative frequency of certain genera and species in the soil which are very rare in the water suggests that where these do occur in the water they have been initially leached out of the soil by heavy rain rather than that the water is their natural habitat.

Another matter which is becoming increasingly evident as more work is done on the group is the variation of individuals from different localities which appear to belong to the same species, and also the variation which appears as a result of continued cultivation under laboratory conditions. Where size of structures is the criterion of species separation, as is generally the case, it is by no means uncommon to find individuals almost intermediate between recognized species, and in certain cases a whole series can be traced from one species to another and then to a third. Intermediates have also been found connecting genera with one another, as, for example, *Calyptralegnia achlyoides*, and there is every indication that as more attention is paid to this group in different parts of the world more similar links will be discovered.

No other group of fungi, or possibly no group of organisms, offers better examples of the evolution of species and even genera from one another, and in time it may be possible to indicate the precise evolution within the group by means of existing examples. But while such a condition is extremely attractive from an evolutionary standpoint, it makes the taxonomic treatment correspondingly difficult, and there is little doubt that in the near future a more satisfactory method of separation of species will have to be found if their identification is to be made possible to anyone except an expert on the group.

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SHORT NOTES.

Dorycnium gracile Jord. in Kent.—The occurrence of this bushy slender-branched leguminous plant apparently wild in Kent is a very remarkable one. It was discovered by Mr. Charles E. Baker, of Meopham Green, in a wild valley about a mile and a half from the village of Meopham. The locality is not very distant from that of *Plantago Cynops* L. described in the *Journal of Botany*, 1920, 271, which, like the *Dorycnium*, is a native of France; while other striking plants found in this area of Kent, though some miles away, are *Althaea hirsuta* L., *Viola floribunda* Jord., *Salvia pratensis* L., at Cobham, and *Orchis hircina* L. at Meopham.

Under the guidance of Mr. Baker, on September 24, I visited the locality, which is on the east slope of one of the chalk downs, and here was a single bush of the plant, conspicuous from its grey glaucous colour, about 2 feet tall and 3 feet across. It was still in flower and also bore a number of the very small elliptic one-seeded pods. The hillside was dotted all over with bushes of *Cornus sanguinea* in fruit, with occasional dwarf *Crataegi*, *Clematis*, *Rubi*, and *Rosa*, while the rest of the ground was covered with Thyme, *Clinopodium vulgare*, *Gentiana Amarella* (in fruit), *Agrimonia*, *Chlora perfoliata*, *Origanum vulgare*, *Hypericum*, *Erigeron acre*, and *Inula squarrosa*. There was little, if any, grass, and none of the weeds of cultivation. Along the top of the ridge ran an old lane where there had been a hedge of beech, now grown into trees, forming an avenue in which were trees of *Pyrus Aria* and *Viburnum Lantana*.

There were no signs of cultivation, nor had there ever been, so far as it was possible to make out, any house or garden in the locality. The nearest house was a very modern one on a ridge to the west, with a steeply sloping valley between it and the ridge on which the plant grew. Nor do I think this barren chalky down had ever been put under cultivation: I believe it had been preserved for shooting, and it abounded in rabbits. I sought

in vain for more plants, but owing to the heavy rain all day was unable to make as thorough an examination of the district as I should have liked.

The plant is a bushy one, with a woody base and innumerable slender-branched stems, glaucous and covered with appressed hairs. The leaves have very short petioles, indeed hardly any, and four or five very narrow coriaceous leaflets on short reddish petiolules, linear-acute, with hairy edges, 1 cm. long, 2 mm. wide. The lower leaves on the plant are rather wider toward the tip than the upper ones and almost oblanceolate. The flowers are in small heads of about twelve, borne on axillary peduncles 6 mm. long, and on very short stalks, ebracteate; they are 3 mm. long, white. The calyx is shortly campanulate, with 5 lanceolate-acuminate red tips or all red, covered with appressed silky white hairs. Corolla: vexillum shortly clawed; apex orbicular, rounded, 2 mm. wide, pure white, with a central rose-pink line and one fainter on each side; alæ short ovate-spathulate, completely concealing the keel, which is rather fleshy, spoon-shaped, purple-black. Stamens and pistil white. Fruit ellipsoid, one-seeded, chestnut-brown, 4 mm. long.

Another apparently identical specimen was collected on the sea-shore at Sheppey by Mr. F. R. Bryson in July 1933.

Typical *D. gracile* Jord. is a native of the south of France, where it usually grows on the sea-coast in maritime marshes; but the allied more prostrate *D. collinum* Jord. & Fourr. (Breviarum, fasc. 2, 23, and Ic. Fl. Europ. i. clxi. 234) grows on calcareous ground at Nyons, and Drome, S. France, quite a similar locality to the one at Meopham.

Unless this plant is a relic of a disappeared French flora it is extremely difficult to see how it got here. It has never appeared in gardens nor in places where chickens are or have been fed, and it is a considerable distance from any cultivation. Both this spot and the locality where *Plantago Cynops* grew are barren chalky slopes on which cultivation of crops has never, so far as is known, existed.—H. N. Ridley.

Sisymbrium thalianum flowering in November.—This was noticed on a wall-top near Taunton. The usual crop of plants appeared, flowered in the early summer, and died down. Since the rain of October some of the maturated seeds have produced vigorous plants, flowering profusely. It seems probable that the seeds were those of 1933, and not of this year, as autumnal germination is an unusual occurrence. Fewer plants than usual were seen at the usual time on this particular wall, and many maturated seeds must have been left ungerminated owing to the abnormal dryness of the season.—W. Watson.

Introduced Plants in Somerset.—During the last three or four years thousands of tons of earth have been brought for widening the embankment of the Great Western Railway. On one of these widened embankments near Taunton large patches of the following plants have been noticed:—*Lactuca serriola*, *Senecio squalidus*, *S. viscosus*, *Linaria dalmatica*, and *Verbascum pulverulentum*. There is little difficulty in accounting for all these plants except the last. *Lactuca serriola* and *Senecio squalidus* have been noticed in the district for many years. *S. viscosus* had not hitherto been met with in Somerset, but occurs in similar situations elsewhere on the Great Western Railway. *Linaria dalmatica* grows in Somerset gardens, and probably a garden demolished during the widening of the line has provided the plant, especially as the ordinary garden marigold occurred with it. *Verbascum pulverulentum* is difficult to account for, as it is an unusual garden plant, and its native stations are not on the Great Western Railway.—W. Watson.

Trichomanes radicans Sw. in the South of Spain.—In April of this year I found this fern in a valley among the hills a few miles inland from Algeciras (Province of Cádiz): it grew very sparingly on wet sandstone rocks in a small cave near a waterfall. This species is very rare in the Peninsula, and so far as I can discover the only previously known localities are "in sylvis umbrosis Galleciae (Nym. Fl. Eur.)" (Willkomm and Lange, Prodr. Fl. Hisp. i. 1) and Cintra in Portugal (Coutinho, Fl. de Port. 38). It is not mentioned in Wolley-Dod's 'Flora of Gibraltar,' though the Algeciras locality is within the area dealt with in that work.

The occurrence at Algeciras of a fern of such an extremely Atlantic type of distribution (in Europe) is of interest, as it has recently been found that the bryophyte flora of the district includes a number of species not known elsewhere in the Peninsula except in north-western Spain and northern Portugal, and is, in fact, a south-eastern outpost of the Atlantic flora (*cf.* P. W. Richards, "Notes on the Bryophytes of the 'Waterfall Valley' near Algeciras," Rev. Bryologique, n. sér. v. 5, 1932).—P. W. Richards.

REVIEWS.

The Life Forms of Plants and Statistical Plant Geography, being the collected Papers of C. Raunkiaer. English translation. Roy. 8vo, pp. xvi, 632, with 189 plates and figures. Clarendon Press: Oxford, 1934. Price 35*s*.

The English edition of Prof. Raunkiaer's works is a notable addition to the well-known series of translations of standard botanical works issued by the Oxford Press. Most of Raunkiaer's papers were written in Danish, and have unfortunately been less

accessible to botanists generally than their importance demanded. These have been translated by Mr. H. Gilbert Carter, of Cambridge, with the exception of one, previously unpublished, which was translated by Miss A. Fausbøll. The translation of three papers, written in French or German, has been done by Prof. A. G. Tansley, of Oxford, who also contributes a valuable Introduction explaining the course and development of Raunkiaer's work as represented by his successive contributions, and giving a brief indication of the scope of each paper. The conception of the publication is due to a Danish Committee, which included the late Professor Ostenfeld, and the Rask-Oersted Fund has contributed to the cost of publication, thereby enabling the work to be produced at the comparatively low cost of thirty-five shillings.

All serious botanical students must be familiar with the 'System of Life-Forms,' Raunkiaer's most important contribution to the study of vegetation, but the opportunity to read in detail his original papers on this subject, its developments, and the author's germane investigations will be generally welcomed.

Of the seventeen papers included the majority are translated from the originals in the 'Botanisk Tidsskrift' and the Kgl. Danske Vindensk. Selsk. Skrifter. The arrangement is chronological. The first is the brief record of Raunkiaer's memorable communication to the Danish Botanical Society, December 5, 1903, establishing his biological types, which he later called life-forms, characterized by the protection afforded to the perennating buds or shoot-apices by their position in relation to the soil surface during the unfavourable season. It occupies one page, and is followed by a translation of the volume published in 1907, 'Planterigets Livsformer og deres Betydning for Geografien,' which is an exposition of his system, well illustrated by a series of seventy drawings from nature, mostly by Mrs. Raunkiaer. The papers which follow vary in size, subject, and importance. Some introduce new conceptions and developments. Such are Chapter IV., "The Statistics of Life-forms as a Basis for Biological Plant-geography" (1908), a systematic treatment of "plant-climates" and the percentages of the different life-forms which characterize them; Chapter VI., "The Quantitative and Statistical Analysis of Plant-formations" (1909–10), developed further in Chapter XI. (1918); Chapter X., "The Use of Leaf-size in Biological Plant-geography" (1916); and Chapter XII., "On the Biological Normal Spectrum"—that is, the percentages of the different life-forms in the floras of different parts of the world. Others dealing with more localized studies are: "Statistical Investigations of the Plant-formations of the Skaw" (the northern point of Jutland) (1913), "The Vegetation of the French Mediterranean Alluvia" (1914), and the previously unpublished "Botanical Studies in the Mediterranean Region," dealing especially with the vegetation of the coastal sand-dunes of the west coast of Italy and a comparison with those of the dune-area of Jutland. More restricted studies are those on the life-form of the Coltsfoot (*Tussilago Farfara*) (1907) and "The Nitrate Content of *Anemone nemorosa* growing in various Localities."

These brief notes give but a poor indication of the amount of painstaking work and information embodied in the six hundred pages of the book, illustrated by excellent figures, 112 of which are photographic plates. Lists of the literature follow each chapter, and Miss J. E. Salzman has prepared a comprehensive index. A good signed portrait of the author forms a suitable frontispiece to the book, the production and typography of which are such as we are led to expect from the Oxford Press.

Botanists all the world over owe a debt of gratitude to the Danish Committee and to the English botanists who have rendered more generally available work of supreme interest and importance.—A. B. R.

The Families of Flowering Plants. Vol. II. *Monocotyledons. Arranged according to a new System based on their probable Phylogeny.* By J. Hutchinson, F.L.S. Cr. 8vo, pp. 243, text-figs. 107. Macmillan: London, 1934. Price 20*s.*

We congratulate Dr. Hutchinson on a double event, the completion of his book on the classification of the Flowering Plants and his recent doctorate at an ancient university. The preparation of the second volume has entailed investigation of the families, and two extended botanical trips to South and tropical Africa in the interim must have been an invaluable education for the work, which, the author explains in his preface, "is not monographic, but represents only the beginning of an endeavour to establish a phylogenetic system for the Monocotyledons." Dr. Hutchinson is now convinced that the group is monophyletic, and has been derived from the Dicotyledons by way only of the Ranales. The Butomales, containing the families Butomaceae and Hydrocharitaceae and Alismatales (Alismataceae, Scheuchzeriaceae, and Petrosaviaceae), represent the earliest development; the remaining orders have developed from these along three lines. The diphyletic origin suggested by Hallier and Lotsy, who derived the Spadiciflorae from the Piperales, he regards as highly improbable; any similarity between the two orders is superficial, and due to parallel development. Parallel development, like hybridity in species, would appear to be a "Will o' the Wisp"; witness Mr. Worsdell's review of Dr. Hagerup's work on the origin of some Angiosperms in our last number. But it is not always easy to decide!

Dr. Hutchinson evidently appreciates a difficulty in the absence of endosperm in his two primitive groups. He regards endosperm as a primitive feature in the seed, "the homologue of the prothallium characteristic of lower groups of plants"; but it is scarcely homologous, for the prothallium is the gametophyte of the Cryptogams, while the endosperm of the Angiosperms is a post-fertilization product. Endosperm is abundant in nearly all the Monocotyledons and also in the Ranunculaceae; its absence in the Butomales and Alismatales, owing to the adoption of an aquatic habit, is held to indicate a considerable gap between the primitive Dicotyledons and their offshoot the primitive Monocotyledons. We must then assume the recovery of the character in the development of the later groups of the Monocotyledons.

An interesting feature of the system proposed is the concept of two lines of descent. The first is indicated by a biseriate perianth, which is present in the two primitive orders and persists in one direction through the Commelinales and Bromeliales as far as the Zingiberales, but is lost in the group of aquatic families culminating in Najadales. In the second line the two whorls tend to fuse, as in the so-called petaloid Monocotyledons, Liliaceae, Iridaceae, &c.; the glumiflorous stock is regarded as a branch of this. These two lines are termed Calyciferae and Corolliferae respectively.

Another feature is the recasting of the great petaloid families. Most botanists will agree with the view as to the somewhat heterogeneous character of the Liliaceae, as conceived for instance in the 'Genera Plantarum' of Bentham and Hooker, and adopted by Engler in his system. Some of the subfamilies were regarded as distinct families by earlier workers; but Dr. Hutchinson goes much further. Regarding the character of the inflorescence—umbellate or otherwise—as of greater value than the relative position of the ovary, he cuts across preconceived notions of the Liliaceae and Amaryllidaceae, characterizing the latter by the umbellate scapose inflorescence, and removing to it the Agapantheae, Allieae, and other groups with a superior ovary. The Onion stands in solitary state as "the useful product" of Amaryllidaceae. There is no doubt that the rigid use of the ovary position as a distinctive character has separated apparently closely allied genera. The Araceae are regarded as an offshoot of the Liliaceae by way of *Aspidistra*—a view which seems to have little to support it save the spicate arrangement of the flowers and the berried fruit.

Much more might be written on points raised by Dr. Hutchinson's interesting and suggestive review of the monocotyledonous families. As he himself admits, much still remains to be done, for instance in the Liliaceae, where the delimitation of the large number of groups that still remain calls for intensive study.

A personal protest must, however, be made. The present writer is rebuked (p. 51) for expressing the view that *Najas* is a primitive type of Monocotyledon. This goes back to 1904, and may perhaps have represented the effect of a somewhat intensive specialized study. If Dr. Hutchinson will refer to the later edition of 'The Classification of Flowering Plants' (1929) he will find anticipated his own suggestion that it is a very reduced form. It is possible that lapse of years may bring some changes into his own views on the thorny subject of phylogeny.

The author records his indebtedness to Mr. J. E. Dandy for the key to the tribes and genera of Hydrocharitaceae, and very appropriately inscribes the volume to Dr. Agnes Arber, whose researches have added so much to our knowledge of the Monocotyledons.

In conclusion, a word of praise is due to the illustrations. The author is in the enviable position of being able to illustrate his own book. The drawings are remarkably clear and helpful, and show a distinct improvement on those of the first volume.—A. B. R.

Welsh Flowering Plants. A Handbook to the Collection in the Welsh National Herbarium. By H. A. Hyde, M.A., F.L.S., and A. E. Wade, F.L.S. 8vo, pp. vii, 179, 2 portraits, 8 text-figs. Cardiff: National Museum of Wales, 1934. Price 5*s*.

This handbook has been compiled to serve as a catalogue of the Welsh Flowering Plants in the Herbarium at Cardiff, and as a complete list of all the native or naturalized species. For this purpose the English county of Monmouth has been annexed by the authors to Wales, which is thus credited with thirteen counties instead of twelve.

The book is much more than a mere catalogue. It is a Welsh topographical botany, with interesting sketches of the main botanical features of each county, and full distributional data. County records for each species of which specimens exist in the National Herbarium are printed in roman type, the localities for the herbarium specimens being also shown in the case of the rarer species. The remaining records are given in italics, and for these authorities are not cited, but it is stated that they have been compiled independently of Druce's 'Comital Flora.' An indication of the sources of these records might have been useful. Watson's distributional types and classes of habitats are adopted throughout, and a novel feature is the insertion of the "life-form" of every species in accordance with Raunkiaer's system. This must have involved considerable labour. Varieties are freely included.

The most controversial feature of the book is the application of the method of determining local status. The whole of the species are divided into four classes:—(1) natives; (2) doubtful

natives; (3) fully naturalized plants; and (4) plants established in areas of human occupation. Weeds of cultivated ground, such as Poppies and Fumitories, are usually placed in the last category, and the British endemic *Fumaria purpurea* is so shown; but *Fumaria capreolata*, like the two Spurreys, is classed as a doubtful native, and *Lepidium campestre* as a native. The Barberry figures as indigenous, as do also *Matthiola incana*, *Smyrnium Olusatrum*, *Senecio viscosus*, all of the *Menthae*, and *Galanthus nivalis*. *Geranium molle* is native, while *G. pusillum* is not so. Every species of *Atriplex* is native, but of *Chenopodium* only *C. rubrum*. *Rumex pulcher* is only doubtfully native; *Asarum europaeum* certainly so. There are other similar instances.

The standard of species admitted seems generally well chosen. It is good to see one Shepherd's Purse only, and to note that the *Taraxaca* are limited to five. *Viola rupestris* and *V. epipsila* might well have been omitted, and not all botanists will allow specific rank to *Solidago cambrica* and *Plantago Hudsoniana*. There are a few cases, such as *Calamintha* (*Satureia*) *Nepeta*, where a plant shown for several counties but not represented in the national collection is probably incorrectly recorded.

Literature has been usually consulted to date, but *Narcissus lobularis* should be *N. obvallaris* (Journ. Roy. Hort. Soc. 1933, 55), and *Limonium paradoxum* (p. 15), like *L. transwallianum*, occurs in Ireland (Journ. Bot. 1931, 44).

There are a few inconsistencies in the nomenclature. Specific epithets taken from generic names sometimes have an initial capital, as *Vicia Lathyroides*; sometimes not, as *Oenanthe pimpinelloides*. *Rubus Marshalli* is printed for *Rubus Marshallii*, and *Euphrasia montana* should have been cited as of Jordan.

It cannot be expected that a handbook of this nature, with its mass of detail, should be exempt from all criticism, but the number of material errors is small and the information brought together both useful and well presented. The authors are to be congratulated on the completion of a work that will be indispensable to all botanists interested in the Welsh Flora.—H. W. PUGSLEY.

NEW EDITIONS OF TEXT-BOOKS.

A Text-book of General Botany for Colleges and Universities. By RICHARD M. HOLMAN and WILFRED W. ROBBINS, of the University of California. Edition 3. Roy. 8vo, pp. xv, 626, frontisp. and 463 text-figs. Wiley & Sons: New York. Chapman & Hall: London, 1934. Price 25*s*.

THE first edition of this book (1924) was reviewed in this Journal in 1925 (p. 310). A second revised and somewhat enlarged edition appeared in 1927; in preparing the third edition the authors have made those changes which the growth of botanical knowledge in the interval seemed to justify. However, the plan and method of treatment do not differ from those of the first edition. The text has increased by about 40 pages and 90 figures have been added as compared with the first edition, and the price has increased by five shillings.

The book remains a very attractive text-book, the text-matter clear and well-arranged and interspersed with a wealth of excellent figures, some borrowed from other works, but many original. The first part deals with the general structure of the seed-bearing plant, its organs and their functions; and the second is a survey of the whole Plant Kingdom, with descriptive examples of the great groups and a final chapter on evolution and heredity. An innovation is the addition to the chapter on the relation of the plant to the environment, which closes part I., of an account of climax associations by Dr. F. E. Clements.

A useful appendix supplies a classified list of books for reference and collateral reading. The frontispiece—"In a Redwood forest"—gives some idea of the majesty of these great Conifers. The insertion of portraits of former eminent workers in botany adds to the interest of the text.

Botany for Schools. By E. R. SPRATT, D.Sc., and A. V. SPRATT, M.Sc. Sm. 8vo, pp. viii, 372, text-figs. 409. University Tutorial Press: London, 1934. Price 4*s*. 6*d*.

THE first edition of this elementary text-book (1932) was noticed in this Journal (1932, p. 299). An increase in size of about 40 pages is due to the addition of three short chapters on the botany of pastures and arable land and salt-marshes, and on a few plants of economic importance.

Some points calling for criticism were mentioned in the previous notice, and attention may again be called to these. In discussing transpiration greater emphasis might be laid on the difference between the upper and under surfaces of the dorsiventral leaf as regards numbers of stomata and their work in regulating the process. In the experiment with a potometer (fig. 33) an indicating bubble should be inserted in the horizontal tube; the passage of the water from the end of the tube might be put down, from the child's point of view, to evaporation from the open end. In fig. 295 no explanation of C and D are given. The book is presumably stereotyped, but it should be practicable to make slight alterations in the text where deemed necessary. The call for a new edition within two years suggests that it is supplying a need. It certainly serves a useful purpose as a text-book at a price within the reach of beginners in botany at the schools.

The Natural Organic Tannins. History: Chemistry: Distribution. By M. NIERENSTEIN, D.Sc., Reader in Bio-Chemistry in the University of Bristol. Cr. 8vo, pp. 319. J. & A. Churchill, Ltd.: London, 1934. Price 21*s*.

MUCH progress has been made in our knowledge of the chemistry of the tannins during the last thirty years, and the present book is a summary of the author's own investigations and of those of his predecessors and contemporaries; but the greater number of the tannins still require classification and elucidation. An introductory chapter deals with the definition, history, and classification of the tannins. The main portion of the work is especially of chemical interest, and represents a digest of previous work and a discussion of the present position. Botanists will, however, appreciate a chapter by Dr. Macgregor Skene on the botany of the tannins. They are widely distributed, but are a more general and important product in archichlamydeous families than elsewhere, and there is a definite tendency for tannin production to be characteristic of a family or larger group. They occur in solution in the vacuoles of the cell, either free or loosely combined with other colloids, or in close combination with colloids in insoluble form. In many cases they are merely waste products of metabolism, but in some instances have been shown to play an active part. Their production may be related to photosynthesis, or they may be formed independently of that process.

The three indexes—subject, authors, and plants respectively—give a ready means of reference to the subject-matter.

'The London Naturalist': The Report for 1933.—The Journal of the London Natural History Society, an account of the activities of the Society during the year, records a small increase in membership. Individual sections comprise Archæology, Botany, Entomology, Ornithology, Plant-Galls, and Rambles. L. G. Payne gives a list, with notes on their habitat, of the Ferns found in the Home Counties and within the London area (20 miles radius from St. Paul's); the more restricted area includes seventeen of the twenty-five found in the Home Counties. H. J. Burkill reports on the plant-gall records for the year, which include three hitherto unrecorded for Britain. An Appendix carries the list of the botanical records for the London area from *Campanula* to *Plantago*. The price is five shillings, and the Report may be obtained from the Secretary, Keppel St., Gower St., London, W.C. 1.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—The first General Meeting of the session was held on October 25, the President, Dr. W. T. Calman, F.R.S., in the Chair. In opening the President read a list, regrettably long, of Fellows who had died since the close of the previous session; the Society had also lost a Foreign Honorary Member, Dr. Nathaniel Lord Britton.

Mr. S. Savage exhibited a portrait in water colours of Nathaniel Bagshaw Ward (1791–1868), F.R.S., F.L.S., together with a lithograph after the portrait by Knight in the Society's Rooms, a pen-and-ink drawing by Miss Maria Ward of part of her father's conservatory at Wellclose Square, a specimen of moss (*Fissidens bryoides* Hedw.) attached to a printed extract from Mungo Park's Travels (apparently distributed by Ward to his friends), and Ward's medal as a member of the Pitt Club. These exhibits were presented recently to the Society by the Misses Phipps Tiarks, of Sydenham. A short account of Ward's life, including his invention of the Wardian Case, was given.

Dr. A. B. Rendle mentioned that Ward's herbarium was now incorporated in the British Museum Herbarium, having been purchased by the Trustees from Ward's executors in 1869. It contained nearly 7000 specimens from various collectors in many parts of the world, including about 3000 from South Africa. Dr. Robert Braithwaite, the eminent British bryologist, married one of Dr. Ward's daughters, and continued his medical practice in Clapham.

Miss Jean Dickson gave an account of her further studies on the floral anatomy of some members of the Papaveroideae—*Glaucium flavum*, *Eschscholtzia*, *Macleaya*, and others—and referred especially to the structure and development of the ovary, as consisting of a sterile and fertile pair of carpels. The paper was illustrated by lantern-slides showing a large series of transverse sections of the developing flower.

At the General Meeting on November 8 Dr. A. B. Rendle discussed, with the help of the original types, illustrated by photographic lantern-slides, the identity of the Linnæan species of *Spermacoce*, an account of which is the subject of a paper in this number of the Journal.

Mr. J. Ramsbottom and Miss F. L. Stephens showed a series of cultures of the fungus *Monilia sitophila*, a pinkish mould often infesting bakeries on the Continent and America, but also occurring on burnt stumps, spent hops, and other substrata. The American workers Shear and Dodge found that the *Monilia sitophila* group is the conidial stage of a Pyrenomycete, to which they gave the name *Neurospora*; in their work they described four species, two of which proved to be heterothallic and one homothallic. The recorded occurrences of the mould in this country were stated, and cultures were shown of *Neurospora sitophila* and

N. tetrasperma. The first is heterothallic, two different strains being necessary before perithecial formation occurs; the eight ascospores are uninucleate. The second is homothallic; the four ascospores are binucleate, but amongst them an occasional smaller uninucleate spore occurs. The smaller spores give rise to different conidial strains, which have to be matched together before fruit-formation takes place, *i. e.*, heterothallism and homothallism are here connected with the nuclear condition of the spores.

IMPERIAL BOTANICAL CONFERENCE.—An Imperial Botanical Conference, commencing on August 28th and lasting 2 to 3 days, according to the programme which may finally be arranged, will be held in London next year. The subjects set down for discussion are of general interest to Empire botanists, and include such topics as pasture research within the Empire, the ecology of tropical forests, the application of ecological methods to the study of native agriculture, problems of fruit storage and transport with special reference to tropical conditions, the furtherance of schemes for the closer co-ordination of botanical research within the Empire, etc. It is hoped that this Conference will furnish a convenient meeting-ground for home and overseas botanists who are on their way to attend the International Botanical Congress which meets at Amsterdam in the week following. The Chairman of the Organising Committee of the Conference is Sir Arthur W. Hill, K.C.M.G., Director of the Royal Botanic Gardens, Kew, and the Hon. Secretary is Professor W. Brown, Imperial College of Science and Technology, South Kensington, London, S.W. 7., from whom further particulars may be obtained.

MR. T. J. FOGGITT.—We hear with regret of the death of Mr. T. J. Foggitt on the 30th October at his home at Thirsk after a short illness. Mr. Foggitt came of a botanical stock, for his grandfather was a well-known Yorkshire botanist, and his father, William Foggitt, a co-worker in his youth with J. G. Baker. Mr. Foggitt had been interested in British Flowering Plants from his early days, and had amassed an excellent herbarium, which is bequeathed to the British Museum. His knowledge of the habitats of our rare species was almost unrivalled, and many younger men owe much to the information which he was ever ready to impart. In 1932, on the reconstruction of the Botanical Society and Exchange Club of the British Isles, he, with his wife, were elected Honorary Treasurers. An interesting paper from his pen, "Recollections of the Thirsk Botanical Society," appeared in the Club's Report for that year.

DR. N. E. BROWN.—We also note with deep regret the death of this veteran Kew botanist on November 25 in his eighty-sixth year.

INDEX.

For Classified Articles, see—Obituaries; Reviews. New Genera, species, and varieties, and new names are distinguished by an asterisk.

Adamson, R. S.: Novitates Africanæ, 21, 43.

Adenopus guineensis *, 42.

Akpatok Island, Flora of, 197.

Albrecht, J. H.: European species of Pogonatum and Polytrichum, 75, 104.

Allium Babingtonii in Ireland, 74.

Alston, A. H. G.: Selaginellae of Trinidad and Tobago, 33; do. collected by Thaddeus Haenke and described by K. B. Presl, 223; do. new species, 227; Gossweiler's plants from Angola and Portuguese Congo; Pteridophyta, Suppl. no. 2.

Angosesili mossamedensis *, 206.

Anoectangium Stracheyanum, 14.

Anomalanthus Lesliei *, 47.

Antithamnion Spirographidis, 65.

Ardagh, J. C.: Bibliographical Notes, 'Catalogue of Trees &c. in the Gardens near London, 1730,' 110.

Armitage, E.: Bryophyta new to Co. Waterford, 18; British Bryological Society, Annual Meeting, 56; Mistletoe on Holly, 293; Convolvulus arvensis with quinquepartite corolla, 319.

Asplenium filare *, Suppl., 4.

Astragalus (Sect. Platyglottis), Palestinian species, 121; palaestinus *, 124.

Bancroft, H.: External leaf-character of cricket-bat and other willows, 165.

Banksia Ashbyi *, Burdettii *, 281.

Barleria, Revision of S. African species, Addenda and Corrigenda, 275.

Barnes, B.: v. Wettstein's Fortschritte der Botanik (1932) (rev.), 182.

Barton, W. C., and Riddelsdell, H. J.: Rubus latifolius of Cornwall, 230; Rubus problems in the light of Genevier's herbarium, 143.

Becherer, A.: Publication of the generic name Vitaliana, 292.

Blyxa senegalensis *, 42.

Bolbitis auriculata *, gaboonensis *, Heudelotii *, Suppl., 3.

Bolus, L., Novitates Africanæ, 22, 45.

Boottia *, 137.

Brambles of Kent and Surrey, 22.

Briggs, G. E.: Stern's Pflanzenthermodynamik (rev.), 262.

British Association, 282, 297.

British Bryological Society, Annual Meeting, 56.

British Guiana, New species, 306.

British Museum Herbarium, Notes from, 40, 279.

Britton, C. E.: Varieties of Galium Mollugo in Britain, 243.

Brokenshire, F. A.: Isoëtes in Devon, 259.

Bryophyta new to Co. Waterford, 18.

Bubbia, Additions to the genus, 40; amplexicaulis *, 40; Comptonii *, odorata *, pauciflora *, umbellata *, 41.

Butcher, R. W.: Thalictrum minus L. in Britain, 153.

Byssophora Duthiei, 14.

Cambridge University Herbarium, list of Collections, 177.
Catalogue of Trees, Shrubs &c. in the Gardens near London, 1730, 111.
Caucalis incognita *, 205.
Cephalanthera grandiflora, Abnormal flowers, 49.
Cirsium eriophorum × lanceolatum in Britain, 171.
Clastobryum tenuirameum *, 14.
Clemens, Chaplain and Mrs., Kinabalu Collection, 1.
Cleome Welwitschii *, 279.
Clidemia charadrophila *, 307; pycnaster *, 306.
Colchicum, Notes on, 341; atropurpureum*, 341; callicymbium*, 343; trigynum *, 344.
Combretum Youngii *, 42.
Compton, R. H.: Novitates Africanæ, 20, 43.
Convolvulus arvensis with quinquepartite corolla, 319.
Coptosapelta montana, 9.
Crataegus, Danish species, 23.
Cuscuta Epithymum and Trifolii in Ireland, 72.
Cypripedium Calceolus, Re-introduction, 57.

Dandy, J. E.: Additions to the genus Bubbia, 40; identity of Lassonia, 101; notes on Hydrocharitaceae, I., 132.
Dipteron *, 138.
Dispersal notes, 52.
Dixon, H. N., Index to Miscellanea Bryologica, 17; Index to Notes, 17; Miscellanea Bryologica, XII., 12; Publication of Hooker's 'Musci Exotici,' 15; Some Japanese Ulotas, 12.
Dorycnium gracile in Kent, 349.
Dryopteris fraternum *, Suppl., 2.

Eig, A.: Astragalus (Sect. Platyglottis): Revision of Palestinian species, 121.
Enneastemon nigritanus *, 281.
Equisetum, Propagation from aërial shoots, 175.
Erica Acockii *, 43; Andreaei *, 44; elimensis var. *, 45; hippurus *, 45; Jeppei *, 46; octonaria*, 45.
Ernestia cataractae *, 308.
Exell, A. W.: Abnormality in Heliopsis helianthoides, 260; new species of Grewia from Tanganyika, 314.

Fritsch, F. E.: Smith's Freshwater Algae of the United States (rev.), 146; R. Chodat (obit.), 207.
Fusidomus, 269.

Galium Mollugo, Varieties in Britain, 243.
Gardenia costulata *, longituba *, 274; Matthewi *, 275.
Garnett, G. S.: Re-introduction of Cypripedium Calceolus, 57.
Gates, R. R.: Sharp's Introduction to Cytology (rev.), 238; Bruun's Cytological Studies in Primula (rev.), 239.
Genlisea anfractuosa *, 310; pulchella*, 300.
Gepp, A.: Jones's Moss Flora of N. America: Grimmiaceae (rev.), 118.
Gibberella, 271.
Gilliland, H. B.: New moss records for Moray and Inverness, 82.
Grewia, New species from Tanganyika Territory, 314; Burtii *, 315; dumicola *, 316; utilis *, 317.
Grove, W. B.: Mycological Notes, VII., 265.
Gunther, R. T.: Letters from John Ray to Peter Courthope, 217.

Halket, A. C.: Barton-Wright's Recent advances in plant physiology (rev.), 181.
Hall, P. M.: Abnormal flowers in Cephalanthera grandiflora and other Orchids, 49.
Heliopsis helianthoides, Abnormality, 260.
Heteromorpha angolensis *, 206.

Hyde, H. A.: Zostera nana in Carmarthen, 58.
Hydrocharitaceae, Notes on, I., 132.

Ichnanthus dasycoleos, 337.
Imperial Botanical Conference, 1935, 360.
Ireland, Standing of certain plants, 68.
Iris foetidissima in Ireland, 73.
Isoëtes in Devon, 259; echinospora in Cornwall, 177.
Ivimey-Cook, W. R., Saprolegniaceæ of Soils of Wales, 345.
Ixora aurorea *, 251; barbata var.*, 252; Curtisii *, fulgida *, 254; Havilandii *, 255; lancisepala *, 253; Marsdenii *, 255; matangensis *, 254; stenophylla, 252.

Jean Louis Berlandier, 115.

Kleinia Archeri *, 47; ovoidea *, 48.

Lachnea elegans *, 20; naviculaefolia *, 21.
Lassonia Buc'hoz, Identity of, 101.
Lathrea squamaria, Exudation of water, 210.
Lemna minor flowering in Cheshire, 321.
Linnean Society: Anniversary Meeting, 216; General Meetings, 30, 63, 94, 118, 151, 183, 359; Annual Dinner, 328.
Lomariopsis cordata *, Suppl., 6; guineensis *, hederacea *, S., 5; madagascarica*, Mannii *, orbiculata *, Warneckei *, S., 6.
Lously, J. E.: Two interesting hybrids in the British Flora, 171.
Lysimachia nummularia in Ireland, 71.

Magnolia heptapeta *, quinquepeta *, 103.
Marquand, C. V. B.: Riccia Beyrichiana in Arctic Europe, 59; Hayata's Systematic Botany, Gymnospermae (rev.), 63.
Martin, M. T.: Regeneration in Polysiphonia nigrescens Grev., 241.
Matthews, J. R.: Rosa perthensis Rouy and its history as a British plant, 167.
Miscellanea Bryologica, XII., 12.
Mistletoe on Holly, 293.
Morgan, E., *see* Ivimey-Cook.
Moss records, New for Moray and Inverness, 82.
Myosotis sylvatica in N. Somerset, 320.

Neotinea intacta, Irish forms, 54; var. *, 55.
Norman, C.: Notes on Tropical African Umbelliferae, 205.
Novitates Africanæ, 20, 43.

Obermeijer, A. A.; Revision of S. African species of Barleria. Addenda and Corrigenda, 275.
OBITUARIES:—
Bancroft, T. L., 141.
Blatter, E., 318.
Britton, N. L., 316.
Bullock-Webster, G. R. 111.
Chodat, R., 207.
Clarke, L., 112.
Cockayne, L., 257.
Elliot, G. F. S., 233.
Foggitt, T. J., 360.
Gimlette, J. D., 176.
McArdle, D., 292.
Scott, D. H., 83.
Vines, S. H., 139.
Oldham, C., Isoëtes echinospora in Cornwall, 177.
Orchis latifolia L., 97.
Orkney, Additions to flora, 22, 142.
Orthaea pendula *, 335.
Ottelia, delimitation and subdivision, 132; acuminata *, Balansae *, 137; Bodinieri *, brachyphylla *, 138; cordata *, cylindrica*, Esquirolii *, exserta*, Fischeri *, kunenensis *, 137; lanceolata *, macrantha *, muricata *, Schinziana *, 138; sinensis *, 137; Stratiotes *, 138; Thorelii *, 139; yunnanensis *, 138.
Otteliastrum *, 138.

Paepalanthus leucocyaneus *, 336.
Panicum kaietukense *, pycnoclados*, 340; tropidoblephare*, 339.

Paratrophis glabra *, 8.
Paspalum scandens *, subfalcatum *, 338.
Pearsall, W. H.: Viola lepida Jord., 113.
Pegia nitida, 11; philippinensis *, 11; sarmentosa *, 10.
Pimpinella nyasica *, 205.
Podalyria chrysantha *, 21; Tayloriana *, 22.
Pogonatum, European species, 75.
Polunin, N.: Flora of Akpatok Island, 197.
Polysiphonia nigrescens, Regeneration, 241.
Polytrichum, European species, 75; new subspecies, 104, 106, 107.
Praeger, R. Ll.: The Standing of certain plants in Ireland, 68; Propagation from aërial shoots in Equisetum, 175; Lathrea squamaria, exudation of water, 210.
Pugsley, H. W.: Irish forms of Neotinea intacta, 54; Sorbus porrigens in Ireland, 58; Flora of Lundy Is., 58; Fernald's Recent discoveries in the Newfoundland flora, (rev.), 260; New variety of Verbascum nigrum, 278; Welsh Flowering Plants (rev.), 355.
Pyrrhosia Schimperiana, Suppl., 8.

Radermachera ramiflora *, 5.
Ramsbottom, J.: Buller's Researches on Fungi, V. (rev.), 211; Nannfeldt's Studien über die nicht-Lichenisierten inoperculaten Discomyceten (rev.), 261; Kallenbach's Die Röhrlinge (rev.), 294.
Ranunculus Lenormandi and hederaceus, Morphology, ecology, and distribution, 185.
Ray, John, letters to Peter Courthope, 217.
Rendle, A. B.: Horwood and Noel's Flora of Leicestershire and Rutland (rev.), 27; Green's Flora of Liverpool District (rev.), 29; Bean's Trees and Shrubs hardy in the British Isles (rev.), 60; D. H. Scott (obit.), 83; Gunther's Greek Herbal of Dioscorides, Englished by J. Goodyer (rev.), 88; S. H. Vines (obit.), 139; Hingston's Darwin (rev.), 150; Silveus's Texas Grasses (rev.), 180; Taylor's Genus Meconopsis (rev.), 213; Macbride's Huxley (rev.), 214; R. Chodat (obit.), 207; Engler and Harms, Die Naturlichen Pflanzenfamilien, XVI. c. (rev.), 235; L. Cockayne (obit.), 257; British Association, 282, 297; D. McArdle (obit.), 292; N. L. Britton (obit.), 316; E. Blatter (obit.), 318; Linnæan species of Spermacoce, 329; Raunkiaer's Life Forms, English transl. (rev.), 351; Hutchinson's Families of Plants: Monocotyledons (rev.), 353.
Rendle, B. J.: Chalk and others, Forest Trees and Timbers of the British Empire, II. (rev.), 148; Hanson's Forestry for Woodmen (rev.), 215; Benoist's Les Bois de la Guyane Française (rev.), 325.

REVIEWS:—

Barton-Wright, E. C., Recent Advances in Plant Physiology, ed. 2, 181.
Bean, W. J., Trees and Shrubs hardy in the British Isles, 60.
Bracher, R., Field Studies in Ecology, 295.
Briggs, B., British Trees, second series, 151.
Bruun, H. G., Cytological studies in Primula, 239.
Buller, A. H. R., Researches on Fungi, V., 211.
Burr, S., and Turner, Dorothy M., British Economic Grasses: their identification by the Leaf Anatomy, 61.
Busch, N., *see* Krenke.
Cassels, C., Introduction to Plant Biochemistry, 327.
Cavers, F., Botany for Matriculation, 239.
——, Practical Botany, ed. 4, 93.
Chalk, L., Davy B. J., Desch, H. E., and Hoyle, A. C., Forest Trees and Timbers of the British Empire.—II. Twenty West African Timber Trees, 148.

REVIEWS (*cont.*):—

Cox, E. H. M., *see* Taylor, G.
Davy, B. J., *see* Chalk, L.
Dawson, W. R., A Leechbook or Collection of Medical Recipes of the Fifteenth Century, 178.
Desch, H. E., *see* Chalk, L.
Evans, A. W., Revision of the genus Acromastigum (Annales Bryologici, Suppl. vol. III.), 327.
Faber, A., Pflanzensoziologische Untersuchungen in Suddeutschland (Bibliotheca Botanica, 108), 179.
Fernald, M. L., Recent discoveries in the Newfoundland Flora, 260.
Good, R., Plants and Human economics, 116.
Green, C. Theodore, Flora of the Liverpool District, 29.
Gröntved, J., *see* Ostenfeld, C. H.
Gunther, R. T., Greek Herbal of Dioscorides illustrated by a Byzantine, A.D. 512: Englished by John Goodyer, 1655, 88.
Hagerup, O., Zur Organogenie und Phylogenie der Koniferen-Zapfen, 23; Zur Abstammung einiger Angiospermen durch Gnetales u. Coniferae, 321.
Handel-Mazetti, H., Symbolae Sinicae. — VII. Anthophyta, 150.
Hanson, C. O., Forestry for Woodmen, 215.
Harms, H., *see* Pax, F.
Hayata, B., Systematic Botany, I. Gymnospermae, 63.
Heim, A., Minya Gongkar, Forschungsreise ins Hochgebirge von Chinesisch Tibet, 115.
Hingston, R. W. G., Darwin, 150.
Holman, R. M., and Robbins, W. W., Elements of Botany, ed. 2, 93.
—— ——, Text-book of General Botany, 356.

REVIEWS (*cont.*):—

Horhammer, L., Die Coniferen-Gattungen *Cheirolepis* und *Hirmeriella* (Bibliotheca Botanica, 107), 27.
Horwood, A. R., and Noel, C. W. F., The Flora of Leicestershire and Rutland, 27.
Hoyle, A. C., *see* Chalk, L.
Hutchinson, J., Families of Flowering Plants, II. Monocotyledons, 353.
Hyde, H. A., and Wade, A. E., Welsh Flowering Plants, 355.
Johnstone, L., British Wild Flowers, 151.
Jones, G. N., Moss Flora of N. America, north of Mexico: Grimmiaceae, 118.
Kallenbach, Fr., Die Röhrlinge (continued) (Die Pilze Mitteleuropas, I., pt. 13), 294.
Krenke, N. P., Wundkompensation, Transplantation und Chimären bei Pflanzen. German translation by N. Busch, 91.
Lily Year Book, 1933. Conference Number, Royal Horticultural Society, 117.
London Naturalist, Report, 1933, 358.
Nannfeldt, J. A., Studien über die Morphologie und Systematik der nicht-Lichenisierten inoperculaten Discomyceten, 261.
Nierenstein, M., The Natural Organic Tannins, 358.
Noel, C. W. F., *see* Horwood, A. R.
Ostenfeld, C. H., and Gröntved, J., the Flora of Iceland and the Fäeroes, 326.
Pax, F., and Harms, H., Die Naturlichen Pflanzenfamilien, ed. 2. XVI. c. Angiospermae: Series Centrospermae, 235.
Raunkiaer, C., The Life Forms of Plants and Statistical Plant Geography, 351.
Robbins, W. W., *see* Holman, R. M.
Seward, A. C., Plant-Life through the Ages: a Geological and Botanical Retrospect, ed. 2, 149.

REVIEWS (*cont.*) :—

Sharp, L. W., Introduction to Cytology, ed. 3, 238.

Silveus, W. A., Texas Grasses, 180.

Small, J., Text-book of Botany, ed. 3, 93.

Smith, G. M., Freshwater Algae of the United States, 146.

Spratt, E. R. and A. V., Botany for Schools, 357.

Stern, K., Pflanzen-thermodynamik, 262.

Taylor, G., An Account of the genus Meconopsis, with Notes on the Cultivation of the Introduced Species by E. H. M. Cox, 213.

Turner, Dorothy M., *see* Burr, S.

Verdoorn, Fr., Annales Bryologici, VI., 92.

von Bernegg, A. S., Tropische und Subtropische Weltwirtschaftspflanzen, III. 1. Kakao und Kola, 293.

von Wettstein, F., Fortschritte der Botanik (1932), 182.

Wade, A. E., *see* Hyde, H. A.

Walter, Hans, Lebensgeschichte der Blutenpflanzen Mitteleuropas : Moraceae, 26.

Wilcox, H. A., Woodlands and Marshlands of England, 62.

Zander, R., Grosses Garten-Lexikon, 237.

Zimmerman, W., Orchidaceae Novae Brasilienses, I.–VII. (Bibliotheca Botanica, 109), 295.

Rhamnus borneensis *, 6 ; lancifolius *, 7.

Riccia Beyrichiana in Arctic Europe, 59.

Richards, P. W. : Trichomanes radicans in South Spain, 351.

Riddelsdell, H. J. : *see* Barton, W.C.

Ridley, H. N.: Some Dispersal Notes, 52 ; J. D. Gimlette (obit.), 176; Dawson's Leechbook or Collection of Fifteenth Century Medical Recipes (rev.), 178 ; new Malayan Rubiaceae, 251, 271 ; Dorycnium gracile in Kent, 349.

Roper, I. M. : South-Western Naturalists' Union, Annual Conference, 208.

Rosa perthensis Rouy and History as a British Plant, 167 ; stylosa in Ireland, 69.

Rubiaceae, New Malayan, 251, 271.

Rubus problems in the light of Genevier's herbarium, 143 ; R. altiarcuatus, griseoviridis, 144 ; morganwgensis, 146 ; Moylei, 144 ; nuticeps, Rilstonei, Wedgwoodiae, 145 ; 'latifolius' of Cornwall, 230 ; stanneus *, 231.

Salisbury, E. J., Faber's Pflanzensoziologische Untersuchungen in Suddeutschland (rev.), 179 ; Morphology, Ecology, and Distribution of Ranunculus Lenormandi and hederaceus, 185.

Saprolegniaceae of Soils of Wales, 345.

Scully, R. W. ; Utricularia ochroleuca in Kerry, 210.

Sedum dasyphyllum in Ireland, 70.

Selaginella dasyloma *, 228 ; ingens *, 229 ; Kanehirae *, procera *, 227 ; Rolandi-Principis *, 228 ; sinuosa *, 230 ; spanioclema *, 229.

Selaginellae of Trinidad and Tobago, 33 ; do. collected by Haenke and described by Presl, 223 ; do. new species, 227.

Senecio addoensis *, 48 ; subcanescens *, 49.

Septoria Gladioli, 267.

Sisymbrium thalianum flowering in November, 350.

Sixth International Botanical Congress, 1935, provisional programme, 263.

Somerset, Introduced plants, 350.

South-Eastern Union of Scientific Societies, Annual Congress, 232.

South-Western Naturalists' Union, Annual Conference, 208.

Spermacoce, Linnæan Species, 329.

Sphagna, New Vice-County Records, inundatum vars. *, 81.

Stearn, W. T. : Notes on Colchicum, 341.

Tarenna arborescens *, 271 ; axillaris *, Bartlettii *, 273 ; crassifolia *, 257 ; debilis *, 272 ; glaberrima *, glabra, 257 ; Hosei *, 272 ; oblanceolata *, 256.

Tectaria sparsiflora *, Suppl., 3.

Thalictrum minus L. in Britain, 153 ; arenarium, 154 ; Babingtonii, 159 ; capillare, 160 ; collinum, 158 ; expansum, 162 ; majus, 161 ; montanum, 156 ; umbrosum, 161.

Thompson, A. : New Vice-County Records for Sphagna, 81.

Thompson, H. S. : Myosotis sylvatica in N. Somerset, 320.

Travis, W. G. : Lemna minor flowering in Cheshire, 321.

Trichomanes radicans in South Spain, 351.

Tutin, T. G. : New Species from British Guiana, 306.

Umbelliferae, Tropical African, 205.

Uromyces Festucae, 265 ; Dactylidis, 266 ; Genistae, 267.

Utricularia alutacea *, 313 ; arenicola *, 312 ; ochroleuca in Kerry, 210 ; rubricaulis *, 312 ; sciaphila *, 333 ; tenuissima *, 354.

van Steenis, C. G. G. J. : Clemens's Kinabalu Collection, 1.

Verbascum nigrum, New variety, 278 ; pulverulentum × Thapsus in Britain, 173.

Vermeulen, P. : Orchis latifolia L., 97.

Vigna occidentalis *, 41.

Viola lepida Jord., 113.

Virgilia divaricata *, 43.

Vitaliana, Publication of name, 292.

Watson, W. : Sisymbrium thalianum flowering in November, Introduced plants in Somerset, 350.

Weinmannia Clemensiae *, 3.

Westbrook, M. A. : Antithamnion Spirographidis Schiffner, 65.

White, C. T. : Bancroft, T. L. (obit.), 141.

Williams, I. A. : Bromus interruptus Druce in Holland, 178.

Willows, cricket-bat and others, external leaf-character, 165.

Worsdell, W. C. : Hagerup's Zur Organogenie und Phylogenie der Koniferen-Zapfen (rev.), 26 ; do. Zur Abstammung einiger Angiospermen (rev.), 321.

Xylopia Mendoncae *, 280.

Zostera nana in Carmarthen, 58.

The index to the Supplement—Mr. John Gossweiler's Plants from Angola and Portuguese Congo : Pteridophyta—is included above.