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SUPPLEMENT II.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

NOTES ON LABIATAE.
II. THE GENUS *ACROTOME* BENTH.

BY G. TAYLOR, D.Sc., F.L.S.

IN the course of investigating the affinity of a recently described species of *Acrotome* it appeared that a revision of the genus would be desirable in order to record certain observations based on the adequate material now available.

When it was originally described (Benth. in Endl. Gen. Pl. 627 ; 1838), the genus *Acrotome* was included with the genera *Craniotome* Reichb., *Sideritis* L., and *Marrubium* L. in the subtribe *Marrubieae* of *Stachydeae*. In Bentham and Hooker's 'Genera Plantarum' (ii. 1168 ; 1876) the treatment of this subtribe was the same except that the genus *Craniotome* was removed and the genus *Tapeinanthus* Boiss. added. The same four genera (*Tapeinanthus* being renamed *Thuspeinanta* Th. Dur.) were grouped together by Briquet (in Engl. & Prantl, Nat. Pflanzenfam. iv. 3, a. 229 ; 1897) to form the tribe *Marrubieae* of the subfamily Stachyoideae. From a critical study of the genus I am left in no doubt that the natural affinity of *Acrotome* is with such genera as *Leucas* Burm. and *Lasiocorys* Benth. in the subtribe *Lamiinae* of Stachyoideae. From the three genera with which it has hitherto been associated in *Marrubieae* it is distinguished by the truncate nutlets and, moreover, it is widely separated from them geographically, being confined to southern Africa, whereas *Sideritis*, *Marrubium*, and *Thuspeinanta* are natives of the north temperate regions of the Old World. The occurrence of *Marrubium* in other parts of the World is the result of introduction. The inclusion of *Acrotome* with these genera in the *Marrubieae* can only be accounted for by the character common to all, that of the stamens included within the corolla-tube, and it is precisely this character which would exclude it from the *Lamiinae*. It seems, however, in spite of this objection, that the other characters of *Acrotome* so strongly

indicate an affinity with *Leucas* and *Lasiocorys* that the genus should be excluded from the *Marrubieae* and referred to the *Lamiinae*.

It is interesting to observe that N. E. Brown, in manuscript notes on certain sheets of *A. inflata* Benth. in the Kew Herbarium (*Cooper* 1382; *Baur* 784), has expressed the opinion that *Acrotome* is doubtfully separable from *Leucas*. A critical examination of the floral structure of all species of *Acrotome* does not justify this assumption, and indeed shows that separate generic status is warranted. It has been stated that the genus is undoubtedly closely related to *Leucas*, but there are important differences in spite of the striking superficial resemblances between certain species in each genus. In *Leucas* the upper labellum is concave, more or less hooding, and very villous, the hairs forming a very

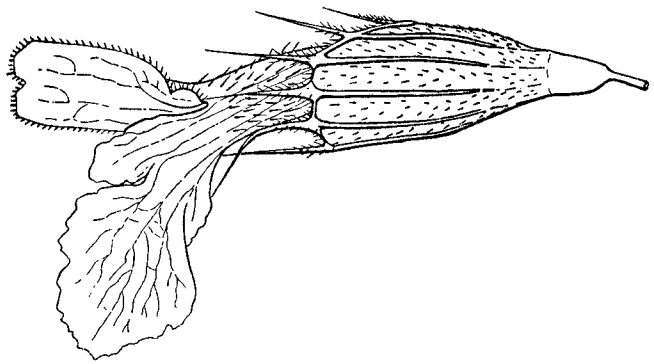

Fig. 1.—A flower of *Acrotome*, × 6. The example presented is of *A. Belckii*, drawn from a more or less ventral aspect, but it may be regarded as typifying the general external floral morphology of the genus.

obvious fringe projecting beyond the upper lip, while the stamens are constantly at least slightly exserted from the corolla-tube. *Acrotome*, on the other hand, has flowers in which the upper lip is straight, almost flat and spreading and without a conspicuous fringe of hairs; the stamens are included within the tube of the corolla (fig. 1). A description is given below of the androecium of *Acrotome*, the structure of which is a fundamental distinguishing character not only from *Leucas*, but from all other genera in the family. *Leucas* and *Acrotome* differ further in their stylar characters. In *Acrotome* the style is entire and oblique at the apex, whereas in *Leucas* it is usually unequally bilobed. Fruiting characters have been used to separate the genera: the nutlets of *Acrotome* are truncate at the apex, while those of *Leucas*

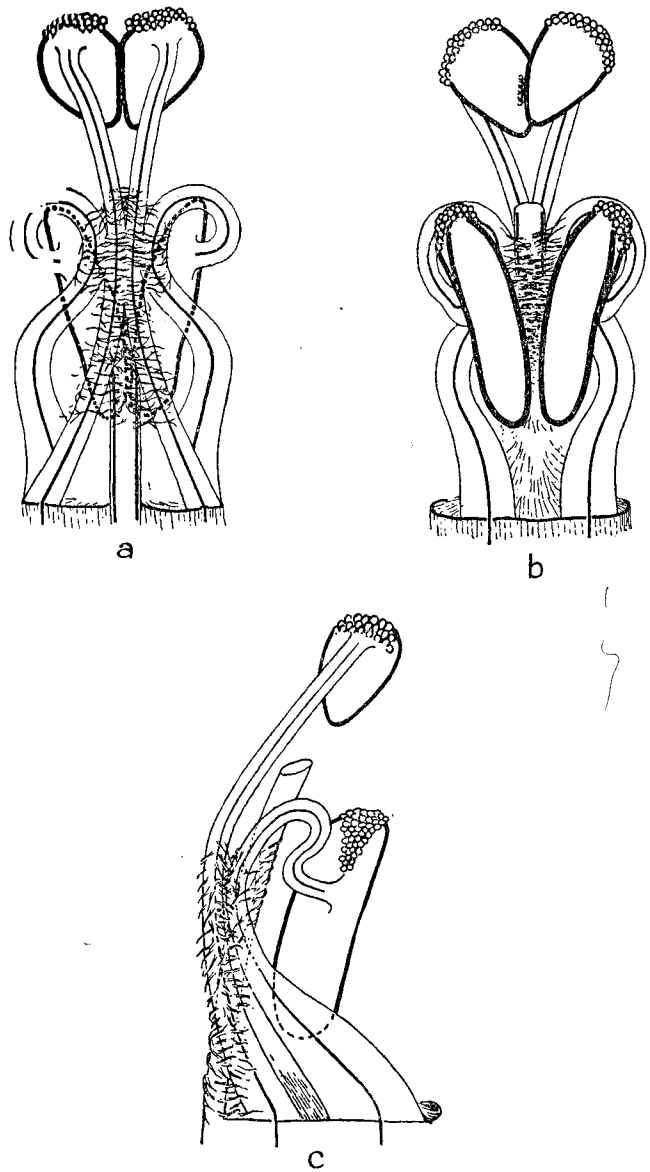

Fig. 2.—Semi-diagrammatic illustrations of the genitalia (× about 40) of *Acrotome*.
a. Dorsal view; *b*. Ventral view; *c*. Lateral view.
The corolla has been removed at the point of insertion of the stamens.

have been described as scarcely truncate. This is an unsatisfactory character for differentiation, since in some species of *Leucas*, for example *L. Bakeri* Hiern, the nutlets are definitely truncate at the apex.

The construction of the androecium in *Acrotome* is so characteristic that it is desirable to examine it in some detail, especially since no circumstantial account of it can be traced. In the accompanying figures (fig. 2) the structure is represented in a semi-diagrammatic manner. The filaments arise at the same level, and about this point on the corolla-tube there is sometimes a ring of hairs or a well-marked glandular area. The filaments of the posterior stamens converge at about halfway up, where a mass of hairs is produced, and the intertwining of these hairs holds the filaments in close association at that point. Above this they diverge, then bend forward and bear obovoid anthers, which are closely connivent along their adjacent faces. The filaments of the anterior stamens have a peculiar and very characteristic double curve and bear narrowly oblong anthers. From their point of origin the anterior filaments converge towards the upper ones where the latter are villous. At this point they also bear hairs which intertwine with those on the posterior stamens, and the four are thus held together in the same lateral plane. Above this a very pronounced sudden curvature takes place in the anterior filaments. It should be observed that the anterior anthers are much larger than the posterior and of a more elongated shape, while all the anthers are provided with a glandular crest which is more easily seen in soaked (and presumably in living) specimens than in the dried state. The position of the style has a definite relationship to the stamens. It follows the posterior wall of the corolla-tube to the point of insertion of the stamens, and above this curves forward through the mass of staminal hairs to assume a position between the two sets of anthers. On the style there are hairs along an area corresponding to those on the filaments, and by the interlocking of the hairs the style appears to be suspended and held in position. The stigma is simply the oblique apex of the style, and faces posteriorly. This complicated arrangement of the genitalia is a specialized mechanism, and the whole apparatus appears to choke completely the throat of the corolla. The biological significance is not obvious, and a clear interpretation can only be arrived at after study in the field.

In the original description of *Acrotome* (Benth. in Endl. Gen. Pl. 627; 1838) no species is mentioned, but it is evident from the phrases '*Calyx . . . oblique quinquedentatus*" and "*Suffrutex capensis*; *foliis parvis, apice dentatis*" that the genus was then considered monotypic with the species later named *A. pallescens* Benth. as basis. Subsequently Bentham (in DC. Prodr. xii. 436; 1848) amplified the description so as to accommodate two additional species, *A. hispida* Benth. and *A. inflata* Benth., which were enumerated along with *A. pallescens*.

The genus *Acrotome* is confined to Southern Africa and is now considered to include eight species. With the exception of *A. inflata* the individual species are of somewhat restricted distribution, and three appear to be highly localised. *A. tenuis* G. Tayl. is known only from two localities in Northern Rhodesia;

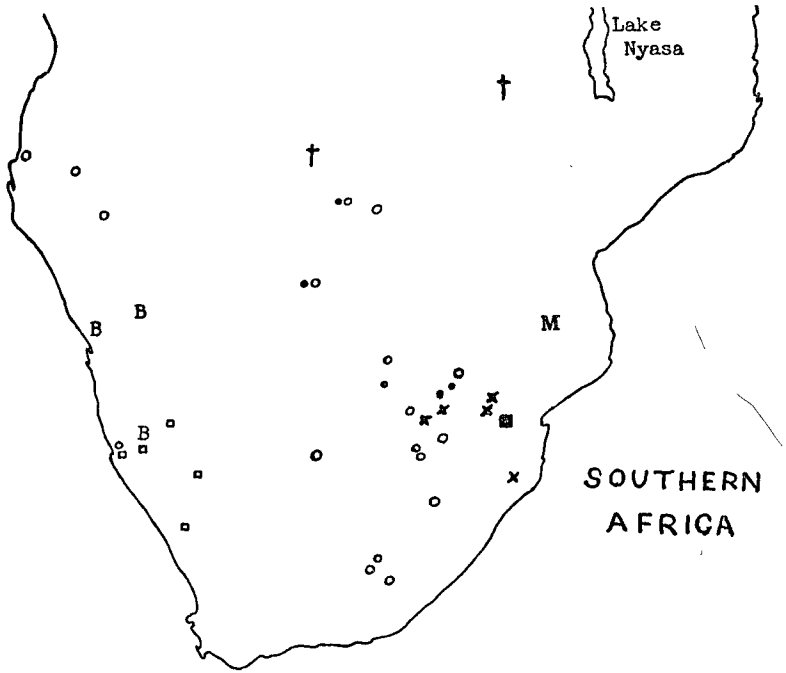

Fig. 3.—Map of distribution of species of *Acrotome*.

○ *Acrotome inflata* Benth.
● *Acrotome angustifolia* G. Tayl.
■ *Acrotome Thorncroftii* Skan.
† *Acrotome tenuis* G. Tayl.
□ *Acrotome pallescens* Benth.
B *Acrotome Belckii* Gürke.
× *Acrotome hispida* Benth.
M *Acrotome mozambiquensis* G. Tayl.

A. mozambiquensis G. Tayl. is recorded only from Mozambique; *A. Thorncroftii* Skan is restricted to the Barberton area in the Transvaal. *A. pallescens* and *A. Belckii* Gürke, while having a fairly extensive range, are confined to the dry regions of temperate southern South-western Africa, the former species extending from Great Namaqualand to the Namaqualand region of Cape Province, the latter from Central Damaraland to Southern Great

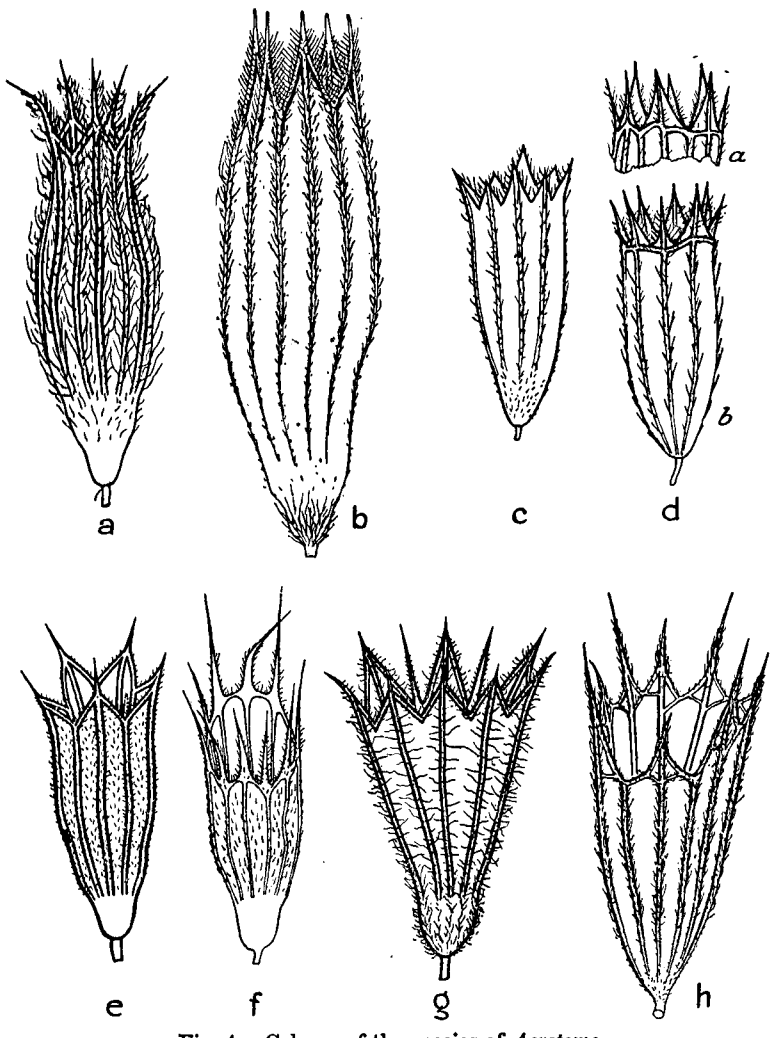

Fig. 4.—Calyces of the species of *Acrotome*.

a. *Acrotome inflata* Benth., ×4½.
b. *Acrotome angustifolia* G. Tayl., ×5½.
c. *Acrotome Thorncroftii* Skan., ×6.
d. *Acrotome tenuis* G. Tayl. { *a*. Ventral view of calyx teeth, ×6. *b*. Dorsal view of calyx, ×6.
e. *Acrotome pallescens* Benth., ×6.
f. *Acrotome Belckii* Gürke, ×6.
g. *Acrotome hispida* Benth., ×7.
h. *Acrotome mozambiquensis* G. Tayl., ×7½.

All drawn from the dorsal aspect (with the exception of d, *a*).

Namaqualand. *A. hispida* is found from Southern and Eastern Transvaal to Northern Natal. *A. inflata* is a very widespread species, its northern limits being Northern Rhodesia on the east and Southern Angola on the west. It extends to South-West Africa and through Bechuanaland, Transvaal, and Orange Free State to the Queenstown District of Cape Province. A map (fig. 3) of Southern Africa is submitted to show the distribution of the genus and its species.

Since characters of the calyx are largely used to segregate the species in the accompanying key, figures of the calyces of all species are given (fig. 4).

Key to the Species.

Lamina broadest below or about the middle, varying from ovate to elliptic- or linear-lanceolate (except in occasional specimens of *A. inflata* where it may be oblanceolate).
- Throat of calyx-tube not or becoming only slightly oblique in fruit.
  - Calyces with 5 teeth; accrescent in fruit, becoming inflated and aggregated in dense globose heads.
    - Stem pubescence of retrorse hairs; lamina varying from ovate to elliptic-oblong.... 1. *inflata*.
    - Stem pubescence of appressed (not retrorse) hairs; lamina linear, narrowly lanceolate or narrowly elliptic-oblong ..... 2. *angustifolia*.
  - Calyces with 8–10 teeth; more or less accrescent in fruit, but not aggregated in dense globose heads.
    - Suffruticose perennials, copiously branched; flowers aggregated in axillary inflorescences..... 3. *Thorncroftii*.
    - Slender annuals; flowers aggregated in inflorescences terminating the branches .. 4. *tenuis*.
- Throat of calyx-tube more or less distinctly oblique, especially when in fruit.
  - Calyx with 5 primary teeth (more or less deltoid at the base and shortly spinescent at the apex) which are often accompanied by 1–3 secondary subulate teeth; stems, at least when young, usually densely pubescent, the minute hairs 2-cellular, straight or slightly curved at the apex, soon glabrescent; mature leaves not exceeding about 2·5 cm. in length and 1·0 cm. in breadth.. 5. *pallescens*.
  - Calyx with 8–10 subsimilar teeth (all subulate); stems, at least when young, more or less densely pubescent, the small hairs 3-cellular, conspicuously curved and reflexed; mature leaves up to about 10 cm. in length and 1·5 cm. in breadth ..... 6. *Belckii*.

Lamina broadest above the middle, varying from obovate to obovate-oblong.
- Pubescence hairs on stem spreading ..... 7. *hispida*.
- Pubescence hairs on stem retrorse ..... 8. *mozambiquensis*.

Enumeration of the Species.

1. Acrotome inflata Benth. in DC. Prodr. xii. 436 (1848).
Leucas Eenii Hiern in Cat. Afr. Pl. Welw. i. 878 (1900).
Lasiocorys Eenii (Hiern) Bak. in Dyer, Fl. Trop. Afr. v. 469 (1900).
A. amboensis Briq. in Bull. Herb. Boiss. sér. 2, iii. 1095 (1903).

Geographical Range.—South Angola and Northern Rhodesia to North-eastern Cape Province.

Angola. Mossamedes Distr.: banks of River Bero, July 1879, *Welwitsch* 5446 (B); between Cahama (Kahama) and Tchipilongu (Shipelongo), 19 May 1909, *Pearson* 2406 (K).

South-West Africa. Amboland: Olukonda, Jan. 1886, *Schinz* 42 (Z); same locality, 19 Dec. 1885, *Schinz* 2077 (Z); same locality, 20 Feb. 1895, *Rautanen* 132 (Z); Ondoga, Olukonda, 17 Mar. 1894, *Rautanen* 235 (type of *A. amboensis*) (B, K, Z); Olukonda, 1926, *Rautanen* 840 (Z); Unknanyama, Ompanda, 4 Mar. 1895, *Wulfhorst* 3 (Z); Unknanyama, 10 Mar. 1895, *Wulfhorst* 23 (Z); Unknanyama, Omupanda, 1898, *Wulfhorst* without number (Z); Unknanyama, 1900, *Tonjes* (Z). Damaraland: Okahandya, 19 Mar. 1906, *Dinter* 26 (B, K, Z); Usakos, alt. 900 m., May 1886, *Marloth* 1437 (K); Harris, April 1890, *Fleck* 591 (Z); without precise locality, 1890, *Fleck* 80 *a*, 372, 945 (Z); without precise locality, 1879, *Een* (type of *Leucas* (*Lasiocorys*) *Eenii*) (B); without precise locality, 1885–86, *Luderitz* 107 (Z); without precise locality or date, *Nels* without number (Z). Great Namaqualand: Lüderitz Bucht, 1927, *Hobart-Hampden* (B).

Northern Rhodesia. Barotseland: Sesheke Distr., *Gairdner* 37 (K). Batoka Distr.: Livingstone, 25 April 1930, *Jenkins* 76 (B).

Bechuanaland Protectorate. Batawana Reserve: Kwebe (Kgwebe) Hills, alt. about 1000 m., 17 Feb. 1898, *Lugard* 181 (K). Bamangwato Reserve: Shoshong, *Holub* without number (K). Without precise locality, *Burchell* 2233 (K).

Transvaal. Waterberg Distr.: Potgietersrust, Jan. 1909, *Leendertz* 1134 (K). Marico Distr.: Lino Kano, Sept. 1876, *Holub* without number (K). Rustenburg Distr.: 6 Mar. 1904, *Nation* 139 (K). Pretoria Distr.: Rietfontein, 18 April 1910, *Mussic in Herb. Burtt Davy* 5617 (K). Heidelberg Distr.: near Viljoen's Drift, 7 Mar. 1905, *Gilfillan in Herb. Galpin* 7148 (K).

British Bechuanaland. Kuruman Distr.: Baltharos, Jan. 1921, *Silk* 191 (K).

Orange Free State. Vredefort Distr.: Leeuw Spruit and Vredefort, 1901–02, *Barrett-Hamilton* (B). Sepani, alt. about 1500 m., April 1931, *Brierley* 57 (K).

Basutoland. Leribe Distr.: alt. 1500–1800 m., May 1913, *Dieterlen* 80 (B, K).

Cape Province. Hopetown Distr.: near Hopetown, Mar., *Muskett in Herb. Bolus* 2034 (K). Albert Distr.: 1861, *Cooper* 1387 (B, K, E). Steynsburg Distr.: Zuur Berg, *Burke* without number (type, in Herb. Kew). Queenstown Distr.: plains, Queenstown and Sterkstroom, alt. 1070–1200 m., Mar. 1893, *Galpin* 1505 (K); Shiloh, alt. about 1070 m., *Baur* 784 (K).

Without precise locality, *Zeyher* 1346 (B).

This species, by far the most widespread in the genus, shows a considerable range of variation in the shape of the leaves, and this is strikingly emphasised if the extremes (*Gairdner* 37; *Dinter* 26) are placed together. The lamina varies from ovate (as in *Jenkins* 76; *Lugard* 181; *Gairdner* 37) to narrowly elliptic-oblong (as in *Dinter* 26; *Welwitsch* 5486). Correlated with the leaf-shape, the degree of petiolation varies; those with the lamina ovate have conspicuous petioles, whereas those with the lamina elliptic-oblong show gradations to an almost sessile condition.

In the majority of specimens, including the type, the flowers are aggregated in subterminal heads. Sometimes, however, a series of flower-heads is borne in the axils of the upper leaves. This tendency to plurality is particularly characteristic of the western representatives of the species (*Welwitsch* 5486; *Pearson* 2406; *Een*; *Dinter* 26), but the condition is also found in specimens throughout the geographical range of the species; from Rhodesia (*Gairdner* 37), Bechuanaland Protectorate (*Lugard* 181), Transvaal (*Nation* 139; *Leendertz* 1134), Orange Free State (*Barrett-Hamilton*), and Cape Province (*Galpin* 1505).

The stature and habit of the species also vary. From the specimens examined and their accompanying field-notes the extremes appear to be exemplified in *Fleck* 591, a slender unbranched herb from about 20 to 30 cm. in height, and in *Gairdner* 76, which according to the collector reaches a height of 1·2 m. and is copiously branched.

With such a wide range of forms the possibility of further division was investigated, but the variations were so intergraded that it was found impossible to define any segregates by constant characters. Further, no distributional features correlated with the variations could be observed.

2. **Acrotome angustifolia,** sp. nov. *Herba* annua ramosa, altitudinis usque ad 1·5 m. attingens; caules obtuse tetragoni, sulcati, apicem versus tomentosi, alibi plus minusve dense pubescentes, pilis appressis sursum directis. *Folia* subsessilia; lamina linearis vel anguste lanceolata vel elliptico-oblonga, basi sensim attenuata, apice subacuta, margine apicem versus plerumque serrata basin versus integra, usque ad saltem 9 cm. longa et

1·3 cm. lata, utrinque plus minusve dense pubescens et pellucido-glandulosa. *Flores* in verticillos subterminales subglobosos denso aggregati. *Calycis* tubus subcampanulatus, apicem versus inflatus, fauce rectus, 10-nervius, per anthesin extus dense villosus intus strigillosus c. 0·5 cm. longus et ore 0·2 cm. latus, in fructu accrescens aliquantulum glabrescens usque ad 1·5 cm. longus et ore c. 0·3 cm. latus, dentibus 5 æqualibus triangularibus apice spinescentibus. *Corollæ* tubus e calyce vix exsertus, extus parte superiore dense retrorse pubescens, c. 0·6 cm. longus; labium posticum leviter concavum, apice rotundatum, extus dense appresso-pubescens, c. 0·2 cm. longum et 0·15 cm. latum; labium anticum trilobatum, intus basin versus glanduloso-puboscens, extus basin versus pubescens, c. 0·3 cm. longum. *Stamina* ad corollæ faucem inserta et in ejus tubo inclusa; filamenta villosa; antheræ apice glanduliferæ, posticæ plus minusve cordiformes c. 0·25 mm. longæ et apice 0·3 mm. latæ; anticæ oblongæ vel elliptico-oblongæ c. 0·5 mm. longæ et 0·2 mm. latæ. *Stylus* c. 4 mm. longus, parte superiore villosus, apice oblique truncatus. *Nuculæ* triquetræ, apice truncatæ, usque ad 3 mm. longæ, apice 1 mm. latæ.

Geographical Range.—Southern Northern Rhodesia, through North-eastern Bechuanaland Protectorate to North-western Transvaal.

Northern Rhodesia. Barotseland: Sesheke Distr., *Gairdner* 101 (K).

Bechuanaland Protectorate. Batawana Reserve: Kwebe Hills, alt. about 1000 m., 22 Feb. 1898, *Lugard* 187 (K). Bakhatla Reserve: Mochudi, Jan.–Apr. 1914, *Harbor in Herb. Rogers* 6525 (K). Kwotwe, 8 Apr. 1930, *Van Son* 28,919 (B).

Transvaal. Waterberg Distr.: Roodepoort, Modsene, Naboomspruit, 16 Feb. 1923, *Galpin* m. 602 (typus in Herb. Mus. Brit.; K); Nylstroom, Dec. 1901, *De Jongh in Herb. Galpin* 6500 (K). Vaalboschfontein, alt. 1430 m., 18 Jan. 1894, *Schlechter* 4229 (B, K, E, Z).

This species, as in *A. inflata*, to which it is most closely related, has the flowers aggregated in dense subglobose inflorescences, and the calyces in fruit are conspicuously accrescent and inflated in their upper part. Up to the present *A. angustifolia* has been consistently identified with *A. inflata*, but it can readily be distinguished from that species on account of its narrower leaves and stem-pubescence, the hairs of which are not retrorse as in *A. inflata*.

3. Acrotome Thorncroftii Skan in Dyer, Fl. Cap. v. 335 (1910).

Geographical Range.—Barberton, Transvaal.

Transvaal. Barberton Distr.: Barberton, Aug. 1907, *Thorncroft* 3124 (type, in Herb. Kew); Barberton, alt. about 940 m., Feb. 1924, *Rogers* 25,492 (B).

4. Acrotome tenuis G. Tayl. in Journ. Bot. lxx. 106 (1932).

Geographical Range.—Serenje District to Barotseland, Northern Rhodesia.

Northern Rhodesia. Serenje Distr.: Kaombi, alt. about 1400 m., Apr. 1930, *Lloyd* without number (type, in Herb. Brit. Mus.). Barotseland: Kanona, Musha Hills, alt. 600–2000 m., Apr. 1932, *St. Clair Thompson* 1289 (B, K).

In the original description of this species the anthers of the posterior stamens were described as 1-cellular, but the receipt of further material has shown that it is only at maturity that the anther-sacs become confluent and thus appear as unicellular structures. The prominent green colouring of the calyx-teeth and calyx-venation are conspicuous features.

5. Acrotome pallescens Benth. in DC. Prodr. xii. 436 (1848).

Stachys Steingroveri Briq. in Engl. Bot. Jahrb. xix. 193 (1894).

Geographical Range.—Damaraland to North-western Cape Province.

South-west Africa. Damaraland: Zwartaus, 31 Mar. 1929, *Dinter* 6251 (K). Great Namaqualand: Mount Brukaros, Nov. 1928–Apr. 1929, *Hoover* 18 (US); same locality and date, *Hoover* 75 (US); Mount Brukaros and vicinity, 26 Mar. 1930, *Nordahl* 6436 (US); Luderitz, Nov. 1923, *Rogers* 29,622 (K); same locality, Nov. 1924, *Rogers* 29,596 (K); Aus, 21 July 1925, *Moss and Otley in Herb. Moss* 13,772 (B); Aus, 28 Nov. 1912, Pearson 8050 (K); rocks north of Aus, 28 Nov. 1912, *Pearson* 8040 (K); Great Karasberg, between Narudas Süd and Krai Kluft, Jan. 1913, *Pearson* 8508 (B, K).

Cape Province. Namaqualand: Doornpoort, 28 Dec. 1910, *Pearson* 6014 (K). Without definite locality, *Drege* 7951 (K).

6. Acrotome Belckii Gürke in Bull. Herb. Boiss. vi. 549 (1898).

Geographical Range.—South-West Africa, from Northern Damaraland to Southern Great Namaqualand.

South-West Africa. Damaraland: Kakaofeld near Otyitambi, 3 Mar. 1885, *Belck* 40 (type, in Herb. Bot. Mus. Zur.); Okahandya, alt. 1300 m., May 1907, *Dinter* 498 (B, K, E, Z); Haigamxab (Haikamchab), 27 Jan. 1907, *Galpin and Pearson* 7407 (K); without precise locality, 1879, *Een* without number (B). Great Namaqualand: Tiras, Apr. 1885, *Schinz* 43 (Z); Aus, *Rogers* 52 (K).

The specimens comprising the type-collection have flowers in which the calyces have eight teeth, but the other specimens examined, without exception, have calyces with ten teeth.

7. Acrotome hispida Benth. in DC. Prodr. xii. 436 (1848).

A. hispida β elongata, γ ? obliqua Benth. *loc. cit.* (1848).

Geographical Range.—South-eastern Transvaal to Northern Natal.

Transvaal. Rustenburg Distr.: alt. 1370 m., 22 Dec. 1903, *Nation* 14 (K). Pretoria Distr.: Premier Mine, 13 Oct. 1917, *Moss* 3429 (B); Aapies (Aapges) River, *Burke* without number (K). Witwatersrand Distr.: Kings Kloof, 4 Oct. 1924, *Moss* 10,454 (B); near Kingskloof, 19 May 1928, *Moss* 16,959 (B). Potchefstroom Distr.: near Schoonspruit (Schoenstrome), *Burke* without number (type, in Herb. Kew). Middleburg Distr.: Witbank, Dec. 1919, *Rand* 80 (B); Witbank, Dec. 1905, *Gilfillan, in Herb. Galpin* 7231 (K). Lydenburg Distr.: Hillside by Pilgrim's Road, Krugerspost, alt. 1340 m., 3 Dec. 1907, *Burtt Davy* 7296 (K); near Lydenburg, Dec. 1895, *Wilms* 1135 (B, K). Carolina Distr.: Waterval Boven, 15 April 1927, *Young in Herb. Moss* 14,990 (B); Carolina, alt. about 1520 m., 20 Dec. 1907, *Burtt Davy* 7397 (K); near Carolina, alt. about 1700 m., Dec. 1905, *Bolus* 12,243 (K). Donkershoek, alt. 1630 m., 16 Nov. 1893, *Schlechter* 3722 (B, K, E).

Natal. Zululand: *Gerrard* 1200 (B, K).

Without precise locality, Vaal River, *Burke* 496 (K).

When he originally described this species, Bentham recognised two varieties, but the extensive range of material now available shows that the varietal characters used for differentiation are unsatisfactory and the forms grade so imperceptibly that none are worthy of taxonomic status.

8. **Acrotome mozambiquensis,** sp. nov. *Herba* perennis ramosa, altitudinis saltem usque ad 3·7 cm. attingens, omnino pubescens; caules erecti, tetragoni, juniores dense retrorso-pubescentes, seniores plus minusve glabrescentes. *Folia* opposita; lamina obovata ad oblanceolata vel elliptico-oblanceolata, basi in petiolum decurrens, apice subacuta vel obtusa vel rotundata, margine ciliata infra integra sed apicem versus plerumque serrata, usque ad 2·3 cm. longa (petiolo incluso) et 0·7 cm. lata, rigide chartacea, supra parce breviterque strigosa, subtus præsertim in costa nervisque strigosa alibi plus minusve glabrescens. *Flores* sessiles vel breviter pedicellati, in verticillos axillares paucifloros conferti. *Calycis* tubus cylindraceus, fauce leviter obliquus, 10-nervius, extus præsertim ad nervos dentesque dense hispidulus, intus subtiliter strigosus, c. 4·5 mm. longus et fauce c. 2·5 mm. latus, dentibus plerumque 8 anguste triangularibus apice spinescentibus. *Corollæ* albæ tubus basin versus constrictus glaberque, extus parte supera dense retrorse pubescens, 4·5 mm. longus ex calycis tubo 1–1·5 mm. exsertus; labium posticum rectum, leviter concavum, apice retusum minute fimbriatum, extus dense appresso-pubescens, c. 3·0 mm. longus et basi 2·5 mm. latus; labium anticum trilobatum, intus basin versus minute pubescens,

sublum basin versus (? glanduloso-) pubescens, c. 4 mm. longum, lobo medio transverse elliptico apice emarginato margine crispulato, lateralibus quadratis margine minute ciliatis. *Stamina* ad corollæ faucem inserta et in ejus tubo inclusa; filamenta barbata; antheræ apice glanduliferæ, posticæ subdidymæ c. 0·3 mm. longæ et 0·5 mm. latæ, anticæ anguste oblongæ fere 1·0 mm. longæ et 0·3 mm. latæ. *Stylus* parte supera villosus, apice oblique truncatus. *Nuculæ* triquetræ, apice truncatæ minute glanduliferæ, c. 0·5 mm. longæ et 0·5 mm. latæ.

Geographical Range.—Companhia de Moçambique.

Portuguese East Africa. Companhia de Moçambique: Muhulane (Mangulane), in sandy places, Nov. 1921, *Sousa* 508 (Typus in Herb. Kew.; B).

For loan of specimens I am indebted to the Director, Royal Botanic Gardens, Kew; to the Regius Keeper, Royal Botanic Garden, Edinburgh; to the Director of the Botanical Garden and Botanical Museum, Zurich; and to the Curator, United States National Herbarium. In the enumeration of the specimens the following abbreviations are used to indicate the herbaria where they are deposited.

B—British Museum (Natural History).
K—Royal Botanic Gardens, Kew.
E—Royal Botanic Garden, Edinburgh.
US—United States National Herbarium.
Z—Botanical Garden and Botanical Museum, Zurich.

The drawings illustrating this paper are the work of Col. M. St. L. Simon, to whom my thanks are due.

MALAY VIOLETS.

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

The genus *Viola*, considering the comparatively poor methods of dispersal which it possesses, is remarkably widespread. In the tropical regions of Malaya the genus is practically confined to the high mountains from 5000 feet altitude upwards. The species in the Sundanese area, Java, Sumatra, and the Malay Peninsula are all of Himalayan affinities, as is the case with almost all the alpine flora of that area. In Borneo they are scarce, and only one Sumatran species and one widely distributed Sundanese species have been found, and in Timor two have been met with—*V. Patrinii* DC., a variety similar to that of the Philippines, but absent from the Sundanese area, and a variety of the widespread *V. Burgersdijkii* Oudem.

Viola alata Burgersdijk, Miq. Pl. Jungh. 121, seems to be almost confined to the Dieng Mountains of Java, Mt. Prahu (*Horsfield*). Its affinity is with *V. verecunda* A. Gray of Japan and China which is referred to it by Becker, but it is a very much larger plant and apparently quite distinct.

V. ARCUATA Bl. Bijdr. 58, Java, Mt. Prahu (*Horsfield*); Telaga Bodas (*Blume and Korthals*); Mt. Gede (*Reinwardt*). Sumatra, Tanjong Alam (*Korthals*); Mount Korinchi at Sungei Kumbang, 4500 feet (*Robinson and Kloss* 104). Flowers pale violet, lower petals veined purple.

V. javanica Becker, Bot. Centralbl. Beiheft xxxiv. pt. 2, 260; Java, Tengger (*Zollinger* 2170, in Herb. Mus. Brit.), appears to me a dwarf form of *V. arcuata* to which Miquel has referred it. It has a stout rootstock whence stolons are beginning to grow, the leaves are slightly more crenulate than in most forms, and the upper stipules are laciniate.

V. INCONSPICUA Bl. Bijdr. 58. *V. trinervis* Korth. Kruidk. Arch. i. 357 (*fide* Miquel). Java (*Zollinger*, ser. ii. 1979). Sumatra, Berastagi (*Ridley*) in fruit, Feb.; Mrapi, flowers blue (*Korthals*), not seen. A tufted plant allied to *V. Patrinii* DC., without stolons except in Korthals's specimen. No one seems ever to have seen fully developed flowers of this plant, and they have never been described.

V. CONFUSA Champ. Sumatra, Alahan Panjang (*C. G. Matthew*). The sheet of the type of this plant from Hongkong in Herb. Kew is separated by Becker into two species of which the flowering ones are the true *confusa*, but two fruiting ones he refers to *V. inconspicua* Bl. The main difference between them is that in the flowering ones the leaves are pubescent and in the so-called *V. inconspicua* Bl. they are glabrous, but specimens of a violet collected by Playfair in Kuangsi, Canton, evidently the same as the Hong-Kong plant and named "*confusa* nordliche form" by Becker, are glabrous. The plants referred by him to *inconspicua* Bl. seem to me totally different from any form of that plant, and true *inconspicua* is absent from any other part of China—so far as I have seen.

Fleet-Surgeon C. G. Matthew collected a single specimen of a violet at Alahan Panjang in Sumatra at 4000 feet, with blue flowers. It seems identical with *V. confusa* Champ., but like Playfair's plant is glabrous. Korthals found a violet at Tanjong Alam at the foot of Merapi in Sumatra, the same district, which he described as *V. trinervis*, and this has been referred to *V. inconspicua* Bl. The description (Korthals, Ned-Kruidk. Arch. 357; 1840) is too incomplete for identification, "Acaulis, folia longe-petiolata hastata acutiuscula crenulato-serrata basi in petiolum decurrentia. Flores cœrulei alte pedunculati." I have not seen the specimen, and it may be the flowering form of *V. inconspicua* Bl. of which flowers other than cleistogamous are unknown. It is possible, however, that the plant is the one collected by Matthew, though the leaves are hardly hastate.

Matthow's specimen differs from the type of *V. confusa* in the longer appendages to the sepals, which are bifurcate at the tip.

The style is straight, dilated upwards, the stigma 2-winged and produced a little at the back and with a small process in front.

Viola korinchensis, sp. nov. *V. sikkimensis* var. *acuminatifolia* Becker in Bot. Centralbl. Beiheft. xxxiv. 260.

Species a *V. glaucescenti* Oudem., cui affinis, stipulis angustis, pedicello pubescenti, sepalis latioribus, petalo inferiore oblongo-spathulato truncato cuspidato, capsulæ valvis crassioribus obtusis nec carinatis, foliis ovatis acutis glabris, differt.

Herba raro stolonifera, rhizomate crasso lignoso 4–7 cm. longo. *Folia* congesta, ovata acuta cordata serrato-crenulata, glandulis in sinubus, 3–6·5 cm. longa 2·5 cm. lata, costa superne elevata, nervis 5-paribus tenuibus subtus parce hirtis elevatis, petiolis 2–11 cm. longis, superne pubescentibus. *Stipulæ* lineari-lanceolatæ laciniatæ 1·2 ad 1·5 cm. longæ, 2 mm. latæ ad bases. *Pedunculus* gracilis 6·5–7 cm. longus, pedicello pubescente. *Bracteæ* 2, lineares acuminatæ angustissimæ 9 mm. longæ. *Sepala* lanceolata acuminata basibus oblongis productis 5 mm. longa. *Petala* superiora subæqualia spathulato-oblonga apicibus rotundatis 9 mm. longa 4 mm. lata pallide violacea vel cœrulea purpureo-striata, petalo inferiore oblongo spathulato cuspidato 5 mm. longo, calcare saccato 2 mm. longo. *Stamina* antheris pubescentibus latis oblongis, appendicibus lanceolatis acutis. *Stylus* erectus superne incrassatus obscure bilobus, processu stigmatico brevi postico. *Capsula* valvis oblongo-cymbiformibus obtusis rubropunctatis nec carinatis 1 cm. longis 2 mm. crassis, in floribus cleistogamis elliptica 4 mm. longa.

Hab. Sumatra, Korinchi Mt., Sungei Penot, Sungei Kembang, and Barong Baru, Tapan. Flowers pale violet, lower petals deep purple or very pale blue streaked with violet (*Robinson and Kloss*, typus in Herb. Mus. Brit.); Mount Singalan (*Beccari* 92, *Yates* 2419).

The typical form of this plant is tufted with a stout rhizome and no stolons, but the stem is long creeping in the plant from Tapan, and in Yates's Singalan plant. The leaves are usually pale whitish at the back, but some seem to be flushed with purple. The nerves, bracts, and upper part of the pedicel and petiole usually bear scattered short trichomes.

The plant has no connection with *V. sikkimensis* Becker to which Becker referred one of Beccari's specimens as a variety var. *acuminatifolia*, but he had then only seen a small fruiting plant. It is closely allied to *V. glaucescens* Oudem. of the Himalayas and has flowers nearly as large.

V. OVALIFOLIA Beck. in *tom. cit.* 256 (Dec. 1916). *V. malvina* Ridl. in Journ. Fed. Mal. Str. Mus. iv. 15 (1917).

Sumatra, Mount Korinchi (*Robinson and Kloss*); Mount Besagi and Mount Dempo (*Forbes* 2073 *a*, 2078 *b*). Borneo, Mt. Kinabalu, Tenompok (*Clemens* 27,032).

Usually a dwarf plant allied to *V. Burgersdijkii* Oudem. One of Forbes's Sumatran plants, however (1902), has petioles 11 cm. tall, the lamina of the leaf 9·5 cm. long and 3·5 cm. wide at the base with a peduncle 10 cm. long, probably a plant drawn up in shade.

V. BURGERSDIJKII Oudem. in Ann. Mus. Lugd. Bot. iii. 77. *V. serpens* auct. not of Wallich; *V. pilosa* Bl. not of Persoon; *V. sarmentosa* Oudem. not of Douglas.

This is the commonest violet in Java and rather variable in leaf-form and size, but is easily distinguished by the translucent white trichomes on the petiole and nerves of the leaf, frequently on both sides. It forms a tuft omitting long slender stolons usually, on which are produced small globose cleistogamous flowers. The leaves are ovate, acute, cordate, crenulate, 4 to 5 cm. long and 3 cm. wide, with slender petioles 4 cm. long, but I found a form on shady banks at Tosari, in which the petioles were 13–17 cm. long and leaves 6 cm. long and 6 cm. wide. This shade-loving form only bore cleistogamous flowers. There is a similar form from Gendro Bodo, Tengger, collected by Mousset "ad vias umbrosas," in the British Museum Herbarium.

The flowers are described by Koorders as pale violet, but those of the Malay Peninsula were white streaked with violet.

Malay Peninsula, Pahang, Telom, Camerons Plateau (*Ridley* 13,533). Java; common (*Horsfield, Viola* 2, *Lobb* 7); Kawa Manuk woods; Podokayo, Tosari (*Ridley*); Telaga Bodas (*Ridley*); Ngadisari (*Koorders* 37,858, 77,866 *b*); Mts. Gede and Pangerango (*Koorders*); Mt. Bungarangan (*Blume*); Merbabu, Merapi, Ungaran (*Junghuhn*), Dieng and Ardjuno; Gunong Malawar Preanger (*Forbes* 1135 *b*). Sumatra, Korinchi Peak, 7300 ft. (*Robinson and Kloss*)!

Var. nov. **timorensis.** Forma nana, rhizomate crasso, foliis parvis 1 cm. longis 8 mm. latis, subtus cum petiolis trichomatibus longiusculis munitis, floribus minoribus albis 7 mm. longis, appendicibus staminum longioribus obtusis.

Hab. Timor, Highest top Mt. Moetis, 7100 feet (*M. E. Walsh* 336, typus in Herb. Mus. Brit.). Flowers white without perfume, very few at one spot. Apparently a very dwarf mountain form with white flowers.

Viola Robinsonii, sp. nov. Species a *Viola glaucescenti* Oudem. cui affinis, petalis inæqualibus superioribus acuminatis acutis, lateralibus brevioribus obtusis, inferiore minore oblongo, apiculato differt.

Herba haud stolonifera, rhizomate lignoso crasso 7–8 cm. longo. *Folia* glabra ovata acuminata acuta, basi cordata, lobis rotundatis sæpe inæqualibus margine serrato, dentibus glanduliferis, 3·5 cm. longa, 2–2·5 cm. lata, nervis e sinu 7, gracilibus subtus elevatis, petiolis gracilibus 4·5 cm. longis. *Stipulæ* lanceolatæ acuminatæ, apicibus angustissimis marginibus laciniatis, laciniis setiformibus, 1 cm. longæ. *Pedunculus* gracilis 5·5 cm. longus. *Sepala* lanceolato-lineari-acuminata, basi breviter producta, 5 mm. longa, 1 mm. lata. *Corolla* ut videtur alba, petala superiora lanceolata acuminata acuta 1·2 cm. longa, 2 mm. lata, lateralia minora oblonga obtusa, inferiore lineari-oblonga basi angustata subabrupte acuminata 6 mm. longa, calcare saccato brevi 3 mm. longo. *Stamina* antheris ellipticis majusculis, appendicibus (in sicco rubris) triangularibus obtusis. *Stylus* rectus, stigmate terminali bilobo, dente minute dorsali. Capsula valvis cymbiformibus 7 mm. longis, 2 mm. latis.

Hab. Malay Peninsula, Gunong Kerbau (*H. C. Robinson*, typus in Herb. Kew.).

This violet is very distinct from all Asiatic ones which I have seen in its very acute petals.

Viola herbivaga, sp. nov. Species a *V. distanti* Wall. cui affinis, rhizomate gracillimo, foliis subarcuatis vel cordatis sinu lato, marginibus undulatis vel obscure crenulatis, floribus et fructubus multo minoribus.

Herba, caule gracillimo vel nullo, ramis gracillimis glabris 4–10 cm. longis. *Folia* dissita glabra subarcuata vel ovata cordata sinu lato, lobis latis rotundatis, marginibus undulatis vel rarius obscure crenulatis, glandulis in sinubus, 1–1·5 cm. longa, 1–1·5 cm. lata, sinu 8 mm. lato, nervis superne invisis subtus elevatis 8, petiolis gracilibus 1–1·5 cm. longis. *Stipulæ* lanceolatæ integræ 2 mm. longæ. *Flores* axillares pedunculis gracilibus 4–5 cm. longis. *Bracteæ* 2 lanceolatæ acuminatæ 2 mm. longæ. *Sepala* ovato-lanceolata tricostata, basibus rotundatis breviter productis, marginibus hirtis, 3 mm. longa. *Corolla* parva pallide violacea striis purpureis in ore labii inferioris, petalis oblongis obtusis 4 mm. longis 2 mm. latis, petalo inferiore obcuneato apice bilobo, calcare brevi saccato 2 mm. longo. *Stamina*, antheris oblongis, appendicibus anguste triangularibus acutis. *Stylus* crassus rectus stigmate terminali bilobo. *Capsula* valvis cymbiformibus carinatis 4 mm. longis, 1 mm. crassis; semina 10, pallida globosa. Flores cleistogami pauci in axillis inferioribus.

Hab. Sumatra, Berastagi, common on the plateau, creeping in turf (*Ridley*, typus in Herb. Kew.).

This pretty little creeping violet is allied to *V. distans* (*Wallich* 4022) of Cherra punji and also to *V. semilunaris* var. *philippinarum* Becker of the Philippines and New Guinea, Arfak Mts. (*Gibbs* 5962); from the latter plant the stiffer arcuate leaves, hairy stipules, etc., distinguish it readily.

V. PATRINII DC. var. nov. **caespitosa**; *V. caespitosa* Don. Timor; Fatumasse among grass (*F. Newton*, May 1896); south of Mount Moetis, open fields (*M. E. Walsh*). This form closely

resembles the one from the Philippines with long-petioled narrow leaves with almost or quite entire margins ; a similar form occurs in India.

V. Hossei Becker was based on a very distinct species from Yunnan collected by Henry, but the author unfortunately referred to it, *V. Burgersdijkii* Oudem. of the Malay Peninsula ; and a plant from " Borneo, Kinabalu 3000 feet, bed of Dahombang where seldom flooded. Flower white, lip streaked with violet, slightly scented " (*Haviland* 1275). The specimen at Kew is flowerless, but it closely resembles *Burgersdijkii* Oudem., except that it appears to be glabrous. He also refers to *V. Hossei*, a plant collected on Mount Dempo, Sumatra, at 2200 m. by *Forbes*, no. 2368, which is *V. ovalifolia* Becker.

V. sumatrana Miq. Sumatra, Mt. Talang (*Teysmann*).

This is described as having yellow flowers. I have no knowledge of any violet so coloured in Malaya and I have not seen the type.

V. celebica Becker, Fedde Repert. Spec. nov. xiv. 321 (1916) ; Bot. Centralbl. xxxiv. Beihefte 416.

Celebes, Mount Lompo-Battang (*Sarasins*). I have not seen this.

Viola jugalis, sp. nov. Species a *V. glaucescenti* Oudem. cui affinis, foliis glabris, rotundatis ovatis profunde cordatis sinu lato, floribus minoribus petalis apicibus rotundatis, inferiore angustiore et breviore.

Herba, haud stolonifera, rhizomate crassiusculo nodoso. *Folia* glabra minutissime punctulata, rotundato-ovata cordata, sinu lato, lobis rotundatis latis, marginibus crenulatis, glandulis sessilibus in apicibus dentium, 4 cm. longa, 4 cm. lata, nervis 4-paribus superne cum costa elevata, subtus gracilioribus elevatis, petiolis crassiusculis alatis 6 ad 7 cm. longis. *Stipulæ* lanceolatæ longe filiformiter acuminatæ, laciniis gracilibus 4 mm. longis. *Pedunculus* alatus 6 cm. longus. *Bracteæ* binæ lanceolatæ longe acuminatæ integræ 5 mm. longæ. *Sepala* lanceolata obtusa, apicibus glandiferis, 5-nervia, ad bases breviter producta callosiformia, 4 mm. longa, 1 mm. lata. *Petala* superiora pallide violacea oblongo-spathulata apicibus rotundatis 8 mm. longa, 3 mm. lata, inferiore multo breviore et angustiore elliptico subobtuso, 2 mm. lato purpureo. Antheræ puberulæ, oblongæ, appendicibus lanceolatis subacutis. Stylus gracilis, stigmate minuto, bilobo.

Hab. Sumatra, Trail from Medan Road to top of Sibayak Volcano. Alt. 5200 feet (*W. N. & C. M. Bangham* 1019, typus in Herb. Kew.).

This species cannot be *V. sumatrana* Miq., as the distributors suggest, as that has yellow flowers. These appear to have been pale pinkish violet with a narrow dark purple lip.

OBITUARIES.

Nicholas Edward Brown

(1849–1934).

The death of Dr. N. E. Brown in his eighty-sixth year removes the last of the great botanists who, during the latter part of the nineteenth century, made the Kew Herbarium famous throughout the world. Like many other systematists, Brown had the collector's instinct with its love of order and classification; he had, moreover, a great love of plants and a remarkable capacity for taking pains. His visits to the Kew Herbarium extended over a period of sixty-one years, and for nearly ten years before this period his interests had been in plants.

Brown was born at Redhill on July 9, 1849, and died at Kew on November 25, 1934. Shortly after leaving the Grammar School at Reigate, where he won a microscope as a prize for botany, he was employed as curator of the private museum established by Mr. W. Wilson Saunders, F.R.S. His interest in that neighbourhood continued until his death, and he was an Honorary Member of the Holmesdale Natural History Club. Brown's first paper, recording a species of *Syntomis* new to Britain, was published in the 'Entomological Magazine' (1872–3). W. W. Saunders edited and published the 'Refugium Botanicum' (1869–73), a work of five volumes dealing with living specimens of "Little Known or New Plants," in which he was assisted by H. G. Reichenbach, J. G. Baker, and W. H. Fitch. Though apparently Brown took no part in the actual production of these volumes, their appearance must have been of immense interest to him, and through Saunders's collaborators he was brought into touch with the botanical world.

His appointment at the Herbarium dated from February 1873, when the botanical staff consisted of Daniel Oliver and J. G. Baker, with Bentham as a voluntary worker, and he threw himself into the work with great enthusiasm and commenced lecturing to the Gardens' staff the following year. He was promoted to be Assistant Keeper in 1909. Though for a time his interests were mainly in English botany and garden plants (as will be seen from the great number of references in the Royal Society's catalogue), he was early introduced to the flora of Africa, on which he ultimately became for many years an acknowledged authority. Amongst his more important general papers his account of the Botany of the Pilcomayo Expedition (Trans. and Proc. Bot. Soc. Edinb. xx. 44–78 ; 1894) and that of the Spermatophyta (except Orchids) of Mount Roraima collected by the McConnell and Quelch Expedition (Trans. Linn. Soc., Bot. ser. ii. vol. vi. 18–76 ; 1901) may be mentioned.

Brown is best known, however, for his elaborations of large groups for the 'Flora Capensis' and the 'Flora of Tropical Africa.' Many of the genera were exceedingly difficult but Brown was never deterred, and, as the editor remarks in one volume, he seemed to find a "peculiar fascination" in the study of families which discouraged other botanists. Some idea of the enormous amount of work involved may be gathered from the following figures: For the 'Flora Capensis' he elaborated, amongst other groups, the genus *Euphorbia* (153 pages), smaller genera of Ericaceae (103 pages), and the Asclepiadaceae (518 pages); and in the 'Flora of Tropical Africa' the genus *Euphorbia* (133 pages) and the Asclepiadaceae (272 pages). The latter Flora also included his treatment of *Eriocaulon* and Aroideae which were regarded as of exceptional merit. Owing to his interest in the floras of these regions he became an expert on the geography of tropical and, especially, of southern, Africa, and for a long period he checked all the references to localities in several volumes for both the African Floras. His familiarity with the exact position of small towns and villages (even when not marked on the map) was an attainment which greatly impressed the writer on one occasion when the whereabouts of a farm on the Veld was under enquiry.

Though he did not specialize in other branches of botany, Brown had a wide interest in geographical distribution. The study of diatoms was a special hobby, and he published several papers on this group including a monograph of *Arachnoidiscus* in 1933! He was a member of the Quekett Club and was an accomplished microscopist. He was, moreover, an enthusiastic philatelist and purchased many series of Colonial stamps. He was not a gardener, but he acquired a valuable collection of the smaller kinds of *Mesembryanthema* and cultivated these in a small greenhouse built for their accommodation.

After his retirement in 1914 Brown continued his work in the Herbarium, concentrating largely on the Iridaceae and *Mesembryanthema*, and published numerous papers, including descriptions of many new species, in the 'Gardeners' Chronicle.' He assisted Dr. Burtt Davy in his 'Flora of the Transvaal' and carried out a considerable amount of private work for Dr. N. L. Britton of New York. He also collaborated in the polyglot work entitled 'Mesembryanthema' which was edited by Mr. E. J. Labarre, and which is remarkable for the very fine series of coloured illustrations. Brown's mind remained clear to the end, and even his latest work was marked by care, though he was apt to attach undue weight to minutiæ which sometimes led to excessive subdivision of genera and species.

Brown was elected an Associate of the Linnean Society fifty-five years ago (Dec. 18, 1879), and in 1921 was awarded the Captain Scott Memorial Medal by the South African Biological

Society. The honorary degree of Doctor of Science of the University of the Witwatersrand, Johannesburg, was conferred upon him in 1932.

By general consent Brown's systematic work was of a very high standard. He was critical almost to a fault. He possessed a good eye, a remarkable memory, and was a skilled draughtsman. The fact that he never mastered a single foreign language made his achievements the more remarkable. His knowledge of the South African flora was astonishing, and it was always a diversion to see how lifelong South African botanists would come to Kew and sit as learners before the great South African authority who had never set foot in the country. He was a keen controversialist and invariably held his own Ecology did not concern him and hypotheses of hybridity appealed hardly less. He had examined specimens! Whilst much work of the same period has had to be completely revised, most of Brown's has so far stood the test of time. It is not to be expected that all will do so. The advantages of modern travel and modern methods of investigation will yield new light, but Brown's work, the product of his extremely critical and conscientious mind, coupled with sound judgment, always appeared to the writer as one of the triumphs of the old-fashioned herbarium botany, and when the floras of vast tracts of little-known territories had to be worked out and classified in a limited time, this method is exactly what was required. To-day, as in the past, Brown's scrupulous care and thoroughness is an example to all.—A. D. Cotton.

Otto Vernon Darbishire

(1870–1934).

Otto Vernon Darbishire, who died after a short illness on October 17, was born at Conway on March 16, 1870. He was at school in Dresden and Florence, spent some time at University College, Bangor, and then went up to Oxford, where he was at Balliol under Jowett. He studied botany with Vines, and took his B.A. with honours in that subject. He then spent some years at Kiel, first as a student, and later as "Assistent" to Reinke; at Kiel he took his Ph.D. Returning to England he was Lecturer in Botany at Manchester University from 1898 to 1909, when he went to Armstrong College, Newcastle-upon-Tyne. In 1911 he was appointed Lecturer in charge of the Botany Department at Bristol University. In 1919 he was elected to the newly created Melville Wills Chair of Botany. During his time of office, and especially in recent years, the number of students increased greatly. He was active in his endeavours to obtain better accommodation and facilities for his students and staff, and the botanic gardens, the greenhouses, and the laboratories all increased under his charge.

Darbishire's scientific work started with an account of the genus *Phyllophora* in the Baltic, undertaken for the "Commission zur Untersuchung der deutschen Meere." He maintained an interest in the algæ throughout his life and was never happier than in guiding students on marine excursions. During the Manchester period he wrote a monograph of *Chondrus* for the "Liverpool Marine Biological Committee." But his chief work, also started at Kiel, was the study of the lichens, a group on which he became a recognised authority, and on the systematics and anatomy of which he published a long series of papers. Mention may be made of the revision of the lichen collections of the Swedish Antarctic Expedition, and of his account in the 'Pflanzenareale' of the distribution of *Roccella*, a genus to which he devoted much attention. A serious accident in 1927 interrupted his research for some years, but later he was again active and published papers on the anatomy and reproduction of *Pertusaria*, *Peltigera*, and *Solorina*. He was also interested in ecology, and was an original member, and, at one time, a Vice-President of the British Ecological Society. In 1924 he was responsible for a series of beautiful photographs of the Lancashire dunes issued in the 'Vegetationsbilder.'

Darbishire was alive to the importance of the work of local Natural History Societies and did much to further their interests. He was twice President of the Bristol Naturalists' Society and, at the time of his death, was President of the South-Western Naturalists' Union, a body for the existence of which he was largely responsible. He had also been President of the British Mycological Society. During the war he commanded the Bristol University Officers' Training Corps. Where his help could be of use he spared neither time nor trouble.

He was a keen teacher and was specially interested in the presentation of the biological aspects of his subjects to beginners. Simple experiments and the use of growing material were characteristic of his methods. He had conducted vacation courses at Bingley and Keswick, and two years ago started a highly successful Summer School in Biology at Bristol. In social life he was a charming and entertaining host. His loss will be felt by a wide circle of former students and by his many friends, both in University and in wider circles. He is survived by a widow and two young sons.—MACGREGOR SKENE.

REVIEWS.

The Gramineae, a Study of Cereal, Bamboo, and Grass. By AGNES ARBER, M.A., D.Sc. Roy. 8vo, pp. xvii, 480, frontisp. and 212 text-figs. University Press: Cambridge, 1934. Price 30*s*.

THE author has delved widely and deeply into the literature of the Grasses and has made careful studies of their structure and development, especially of the details revealed by micro-

tome series of the bud, leaf, and spikelet, which are depicted in a wealth of delicate and extraordinarily informative drawings. To read the illustrations with their detailed legends and admirably indexed figures is an education in the variety of form and development. The author's aim has been, by a study of the aspects of the subject which most appeal to her, primarily to detect the pattern and rhythm underlying that complex of plant-types called the Gramineae, and in the last chapter she develops this theme. But it merely results in an expression of the fact that the grasses have certain well-marked characteristics of their own which are variants of the characters common to flowering plants generally.

The first three chapters are an historical sketch of the relation of the grasses to mankind, in which the author's interest in the Fathers of botany is shown by the reproduction of a number of early drawings. Then follow chapters on the Bamboo, its vegetative and reproductive phases. Here, as throughout the book, chapter and verse are given for every statement by means of foot-notes referring to the bibliography at the end of the book, evidence of an exhaustive study of the subject in hand. Here, too, we find exemplified the confession in the author's preface: "I have not hesitated to turn aside, from time to time, down any passage of the labyrinth which has taken my fancy." Here the deviation originates in the tree-habit of the bamboo, and is a criticism of the widely accepted view as to the antiquity of the tree-habit in comparison with the herbaceous. In the author's view the tree-habit may represent senescence, gigantism burdened with an accumulation of waste products comparable with the huge monsters which presaged the extinction of various animal groups. Here, too, we find an example of the author's special contribution to her subject, page upon page of drawings illustrating in the clearest manner the details of structure and development of the inflorescence, spikelet, and flower.

The following chapters deal with the grasses as distinct from the bamboo, and similarly combine information culled from previous workers with the results of the author's investigations and an expression of her views. A fact which emerges clearly is the importance of compression in the bud-stages in producing the reduction effects traceable in the reproductive shoots of the Gramineae. But, in addition, the author suggests an inherent tendency towards sterilization, comparable with the "advancing sterility" studied by McLean Thompson in the Leguminosae.

As to the interpretation of the grass-embryo the author adopts the view that the scutellum and coleoptile together represent the cotyledon, the former being the sucking organ characteristic of the cotyledon of other Monocotyledons. The epiblast and coleorhiza are merely non-vascular outgrowths with no special significance. Incidentally attention is drawn to the fact that we have comparatively little information on the

seedling stages of most of our native species ; here is scope for interesting field-work. Another subject noted as requiring further study is the anatomy of grass roots, "even from the disjointed information at present available, it is clear that there is a great variety in the skeletal scheme."

Later chapters deal with special phases of the subject. In "Morphological Categories" there is a return to a subject which the author has treated more fully elsewhere. The importance of shoot and root as representing the two primary plant categories is emphasized. Other chapters deal with distribution and dispersal, and a discussion of the "putative hybrids" Maize and *Spartina Townsendii* or "Townsend's Cord-Grass," which is a manufactured and in no sense a "popular" name. The author has a commendable liking for popular names, but their use requires judgment. Dog's-tooth would seem more appropriate for *Cynodon Dactylon* than "Bermuda Quick," and *Poa annua* is surely a better-known name than "Causeway Grass," though the latter has the sanction of authority.

An extensive bibliography collects in alphabetical order the references from the foot-notes.

We congratulate the author on the completion of another volume full of interest and charm and the Cambridge Press on its production. A. B. RENDLE.

Catalogue of the Manuscripts in the Library of The Linnean Society of London.—Part I. *The Smith Papers (The Correspondence and Miscellaneous Papers of Sir James Edward Smith, M.D., F.R.S., First President of the Society).* By WARREN R. DAWSON, F.R.S.E. 4to, 114 pages. London (The Society), 1934. (The edition is limited to 250 copies.) Price 10*s.* net (to Fellows 7*s.* 6*d.*).

EVERYONE who has had to deal with a mass of uncalendared manuscript material will welcome this addition to the catalogues of manuscript collections. Mr. Warren Dawson has performed his "labour of love" with great accuracy (adding in some instances dates of birth and death not hitherto printed), and has coordinated all the MS. material relating to its first President that could be found in the Linnean Society's archives.

Sir James Edward Smith, one of the founders, and President for the first forty years, of the Society, was in an unique position to receive correspondence that with time would become valuable documents in the history of botany. Previous to the founding of the Society in 1788, he had made the "grand tour," during which he took his M.D. degree at Leiden University. Everywhere he went he was received with kindness and hospitality, for it was well known all over the Continent that he had become the possessor of the collections of the celebrated Linnæus. Many of the friends made during that time became his correspondents, and not a few were elected Foreign Members of the Linnean Society. Here also are to be found catalogued the letters of many early "good Linneans," including not a few of those "discreet Fellows" referred to in the Society's Charter.

Although the Smith MSS. are important documents in connection with the early history of the Linnean Society of London, they have also much significance for the history of botany during the half century following the death of Linnæus. In them it is possible to trace in some detail the steadfastness to the Linnean System which characterized not only the early Fellows of the Society, but also many well-known foreign botanists.

Smith's correspondence has also a definite value in relation to the Smithian Herbarium in the Society's possession. That Herbarium contains many type-specimens, and has yearly increased in importance since the death of its compiler in 1828.

It is to be hoped that the Linnean Society will publish further parts of this Catalogue, and, following the good example set by Mr. Warren Dawson, enable the other valuable manuscript collections in the Society's archives to become more available.—S. SAVAGE.

BOTANICAL EXCHANGE CLUBS.

The Botanical Society and Exchange Club of the British Isles.

THE first part of the Report for 1933 is edited by the Secretary, Mr. W. H. Pearsall, and occupies 284 pages. As in previous years a number of members have contributed papers of varied interest.

The "Plant Notes for 1933" show one notable addition to the flora, *Veronica praecox* All., discovered by Mr. Lousley. There are also three new *Hieracia* described by Dr. Dahlstedt ; and two more *Taraxaca* are added to the 95 species of Druce's Plant List, although we read on p. 495 that no English botanist of repute would now recognize these scores of species. Messrs. Wilmott and Gilmour continue their abstracts of papers bearing on the British Flora, and after obituary notices of the late Dr. Drabble, Mr. W. D. Miller, and Dr. Stapf, we come to "New County and other Records." These have many surprises. *Arabis scabra* All., first reported for Bristol by Ray in 1686, forms the subject of one record. The Cheddar Pink, also known since the time of Ray, is given for Cheddar ; and similarly *Hieracium lima* from its only known station. We learn that *Orobanche caryophyllacea* occurs at Dover, *Leucojum aestivum* at Twyford, and *Teucrium Scordium* and *Scirpus Holoschoenus* on Braunton Burrows! "Are they not written in the Book of Jashar?" springs to one's lips as one notes the well-known habitats that figure on nearly every page, and occasionally

attention is injudiciously drawn to the precise stations for rarities. Other records, like *Lactuca alpina* for Ullswater, are equally but differently surprising.

The Records are succeeded by fifteen pages of corrections to previous reports and to the Comital Flora, and among following articles Dr. Butcher has some interesting notes on *Zostera*, and Mr. Pearsall instructions for beginning the study of Grasses. There are two important studies of *Stachys sylvatica* and *Betula alba* by the late G. F. Scott Elliot. The last 58 pages of the Report are taken up by a list of Glamorgan Plants by Miss Vachell. The intention of a list in this form is not clear, for nearly all the native species mentioned, and many of the aliens, appear in Riddelsdell's ' Flora of Glamorganshire ' (issued as a Supplement to this Journal in 1907), although this work is only partially cited. Mr. Riddelsdell himself prints a list of 149 county records for Glamorgan which were omitted from the second Supplement to Topographical Botany.

The second part is the Report of the Distributor, Mr. F. Rilstone, who, it is hoped, will make a speedy recovery from his illness. Twenty-five members sent in 2552 sheets, and the Report contains many notes of interest by Messrs. Britton, Fraser, Lousley, Pearsall, and others. The conflicting views on the identity of several of the *Rubi* contributed is regrettable, and it is noticed that in some cases names are rejected without the suggestion of any alternatives.

The printing and " get up " of the whole Report are, as usual, excellent, with very few misprints, but stiff covers could apparently be provided, at little if any extra cost, in place of the flimsy paper covers that tear almost as soon as handled.—H. W. P.

Watson Botanical Exchange Club.

THE fiftieth and final Report (1933–34), edited by the Hon. Sec., Mr. H. Stuart Thompson, indicates a continued diminution in the exchange of specimens, the number of contributors having fallen to thirteen. Mr. E. C. Wallace acted as Distributor for the third time, and the Report contains a number of interesting notes by Messrs. Britton, Fraser, Lousley, and others. Among the plants sent in is Mr. Lousley's recent addition to the British Flora, *Veronica praecox* All.

Besides the usual plant-notes the Report includes an obituary notice of the late Dr. E. Drabble (with an excellent portrait) by the Hon. Secretary, who also contributes a short but interesting history of the club since its foundation in 1884.

It is not without feelings of regret that one peruses this last Report of a club that has done much useful work in the study of critical forms of British Flowering Plants, but it has been evident for some time that while the taste for collecting wild flowers has spread to such an extent as to endanger the existence of many rare species, the interest in actual taxonomic botany among amateurs has declined, and the maintenance of two exchange clubs for phanerogams has become manifestly superfluous. There are, fortunately, symptoms among the younger generation of a reviving interest.—H. W. P.

Lichenographia Fennica, IV.—Lecideales, II. By ED. A. VAINIO. 8vo, pp. 531, 4 pls. Acta Societatis pro Fauna et Flora Fennica: Helsingfors, 1934.

DURING the later portions of Vainio's life he had been engaged in preparing a full account of the lichens of his own country. The ' Lichenographia Fennica ' was planned in seven volumes, but he only finished three of these before he died. The first part (1921) dealt with the Pyrenocarpales, the second (1922) with the Cladoniales, and some which Vainio included with the " Lecideales," whilst the third part (1927) was concerned with the Coniocarpales. The manuscript for the fourth part was far advanced, and the Board of the Societas pro Fauna et Flora Fennica were fortunate in prevailing upon such a competent lichenologist as Bernt Lynge to finish and edit it. This must have been a formidable task, and the editor must be congratulated on the admirable way in which he has kept to the spirit of the original conception, even though it must have required much repression of his own views on many occasions.

The descriptions of the various species of *Lecidea* (including *Psora* and *Biatora*), *Protoblastenia*, and *Catillaria* (including *Biatorina*) are given, with the attention to detail so characteristic of Vainio, and lichenological literature is richer through the combination of such an author and editor.

One new genus, *Diplophragmia*, is described, differing from *Biatorina* chiefly in the presence of two septa in the spores. There are thirty-eight new species, chiefly of *Lecidea*, described. Thirty of these are entirely new, whilst eight are due to elevation of rank. Some of them are doubtful segregates, having no essential differences from previously described species, whilst *L. hypocyanea* Vain. has no right to that name, since a different plant, *L. hypocyanea* Stirton in Scott. Nat. (1880) has a prior right. In a similar way *L. subcongrua* Vain. seems to be misused. It dates from 1883, but Nylander used this name for another plant in 1874. A few lichens are transferred from one genus to another. *Lecidea geophana* (*L. pleiospora* A. L. Sm. in Journ. Bot. 1911, 41, a synonym not given in the references) has 12–16 spores in the ascus and has been considered as an exceptional *Lecidea*. In 1914, J. A. Wheldon suggested (*in litt.*) its transference to *Biatorella* and this has been done by the combined action of the author and editor in the present work. *L. neglecta* is considered to be a *Crocynia* sometimes infested with the apothecia of the parasitic *Nesolechia neglecta* Vain. *Lecanora*

symmicta, *L. sulphurea*, *L. orosthea*, *Aspicilia pelobotrya*, and *Biatorina Lightfootii* are put under *Lecidea*. The plant named *L. subduplex* is given by A. L. Smith (Mon. Brit. Lich. 127 ; 1926) as synonymous with *Biatorina pilularis*, and its description corresponds fairly well with that plant.

L. goniophila is restricted to plants growing on rocks which are not calcareous, its calcicolous ally being *L. subsequens*. The author and editor (in Lich. Nov. Zemlya) disagree in various points in regard to *L. somphotera*, *L. epiiodiza*, *L. leucomelaena*, *L. arctogena*, and *L. superlata*.

The excellence of the work is, however, marred by Vainio's attitude towards nomenclature. He appears to regard the changing of names as of primary importance, and many of his changes are not substantiated by his own references. For example *L. lignaria* is antedated by *L. betulicola*, and *L. speirea* by *L. cinerascens*. During his later years he did not pay adequate regard to the work of previous lichenologists. Such substitutions as the following bristle with difficulties, and his attempts to substantiate them are far from convincing :—*L. cyanea* for *L. pantherina*, *L. steriza* for *L. contigua*, *L. erythrophaea* for *Biatora tenebricosa*, *L. globularis* for *B. asserculorum*, *L. atrocinerea* for *L. tenebrosa* (*L. griseoatra*), *L. euphorea* for *L. parasema*, *L. olivacea* for *L. parasema* var. *elaeochroma*, *L. erratica* for *L. expansa*, *L. fusca* for *L. sanguineoatra*, *L. coarctata* var. *trapelia* for *B. coarctata* var. *glebulosa*, *Catillaria denigrata* for *Biatorina synothea*. *L. insularis*, *L. limborina*, *L. plana*, *L. inserena*, and *L. arctogena* were the first names adopted for the plants respectively named *L. intumescens*, *L. trochodes*, *L. enteromorpha*, *L. tumidior*, and *L. leucomelaena* by Vainio. The revivals of *L. scalaris* for *Psora ostreata*, *L. cyathoides* for *L. rivulosa*, and *L. caesioatra* for *L. arctica* are either unwarrantable or inadvisable.

There is no justification for *L. paniceola* Vain. (nov. comb.), especially as the plant called *L. elegans* by Vainio does not warrant any more than a varietal status and scarcely even that. The statement that A. L. Smith (Mon. Brit. Lich. 76 ; 1911) refers Leighton's no. 157 to *L. polycarpa* is incorrect, as she refers it to *L. plana*. On p. 258 *L. immersa* β. *atrosanguinea* Floerk. Berl. Mag. 308 (1809) (see herb. Ach.) is given as synonymous with *L. goniophila*, whilst on p. 265 it is given as synonymous with *L. atrosanguinea*.

Considering the length of the work clerical errors are few. On p. 340 the date of Schaer. Spic. is given as 1883 instead of 1833, on p. 343 the apothecia of *L.* (*Biatora*) *flexuosa* are described as " parva, 3–5 mm. diam.," and on p. 417, line 4, " p. 133 " is given instead of " p. 555."

There are excellent keys supplied by the editor for the different species of *Protoblastenia*, *Lecidea*, and *Catillaria* described in the book.—W. WATSON.

Moss Flora of North America north of Mexico. Vol. III. Part 4. By A. J. GROUT, Ph.D. 4to, pp. 179–277, pls. xlv.–lxxx. Published by the Author : Newfane, Vermont, 1934. Price $5.00.

DR. GROUT is to be congratulated on the completion of this volume (the first to be issued), in the comparatively short time of six years—Part I. was issued in 1928. When one recollects how the floras of large countries have been prolonged in their issue over almost interminable periods, it is refreshing to find such an ambitious undertaking as the moss flora of practically the whole of North America promising to be completed within a reasonable period. Dr. Grout has been helped in this by " farming out " some individual genera to specialists. This may, theoretically, have the disadvantage of introducing a lack of uniformity in the treatment of the mosses as a whole, but even if this were so it is compensated by securing the experience of special workers at critical groups. The present part completes the Pleurocarpous mosses, including Leskeaceae, Neckeraceae, Fontinalaceae, and several smaller families.

The volume is well illustrated. In a very large number of species the plates of the ' Bryologia Europæa ' and of Sullivant's ' Icones Muscorum ' have been reproduced, and subscribers to the Flora will have most of the advantages of those works at less than a twentieth of the expense. The synonymy given is mostly that of American works ; this is for the most part all that is needed for American bryologists, but is a slight drawback for European workers. Useful keys are given to both genera and species. The key to Leskeaceae, it may be noted, will be found at the end of the family.

The treatment of Fontinalaceae by Dr. Welch amounts to a monograph of the North American species of the family. It will be a valuable aid to workers on the difficult genus of *Fontinalis*. In spite of a considerable number of reductions, either to synonymy or to varietal rank, twenty-four species are treated by Dr. Welch, all of which are well illustrated, mostly by careful original drawings by William Gray. Dr. Welch has practically confined his studies to North American plants; it would have been very useful to European students, though it could hardly be expected, if his wide experience of the northern forms had been extended to European plants, as it is quite possible that some of the " smaller " species described in Europe may be identical with North American plants. Especially is this the case when one recalls the manifold forms, with us, of *F. squamosa*, a species which is not represented at all in North America (unless it is masked under some of the vars. of *F. novae-angliae*), except in so far as it is known as *F. dalecarlica*, which, by the way, Cardot considers as the original *F. squamosa* of the Linnæan herbarium.

The vexed question of the validity of *Haplohymenium* Doz. & Molk. is wisely solved by Dr. Grout by retaining *H. triste* (Ces.) Kindb. temporarily under *Anomodon*. The treatment of some of the genera of Leskeaceae has been much facilitated by the previous work of Dr. Best and others. We note that the central papillæ of *Pseudoleskea atrovirens* (Dicks.) as contrasted with the apical ones of the other species are not used in the key, or emphasized in the description, though the character would seem of leading importance. Is there any good reason for the spelling *Herpetineurum*? It was published by C. Müller as *Herpetineuron*. The treatment of *Fabronia* is very wholesome. It suggests that many of the described species—we are thinking especially of the African ones—may be based on unsatisfactory characters. They are certainly very elusive.

The volume is a worthy addition to our knowledge of the North American mosses. H. N. D.

Lily Year Book, 1934. Edited by F. J. CHITTENDEN, F.L.S., V.M.H. 8vo, pp. 117, frontisp., and 43 pls. and text-figs. Royal Horticultural Society, 1934. Price 5*s*. paper; 6*s*. cloth.

THIS, the third number of the Year Book, contains seventeen articles and a number of notes; there is much of interest to the botanist as well as to the gardener. "The genus *Notholirion*," by A. D. Cotton, is a taxonomic description of the four species, one described for the first time, for which distinction from *Lilium* is claimed. A cytological study of the chromosomes of *Lilium*, by workers at the John Innes Institution, is prefaced by a general account by Sir Daniel Hall on the significance of chromosomes in plant breeding. Kingdon Ward contributes observations in the field on Tibetan Lilies, and E. K. Balls notes on species recently collected in the Pontus. The etiology of the *Botrytis* disease is discussed by Miss M. R. F. Taylor, and there are notes on the aphis carrying lily-mosaic (by A. D. Cotton) and on diseases of the Bermuda Lily (by L. Ogilvie). The frontispiece is a portrait of G. F. Wilson, the founder of the Wisley Garden and a keen cultivator of lilies. Many of the excellent plates show species growing in their natural habitats or at Wisley or in other gardens.

Pathologie der Mitose. By GEORG POLITZER. (*Protoplasma Monographien*, Band 7.) 8vo, pp. vii, 238, text-figs. 113. Gebrüder Borntraeger: Berlin, 1934. Price R.M. 16.20.

THIS book deals with abnormal phenomena of mitosis produced by such agencies as X-rays or occurring naturally as in hybrids. Sections are devoted to such topics as clumping of the chromosomes, distortions of the spindle, and disturbances of the rhythm of nuclear divisions. The author has made considerable experimental contributions to these subjects. A section of ten pages summarizes the work on the chromosomes of cancerous tissues, and the hypotheses offered to explain the wide range of chromosome number observed in human and other cancers. The irregular chromosome behaviour in hybrids is only touched upon in five pages.

The effects of heat, ultra-violet and other rays, narcotics, and electric currents on mitosis are also considered. The work deals mainly with animal tissues, but work on plant cells is also referred to when occasion demands. In the last chapter the author concludes that the various stimuli that can be used to affect the cell are specific in their effects. A bibliography and index complete the volume.—R. R. G.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on November 22, Mr. H. N. Dixon gave an account of his paper on the "Moss Flora of Borneo," based on recent collections made by Mr. R. E. Holttum (on Mt. Kinabalu) and Mr. P. W. Richards. Two new genera and seventy-two new species had been found and there were eighty-five new records. Interesting examples of discontinuous distribution were supplied by the discovery of *Andraea* and others on the higher parts of Mt. Kinabalu.

Mr. R. A. Akroyd showed an instructive series of lantern-slides illustrating the nature of the country and vegetation on the mountain ranges on the borders of the Belgian Congo and Uganda, the home of the eastern Gorilla.

Miss F. M. O. Waight gave an account of her work entitled "A Quantitative Study of Geotropism and of the Development of the Statolith Apparatus throughout the Life-history of the Wheat Plant."

At the meeting on December 6, Mr. D. Dilwyn John described, with the aid of a beautiful series of lantern-slides, the physical features of the South Orkney Islands. It is a region of mountains and glaciers the flora of which is even poorer than that of Graham Land farther south, the two flowering plants found in the latter, a *Festuca* and a *Colobanthus*, being absent, the flora consisting only of lichens and mosses.

FLORA'S LEAGUE.—Sir Maurice Abbot Anderson, C.V.O., founder and president of the League, sends the Handbook and Report of its activities for 1932–34; copies may be obtained from the Secretary, Flora's League, c/o The Council for the Preservation of Rural England, 17 Great Marlborough Street, London, W. 1. Price sixpence, post free.

The activities include lectures, distribution of posters, the establishment of local branches (thirty-nine have already been formed in eighteen counties), and association with other organizations working for the preservation of natural beauty in rural England, Wales, and Scotland. The preparation of a schedule of wild plants which need special protection in different counties has been carried out by Mr. W. H. Pugsley, and schedules have been supplied to thirty-one County Councils for use in their respective areas. The handbook also includes information on the work of the Council for the Preservation of Rural England and the Wild Plant Conservation Board.

Regional Survey.—The Le Play Society has issued a guide card (22×19 inches) entitled "Exploration," which has been specially designed to help students and also teachers who are introducing into their schools the Regional Survey methods of study of Geography, Nature Study, &c. It comprises lists of suggestions as to procedure, tabulated under fourteen headings, which include botany, zoology, geology, archæology, &c. The idea is an excellent one, and the guide should prove invaluable to all who are sufficiently interested in their localities to make a definite study of them. The price is 4*d*.; postage in roll 3*d*. The address of the Society is 58 Gordon Square, London, W.C. 1.

'British Mycological Society Transactions,' xix. pt. 1 (October 1934). This number is occupied mainly with Dr. W. Brown's Presidential Address, entitled "Mechanism of Disease Resistance in Plants" (pp. 11–33) and "An Evolutionary Study in Agarics: *Collybia apalosarca* and the Veils" by E. J. H. Corner, of the Botanic Gardens, Singapore (pp. 13–88). The latter is an exhaustive study of the structure and development of the fruit-body and a comparison with allied species, and a reconsideration of the morphology of the marginal veil which reconciles de Bary's account with modern views. Three short papers deal respectively with the identity of *Isaria* Hill (by T. Petch), *Phytophora megasperma* Droschler, a disease of carrots in Tasmania (by W. J. Dowson), and *Naumovia abundans* Dobrazr., a Pyrenomycete first noticed in Scotland in 1912 and in Russia in 1926, and now widespread in the British Isles (by J. Ramsbottom). E. M. Wakefield gives an account of the two forays of 1933 with complete lists of the species gathered.

'Sinensia,' iv. no. 10 (April 1934), is now the organ of the National Research Institute of Biology, "Academia Sinica" the new name for the Metropolitan Museum of Natural History. The address is 68 Ching Hsien St., Nanking, China. The present number is mycological and contains notes on the Hypocreales and Ustilaginales of China by S. C. Teng and C. I. Shen respectively. Keys are included to the families and genera, and some novelties are described. There are some good full-page illustrations. The price is $1.30.

PTERIDOPHYTA OF ANTIGUA.

By A. H. G. Alston, M.A.

Urban gives a short list of Antigua collectors in 'Symbolæ Antillanæ,' iii. 153, but only a few records from their collections have been published. The British Museum received an important collection of Antigua ferns made by a Dr. Robertson with John Smith's herbarium. Antigua records in Grisebach's 'Flora of the British West Indies' (1868) are negligible. In recent years certain American collectors have visited Antigua, but again nothing appears to have been published except where mention is made of Antigua in the extralimital distribution of Porto Rico and Virgin Islands species by Maxon (Scient. Surv. Porto Rico & Virgin Is. vi. pt. 3; 1926), who mentions thirteen species from the island.

The British Museum has recently received a collection of thirty-five species of Pteridophytes made by Mr. Harold E. Box, who was resident in Antigua from 1931 to 1934. Mr. Box believes that the specimens he has sent, a duplicate numbered set of which he has presented to the United States National Herbarium, represent all the species occurring in a wild state in the island, and therefore it seems desirable to publish the list.

Descriptive Introduction *. By Harold E. Box.

Antigua is one of that group of West Indian islands comprising the Leeward Islands colony, of which it is the seat of Government. It is situated in latitude 17° 6′ N. and longitude 61° 45′ W. The island is roughly pentagonal, with numerous deep indentations in the shore-line, which reaches about 70 miles in total length. The greatest distance across the island from east to west is 12 miles and from north to south 9½ miles; the area is 108 square miles.

Geologically, the island falls into three well-marked sections: (1) the northern and eastern, of coral-limestone formation, consisting of gently undulating country rising to not more than 150 feet elevation in the Pope's Head Hills; (2) the south-western, of volcanic origin, which is decidedly mountainous, with numerous peaks rising above 1,000 feet in elevation (the highest being Boggy Peak, 1,330 feet) and rugged ridges separated by innumerable little valleys of great fertility; and (3) the central plain, running diagonally across the island from north-west to south-east, separating the limestone from the volcanic districts, and seldom rising above 60 feet except on isolated hills.

A century or so ago almost every cultivable acre in Antigua was under sugar-cane, but to-day not more than about 9,000 acres

* This introduction is amplified from that utilised by Dr. Stuart T. Danforth in his "Birds of Antigua" ('The Auk,' li. no. 3; July 1934).

are devoted to this crop, with the result that abandoned sugar estates occur throughout the territory from sea-level to near the tops of some of the highest hills. Sugar-cane is still the staple crop, but there is also a considerable area of peasants' small holdings, where provisions and fruits are grown, especially in the alluvial valleys to leeward, but they may also be seen elsewhere throughout and especially on the steep hill-sides in the south-west.

The rainfall in the north and east is relatively scanty, the annual average being around 35 inches, so that there are large areas of xerophytic vegetation, some of them wooded and of very interesting types, *e. g.*, the magnificent stand of whitewoods (*Bucida Buceras*) known as Collin's Woods near the eastern extremity. Throughout this area, which is very largely under sugar-cane cultivation to-day, are scattered numerous wooded knolls on which the Loblolly (*Pisonia subcordata*) is the dominant tree and thickets of *Leucaena glauca* or *Croton balsamifer*; there are also vast areas of low dry brush and scrub, especially near the coast, as well as of poorly-kept pastures largely overgrown with " cossie " (*Acacia arabica* and *A. Farnesiana*). The xerophytic type of country culminates in a type of landscape showing Agaves and Cacti dominating. The xerophytic zone is not confined to the limestone region, but runs also in a belt along the south-west coast-line; in the heart of the volcanic district, however, over an area of from 15–20 square miles, where there is an annual precipitation which must be close upon 55–60 inches, the vegetation is definitely mesophytic, though without the Palms (*Euterpe*) and Tree Ferns (*Cyathea*, *Hemitelia*) characteristic of the more mountainous Caribbean islands, such as Montserrat.

The mesophytic vegetation of Antigua consists of obviously second-growth plant associations, and it is doubtful whether there remain more than traces of the original forest covering. The climax is reached in a type resembling rain forest, where the Silk Cotton (*Bombax Ceiba*) and the Locust (*Hymenaea Courbaril*) are the largest trees; good examples of this residual forest are to be found on the northern slopes of Sugar Loaf Mountain and in a few other restricted localities, as in Dunning Valley.

Due to constant winds the vegetation of the hill summits, even in the wettest districts, partakes of a xerophytic nature; very characteristic are thickets of *Myrica* and *Eugenia* with occasional Loblolly and White Cedar (*Tecoma leucoxylon*) trees.

The disastrous effects of indiscriminate deforestation are particularly noticeable, and little serious attempt seems to have been made at any time to conserve the few acres of forested lands remaining (those on Sugar Loaf Mountain being a notable exception). The highest hill in the island, Boggy Peak, is denuded of trees to the summit, which is clothed for the last two hundred feet with coarse grass (*Andropogon saccharoides*), and occasional low bushes.

There is only one permanent river (Bendal's Stream) and even this is reputed to dry up in the times of severe drought to which the island is occasionally subjected. In the rainy season—July to mid-December,—however, several ill-defined watercourses, which have their origin in the central plains or in the eastern part of the hilly region, meander across the island to drain eventually into the eastern bays. In the leeward valleys there are a few small mountain streams, which have cut through the rocky substratum during the course of ages and, bringing down boulders from the heights above, have resulted in miniature gorges and grottos, which are very picturesque in flood-time.

The largest stretches of freshwater are the two reservoirs maintained by the Antigua Sugar Factory at Gunthorpes, near the northern edge of the central plains, and the Government reservoirs at Wallings and Body Ponds in the heart of the mesophytic region; each of these covers several acres. Throughout the cultivated districts are to be found large numbers of little ponds and pools which support an interesting aquatic flora.

The coast is either rocky headland, sandy beach backed by the usual dune vegetation, *e. g.*, sea-grape (*Coccoloba Uvifera*), or mangrove swamps (*Rhizophora*, *Laguncularia*, *Conocarpus*, *Avicennia*) backed by thickets of Whitewood (*Bucida Buceras*) and Manchineel (*Hippomane Mancinella*), and mud-flats with *Batis maritima*, *Sesuvium Portulacastrum*, and *Sporobolus virginicus*.

It will be seen, therefore, that from an ecological point of view the vegetation of Antigua may be classified as intermediate between that of the wetter mountainous islands and that of the flat and obviously dry islands, of which the Virgin Islands are typical. Under such conditions it is not surprising that the fern flora should be scanty; it is interesting, indeed, that as many as thirty-five species of Pteridophytes have been found there.

Very few species occur outside of the mesophytic area. *Acrostichum daneaefolium*, of course, is to be found in the vicinity of mud-flats near the coast, occasionally in pure stands, but also as large individual plants along streams bordered by Manchineel and Whitewood, *e. g.*, Collin's Woods. Owing to the pronounced salinity of the soil, this fern is also to be found well into the interior of Antigua wherever conditions are suitable for halophytic growth.

In the typical limestone area, three species only are known; *Anemia adiantifolia*, the introduced *Pteris vittata* on old walls and (rarely) on rocky road cuttings, and *Polypodium heterophyllum* occasionally as an epiphyte in wooded regions.

The majority of the Antigua species are confined to the south-western area of volcanic origin. It has been shown above that this region supports xerophytic as well as mesophytic

vegetation, and in each of these zones are to be found many interesting ferns. It is remarkable that the typically xerophytic fern of the West Indies, *Hemionitis palmata*, does not seem to occur in Antigua in spite of apparently suitable conditions.

In the dry woodlands covering the hills which border the true mesophytic zone very few terrestrial species are to be found, but *Adiantopsis radiata* and *Pteridium caudatum* may be mentioned. Among rocks and boulders, however, the species are more numerous, and epiphytes fairly characteristic; they include *Cheilanthes microphylla* and *Doryopteris pedata* in the former category, and five species of *Polypodium* in the latter, though *P. lycopodioides*, so abundant everywhere in all of the southern West Indian islands, is confined in Antigua to rocks and tree-trunks on hills above 800 feet elevation.

In the mesophytic area proper the second-growth vegetation includes several fern species, but these are often confined to very restricted localities, e. g., *Anemia adiantifolia*, which covers the floor in second-growth thickets on some of the ridges above Christian and Macarthy Valleys, and *A. hirta* (Dark Valley). Perhaps the most widely distributed and typical fern of the area is *Blechnum occidentale* (absent, strangely enough, from anywhere in the vicinity of Sugar Loaf Mountain), but others of fairly general distribution in the wetter districts are *Dryopteris subtetragona* and *Pityrogramma calomelanos*, which occasionally invade cultivated lands, occurring as weeds in peasants' canefields. The foregoing are terrestrial, but several epiphytes occur, notably *Polypodium phyllitidis*, *P. aureum*, *P. heterophyllum*, and the exceedingly rare *Paltonium lanceolatum*.

In the leeward valleys the stream beds are frequently well shaded by Mango (*Mangifera indica*), Almond (*Terminalis Catappa*), and occasional (introduced) Palms; here occur the two species of *Tectaria*, the rare *Dryopteris Poiteana*, *D. mollis*, *D. patens*, and *Pteris biaurita*, as well as abundant *Blechnum*. On mossy boulders and damp cliffs in the upper reaches of the mountain streams one finds the maidenhair fern, *Adiantum tenerum*, and the delicate *Asplenium cristatum*, as well as *Polypodium phyllitidis* and other lithophytic species of more general distribution.

The climax forest already mentioned supports an interesting and very characteristic fern flora. The typical terrestrial forest fern of Antigua is *Adiantum villosum*, frequently found in large pure societies; it does not occur, however, in the forests on Sugar Loaf Mountain. *A. tetraphyllum* was probably more abundant than it is to-day; it occupies similar situations to *A. villosum*, but is apparently confined to a few acres of forested land on the western slopes of Christian Valley. Where conditions approach those of rain forest, with low range of temperatures, high relative humidity, and ample shade, a very characteristic

plant indicator is the fern *Asplenium serratum*, the most important constituent of the forest on Sugar Loaf Mountain, and in such places the solitary filmy fern of the island, *Trichomanes Kraussii*, occurs on old tree trunks and mossy boulders together with the hepatic *Radula pallens* Nees (determined by W. R. Sherrin). In these forested lands the larger epiphytic ferns often reach luxuriant proportions; the more conspicuous are *Polypodium phyllitidis*, *P. aureum* (fronds of which have been measured up to five feet in length), the grass-like *Vittaria lineata*, and the climbing *P. heterophyllum*.

It is to be noted that neither the Lycopodiaceae nor the Selaginellaceae are represented in Antigua collections, nor is there any reason to believe that they ever occurred in the island. The Psilotaceae are represented by *Psilotum nudum*, which is very rare and probably on the verge of extinction.

List of Species. By A. H. G. Alston.

Hymenophyllaceae.

Trichomanes Kraussii H. & G. Mossy boulders and tree trunks in forest approaching rain-forest type, Sugar-Loaf Mt., N. side, at 750 ft., 241. Confined to above locality, where it is frequent.

Polypodiaceae.

Dryopteris mollis (Jacq.) Hieron. Fairly common in rich soil in shady places in ravines, Christian Valley, 234. Not found elsewhere.

D. patens (Sw.) Kze. Fairly common in rich soil in rather open places in ravines, Christian Valley, 233. Not found elsewhere.

D. Poiteana (Bory) Urban. On rich soil by side of small ravine, Christian Valley, 210. Rare.

D. subtetragona (Link) Maxon. Damp places in clearings in woodlands; ravines etc., Fig Tree Hill, 206. Common in S.W. (volcanic) region of island. Christian records a variety approaching v. *guadalupensis* as collected by Rose, no. 3322.

Tectaria martinicensis (Spreng) Copel. Banks of streams and ravines in woodlands, Christian Valley, 209. Fairly common, but local, in S.W. (volcanic) region.

T. heracleifolia (Willd.) Underw. On damp rocks in wooded ravine, Fig Tree Hill, 211: uncommon. In open soil on shady banks by ravine, Christian Valley, 239: only one plant found. Probably rare.

Nephrolepis biserrata (Sw.) Schott. On palms (*Phoenix*) by side of stream, near Sawcotts Village, 236. Uncommon and local in S.W. (volcanic) region. Also at All Saints' Village.

ASPLENIUM CRISTATUM Lamk. Decaying stumps and mossy banks in mesophytic forest approaching rain-forest conditions, Sugar Loaf Mt. (Falmouth Peak), at 750 ft., 227. Fairly common, but extremely local. Also at Fig Tree Hill and Christian Valley in similar type of forest.

A. PUMILUM Sw. In rich damp soil among rocks under bushes, Sugar Loaf Mt. (Falmouth Peak), at 600 ft., 225. Very scarce; and local in Antigua.

A. SERRATUM L. Decaying stumps, mossy rocks, etc., in mesophytic forest approaching rain-forest conditions, Sugar Loaf Mt. (Falmouth Peak), at 750 ft., 229. Characteristic of above localities, but very local in Antigua. Also in similar forest in Christian Valley and Dunning Valley.

BLECHNUM OCCIDENTALE L. In societies on rich soil in moist places under trees and shrubs by ravines, Christian Valley, 208. Rather local in S.W. (volcanic) region.

PITYROGRAMMA CALOMELANOS (L.) Link. Damp soil on edges of streams, ravines, etc., in abandoned lands, near Fig Tree Hill, 207. Fairly common in S.W. (volcanic) region.

DORYOPTERIS PEDATA (L.) Fée. Among mosses in mesophytic forest approaching rain-forest conditions. Sugar Loaf Mt. (Falmouth Peak), at 750 ft., 220. Not found elsewhere.

ADIANTOPSIS RADIATA (L.) Fée. Among rocks on floor of "dry" forest, Sugar Loaf Mt. (Falmouth Peak), at 800 ft., 219. Fairly common in one locality; rare elsewhere.

CHEILANTHES MICROPHYLLA (Sw.) Sw. Among rocks in open woodland on hillside near coast, Crab Hill, at about 250 ft., 203. Apparently rare. Rich soil on ravine bank under shrubs, Sugar Loaf Mt. (Falmouth Peak), lower ravine near coast at 150 ft., 217. Among grasses, on exposed wind-swept rocky ridge, Sugar Loaf Mt. (Falmouth Peak), at 1000 ft., 224: only found once.

ADIANTUM TENERUM Sw. Moist ravines and shady banks under shrubs, Ravines of Christian Valley, 232. Fairly common, but very local.

A. TETRAPHYLLUM H. & B., ex Willd. In mesophytic forest approaching rain-forest conditions. On ground, in leaf-mould, Christian Valley, 235. A few plants only. Not seen elsewhere.

A. VILLOSUM L. In societies on rich soil in wooded ravines, Fig Tree Hill, 205. Fairly common locally.

PTERIS BIAURITA L. Damp shady places in wooded ravines, Christian Valley, 240. Apparently confined to Christian Valley, where it is rather uncommon.

P. VITTATA L. On walls, in the town, St. John's, 238. Apparently confined to the town. Common.

PTERIDIUM CAUDATUM (L.) Maxon. Among bushes on rather exposed rocky hill summit, Saddle Hill (New Division), near Yorks, at 600 ft., 230. Not seen elsewhere, probably very rare.

VITTARIA LINEATA (L.) Sw. On mossy tree-trunks in mesophytic forest approaching rain-forest conditions, Sugar Loaf Mt. (Falmouth Peak), at 750 ft., 228. Rare and local.

PALTONIUM LANCEOLATUM (L.) Presl. On tree-stump in mesophytic forest in ravine, near Walling's Reservoir, 237. Very rare. Only found once.

POLYPODIUM AUREUM L. In crown of trees, crevices of large rocks, etc., in "dry" forest, Sugar Loaf Mt. (Falmouth Peak), at 900 ft., 222. Fairly common. With lithophytes on large rocks in exposed places in "dry forest zone," Sugar Loaf Mt. (Falmouth Peak), at 900 ft., 223. Fairly common. In crowns of trees in rather open woodlands on hills, Dark Valley, below Boggy Peak, at 750 ft., 213. Fairly common in S.W. (volcanic) region.

P. BRASILIENSE Poir. Protected rocky faces of exposed ravines. Zone of low rainfall, Sugar Loaf Mt. (Falmouth Peak), at 750 ft., 221. Rather uncommon and local.

P. HETEROPHYLLUM L. On tree trunks, often among lithophytes on rocks in exposed places on hills, near Buckley's, at c. 350 ft., 202. Common and widely distributed.

P. LYCOPODIOIDES L. Among lithophytes on exposed rocky ridges. Also on trees, Boggy Peak, at 1200 ft., 215. Common in S.W. (volcanic) region.

P. PHYLLITIDIS L. On moist rocks in wooded ravine, Fig Tree Hill, 204. Rather uncommon. On trees and rotting stumps in mesophytic forests, Fig Tree Hill, 212. Common in forests in S.W. (volcanic) region.

P. POLYPODIOIDES (L.) Watt. Among lithophytes on exposed rocky ridges. Also on trees, Sugar Loaf Mt. (Falmouth Peak), at 950 ft., 220. Common in S.W. (volcanic) region. Among lithophytes on exposed rocky ridges, also on trees, Boggy Peak, at 1200 ft., 216. Common in S.W. (volcanic) region.

ACROSTICHUM DANEAEFOLIUM Langsd. & Fisch. Salt-marshes near coast, occasionally in interior, near Parham, 201. Fairly common. Rocky stream bed in shallow ravine, between Sugar

Loaf Mt. (Falmouth Peak) and Nook Hill, 218. Very local and rare in Antigua (2 sheets). Mr. Box states that fronds with all or only the upper pinnæ fertile may be found on the same plant. *A. aureum* L. may be distinguished by the glabrous under surface of the pinnae.

SCHIZAEACEAE.

ANEMIA ADIANTIFOLIA (L.) Sw. In societies on rich moist shady banks under shrubs, Macarthy Hills, above Christian Valley, at 900 ft., 231. Not seen elsewhere.

ANEMIA HIRTA (L.) Sw. Under trees and bushes in damp places by side of trail, in societies. Dark Valley below Boggy Peak at 750 ft., 214. Very local in S.W. (volcanic) region.

PSILOTACEAE.

PSILOTUM NUDUM (L.) Beauv. At base of tree trunks in second-growth mesophytic area, Christian Valley, 242. Very local and rare in Antigua.

UTRICULARIA RENDLEI, A NEW SPECIES FROM VICTORIA FALLS.

BY FRANCIS E. LLOYD, M.A., D.Sc.

AMONG several species of *Utricularia* collected by Dr. A. B. Rendle and myself on Livingstone Island, Victoria Falls, in the summer of 1929, on the occasion of an excursion of a party of the British Association following the South African meeting, there was one which was apparently referable to the American *Utricularia subulata* L., and which has been so referred, but which on closer examination turns out to be quite distinct. It is, moreover, one of a group of species all more or less like *U. subulata*, represented in various collections, all of which are equally distinguishable from that species, but which await further study before a definitive treatment may be had.

As to the species in present question, which I propose to name *Utricularia Rendlei*, in honour of Dr. Rendle and as a souvenir of our memorable botanical journey together, there is presented below a comparison of its characters with those of *U. subulata*. Materials of this was obtained through the kindness of Dr. Th. Uphof, Florida, U.S.A., and was preserved in spirit, as was also the African, thus assuring possibilities for study denied to those dependent on dried herbarium material alone. And here it cannot too strongly be urged that those who are making collections of this genus should procure carefully preserved spirit or formalin material of the whole plant. This means the painstaking

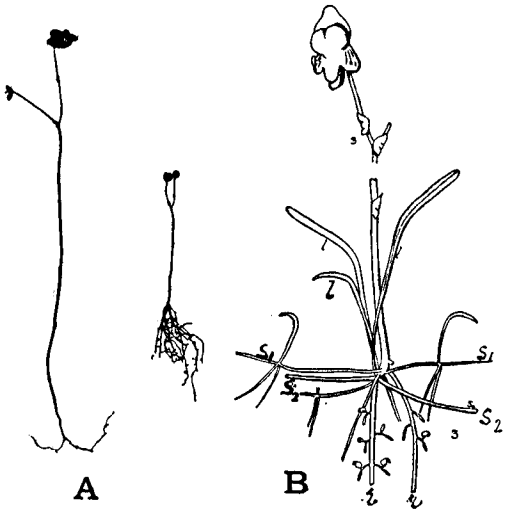

Fig. 1.—*Utricularia Rendlei* F. E. Lloyd. A. Two shadow prints of the type-specimen, nat. size. B. Sketch of same, × 3: s_2, secondary stolon from which the plant arose; s_1, primary stolons of the new plant; *l*, leaf; *r*, rhizoids.

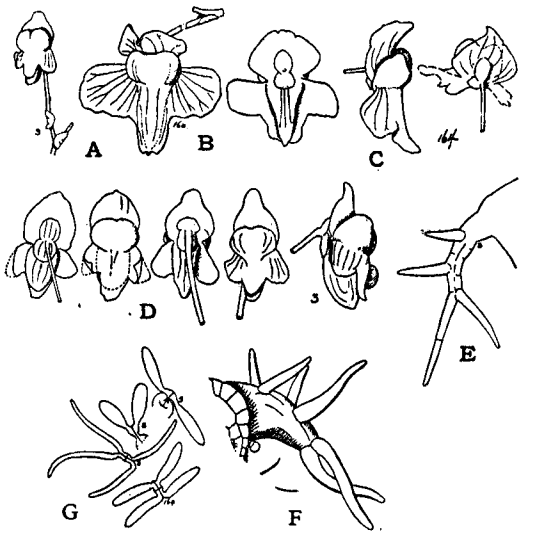

Fig. 2.—A. Flower of *Utricularia Rendlei*, × 4. B. Flower of *U. subulata*, × 4. C. Three positions of the flower of *U. subulata*. D. Five positions of the flower of *U. Rendlei*. E. Antenna of *U. Rendlei*. F. Antenna of *U. subulata*. G. 3, bifids and quadrifid of *U. Rendlei*; 164, quadrifid of *U. subulata*. C, D, enlarged; E–G, much enlarged.

separation of the parts found in the substratum in the case of those species called terrestrial.

U. Rendlei.	*U. subulata.*
A very small plant usually less than 6 cm. tall (fig. 1). Scales of scape much less conspicuous.	Larger and coarser, "2–20" cm. in height.

As I have shown elsewhere, the traps are of the type of *U. vulgaris*. They are, however, very minute (generally less than 0·5 mm. long), not only in the two species under discussion, but in others closely related, e. g., *U. triloba* Benj., and have a much smaller number of bifids (±13) and quadrifids (±12). But of more importance here is the fact that the traps of *U. Rendlei* and *U. subulata* are alike in having the same shaped bifids (8) flanking the inner extension of the entrance, but differ in the shape of the quadrifids (as above indicated).

The following is the technical description :—

Utricularia Rendlei, sp. nov. Herbula *U. subulatae* L. similis, sed differt statura minore (alt. 2·5–6 cm.), floribus minoribus, labio superiore ovato obtuso, antennis gracilioribus longioribusque, et quadrifidorum brachiis elongatis gracilibus undulatis quam eis *U. subulatae* admodum duplo longioribus.

Hab. Northern Rhodesia : Livingstone Island, *F. E. Lloyd*, no. 3 (typus in Herb. Mus. Brit.).

I am indebted to Mr. George Taylor, of the Department of Botany, British Museum, for assistance.

McGill University, Montreal.

RECENT ADVANCES IN IRISH FIELD BOTANY.

By R. Lloyd Praeger, D.Sc.

Irish field botany is at present at a low ebb owing to the lack of workers. Within the last twenty years we have lost by death R. M. Barrington, N. Colgan, C. H. Waddell, H. W. Lett, and Miss Knowles, and very few have advanced or are advancing to take their places. Nevertheless, the last few years have produced some interesting additions to the Irish flora and important extensions of range in the case of some of the rarer plants. These have been published mainly in the 'Proceedings of the Royal Irish Academy' and in the 'Irish Naturalists' Journal.' As these publications have not a wide circulation in Great Britain, and as in spite of political boundaries Great Britain and Ireland form a natural biological unit, I willingly take advantage of the Editor's permission to summarize here some of these results. If the range in Great Britain of the plants dealt with be kept in mind, it will be seen that the Irish range as now known offers, in some cases, very pretty problems in plant distribution. The bracketed numbers at the end of paragraphs refer to papers listed at the end of these notes, where additional details may be found.

Ranunculus scoticus E. S. Marshall.—Range not yet worked out. Known now from eleven vice-counties, mostly in the south-western part of the northern half of Ireland. Extends to Londonderry and Wicklow (7).

Caltha radicans Forster.—For long known only from a single station (L. Erne), just as it was in Britain. But these plants belong to an extreme form, with unusually triangular leaves. On the standard of Forster's original description, the plant is spread all over Ireland (36 out of 40 vice-counties, and no doubt universal). It is by no means a plant of hilly regions, but is especially abundant on the lake-shores of the Limestone Plain, and is not seen on the hills, its highest station being 700 feet. While *C. palustris* is in Ireland a plant of very uniform facies, where it grows unmixed with *C. radicans*, many intermediates occur where both are present, due I doubt not, to crossing. But apart from this, *C. radicans* is a very variable plant. Examination of some hundreds of Irish examples from about a hundred stations shows the distinguishing characters of *C. radicans* to be :—plant smaller and slenderer than *C. palustris* (though occasionally 2 feet high !) ; rootstock not branched, but plant single-crowned ; root-leaves more or less triangular, with base of lamina widely splayed ; flower-stem mostly sharply deflexed at base, slender, often purple, central hollow small, in open ground prostrate or rooting at once or eventually at its one to three nodes, in closed vegetation declining and scarcely rooting, unbranched or with one to two weak branches, lowest internode much shorter than the succeeding one (often very short). Flowers one or several, rather small, sepals not contiguous. None of these characters are present in well-grown *palustris*, though, for instance, single prostrate unbranched stems may be found in exposed situations. But it is seldom that all these characters are found together in *radicans*. Mostly some of them are absent, and the plant is identified by possessing the majority of them. Among the most persistent are the single crown and the very short lowest internode, characters not mentioned in the text-books. How far this variability in *radicans* may also be due to crossing with *palustris* manifesting itself in a very irregular manner I am not prepared to say, but I am inclined to think that this is seldom the case (5).

Cochlearia anglica L.—Long considered a southern plant in Ireland, as it is in Britain. Now known to occur in muddy situations round the whole coast, crossing everywhere with *C. officinalis*, so that in some places pure *anglica* is difficult to find. Var. *Hortii* Syme is clearly one of these hybrid forms (1, 7).

C. groenlandica L. ? (*C. scotica* Druce).—From Cork round the west coast to Antrim, crossing occasionally with *C. officinalis*. The Cork and Kerry stations are interesting, in view of the fact that in Britain the plant appears to be exclusively Scottish (1, 7).

Elatine Hydropiper L.—The aboriginal Irish stations for this rare plant appear to have been Lough Neagh and two small lakes in Co. Down—Lough Shark and Lough Brielan. After the canals were made about 150 years ago it spread along them in local patches eastward to Belfast and southward to Newry. The largest present colony is near Newry, where the plant occupies the canal in abundance from that town for fifteen miles northward (6).

Helianthemum Chamaecistus Mill.—Stated by H. C. Hart to have been found (for the first and only time in Ireland) on limestone rocks near Ballyshannon in Donegal in 1893. Omitted from subsequent books as an introduction or escape. Refound in the same place in 1933, undoubtedly native. The extreme rarity in Ireland of this widespread British plant is remarkable (4).

Sorbus.—The distribution of the segregates in Ireland is strikingly different from what prevails in Great Britain. *S. Aria*, the most widespread British form, is known in Ireland only from the area around Galway. The prevailing Irish plant is *S. porrigens*, which has been found so far in 16 of the 40 vice-counties, from Kerry and Wexford northward to Dublin and Sligo. *S. rupicola* is widely but very sparingly spread from Killarney to Londonderry. The rare *S. anglica* is at Killarney. *S. latifolia* occurs in the south-eastern counties—I believe native (2).

Saxifraga spathularis Brot. (*S. umbrosa* auct., non L.).—The range of this characteristic Hiberno-Lusitanian plant has been quite unexpectedly extended by the discovery of two mountain stations in Wicklow by Mr. A. W. Stelfox and Prof. F. E. Hackett respectively.

Sarracenia purpurea L.—Among alien plants, the most remarkable to be reported is this. A few plants introduced into a peat-bog near Termonbarry in Co. Roscommon in 1926 have increased to many thousands, and in June the groves of tall drooping claret-coloured flowers combined with the scarlet and yellow foliage form a very remarkable sight. A similar introduction in Co. Westmeath is deprived of equal success only by traffic due to turf-cutting (1).

Apium inundatum × *nodiflorum* (*A. Moorei* Druce).—Proving quite common in Ireland, and now on record from twenty-four of the forty vice-counties. If a hybrid, as I believe it is, its rarity in England as compared with Ireland is remarkable (7).

Senecio aquaticus × *Jacobaea*.—Has this hybrid been overlooked in Great Britain, where it is apparently rare? In Ireland it is very common, being almost invariably present where the parents grow in proximity. The hybrids are fertile, with the result that a series of intermediates often connects one species with the other (7).

Arbutus Unedo L.—Unquestionably native on limestone and metamorphic rocks round the margin of Lough Gill in Sligo. This represents an extension northward of 160 miles from its nearest previous station (Killarney), which was the northern limit of its known world-range (1).

Orchis majalis Rchb.—Mr. Pugsley has dealt (Proc. Linn. Soc. 1933–34, 96, and Journ. Linn. Soc. (at press)) with the occurrence in Ireland of this Orchis, which has not so far been found in Great Britain.

Spartina Townsendii H. & J. Groves.—Has been planted on muddy foreshores in six Irish counties, ranging from Cork to Down. In some stations it is making good progress (1).

Juniperus.—The range of the two Junipers has been confused owing to the too ready assumption that prostrate plants were *J. sibirica*. While *J. sibirica* appears to be always prostrate or nearly so, *J. communis* may be erect or spreading (and up to 20 ft. in height), or absolutely prostrate (and up to 30 ft. across). *J. sibirica* is mostly upland (to sea-level on dunes in Kerry) and calcifuge, while *J. communis* is lowland, on all kinds of rocks. Both have a western and northern range in Ireland (3).

Phegopteris Robertiana Braun.—The apparent absence of this fern from Ireland, in view of the great extent of suitable limestone ground, was one of the puzzles of local phytogeography. It has now been found occupying one low hill near Headford in N.E. Galway, among *Vicia Orobus*, *Gentiana verna*, *Neotinea intacta*, etc., etc. (1).

Equisetum arvense × *limosum* (*E. litorale* Kühlew.).—This hybrid, like *Senecio aquaticus* × *Jacobaea*, is proving quite common in Ireland, as contrasted with an apparent comparative scarcity in England. It is known from 19 of the 40 vice-counties, and the list is extending rapidly. Mostly in the form *elatius* Milde, but other forms nearer one or other parent occur. Seldom in water and very seldom in dryish soil (7).

Equisetum trachyodon Braun.—The wide distribution of this species in Ireland, as compared with its great rarity in (? or absence from) Great Britain, is remarkable. It is now known from 16 of the 40 vice-counties, ranging from Kerry to Londonderry and from Dublin to Mayo (7).

Owing to the dearth of workers already referred to, the bulk of the above extensions of range have arisen from my own work; and almost all of them have been recorded in papers by myself, as under; in these a good deal of further information will be found. The whole range of each member of the Irish flora, as at present known, is summarized in my recent book at the end of this list.

I am indebted to Mr. H. W. Pugsley and Mr. A. J. Wilmott for help, especially as regards the *Sorbus* group.

List of Works referred to.

(1) "Some Noteworthy Plants found in or reported from Ireland." Proc. Roy. Ir. Acad. xli. B, 95–124 (1932).
(2) "The *Sorbus Aria* Group in Ireland." Irish Nat. Journ. v. 50–52 (1934).
(3) "Irish Junipers." *Ibid.* 58–61.
(4) "*Helianthemum vulgare* in Ireland." *Ibid.* 76–77.
(5) "*Caltha radicans* in Ireland." *Ibid.* 98–102.
(6) "Fifteen Miles of *Elatine Hydropiper*." *Ibid.* 101–104.
(7) "A Contribution to the Flora of Ireland." Proc. Roy. Ir. Acad. xlii. B, 55–86 (1934).
(8) 'The Botanist in Ireland.' Dublin, 1934.

THE PRIMARY DIVISIONS OF THE GENUS *NITELLA* *.

By the late James Groves.

The classification of the Charophyta presents considerable difficulty, owing to the frequent parallelisms in characters in different sections. Although attempts were made by various authors from Bruzelius and Agardh (1824) onwards to classify all the known species, it was not until Alexander Braun, whose knowledge of the group has never been equalled, began to write on the subject in 1834–5 that the value of relative characters came to be appreciated. It is in Braun's masterly paper on the African species (in Monatsb. Akad. Wiss. 1867; 1868) that we get the basis of the modern classification of the group, and the same arrangement is followed in the 'Fragmente einer Monographie der Characeen' (1882), which embodies the notes &c. left by Braun, edited by Nordstedt, with additions and a valuable "Clavis" by the latter author, amplified so as to include all the known species.

The primary divisions of the genus *Nitella* adopted by Braun were based on the construction of the final rays of the branchlets, styled dactyls. The first division, *Monarthrodactylae*, included those species having the dactyls one-celled, the second, *Diarthrodactylae*, having them two-celled, the third, *Polyarthrodactylae*, having them three- to six-celled. Under the first and second of these primary divisions Braun had two subdivisions, *Homoeophyllae* and *Heterophyllae*, the first including species having the branchlets in a whorl more or less equal, the second those of which the branchlets in a whorl are of two distinct sizes, the smaller being simpler than the larger and "*interjectis*."

Most of the species in Braun's first primary division constitute a natural section composed of the *flexilis* and *acuminata* groups, and the somewhat anomalous *N. cernua*, characterised by the uniformly one-celled dactyls and once-forked branchlets.

* [This paper was found in a cover labelled "Journal of Botany drafts," and was to have been the first of a series of short papers entitled "Notes on Charophyta," which the author proposed to contribute from time to time.—G. O. Allen.]

The division, however, also includes three other species presenting some important points of difference—*N. clavata*, *N. Dregeana* Kütz. (*N. tricuspis* Br.), and *N. Stuartii*. *N. clavata* and *N. Stuartii* are both "heterophyllous," and the branchlets of the latter are repeatedly forked, while in *N. Dregeana* the dactyls are indifferently one- or two-celled. These three species do not show any marked affinity to any of the others in the division, nor indeed to one another.

In Braun's second division, *Diarthrodactylae*, there are several species having frequently some three-celled dactyls, while in the third division, *Polyarthrodactylae*, in some species two-celled dactyls sometimes occur, so that it is difficult to draw any satisfactory line between these two divisions.

It seems to the present writer that it would be a more natural arrangement to divide the genus in the first place into (1) those species which have all the branchlets in a whorl in a single circle and more or less equal, and (2) those having them in more than one circle and of two distinct kinds, that is the putting together the *Homoeophyllae* of two of Braun's two primary divisions to form one new primary division "*Homoeoclemae*," while a second new primary division, "*Heteroclemae*," would include the *Heterophyllae* of the two of Braun's primary divisions *. The number of cells in a dactyl seems to afford a far less stable, as well as less important, character than the production of distinct circles of branchlets in a whorl arising from different tiers of cells instead of in a single circle.

The practically world-wide species *N. hyalina* may be taken as the most representative type of the *Heteroclemae*. Prof. A. Ernst, in the plate illustrating his paper "Die Stipularblätter von *Nitella hyalina* (DC.) Ag.," shows clearly the difference of origin of the larger and smaller branchlets. Braun does not seem, strangely enough, to have appreciated this difference, for, in his description of *N. hyalina*, he refers ("Characeen Afrikas," *tom. cit.* 890) to the smaller branchlets as "interjectis" and in the remarks styles them "Zwischenblatter," inferring that they are adventitious branchlets, such as are found in some species of *Nitella* and *Tolypella*. On the other hand, T. F. Allen, who, in his numerous papers on the American and Japanese Charophytes, has added so much to our knowledge of these plants, clearly points out the important difference in origin of the two types of branchlet. In his remarks on a new (homœoclemous) species, *N. subspicata* (Bull. Torrey Bot. Club, xxv. 7; 1896), he writes: "These specimens show a variation in the character

* Canon Bullock-Webster and the present writer in "British Charophyta" adopted the terms "*Homoeoclemae*" and *Heteroclemae*" instead of "*Homoeophyllae*" and "*Heterophyllae*," as we did not consider that the branchlets of Charophytes on which the gametangia are borne could be rightly regarded as leaves.

of the leaves of a verticil; they are frequently dimorphous, but never heterophyllous, as in *N. clavata* A. Br. of the Pacific coast. . . . the difference between *heteromorpha* and true *heterophylla* is constant and fundamental in the development of the nodal cells, rather than accidental and variable."

Nordstedt appears to have held a contrary view, for, in 'Australasian Characeae,' pt. 1, 2, he writes: "The two sections '*homoeophyllae*' and '*heterophyllae*' are not, however, really distinct." It is true that in some of the weaker forms of the *heteroclemae* the number of the smaller branchlets is much reduced, though I think their presence can always be detected. At any rate, the distinction seems more stable than that based on the number of cells composing the dactyls.

The re-arrangement of characters which I suggest would have the effect of removing two of the unlike species (*N. Stuartii* and *N. clavata*) from Braun's *Monarthrodactylae*, while the third, *N. Dregeana*, could advantageously be placed in a separate division, *Heterodactylae*, as suggested by Braun himself, since, as already stated, the dactyls are indifferently one- and two-celled.

For the reasons stated I propose in future taxonomic papers to treat the *Homoeoclemae* and *Heteroclemae* as the primary divisions of *Nitella*.

Additional Note.

This change was introduced by Groves for the first time in his "Notes on Indian Charophyta" (Journ. Linn. Soc., Bot. xlvi.; Apr. 1924).

The heteroclemous character of *N. Stuartii* was first recognised by Groves, who found it to be definitely so, at any rate in the upper whorls of branchlets.

I append for the sake of clarity so much of Braun's classification as arises from this paper and also the re-arrangement which Groves suggests, together with a list of the species held to be heteroclemous subdivided on the basis of the number of cells in the dactyl.

N. plumosa was first recognised as heteroclemous in "New and Noteworthy South African Charophyta. I.," by James Groves and Edith L. Stephens (Trans. Roy. Soc. S. Africa, xiii. pt. 2, 152: 1926).

Fillarszky, in "Die Characeen der Deutschen Limnologischen Sunda-Expedition" (Archiv f. Hydrobiologie, Suppl. Bd. xii. "Tropische Binnengewässer, iv." 707; 1934), has described a new species, *N. pseudograciliformis*, as exhibiting accessory branchlets in the middle whorls, and mentions that *N. hyalina* was hitherto the only known heteroclemous monœcious arthrodactylous *Nitella*. He mainly distinguishes his plant from *N. hyalina* by its primary branchlets being up to 4-furcate and the secondary 1–2-furcate, whereas in *N. hyalina* they are 2–3-furcate and usually 1-furcate respectively.

N. tumida is a minute strange plant from hot salt springs in South Australia. Nordstedt puts it as "*heterophylla*," but Groves has a note "query if belonging to *Heteroclemae*."—G. O. A.

Braun's Arrangement.

- Monarthrodactylae.
  - Homoeophyllae.
  - Heterophyllae.
- Diarthrodactylae.
  - Homoeophyllae.
  - Heterophyllae.
- Polyarthrodactylae.

Groves's Arrangement.

- Homoeoclemae.
  - Anarthrodactylae.
  - Heterodactylae.
  - Arthrodactylae.
    - Bicellulatae.
    - Pluricellulatae.
- Heteroclemae.
  - Anarthrodactylae.
    - *N. clavata* Br.
    - *N. Stuartii* Br.
  - Arthrodactylae.
    - Bicellulatae.
      - Dicœcious.
        - *N. Lhotzkyi* Br.
        - *N. congesta* Br.
        - *N. tumida* Nordst.
      - Monœcious.
        - *N. hyalina* Kütz.
        - *N. pseudograciliformis* Fil.
    - Pluricellulatae.
      - *N. plumosa* Br.
      - *N. struthioptila* Gr. & Steph.

NOMENCLATURE OF SOME BRITISH AND GERMAN OAKS.

By O. Schwarz, Ph.D.

Linnæus, Sp. Pl. 996 (1753), gives only one indigenous north European species of oak, *Quercus Robur*, with the reference *Quercus cum longo pediculo* Bauh. Pin. 420. There is no evidence that this included any other oak now regarded as a distinct species or variety. In his 'Flora suecica,' ed. 2, 340 (1755), Linnæus added the var. *β, Q. latifolia mas, quæ brevi pedunculo est*, Bauh. Pin. 419, to the type. Hence there can be no doubt that *Quercus Robur* L., Sp. Pl. 996, is the first valid specific binominal for the tree cited by most of the continental authors as *Q. pedunculata* Ehrh. Moss (Journ. Bot. xlviii. 6; 1910), and afterwards Ulbrich (Mitt. Deutsch. Dendr. Ges. 311; 1924) cleared up the confusion caused by later authors in the use of Linnæus's name, and there is nothing of importance to add.

But there was also confusion as to the correct name for a second north European oak, which in botanical works appears either under the name of *Q. Robur* Miller (Gard. Dict. ed. 8, no. 1; 1768), or of *Q. sessilis* Ehrh. (Arb. frut., Dec. ix, 87; 1789),

or of *Q. sessiliflora* Salisbury (Prodr. 392; 1796). Miller's name, erroneously given to this oak, cannot be adopted. The decision between the two others is rather difficult; though Ehrhart's name appeared without any description, the custom of this author to apply the binominal not only as a trivial, but also as a short diagnosis and the apposite contrast of the name *Q. sessilis* to *Q. pedunculata* leaves no doubt as to the plant indicated. But most modern authors prefer Salisbury's name, which is confirmed by the citation of an earlier synonym, *Q. Robur* var. *sessilis* Martyn (Fl. Rust. tt. 11, 12; 1792).

Occupied with the preliminary studies on a monographic revision of the oaks of the Old World, I have not been satisfied by this standpoint. It seemed improbable that an oak, so well known to the common people and to foresters, and so evidently distinct from the pedunculed oak by its habit, leaf- and fruit-characters, should not have been distinguished before Ehrhart. It is, therefore, not surprising that Mattuschka (Fl. Siles. ii. 375; 1777) gave a detailed German description of a *Quercus petraea*, for which he cited *Quercus latifolia brevi pedunculo*, Bauh. Pin. 419, the var. β of Linnæus's 'Flora Suecica.' But the adoption of this first binominal is impossible, as Mattuschka quoted it as a "Spielart" (variety) of *Quercus Robur* L.; in his 'Enumeratio,' 260 (1779), we are no further, as he mentions there only *Q. Robur* β, *Q. petraea* with the same synonym.

But a few years later the name appears with specific rank. Lieblein (Fl. Fuldensis, 403; 1784) published the name with a German description and discussed its specific differences from *Q. Robur* L.; curiously, he did not cite Mattuschka, but wrote simply "*Quercus petraea* Linn." It seems, therefore, that Mattuschka's name was so relatively well known that Lieblein regarded it as created by Linnæus. But neither the incorrect citation "Linn." nor the want of a Latin description have any bearing on the publication and official adoption of the name. Though it may be regretted that the names *Q. sessilis* or *Q. sessiliflora* so generally well known have now to disappear, the use of Mattuschka-Lieblein's name avoids a decision between *Q. sessilis* and *Q. sessiliflora*. The priority of Lieblein's binominal is incontestable, hence the name *Quercus petraea* ["Linn." ex] Lieblein for the sessile oak is unassailable.

The third oak noted—apparently erroneously—as occurring in England is recorded by Ascherson-Graebner (Synopsis, iv. 479; 1911) as *Q. lanuginosa* Lam. (Fl. Franc. ii. 209; 1778). Though Schinz and Thellung (Vierteljahresschr. Naturf. Ges. Zürich, liii. 530 (1908) and lviii. 55 (1913)) rejected this name for good reasons, Ulbrich (Mitt. Deutsch. Dendr. Ges. 297; 1924) tried to restore it. The Swiss authors answered (*l. c.* lxxii. 213; 1927) that they already had sufficiently proved the impossibility of the application of this name and insisted upon the name of

Q. pubescens Willd. (Berl. Baumzucht. 279; 1796) and after careful revision of the publications concerned I can only follow them. Lamarck's description, which Ulbrich (*l. c.* 300) regards as corresponding "with *Quercus languinosa*, but not with *Q. Cerris* L.," gives just the most striking features of *Q. Cerris* L. by the words "cupule . . . hérissée" and "dans leurs aisselles . . . deux petites écailles linéaires et stipuliformes"—further, Lamarck cites *Q. Cerris* L. and some of its earlier synonyms. There is, therefore, no doubt, that he intended merely to introduce another specific binominal for Linnæus's species.

As to *Q. lanuginosa* Thuill. (Fl. Env. Paris, 502; 1799) and *Q. pubescens* Willd., the latter has incontestable priority. Ulbrich's opinion (*l. c.* 301) that Willd. Herb. no. 17648, fol. 8, came "without any doubt from the original material of Lamarck's *Quercus lanuginosa*" is stated without any proof, being a mere suggestion. Willdenow (Sp. Pl. ed. 3, 451; 1805), changing his opinion in writing "*Quercus pubescens* in meo arboreto berolinensi, p. 279, descripta est *Q. albae* varietas, hæc varietas folia maiora basi attenuata habet," contradicts his first detailed description, corresponding very well, as to morphological characters and as to place and habitat, with the pubescent oak he describes some pages later (p. 450). Willdenow's herbarium gives no certainty either as to the first or to the second species. We, therefore, can only use Willdenow's descriptions, and can take in consideration change of opinion only, when given with well-founded reasons and with regard to the original type-material. That being not the case, the name *Q. pubescens* Willd. (Berl. Baumzucht, 279; 1796) must be accepted without regarding Willdenow's later opinion, probably based on wrongly determined cultivated plants.

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NEW VICE-COUNTY RECORDS FOR SPHAGNA, MAINLY FROM THE NORTHERN COUNTIES.

By A. Thompson.

Sphagnum fimbriatum Wils. var. *intermedium* Russ.; marshy moor nr. Hodders Combe, Quantocks; v.c. 5. Var. *tenue* Grav.; marsh, School Knott, Windermere; v.c. 69.

S. Girgensohnii Russ. var. *gracilescens* Grav.; damp ground, Blacka Moor, Sheffield; v.c. 57.

S. compactum DC. var. *squarrosum* Russ.; damp ground, Wheeldale Moor, Goathland; v.c. 62.

S. pulchrum Warnst.; Murk Mire nr. Egton Bridge; v.c. 62; marshy ground nr. Capel Curig; v.c. 49; marsh, Honister Pass; v.c. 70; and Austwick Moss; v.c. 64.

S. recurvum Beauv. var. *majus* Ångstr.; marsh Tal-y-Fan, nr. Conway; v.c. 49.

S. fallax von Klinggr. var. *plumosum* Warnst.; submerged, reservoir, Goathland Moor; v.c. 62. Var. *robustum* Warnst.; marshy place, Coledale nr. Keswick; v.c. 70; and Helwith Moss; v.c. 64. Var. *Schultzii* Warnst.; marshy ground nr. West Beck, Goathland; v.c. 62.

S. cuspidatum Ehrh. var. *falcatum* Russ.; Austwick Moss; v.c. 64. Var. *plumulosum* Schimp.; wet moor by Roman Road, Goathland; v.c. 62.

S. obesum Warnst. var. *luxurians* Warnst.; submerged in small stream, Park Dyke Marsh nr. Goathland; and submerged in reservoir, Goathland Moor; v.c. 62; also, submerged in pool, Mickleden; v.c. 69. Var. *canovirens* Warnst.; half under water, Bordley Moor; v.c. 64; wet ground in a wood, Hodders Combe, Quantocks; v.c. 5; mostly under water, Bwlch-y-Ddeufan, nr. Conway; v.c. 49; and nearly submerged, Burmoor, Lancs; v.c. 60. Var. *mastigocladum* Warnst.; submerged in pool in Whoeldale Beck, nr. Goathland; v.c. 62. Var. *plumosum* Warnst.; nearly submerged in pool, Penyghent; v.c. 64.

S. subsecundum Warnst. var. *tenellum* Warnst.; Cat Bells, Keswick; v.c. 70.

S. inundatum Warnst. var. *robustum* (Warnst.), Sherrin; on a stone in trickling water, Fen Bog, Goathland; v.c. 62; and Tal-y-fan; v.c. 49. Var. *densum* (Warnst.), Sherrin; bog, nr. Eller Beck, Goathland; v.c. 62; and wood above Lodore Falls, Keswick; v.c. 70. Var. *lancifolium* Warnst.; boggy ground, Bretton Clough, Derbyshire; v.c. 57. Var. *diversifolium* Warnst.; marshy ground nr. Watendlath; v.c. 70.

S. auriculatum Schimp. var. *ovatum* Warnst.; wet fell nr. Ashness Gate, Keswick; v.c. 70. Var. *laxifolium* Warnst.; ditch, moor nr. Beck Hole, Goathland; v.c. 62 and on clay bank, Honister Pass; v.c. 70. Var. *submersum* Warnst.; marsh, Skipworth Common; v.c. 61; and by a stream, Newlands, Keswick; v.c. 70.

S. aquatile Warnst. var. *intortum* Warnst.; marsh, Two Howes Rigg, Goathland; v.c. 62. Var. *remotum* Warnst.; submerged in pool, Two Howes Rigg; v.c. 62; Dunkery Beacon; v.c. 5; and wet rock Hobcarton Crags; v.c. 70.

S. crassicladum Warnst. var. *diversifolium* Warnst.; nearly submerged, marsh, Bwlch-y-Ddeufan, Conway; v.c. 49. Var. *intermedium* Warnst.; half in water, marsh on moor nr. Hodders Combe, Quantocks; v.c. 5.

S. papillosum Lindb. var. *normale* Warnst.; Capel Curig, Bwlch-y-Ddeufan and Moel Siabod; v.c. 49. Var. *sublaeve* Limpr.; marsh, Tal-y-Fan nr. Conway; v.c. 49.

S. subbicolor Hampe; marshy wood nr. Watendlath; v.c. 70.

S. medium Limpr.; Helwith Moss; v.c. 64.

v.c. 5 is S. Somerset; 49, Carnarvon; 57, Derby; 60, W. Lancs; 61, S.E. Yorks; 62, N.E. Yorks; 64, Mid-W. Yorks; 69, Westmorland and N. Lancs; and 70, Cumberland.

I am greatly indebted to Mr. W. R. Sherrin for checking the naming of all my specimens.

SHORT NOTE.

EUPHRASIA ROSTKOVIANA Hayne IN SCOTLAND.—Among two gatherings of *Euphrasia brevipila* B. & G. collected at the roadside between Thirlestane Youth Hostel and Ettrick-bridge Road End, in Selkirk, on the 3rd of July last year, were a number of large-flowered glandular specimens. Mr. H. W. Pugsley has identified them as *Euphrasia Rostkoviana* Hayne, and says: "they are the first that I have seen from Scotland." All other records for Scotland so far have not been the true Continental species as understood by Hayne (Pugsley, Journ. Linn. Soc., Bot. xlviii. 523; 1930). He suggests that the Selkirk specimens are var. *obscura* Pugsley, but cannot be certain as they are rather young. There is no doubt, however, that they are *E. Rostkoviana* Hayne. I have to thank Mr. Pugsley for this identification.—E. O. CALLEN.

REVIEWS.

The London Clay Flora. By ELEANOR MARY REID and MARJORIE ELIZABETH JANE CHANDLER. 4to, pp. viii, 561, pls. 33, text-figs. 17. Trustees of the British Museum: British Museum (Natural History), 1933*. Price £2 10*s.* 0*d.*

THIS monumental volume is a memorial to the industry and scientific acumen of James Bowerbank, on whose collections and work it is based. In an introductory note written nearly a century after the publication of Bowerbank's 'Fossil Fruits of the London Clay' (1840) the authors pay a high compliment to his work, which has for them "stood for years as a model of what palæobotanical study and exposition ought to be. And never more so than when, as in the past few years, we have had occasion to scrutinize it in its every detail." Bowerbank's collection of London Clay fruits and seeds from Sheppey was

* We regret the delay in noticing this important work—by an oversight a copy has been only recently received.

bought by the British Museum in 1865, but, owing to decay from their pyritized condition, a large proportion of the original 25,000 specimens have perished. A contrast is made between Bowerbank's careful work and the unsatisfactory and erroneous list of Sheppey plants published (1879) by Baron Ettingshausen based on a hurried study of the collection. In a tabulated list the present authors have indicated their own determinations of the specimens included in Ettingshausen's list, which was published without descriptions or figures.

In his prefatory note, Dr. W. D. Lang, the Keeper of Geology, states that Mrs. Reid and Miss Chandler have devoted seven years to the elucidation of the still extensive relics of Bowerbank's collection, together with more recent acquisitions and material collected by themselves. They have produced a volume which will take high rank among descriptive works on palæobotany. Their notes on "the practical study of the London Clay fruits and seeds" indicate the tremendous advance towards accuracy in determination due to the improvement in methods of study and technique that they have adopted or developed. An important feature also has been their preparatory study of living fruits and seeds, especially of the Indo-Malayan genera in view of the presumed affinity of the London Clay Flora.

The authors' list contains about 215 species assigned to fifty families, in a few cases to recent genera, but mainly to genera more or less closely allied to recent ones, which have no modern representatives. A large proportion of the genera and species are described for the first time. Several new genera, though amply represented in the flora, it has not been possible to assign to any family. One, *Lagenoidea*, is represented by two species, which rank amongst the most abundant of the Sheppey fruits, and, it is suggested, belong to a family now extinct. The authors discuss in detail the evidence for and against inclusion of individual species in a living genus, and give reasons for their conclusion that a large proportion of the London Clay genera are extinct. These are based on a grouping of diagnostic characters that differs from those in recognised recent genera, on numerical changes in important characters such as "the reduction in the number of locules which, with the lapse of time, has occurred in, or in relation to, certain genera," and, finally, on changes of degree in many characters, where there is conformity among the living species in respect of certain characters which is wanting in the fossil. A similar difficulty has arisen in assigning certain genera to existing families; when the evidence seemed to warrant it species have been doubtfully placed within the living families to which they seemed to be allied.

As regards the affinities of the flora, the closest is with that of the Malay Islands, followed successively by the Malay Peninsula, Further India, and India and Ceylon. At a considerable interval

follow Australasia, Tropical Africa, China, and Japan, and the Himalayas, and in a less degree Central and South America. A striking feature is the almost complete absence of a phytogeographical affinity with Europe and Western Asia. Pure systematy would therefore recognise the tropical, largely Indo-Malayan, character of the London Clay Flora. But doubts have been expressed as to the value of plants as indexes of climate, based on the fact that tropical genera may contain extratropical species and on the assumption that in course of time plants may have changed in their reactions to climate. Relying partly on evidence afforded by Pleistocene floras during changes of climate, the authors conclude that plants *are* true indexes, but it must be the bulk of the flora that interprets the climate, not a few exceptions.

This being accepted, the more serious difficulty arises as to the possibilities of the existence of a tropical rain-forest flora of Indo-Malayan type in or about latitude 50° N. in Eocene times. Wegener's theory is rejected, as the permanence of the Atlantic Ocean is required to account for the preponderance of the eastern element. Dr. C. E. P. Brooks's hypothesis, involving changes in distribution of sea and land, with the aid of Dr. Simpson's hypothesis of change in solar radiation, is held to account for a hot Eocene climate at so high a latitude; and the London Clay flora is assumed to have reached what is now Southern England by way of the shores of the Tethys Sea, and to have been living in the Anglo-Belgian basin at its northernmost limit.

But these are all matters dealt with in the interesting and readable Introduction (pp. 3–90). The bulk of the volume is occupied by the detailed and painstaking "Systematic Description" of the fossils and discussions of their affinities in each case. The fine series of plates reproduced from Miss Chandler's photographs and depicting several hundreds of specimens are most helpful. The families Lauraceae, Annonaceae, Euphorbiaceae, and Palmae provide the greatest number of representatives. The commonest fossil is the palm-like *Nipa*, as to which the authors somewhat scornfully reject the fossil generic name *Nipadites*, perhaps with good reason. But they would seem to be less justified in including all the previously described species, doubtless far too numerous, in *N. Burtini*. This assumes a very wide variation in size and form.

The anticipation of the generic name *Platycarya* Sieb. & Zucc. (1843) by *Petrophiloides*, the name given to a fossil genus by Bowerbank in 1840, suggests an addition to the list of "Nomina generica conservanda."

The authors are to be congratulated on the completion of a fine piece of work and the authorities at the Museum on having made its production possible.—A. B. RENDLE.

Researches on Fungi. Vol. VI By Professor A. H. R. BULLER, F.R.S. Roy. 8vo, pp. xii, 513, text-figs. 231. Longmans, Green & Co. : London, 1934. Price 28*s.*

THE main part of the present volume of Professor Buller's work deals with researches accomplished some years ago of which only preliminary accounts have appeared. Whether this means that the author now intends to rest from his laborious task remains to be seen. It will be generally admitted that the six volumes have added a great deal to our knowledge of fungi and have had a definite influence on some aspects of mycology.

The volume is divided into three parts :—the biology and taxonomy of *Pilobolus* ; the production and liberation of spores in the Discomycetes ; and pseudorhizæ and gemmifers as organs of certain Hymenomycetes.

The account of *Pilobolus* occupies 189 pages, and as well as dealing with the author's own contributions gives a critical and detailed summary of previous work. There is also a systematic account of the genus by W. B. Grove which " may be considered to be a revision of the systematic part of the Monograph of the Pilobolidae " published fifty years ago.

The discharge of the sporangium in *Pilobolus* is a very well-known phenomenon. The sporangia are occasionally the cause of spotting of roses, Richardias, and other plants growing on a well-manured substratum, and have given trouble in identification. Link, so early as 1809, attributed the projection of the sporangium to the subsporangial swelling, but Buller showed some years ago that in addition to acting as a squirting apparatus the swelling is an optical sense organ (ocellus) responding to heliotropic stimuli, and so allowing for the sporangium to be shot off into an open space. A number of diagrams show clearly how light is refracted through the swelling, though, a small point, no mention is made of the effect of the watery drops excreted from the sporangiophore. A new species, *P. umbonatus*, is described, distinguished by its umbonate sporangium and minute ellipsoidal spores. As criteria which " should be added " to those so far employed by taxonomists are listed the shape of the subsporangial swelling, the ratio of the width of the sporangium to that of the subsporangial swelling, the nature of the depressions or wrinkles on dried discharged sporangia, and the nature of the fringe of the sporangium-wall of dried discharged sporangia.

The phenomenon of " puffing " in Discomycetes is well known. As Buller says, it was mentioned and figured by Micheli in 1729. There is, however, an earlier manuscript reference by A. Buddle in his ' Methodica nova stirpium Britannicum ' (*cf.* Essex Nat. xxiv, 176 ; 1934). Two additional ones to those given by Buller are Haller (1768) and Lightfoot (1777). The puffing is very frequently seen when a box containing Discomycetes is opened. Cultures of Ascobolaceae show the phenomenon

in a startling manner, for when the lid of a Petri dish is removed the hymenial surface changes suddenly from purple to yellow or white. Buller has studied the phenomenon by sectioning the hymenium and by experiment. He shows that when an apothecium puffs it produces a blast of air. If the asci of *Sarcoscypha protracta* were to explode separately they would eject the spores only about 1½ inches, whereas in puffing they may be carried upwards to a height of 5–7 inches.

The asci of the larger Discomycetes at least appear to be heliotropic. The discharge of spores is often audible, but this appears to have no biological significance. It is a little surprising to find a section with over twelve pages and nine illustrations headed "A simple method for rendering audible the puffing of Discomycetes "—one places the fruit-body to one's ear !

The last section deals with the pseudorhiza (" rooting base ") of *Collybia radicata*, *Mycena galericulata*, and *Coprinus macrorhizus*. The fruit-body begins as a primordium at the surface of a buried substratum. The primordium becomes differentiated into the primordia of the stipe and pileus. The primary stipe differentiates into stipe-shaft and stipe-base or pseudorhiza. The latter elongates by intercalary growth and pushes the rudimentary stipe-shaft and pileus through the soil. The pseudorhiza of *Collybia fusipes* is by contrast perennial, giving rise each year to new fruit-bodies from the stem. These each produce a pseudorhiza—thus the pseudorhiza increases in size and becomes more and more branched.

The last chapter deals with the remarkable *Omphalia flavida*, the cause of the American coffee-leaf disease. The so-called *Stilbum*-bodies are redescribed and shown to be gemmifers bearing gemmæ which when detached by abscission are capable of reproducing the fungus. The fungus is able to infect leaves other than those of coffee, and the mycelium is luminous.

The present volume has the same wealth of illustrations as its predecessors, but many will prefer the author's older style of drawing to his more modern " engineering " type. We must congratulate Professor Buller on having reached a definite point in the publication of his ' Researches '—over 2650 pages and 1000 illustrations.—J. RAMSBOTTOM.

The Botanist in Ireland. By R. LL. PRAEGER, D.Sc. Sm. 8vo, pp. xii, 507 (401 bearing numbers of sections 1–491, the remainder numbered 492–587), text-figs. 29, photograph-plates 44, col. maps 6. Hodges, Figgis & Co. : Dublin, 1934. Price 12*s.* 6*d.*

To those familiar with the author's ' Tourist's Flora of the West of Ireland ' this work needs no other commendation than to say that it does for the whole of Ireland all and more than

the earlier work did for a part of it. The author rightly says that Ireland is a pleasant green country where the botanist finds a charming freedom to wander and a considerable number of very interesting plants to attract him, and this attractiveness is set out in a pleasant and charming style—" all that I have to say at the conclusion of fifty years' field-work in Ireland . . . is embodied in condensed form in the present work . . . so while much remains to be done . . . it is hoped that the present account will be found to offer a tolerably balanced view of the flora of Ireland as it is at present known."

All matters of importance to the student of a flora are passed in review :—geological history in relation to present surface (sections 3–14), topography (15–21), climate (22–26), general history of the flora (27–28), character of the flora, which includes accounts of the various floristic elements and a comparison with the British flora, of the distribution of plants within Ireland, of woodland, grassland, peat-bog, marshes, lakes, calcicoles, calcifuges, coasts, islands, mountains, and human influence (29–76).

Short sections follow, dealing with the " Botanical Subdivision of Ireland " and with " Workers at the Flora." The latter serves as a bibliography, but other references are given at the ends of sections, in footnotes, and throughout the book. Sections 79–219 contain accounts of rare and interesting plants, in the order of the ' London Catalogue.' These summaries are excellent—up-to-date and well documented, full of information useful to the serious student.

The main portion of the volume (220–491) is a botanical tourist's guide book in which the features are described district by district. The reader is taken on tour (map, p. xii) from Dublin southwestward to Kerry, up to Connemara, round the north coast, and down to Louth, the interior being dealt with in detours. With this book in his bag, the botanist can travel with understanding of the topography, vegetation, and species of interest in his vicinity. One who has travelled in Ireland can travel again in imagination, and can even note points which he had failed to emphasise at the time. Information of all kinds has been swept up from various sources and is presented in a form both compact and eminently readable : the author's choice of vivid descriptive adjectives is especially pleasing. Pages 492–539 contain a list of all species (and hybrids) with a census of their occurrence in the vice-counties (map, p. 492), and the work is completed by a good index.

Individual specialists will find points to criticise, but that is inevitable in any compilation. Printing, paper, binding (except perhaps the dull cover), maps, photographs, all are good, and I have not met better value for the low price. It is a worthy monument of half a century of work.—A. J. Wilmott.

Index Filicum, Supplementum tertium, pro annis 1917–1933. By Carl Christensen. 8vo, pp. 219. H. Hagerup : Copenhagen, 1934.

Dr. Christensen is to be congratulated on the completion of a third supplement to this invaluable work. The ' Index Filicum ' has done for students of ferns what the ' Index Kewensis ' does for students of phanerogams. The arrangement of this supplement differs somewhat from those previously published, as the new species are no longer separated from the *corrigenda*—a marked improvement. The new supplement starts with a re-arrangement of the genera, of which 213 are admitted against 149 in 1906. On p. 16 there is an interesting summary of the number of species maintained—9387, compared with 8000 in 1917, 7411 in 1913, 5940 in 1906, and 2235 in 1868 (Baker, Syn. pt. vii.). The opinions of botanists have varied so greatly that these 9387 have been given no less than 30,304 names.

At the end of the volume Dr. Christensen gives a catalogue of books, which shows who has contributed to this steady increase in the number of known ferns. The most prolific writers are the late Prince Roland Bonaparte with a total of 17 papers, including those in previous supplements, R. C. Ching (25), C. Christensen (61), E. B. Copeland (67), B. Hayata (23), W. R. Maxon (84), and the late Prof. Rosenstock (33). Dr. Christensen's catalogue shows that work is not so confined to Europe as formerly, but is being published in many periodicals all over the world : a fact which makes it far more difficult for the modern student to see all the papers, except at a few great libraries. However, it is satisfactory to note that about three-quarters of those listed are in the English language. Another fact which is brought home to the British botanist is how small is the proportion of work, as judged purely by bulk, now done in this country compared with the nineteenth century, when Mr. J. G. Baker's papers and Sir W. Hooker's books represented a very large proportion of the work done on ferns. In the present supplement, excluding R. E. Holttum (eight papers) and H. N. Ridley (five papers), because most of their work has been done at Singapore, most of the taxonomic work done recently in Britain appears to have been by A. Gepp. It is probable then that the bulk of the ferns discovered in recent years are unrepresented in collections in this country. Another question which is more difficult to answer from a perusal of the new supplement is—What countries are producing the stream of novelties ? New Guinea is clearly one, and it is possible that the Malayan Archipelago will prove to have an even richer fern-flora than the Andes. China and Madagascar have also been rich fields ; on the other hand, there seems less from South America. But, nevertheless, all the wetter parts of the tropics are still yielding new species, and seem likely to continue to do so.—A. H. G. Alston.

A Bibliography of Gilbert White, the Naturalist and Antiquarian of Selborne, with a Biography and a Descriptive Account of the Village of Selborne. By EDWARD A. MARTIN, F.G.S. Cr. 8vo, pp. viii, 195, frontisp., 7 pls., and 9 text-figs. Halton & Co., Ltd.: London, 1934. Price 10*s.* 6*d.*

MR. MARTIN has been well advised to bring up to date his book on Gilbert White, originally issued over thirty years ago, and the present volume forms a useful addition to the extensive bibliography, the exhaustive précis of which occupies the latter half of the book. The various items are arranged chronologically, except that successive editions by the same editor follow each other. The interest of these is naturally a special one, but the first five chapters have a wider appeal, supplying an interesting account of the life and methods of work of the Selborne naturalist and a pleasing picture of his home and surroundings.

It is perhaps not strange that no portrait of so retiring a student of petty everyday happenings should have been available when his old college Oriel, Oxford, of which Gilbert was for fifty years a Fellow wished to have a portrait painted for their Hall. Mr. Martin, however, records a happy find in the shape of two pen-and-ink sketches on the fly-leaves of a presentation copy to White of the first edition of Pope's 'Iliad': "on my taking the degree of B.A., June 30th, 1743." They represent the same head, and one is inscribed "Portrait of J. W." These bear a close resemblance to the reputed portrait, formerly in the collection at Knebworth Hall. The three portraits are reproduced, the Knebworth Hall picture forming the frontispiece to the volume. The six volumes of the 'Iliad' have been acquired by the British Museum.

In his chapter on "The Wakes," where White lived for the last thirty-eight years of his life, Mr. Martin notes the subsequent alterations to the house and the possible demolition of the original portion unless it be purchased, when the opportunity arises, by the nation or by public subscription. An effort to purchase it on behalf of the nation in 1902-3 failed.

Gertrude Jekyll. A Memoir by FRANCIS JEKYLL. With a Foreword by Sir EDWIN LUTYENS. 8vo, pp. 248, frontisp., 15 pls., 3 text-figs. Jonathan Cape: London, 1934. Price 10*s.* 6*d.*

IT is fitting that some notice of Miss Jekyll's work should appear in the *Journal of Botany*, for, though perhaps not a botanist in the technical sense, she had a wide knowledge of plants in their native homes, acquired during visits to Switzerland and countries round the Mediterranean. The Memoir is the story of her life, the earlier days rich in very varied artistic interests, tending towards middle life to the realisation of her artistic

sense in the planning and beautifying of her own, and, in association with the architect, Sir Edwin Lutyens, many other gardens throughout the country. About 1880, when making the Garden at Munstead, in Surrey, she met William Robinson, and the development of the natural from the formal type of garden in which she played so great a part was largely inspired by this association.

The fruit of her practical experience was made available to other garden lovers in her numerous books and articles in gardening and other periodicals. 'Wood and Garden' and 'Home and Garden' appeared in 1899 and 1900. 'Colour in the Flower Garden' (1908) and others were issued in the "Country Life" Library.

The frontispiece is a reproduction of her portrait painted by William Nicholson in 1920.

Text-book of Pharmacognosy. By GEORGE EDWARD TREASE, B.Pharm., Ph.C., Lecturer on Pharmacognosy in the University College of Nottingham. Cr. 8vo, pp. x, 653, 187 text-figs. Baillière, Tyndall, and Cox: London, 1934. Price 21*s.*

THE exclusion of botany as a subject from the higher examinations in pharmacy in Great Britain has necessitated the study of a certain amount of systematic botany in conjunction with the study of pharmacognosy. That this subject becomes, in fact, a study in applied botany is evident from a survey of the contents of Mr. Trease's text-book. It is arranged in three parts—the first, "General Principles" (pp. 1–132), contains an historical introduction and chapters on the cultivation of medicinal plants (by H. M. Hirst), on Enzymes, Vitamins, and Hormones (by H. H. Barber), on collection and storage of drugs, insect and other pests, and London commerce in drugs, on plant principles and their extraction (by W. R. Heading), plant-phenols as an aid to identification (by A. H. Ware), and on the microscope and filtered ultra-violet light respectively as aids to identification.

Part II., which occupies the greater part of the book, entitled "Drugs of Vegetable Origin," is a systematic account of the drugs arranged under their respective Phyla, Orders, and Families. The important feature is naturally the drug, the source, history, preparation, characters, constituents, uses, etc., of which are described in detail, but these are prefaced by concise botanical descriptions of the orders and families to which they belong. Part III. is brief, and deals with a few animal products. A useful appendix is a list of Latin words with their meanings that are used as specific epithets.

The book is well illustrated; many of the figures are borrowed from various sources, of which due acknowledgment is made.

A Laboratory Guide for a Course in General Botany. By LEE BONAR, R. M. HOLMAN, and LUCILE ROUSH, of the Department of Botany of the University of California. Edition 3. Roy. 8vo, pp. xvii, 112, 1 text-fig. Wiley & Sons, New York; Chapman and Hall, London: 1934. Price 7*s.* 6*d.*

THIS laboratory guide is designed for a year's elementary course in botany in association with the use of Holman and Robbins's 'Elements' and 'Textbook' of Botany, "reading assignments" of which are indicated at the beginning of each lesson. The subject is divided into two parts, the first dealing with the structure and functions of seed-bearing plants arranged under the different organs and the second a study of a limited but representative number of types of the principal groups of plants. In each lesson material for study is indicated, and directions for work are given with notes on what the student must look for in his preparations. Some physiological exercises have been included in the form of directions for the observation of demonstrations. The only illustration is that of a simple apparatus for demonstrating respiration. A set of questions follows each lesson. An appendix provides instructions for making permanent preparations, and notes on procedure which will be useful to the teacher. There is also a glossary and a useful classified list of books for reference and collateral reading.

Annales Bryologici. Edited by FR. VERDOORN. Vol. VII. Pp. 163, with text-figs.—Supplementary Vol. IV. *Studien über Asiatische Jubuleae mit einer Einleitung: Bryologie und Hepaticologie, ihre Methodik und Zukunft.* By FR. VERDOORN. Pp. viii, 231, frontisp., and 32 text-figs. Martinus Nijhoff: The Hague, 1934. Price 6 Guilders each.

THE annual volume (VII.) of the Yearbook contains papers of varied interest. H. N. Dixon contributes a list of the mosses of Celebes based principally on G. Kjellberg's collection of 1929, to which other records have been added. The list includes twelve new species and forty hitherto unrecorded for the island. There is a marked affinity with the moss flora of Borneo, especially with the montane flora. Hans Buch gives a short list of species of *Plagiochila* from South Chile. Of ecological interest are two papers by Helmut Gams on the Steppe Mosses—*Funaria hungarica* Boros as an Aralo-caspian element, and the species of *Pterygoneuron* in the Alps and the *Stegonietum*. Th. Herzog continues his studies on *Drepanoleujeunea*, and gives an exhaustive and profusely illustrated account of the characters of six previously described species to which he adds two novelties from the Moluccas and Java, and K. Walther discusses in detail variability within the form-groups of *Polytrichum juniperinum* Willd. L. Loeske gives critical notes on *Tortula Freibergii* Dix. & Loeske, sp. nov., an Italian species, and on *T. obtusifolia* and allied forms, and also a centenary appreciation of the work of K. G. Limpricht. V. Schiffner discusses the systematic position of the genus *Macvicaria* recently described by Nicholson from China, and suggests that it should be regarded as a section of *Madotheca*; and G. Chalaud describes the development and germination of the multicellular spores of *Fegatella*.

The Supplement is dedicated to the memory of Richard Spruce, the founder of the study of the *Jubuleae*. It contains three sections of a systematic nature, in continuation of the author's study of the Frullaniaceae, dealing namely with the Asiatic (especially Indo-Malayan) and Australian Lejeuneaceae-Holostipae, the Asiatic species of the Tamariscineae, and some notes on recent collections. In an Introduction the author discusses methods of studying the Bryophyta, especially their taxonomy and nomenclature. The work of Stephani, more particularly the later sections of his 'Species Hepaticarum,' is severely criticised.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on January 10, Miss Ruby E. Dowling gave an account of her work on the ovary in the British species of the genus *Plantago*. The number of the ovary-cells and seeds has been generally used as affording characters distinctive of the species, and Miss Dowling's studies supplied additional evidence. In *P. Coronopus* the ovary is two-celled (not 3–4-celled, as has been assumed), and contains 5 ovules: 73 per cent. of the capsules contained 5 seeds, the remainder 1 to 4. In *P. major* the 2-celled capsule contains many seeds, counts revealed peak numbers of 10 to 18. It was suggested that hybridism might occur with a many-seeded variety equivalent to the Continental var. *polysperma*. In *P. media* there are 3 ovules in 2 tiers in each of the two cells: one-seeded capsules may result from abortion. In *P. maritima* there are usually 3 ovules, 2 on one side of the placenta, which has a double attachment above, and one on the other; there is often only one seed. *P. lanceolata* has one ovule in each of the two cells, one or both may develop to a seed: the one-seeded condition has not previously been observed.

The Botanical Secretary gave an abstract of a paper by Mr. A. H. R. Woodforde, of the Department of Agriculture, Tasmania, entitled "The Inheritance of a Substance in the Roots of Seedling Hybrid Derivatives of *Lolium perenne* L. × *Lolium multiflorum* Lam. causing a Fluorescent Reaction visible in Filter-paper by Screened Ultra-violet Light."

'THE GARDENS' BULLETIN, STRAITS SETTLEMENTS,' viii. pt. 1 (October 1934), contains a valuable critical communication by C. F. Symington on some Malayan Dipterocarps ("Notes on Malayan Dipterocarpaceae.—II."). A study of the Malayan species of *Anisoptera* leads to the conclusion that the recently segregated genus *Scaphula* Parker should not be maintained, but should be included in *Anisoptera* with a slight alteration in the generic definition. The same author clarifies the taxonomy of a much confused species, *Hopea sangal* Korthals, and gives preliminary results of his study of the anomalous genus *Balanocarpus* Bedd. (based on the doubtful character of a wingless calyx), the disruption of which is regarded as imminent with the distribution of its species among various groups of *Hopea* and *Shorea*. These papers are illustrated by ten well-drawn and highly informative plates. A. H. G. Alston's review of the genus *Selaginella* in the Malay Peninsula is a concise account of the synonymy and distribution of the species, of which twenty-five are recognised, with a key to their determination. J. A. Baker supplies some notes on the structure of the leaf and stem of species of *Macaranga* related to the presence of ants, which may afford partial protection from pests.

'JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY.'—The December number (lix. pt. 6) contains articles of special interest. Thomas Hay gives a review of botanical exploration in the "sealed country" of Nepal from Buchanan Hamilton (1802) and Wallich (1820) onwards. Serious botanical exploration began in 1928, with native collectors, and has resulted in notable additions in *Meconopsis*, *Primula*, and other genera of garden interest and many hundreds of specimens now in course of study at the Natural History Museum. There is a report of a lecture by D. E. Green on common diseases of the Rose and the results of experimental work at Wisley. "A Great Gardener Architect," by the Assistant Secretary, is an interesting account of the life and work of Sir Joseph Paxton, whose early training as a gardener was at the Society's Chiswick Gardens.

'SOUTH AFRICAN GARDENING AND COUNTRY LIFE.'—Mrs. L. Bolus contributes descriptions, with photographs, of five new species of Mesembryanthemums (*Argyroderma*) to the August and September numbers, and to the October number of *Freesia Framesii*, sp. nov. *Stapelia longipes* Luckhoff, sp. nov., is also described and figured in this last number.

MR. RONALD GOOD, Department of Botany, University College, Hull, who is working on the distribution of the Lizard Orchid (*Himantoglossum hircinum*), would be glad to receive authentic records of its occurrence in this country. These will be used in the construction of small-scale maps. No information received as to localities will be published.

ABNORMAL SPIKELETS IN THE GENUS *AGROSTIS* LINN.

BY W. R. PHILIPSON, B.A.

THERE are within the genus *Agrostis* certain abnormal states of the spikelets, to some of which systematists have given specific or varietal rank. Certain of these abnormalities are caused by the presence of parasites, and revert to their normal structure if they become free from the disease. Such forms, however well defined, cannot be allowed a taxonomic status as species or varieties, although the names they have been given die hard. The following abnormalities have been encountered during a revision of the British forms of *Agrostis*, and it is hoped that a fuller account than would be justified in a purely taxonomic paper will help to clarify the position of these misleading types.

The abnormalities are described under four heads, of which the first and third are due to a diseased condition of the plant and are of fairly frequent occurrence. The other two deviations from the normal are much rarer, and nothing is known of their cause or of their genetical behaviour :—

1. Infection with *Anguillina agrostis* (Steinbuch) Goodey.—*Agrostis sylvatica* Huds.
2. Proliferation.
3. Infection with *Tilletia decipiens* (Pers.) Körn.—*Agrostis pumila* L.
4. Two-flowered spikelets.

1. INFECTION WITH *ANGUILLINA AGROSTIS* (Steinbuch) Goodey. —*AGROSTIS SYLVATICA* Huds.

In the first edition of his ' Flora Anglica ' (1762, p. 28) Hudson includes a new species of *Agrostis*, *Agrostis sylvatica*, with the following diagnosis : "panicula coarctata mutica, calycibus æqualibus, corolla ante florescentiam calyce breviore, postea duplo longiore." He gives references to descriptions in Petiver (1716) and Ray (1724), and states that the grass was first discovered by Buddle in Bishop's Wood, Hampstead, adding another station, Hornsey Wood, where he had himself collected it.

The name given by Petiver (1716, p. 4), "Gramen Miliac. sylvestr. glumis oblongis," which was later taken up by Ray (1724), is hardly sufficient for the diagnosis of the plant, but he refers to Buddle as the original collector. There is a specimen of *Agrostis* with abnormal enlarged glumes and lemma in Buddle's herbarium at the British Museum. The specimen consists of a panicle without any foliage, but there are several normal spikelets in the panicle, so that diagnosis of the species is possible. The spikelets are awned and the palea is absent, so that there can be no doubt that it belongs to *A. canina* L. As the locality is written up as Hampstead, this must be the grass to which Petiver and Hudson refer.

The occurrence of the word " mutica " in Hudson's diagnosis makes it probable that his description was not based on Buddle's specimen, which is awned, but on another gathering, either of *A. stolonifera* L. or *A. tenuis* Sibth., which also showed the abnormal elongation of the glumes and lemma. Unfortunately, Hudson's herbarium is not available, but it is probable that the type of Hudson's species was his own gathering from Hornsey Wood recorded in the ' Flora Anglica.' There is no need to establish on what type Hudson based his *A. sylvatica*, because a specific or varietal epithet cannot be applied to an abnormality which is known to be due to the infection of a nematode worm.

Linnæus included Hudson's name in the ' Species Plantarum ' (ed. 3, 1665 ; 1764) and was followed by other continental authors. Hudson later (ed. 2, 32 ; 1778) included this grass as a variety of his great species *A. polymorpha*, and Withering, at first (ed. 1, 43 ; 1776) using Hudson's binominal, later (ed. 3, 133 ; 1796) regarded it as a variety of his *A. vulgaris*. Reichenbach (1834) figures panicle branches under the names *A. vulgaris* var. *vivipara* (fig. 1429) and *A. stolonifera* var. *vivipara* (fig. 1434), but the *A. sylvatica* figured in Host's ' Icones ' (fig. 58 ; 1809) is quite different, having no enlarged glumes. Other authors did not give this condition of the spikelets even a varietal rank, merely recording that " vivipary " sometimes occurred. Botanists seem to have been agreed that the abnormality occurred in both *A. stolonifera* L. and *A. tenuis* Sibth., and that the condition was an example of " vivipary."

Many botanists still believe this state to be a " viviparous " form of the species in which it is found, although zoologists have long been aware that it is a gall caused by the presence of the nematode *Anguillina agrostis* (Steinbuch) Goodey. As early as 1799 Steinbuch discovered and described this nematode under the name *Vibrio agrostis*. Later authors have given lists of grasses attacked by this nematode (Houard, 1908 ; Marcinowsky, 1909), but they do not appear to have understood the taxonomy of *Agrostis*.

Goodey (1930) gives a very thorough account of this parasite and its effect on the host plant. His description of the structure of galled spikelets and panicles needs no expansion.

Fig. 1 shows the appearance of a galled spikelet of *A. stolonifera* and fig. 2 that of a normal spikelet on a larger scale. The outstanding effects of the nematode are the enlargement of the glumes, usually unequally, so that the inner becomes the longer ; the lengthening of the lemma together with an increase in the number of its nerves ; and the development of the ovary into a spindle-shaped purple gall, in which the parasites are to be found. When this structure is compared with that of a spikelet showing proliferation (so-called " vivipary ") (fig. 3) important differences are apparent. In the first place, the glumes of proliferated spikelets in *Agrostis*, as in other genera, are not enlarged, as they are in the galled spikelets, but remain as in a normal spikelet, and the lemma when considerably enlarged shows a transition to the structure of a foliage leaf by the appearance

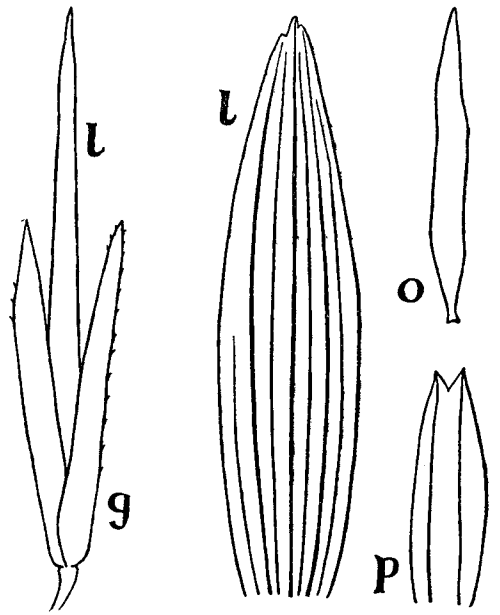

Fig. 1.—*Agrostis stolonifera* L. Gall of *Anguillina agrostis* (Steinbuch) Goodey. *g*, glumes ; *l*, lemma ; *p*, palea ; *o*, ovary. ×7½.

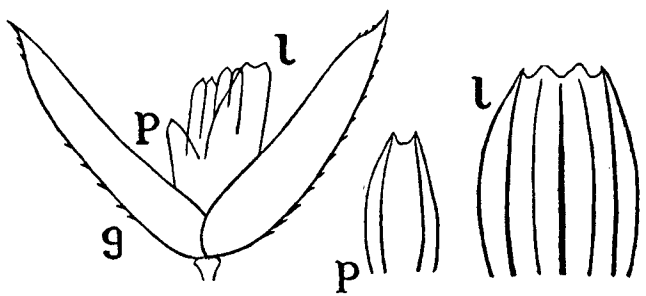

Fig. 2.—*Agrostis stolonifera* L. Normal spikelet. *g*, glumes ; *l*, lemma ; *p*, palea. ×15.

of blade and sheath regions, separated by a ventral scale, the ligule. No such scale is ever found in the galled lemmas, though they may be very large and many-nerved.

Proliferation in other genera of grasses has never been considered to be due to the presence of a parasite, and it seems apparent that there is no connection between this galled state of *Agrostis* and the proliferating spikelets next to be described.

2. Proliferation.

It is possible that the use of the term "vivipary" to include the galled condition of species of *Agrostis* produced by infection with *Anguillina agrostis* has blinded botanists to the occurrence of normal "vivipary"—or, more strictly, proliferation—in the spikelets of this genus. If such a condition were found, it would perhaps be considered to be *Agrostis sylvatica* Huds. and no particular notice be taken of it. As a result, I have not been able to find in the literature any reference to the occurrence of

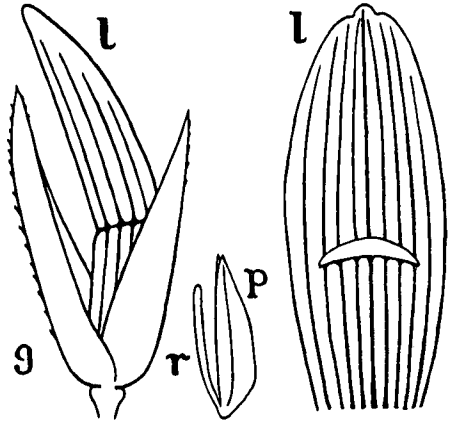

Fig. 3.—*Agrostis stolonifera* var. *maritima* Koch. Proliferating spikelet. *g*, glumes; *l*, lemma; *p*, palea; *r*, rhachilla. ×15.

proliferation in the spikelets of the genus. The descriptions of proliferating spikelets given below are from a plant of *A. stolonifera* var. *maritima* Koch growing in the Experimental Plots at the Royal Botanic Gardens, Kew. The plant was grown from a root collected on the damp cliffs below Tynemouth Castle, Northumberland, in the summer of 1933. At this time there was no indication of proliferation in this or any other plant examined at this station. The plant became well established at Kew, and in 1934 sent up nearly 200 panicles. Of these the great majority contained normal spikelets only, but two panicles contained a few proliferating spikelets among the predominating normal ones.

One of these proliferating spikelets is shown in fig 3. The two glumes when compared with a normal spikelet (fig. 2) are seen to be quite unchanged in any way The lemma, however, is enlarged, being considerably longer than the glumes, whereas

normally it is much shorter, and it has nine longitudinal nerves instead of the normal five. About a third of its length from the base can be seen a constriction, and at this level on the ventral surface is a small transparent scale, corresponding with the ligule of the normal foliage leaf, and marking the junction of sheath and blade. This scale did not extend from side to side of the lemma in any of the spikelets dissected, as does the normal ligule, but that is no doubt due to the fact that proliferation is not strongly developed, and the transition from lemma to leaf has not advanced very far, as it does in other species (Philipson, 1934). In the axil of the lemma is a flowering shoot bearing a small palea, two lodicules, and aborted sexual organs. The rhachilla is produced beyond the insertion of the lemma, while in normal spikelets it invariably terminates there.

The panicle from which the spikelet figured was taken contained several similar spikelets, chiefly towards its upper end; at the base the spikelets were mostly normal, while about the middle of the panicle the lemmas were more or less enlarged, showing all stages of transition from a normal five-nerved lemma to the type shown in fig. 3. The sexual organs of the spikelets with lemmas only slightly affected were quite functional, producing abundant pollen and setting seed. The rhachilla was only produced in the spikelets which had been most markedly affected by proliferation.

The other panicle which showed proliferation consisted almost entirely of normal spikelets, with only a few enlarged lemmas at the upper end. In these the lemmas were longer than in the spikelets of the panicle previously described, but differentiation into a foliage leaf had not progressed so far. They were all only seven-nerved with a very minute membranaceous scale on the ventral surface, inserted across the middle three nerves only. The apex of these lemmas was very definitely three-lobed, the small central lobe receiving three nerves, and each large lateral lobe two nerves. Only faint indications of these are left in the lemmas of the other panicle. The floral organs of these spikelets were reduced and functionless, and the rhachilla was not produced in them.

The structure of these abnormal spikelets of *Agrostis* is exactly parallel with that found in other grasses whose spikelets proliferate, e. g., *Poa alpina* (von Mohl, 1845), *Deschampsia caespitosa* (Philipson, 1934). The glumes remain unaltered and the lemma becomes enlarged with a membranaceous scale on its ventral surface, so that it closely resembles a minute foliage leaf. The floral organs become aborted with the enlargement of the lemma, and the rhachilla shows a tendency to elongation. There can therefore be no doubt that this plant of *A. stolonifera* var. *maritima* affords an example of true proliferation in no way connected with the gall produced by the presence of *Anguillina agrostis*.

3. Infection with *Tilletia decipiens* (Pers.) Körn. —*Agrostis pumila* L.

Linnæus ('Mantissa,' 31; 1767) describes a new species, *Agrostis pumila*, of low habit and with numerous erect culms. His description ends with the phrase "Semina majuscula." There is a specimen in the Linnean Herbarium named *A. pumila* by Linnæus, which shows these characters, including the enlarged ovary. Linnæus refers, in the 'Mantissa,' to a description by Scheucher (1719, 131), who also includes a reference to the enlarged "seed," in the final words of his name—"semine exiguo, rotundo."

This form of *Agrostis* was first recorded in Britain by Lightfoot (1777), who figures it on the title-page of his 'Flora Scotica,' but there is no specimen of this grass in his collection at Kew. Most authors considered this state of *Agrostis* to be a variety of *A. tenuis* Sibth., and frequent comment was made on its liability to fungal infection. There was, however, considerable hesitancy on the part of botanists to admit that the characters of this form were merely the symptoms of a disease. Perhaps this was because the diagnostic characters of this state are clearly defined, so that it was hard to believe that it was not a "good" species. The most important characters of *A. pumila* are the dwarf, closely cæspitose habit, with numerous short erect culms; the panicle usually very compact with undulating branches; the spikelets frequently with the glumes shorter and broader than in healthy specimens; and the ovary enlarged and dark-coloured. There is some variation in these characters in the diseased state, but this would be expected, since variation in the hosts before infection would be retained to some extent afterwards. The severity of the fungal attack no doubt also influences the extent to which the symptoms are developed.

Another, and perhaps the most important, factor which has tended to confuse the issue and make botanists doubt that this form was invariably diseased is the occurrence of a superficially similar form of *A. tenuis*, which is a true variety and does not owe its characters to the presence of a parasitic fungus. The typical form of *A. tenuis* may be very stunted on dry or poor soils, but will regain its normal vigour on transplantation to a good soil. There is, however, a low-growing form of *A. tenuis* which preserves its dwarf habit under cultivation, and is further distinguished by its extensively creeping rhizomes, its stiff rolled leaves, and the frequent occurrence of five instead of the normal three nerves in the lemma. This variety of *A. tenuis* has received scant notice in British floras; it is the *A. vulgaris* var. *curvata* Hack. recorded by Linton, p. 249 (1900), and is probably the same as the continental *A. vulgaris* var. *humilis* of Ascherson and Graebner (1899, p. 181).

The grouping together of all the dwarf forms and varieties of *A. tenuis* has obscured the true nature of the original *A. pumila* of Linnæus, undoubtedly the diseased condition, which was very distinct in the characters of its panicle and spikelets.

The fungus which infects the plant was described by Persoon (1801, p. 225) under the name *Uredo* (*Ustilago*) *segetum* ε. *decipiens* and its habitat given as "intra glumas *Agrostis pumilae* L., varietatis morbosæ *Agr. vulgaris*." Körnicke (1877, p. 30) later gave the fungus specific rank under the name *Tilletia*

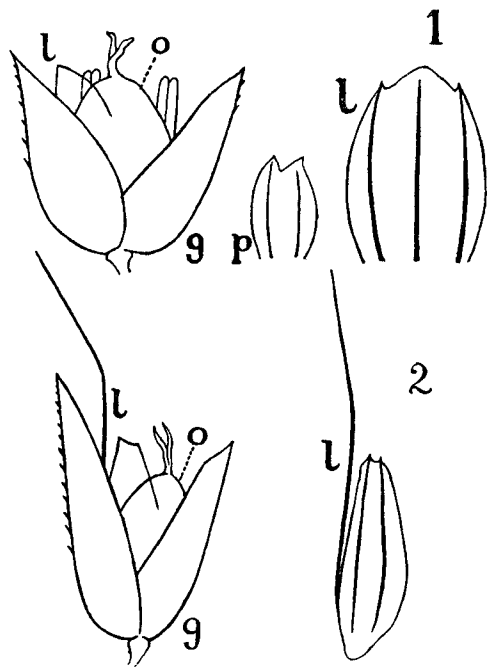

Fig. 4.—*Agrostis* infected with *Tilletia decipiens* (Pres.) Körn. 1. *A. tenuis* Sibth.; 2. *A. canina* L. *g*, glumes; *l*, lemma; *p*, palea; *o*, ovary. ×15.

decipiens. Synonyms are given in Winter (1884), Saccardo (1888), and Oudemans (1919). Although the parasite is most prevalent on *A. tenuis* it is also found on *A. stolonifera* and *A. canina*, when it produces the same symptoms of stunting and a crowded panicle. Rostrop (1901, p. 306), in the 'Botany of the Faeröes,' records the occurrence of *Tilletia decipiens* on *A. canina* at "Thorshaven and several other places." The spikelet of *A. canina* figured (fig. 4) was collected on Foula, one of the Shetlands, in 1928 by Mr. J. Gladstone. There are other

specimens of the diseased state of *A. canina* in the Kew Herbarium and the British Museum Herbarium.

Infected plants have been known to become free from the fungus under cultivation (Rept. Bot. Exch. Club, 1907, 319) when they revert to the characters of the typical *A. tenuis*, as can be seen from a specimen in the Bickham collection at Cambridge. There is a very interesting specimen of *A. pumila* in the British Museum Herbarium, collected by Ridley near Hereford, in which two culms are free from the parasite and have the typical appearance of *A. tenuis*, while the other culms are dwarfed and the panicles dense.

There are no longer any grounds for the retention of the name *Agrostis pumila* L. or any of its synonyms, since the original description was based on a diseased type and its characters are never present in the absence of the fungus.

4. Two-flowered spikelets.

The tribe Agrostideae, to which the genus *Agrostis* belongs, is characterised by spikelets consisting of a pair of sterile glumes and a single lemma and flower. The rhachilla may occasionally

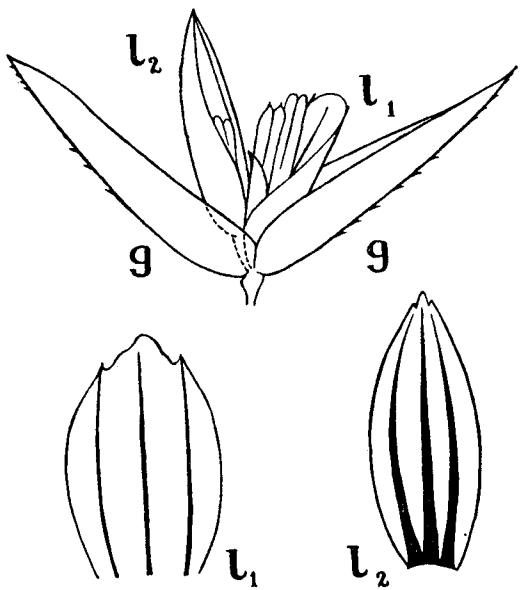

Fig. 5.—*Agrostis tenuis* Sibth. Two-flowered spikelet. *g*, glumes; l_1, l_2, first and second lemmas. ×15.

be prolonged in some genera, but not in *Agrostis* in its strictest sense, and deviation from the single-flowered condition is of extreme rarity. Lange (in Willkomm and Lange, Prodr. Fl. Hisp. 54; 1861) records the occurrence of plants of *A. setacea* Curt. with two-flowered spikelets, and gives this form the varietal name "*biflora*." The spikelet figured here (fig. 5) is from a specimen of *A. tenuis* Sibth. in the Kew Herbarium. It was originally in Hooker's Herbarium, but no locality is given. The single panicle has two-flowered spikelets especially on the upper branches, though the majority are perfectly normal.

Very little variation occurs in the structure of these abnormal spikelets, and the specimen figured may be taken as typical of them all. The glumes are normal and, though larger than the average for the species, by no means exceed the range of length normally found. The first lemma is perfectly developed and typical of *A. tenuis*, with three nerves, the lateral just excurrent, and a blunt apex. The palea, lodicules, and sexual organs are also normal. The prolonged rhachilla varies in length up to

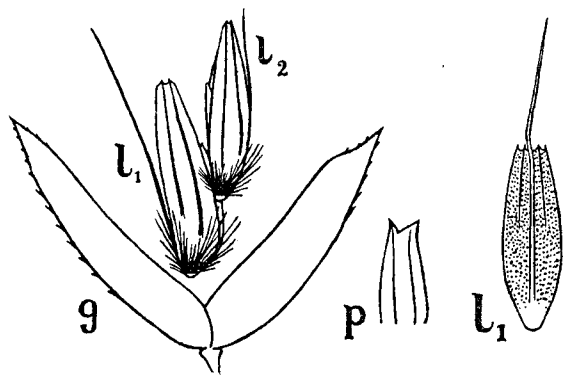

Fig. 6.—*Agrostis* sp. Two-flowered spikelet. *g*, glumes; l_1, l_2, first and second lemmas; *p*, palea of first flower. ×15.

1 mm., and bears at its extremity the second floret. The second lemma is not typical of the species, being coloured and not membranaceous (that is, more like a glume in texture), and the three nerves are broad like that of the glumes. This stronger texture is no doubt due to the more exposed position of the floret. The apex of the lemma is narrow, the two lateral nerves becoming excurrent close to the median line. In the largest of these upper lemmas the apex is quite entire, the two lateral nerves ending close to the median nerve, below the acute apex. The palea, lodicules, and sexual organs of these second florets are all normally developed, though usually slightly smaller than those of the first floret. They appear to be functional, but the young state of the inflorescence makes it impossible to say whether seed could be set or not.

Another specimen of *Agrostis* (fig. 6) with a few two-flowered spikelets in a panicle consisting mainly of single spikelets is

preserved in the British Museum Herbarium. This specimen was collected by Wm. Gardiner in Forfar in 1834. The identity of the species to which this abnormality belongs is difficult to determine, because the presence of a second floret is not the only aberrant feature of the plant. The lemmas both of the upper and lower florets are typical of *A. canina* not only in the awn which is sometimes present in *A. tenuis*, but in the possession of two pairs of lateral nerves each of which reaches the apex, to become shortly excurrent at the tip of a small tooth. The dorsal surface of the lemma is closely beset with a minute scabridity, which in *A. tenuis* is much less closely and less uniformly scattered. While the lemmas depart in no way from the form typical of *A. canina*, the paleas of both florets, instead of being so minute as to be practically absent, are quite as well developed as in *A. tenuis*—that is, they are over half the length of their lemmas. This enlargement might be considered to be additional evidence of the abnormality of the spikelet, of its tendency to elongation and promoted growth, especially as the tufts of basal hairs of each of the florets are also greatly elongated. The presence of the palea, with its suggestion of *A. tenuis*, cannot be so easily explained away, as the character of the ligule, which is short and blunt, also shows a resemblance to *A. tenuis*.

Large paleas are rarely found in plants otherwise conforming to the structure of *A. canina*, and when found the plants are usually considered to be hybrids with *A. tenuis*. It seems very probable that the present specimen is a hybrid, since it shows a combination of characters which are usually so clearly confined to two distinct species.

The upper floret is identical in structure with the lower, but is slightly smaller. The lemma is not thickened, and shows no tendency to resemble glumes. The sexual organs of the upper floret were so diminutive as to suggest that they were functionless.

In the proliferated spikelets of *Agrostis* described in this paper the rhachilla is in some instances produced beyond the insertion of the lemma, but does not bear additional lemmas as in proliferated spikelets of some other species. The production of two flowers in a normally one-flowered spikelet may be considered as a kind of proliferation, but, as it is unaccompanied by any transformation of the lemma towards a foliage leaf, it seems best to separate this condition from proliferation as normally understood in grasses. The cause of this abnormality and its genetical nature are unknown, but it seems possible that it is of significance in showing a close relationship between the tribes Agrostideae and Aveneae, for if the two-flowered spikelets were normal for the species, they would have to be placed in the latter group.

My thanks are due to the Department of Scientific and Industrial Research, which has awarded me a grant to help me to carry out taxonomic work on the British species of *Agrostis*. I also wish to thank the Director of the Royal Botanic Gardens, Kew, and Dr. Turrill and Mr. Hubbard of his staff for much advice and assistance throughout my work.

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A NEW BRITISH MINT.

By H. W. Pugsley, B.A., F.L.S.

When staying in September last at Salcombe, South Devon, I met with a patch of mint quite new to me, which I immediately recognized must be a hybrid between *Mentha rotundifolia* Huds. and *M. arvensis* L. The former species, which grows in numerous localities in South Devon, is peculiarly frequent about Salcombe, and *M. arvensis* occurs in many of the cornfields there. So far as I can trace, no cross between these species has hitherto been recorded for Britain, but the hybrid is known as a rarity both in France and Germany. Unlike some of our presumably hybrid mints, such as *M. piperita* L., which are survivals of mediæval cultivation, the new plant at Salcombe appears to have spontaneously arisen at the spot where I found it.

The earliest notices of a hybrid of this parentage appear in 'Flora,' 1854, 543, and 'Jahresbericht der Pollichia,' xii. 29, 37, & 38, where two forms are described by F. Schultz. The first of

these, *M. Wohlwerthiana*, is stated to have rotund-ovate, rugose leaves, and whorls of whitish or rosy flowers like *M. rotundifolia*; the second, *M. Muelleriana*, is characterized by foliage of somewhat similar form, but sub-cordate, more rugose and villous, and its verticillate flowers are of a lilac colour as in *M. arvensis*. There is authentic material in the British Museum Herbarium of both these plants. *M. Muelleriana* is represented by Schultz, Hb. Norm. no. 118, from the Bavarian Palatinate, near Weissemburg, and no. 118 *bis*, from Neuwied, in Rhenish Prussia. The specimens agree generally with the description, but the foliage appears but little more rugose and hirsute than that of *M. arvensis*. The calyx is long-hirsute and the stamens are included. *M. Wohlwerthiana*, also from Weissemburg, was sent out by Schultz under Hb. Norm. nos. 117 & 335. Both specimens show foliage similar to that of *M. Muelleriana*, and whitish corollas, no. 117 having small, short-pedicelled flowers with included stamens, no. 335 larger flowers on longer pedicels with exserted stamens. Schultz also issued nos. 117 *bis* and 335 *bis*, as *M. Wohlwerthiana*, from Lourdes, in the Pyrenees. These are rather dwarf examples of *arvensis*-like habit, and branched from the base. Their leaves are more villous, and those of the branches shortly petioled and relatively large. The flowers seem to have been lilac in colour, and they are not identical with the German form.

These plants were subsequently dealt with by Briquet in his "Fragmenta Monographiæ Labiatarum" (Bull. Soc. Bot. Genève, 1889), where (p. 57) they are treated as one hybrid, *M. Muelleriana*. Under this name Briquet combines with them *M. stachyoides* Host, Fl. Austr. ii. 146 (1831), which had not been described as a hybrid plant, and *M. arvensis* v. *micrantha* F. Schultz in 'Archives de Flore,' p. 194. ×*M. Muelleriana* is divided into three subspecies—*Muelleriana*, *stachyoides*, and *micrantha*. *M. stachyoides* differs widely from *M. Muelleriana* and *M. Wohlwerthiana* in its relatively narrow leaves; and *M. arvensis* v. *micrantha* is also quite distinct. Under the subspecies *Muelleriana*, Briquet includes *M. Wohlwerthiana* as a form or synonym, and also *M. carinthiaca* Bor. Fl. Centr. ed. 3, p. 514, founded on *M. carinthiaca* Host, Fl. Austr. ii. 149, of which I have seen no authentic material.

Rouy (Fl. Fr. xi. 391; 1909) adopts for the hybrid (*sensu lato*) the older name, *M. stachyoides* Host, and divides the forms into α *Scordiastrum* nob. (*M. Muelleriana* subsp. *stachyoides* Briq.), β *Malinvaldi* nob. (*M. arvensis* v. *micrantha* F. Schultz), γ *Wohlwerthiana* nob. (*M. Wohlwerthiana* F. Schultz), and δ *Muelleriana* nob. (*M. Muelleriana* F. Schultz). The hybrid is said to occur in France, always rarely, in localities where the parents grow together in abundance; var. β is given as "très rare," and var. δ as "la moins rare."

It is evident from a comparison of the Salcombe plant with the Continental forms that it is very close to *M. Muelleriana* and *M. Wohlwerthiana*, and quite distinct from *M. stachyoides* and *M. arvensis* v. *micrantha*. It agrees almost exactly with Schultz's original description of *M. Muelleriana* except that its leaf-margins are more serrate, and it accords well with the shorter accounts of Briquet and Rouy. Of the exsiccatæ examined it recalls most strongly Schultz, Hb. Norm. no. 117, *M. Wohlwerthiana*, but his has whitish flowers, and like the other German as well as the Lourdes specimens, less rugose, reticulate, and villous foliage.

On the whole, the new form seems best referred to ×*M. Muelleriana*, separable as a variety on account of its minor differences. Whether *M. Muelleriana* should be united with *M. stachyoides* under a single binominal is open to question.

The following description has been drawn up from the Salcombe specimens :—

×M. MUELLERIANA F. Schultz in Flora, 1854, 543; Jahresber. der Pollichia, xii. 29 & 38 (1854); Briquet, Fragmenta etc. in Bull. Soc. Bot. Genève, 1889, 57, as subsp. *Muelleriana*; ×*M. stachyoides* v. *Muelleriana* Rouy, Fl. Fr. xi. 391 (1909).

β **serratifolia,** var. nov.

Exsicc. Pugsley, no. 518.

Folia crassa, bullato-rugosa, reticulata, haud remote serrato-crenata, pilis crispatis partim ramosis subtomentosa, valde glandulosa. Pedicelli brevissimi; calyx parvus; stamina antheris abortivis exserta. Aliter ut in typo.

Flowering stems about 40 cm. high, stout, suberect, villous with crisped hairs, much branched almost from the base. Leaves crowded, thick, rugose, net-veined, serrate-crenate, and longer than the internodes; the cauline, except the uppermost, relatively large (–5 cm. long), the floral and those of the branches very much smaller (5–25 mm. long); all sessile except the lower cauline, which are shortly (–5 mm.) petioled; the cauline ±broadly ovate, obtuse, subcordate, those of the branches rather narrower, subacute, and subtruncate, the floral broader, ±rotundate or even broader than long, submucronate, the uppermost scarcely exceeding the flowers; all subtomentose, especially on the under surface, with crisped and partly branched hairs; markedly glandular with strong scent resembling that of *M. rotundifolia*. Flowers verticillate, in many rather crowded whorls, with lanceolate bracteoles shorter than the flowers. Pedicels very short (0·75 mm.), nearly glabrous; calyx small, about 2 mm. long, including the triangular-subulate teeth, which are about as long as the campanulate tube, densely glandular and hirsute, with finer hairs than in *M. arvensis*. Corolla purplish-lilac as in *M. arvensis*, about twice as long as the calyx,

pubescent externally. Stamens exserted, but shorter than the style ; anthers abortive.

A larger stouter plant than *M. arvensis*, of similar habit, but in foliage, indumentum, and scent recalling *M. rotundifolia* ; with the verticillate inflorescence and lilac corolla of *M. arvensis*, but a small campanulate calyx intermediate in form and clothing between the two parents.

As it unfortunately happens that the station for this rare plant is threatened with destruction, I shall be glad to facilitate the collection of further specimens during the coming summer. An example has been placed in the British Museum Herbarium.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

New Leguminosae from Tanganyika.

By E. G. Baker, F.L.S.

The following species have been collected by Mr. B. D. Burtt. Except where otherwise stated, the specimens are in the British Museum Herbarium :—

Indigofera gyrocarpa, sp. nov. *Frutex* ad *I. rhynchocarpam* Welw. accedens. *Stipulæ* subulatæ 6–10 mm. longæ. *Folia* imparipinnata ; foliolis sæpissime 5–7, foliolis terminalibus obovatis 20–45 mm. longis, 15–30 mm. latis, foliolis lateralibus late ovatis vel suborbicularibus, superne glabris discoloribus subtus pallidioribus. *Flores* in racemos dispositi. *Calyx* in toto 2–3 mm. longus. *Vexillum* elliptico-oblongum 12–13 mm. longum ±8 mm. latum. *Alæ* oblongæ. *Carina* 11–13 mm. longa. *Legumen* ±10-spermum apice curvatum.

Hab. Tanganyika Territory : Manyoni, below kopje at 4200 ft., December 28, 1931, *B. D. Burtt* 3452 (type). " Shrubby plant to about 6 ft. high, flowers creamy-white tinged with pink. Frequent in *Berlinia-Brachystegia utilis* woods." Kondoa District, Mangoloma, near Luchokoa, alt. 4500 ft. approximately, March 15, 1928, *B. D. Burtt* 1734 (type of fruit). Native name : " mateja."

This is an ally of *I. rhynchocarpa* Welw. It differs entirely in the shape of the leaflets ; the terminal leaflets are obovate. Also allied to *I. Garckeana* Vatke, but differs in the texture of the cortex and pubescence of the leaves, etc.

Smithia Burttii, sp. nov. *Herba* gracilis ad *S. capituliferam* Welw. valde accedens. *Caulis* erectus ramosus 7–10 cm. altus. *Folia* 3–5-juga ; foliolis oblongo-obovatis 3–5 mm. longis. *Stipulæ* acutæ deorsum non protractæ. *Flores* in apice caulis et ramulorum cymulosi congesti. *Bracteæ* glabræ non glandulosæ. *Calyx* ±2·5 mm. longus, dentibus inæqualibus. *Vexillum* roseum 3–4 mm. longum, panduriformi-obovatum. *Alæ* anguste oblongæ cum ungue 3–4 mm. longæ. *Carina* purpureo-rosea ±4 mm. longa. *Ovarium* ±2 ovulatum. *Legumen* biarticulatum.

Hab. Tanganyika Territory : Manyoni District, Kazikazi, alt. 4200 ft. Drier margins of *Lannea humilis* marshy glades, May 20, 1932, *B. D. Burtt* 3582 (type). " Bright green foliage, pink standard, purple-mauve keel. Flowers in afternoon."

This is a small branched herb with much the aspect and habit of *Smithia capitulifera* Welw. from Angola, from which it differs in the colour of the flowers (those of *S. capitulifera* are white), in having fewer leaflets, and the bracts not ciliate nor glandular.

Aeschynomene Burttii, sp. nov. *Frutex* ad *A. fulgidam* Welw. accedens, ramis cortice ferrugineo obtectis. *Folia* 20–30-juga, foliolis linearibus 4–7 mm. longis, 1·5 mm. latis, utrinque glabris, margine sparse hirtis. *Flores* majusculi in racemos laxos dispositi. *Bracteæ* striatæ 4–5 mm. longæ. *Pedicelli* graciles. *Calyx* bilabiatus 10–12 mm. *Vexillum* oblongo-obovatum cum ungue 19–20 mm. longum. *Alæ* basi unguiculatæ cum ungue 20 mm. longæ. *Carina* dorso rotundata cum ungue 13 mm. longa. *Legumen* sæpissime biarticulatum articulis 6–7 mm. longis, 5–6 latis.

Hab. Tanganyika Territory : Mpwapwa ; head of Tubugwe Valley, alt. 5000 ft. and over, August 3, 1933, *B. D. Burtt* 4780 (type). " Growing on gravelly quartzite hilltops among stunted *Brachystegia* and *Uapaca Kirkiana*. A dark green shrub growing very compactly like a cypress, with pale yellow flowers. Locally frequent." August 20, 1930. *Greenway* 2426 (Herb. Kew.).

Baphia (*Delaria*) **Burttii,** sp. nov. *Frutex* erectus circ. 10-pedalis ad *B. massaiensem* Taub. accedens. *Folia* ovata vel oblongo-ovata apicem versus attenuata apice ipso obtusa 4–8 cm. longa, 2·5–5 cm. lata, superne glabra subtus sparse pubescentia ; petiolis brevibus ±5 mm. longis, rufo-pubescentibus. *Flores* in racemos 2–3-floros dispositi racemis axillaribus. *Calyx* 8–10 mm. longus, extus pubescens. *Vexillum* ±11 mm. longum, 15 mm. latum. *Alæ* cum unguibus ±13 mm. longæ. *Carina* cum ungue 11–12 mm. longa. *Legumen* rectum glabrum apice mucronatum 9–11 cm. longum ±2·5 cm. latum 2–3-spermum, extus brunneo-purpureum.

Hab. Tanganyika Territory : Flowers and young leaves. "A rare and local constituent of the great thickets at Itigi-Saranda, between Singeda and Manyoni, December 1, 1926," *B. D. Burtt* 527 B. Mature leaves and pods. " Rocky ' duricrust ' decayed granite soils very shallow, on Rift wall." Manyoni District, Rift escarpment between Kilimatandi and Saranda, alt. 3600 ft., January 20, 1933, *B. D. Burtt* 4580. " Coppicing

shrubs to 10 ft. high, fruit larger than *B. massaiensis* Taub. Shrubs with erect stems, not spreading or ' weeping-over ' like *massaiensis* and flowers appearing a month or more later. Very local."

An ally of *B. massaiensis* Taub., but differing in its erect, not divaricate habit, the pubescence and venation of the leaves, the more pointed flower-beds and larger purple-brown pods.

Cassia (*Carthartocarpus*) **Burttii,** sp. nov. *Frutex* ad *C. Fistulam* Linn. et *C. Sieberianum* DC. accedens, circ. 6-pedalis. *Folia* ±7-juga, foliolis glabris ellipticis vel ovato-ellipticis 5–7 cm. longis, 3–4 cm. latis, apice subacutis foliolis proximalibus minoribus 3–3·5 cm. longis ; petiolulis 4–5 mm. longis sparsissime pubescentibus. *Flores* albi in racemos laxos et elongatos dispositi. *Pedicelli* 2·5–3 cm. longi. *Calyx* ±8 mm. longus, sepalis ellipticis. *Petala* oblongo-obovata, 15–17 mm. longa. *Stamina* 3 longiora, antheris 4–5 mm. longis, 7 breviora. [*Legumen* ignotum.]

Hab. TANGANYIKA TERRITORY : Morogoro District, loosely branched shrub 6 ft. high, with branched racemes in open thicket along small dry ditch in *Combretum* savannah, Wami Road, at 1700 ft., December 9, 1933, *B. D. Burtt* 5032 (type) ; Uluguru, *H. J. Schlieben* 3096 ; Lindi Provence, Tendaguru, slender tree, flowers white, wooded grassland on hillside at 700 ft., November 27, 1930, *J. W. H. Migeod* 1008, flowers white, slight scent, November 5, 1929, 651.

This shrub or slender tree is a close ally of *Cassia Sieberiana* DC. and *C. Fistula* Linn. It has glabrous leaflets in about 7 pairs. The flowers are white, which distinguishes it from *C. Sieberiana* DC. The inflorescence is lax and branched. The calyx is 8 mm. long and the petals 15–17 mm. long.

Corbichonia decumbens (Forsk.) Exell, comb. nov. (*Orygia decumbens* Forsk., Fl. Aegypt.-Arab. 103 (1775) ; *Glinus trianthemoides* Heyne ex Roth., Nov. Pl. Sp. 231 (1821) ; *Axonotechium trianthemoides* (Heyne) Fenzl, in Ann. Wien. Mus. Naturgesch. i. 355 (1836)).

The genus *Orygia* Forsk. was based on two species, *O. portulacifolia* and *O. decumbens*. The former is a species of *Talinum* (*T. portulacifolium* (Forsk.) Aschers.) : the latter belongs to the Molluginaceae, and the name *Orygia* is usually maintained in that family. There can be no doubt, however, that *Orygia* should be considered a synonym of *Talinum* Adans., for the type-species of the former genus is obviously *O. portulacifolia*, not *O. decumbens*. Forskål's generic description (ORYGIA. Polyandria, monogynia. Pentapetala infera. Calyx diphyllus. Capsula 3-valvis, unilocularis) agrees in every respect with *O. portulacifolia*, while it definitely excludes *O. decumbens*, which is described as " Calyx 5-phyllus . . . Petala multa, 20 ? . . . Capsula . . . 5-valvis, 5-locularis." *Orygia* Forsk. is thus a synonym of *Talinum* Adans. and the genus erroneously known as *Orygia* in the Molluginaceae, becomes *Corbichonia* Scop. (Introd. Hist. Nat. 264; 1775)). Scopoli straightened the matter up correctly, but did not actually make the combination *C. decumbens*. It was made by Daydon Jackson, Index Kew. Suppl. i., Addend. 474 (1906), but only as a *nomen synonymum*.—A. W. EXELL.

BUDDLEJA LONGIFOLIA Gagnepain.

This species was described by Gagnepain in Lecomte, Not. Syst. ii. 190, 191 (1912), and was based on Yunnan material collected by Delavay at Kichan, near Tali, and also in the neighbourhood of Tapin-tze, in 1884 and 1889. It has since been found on the Chienchuan–Mekong divide, Yunnan, and in N.E. Upper Burma by Forrest. Recently, when identifying as this species an unnamed *Buddleja* cultivated in Col. Stephenson Clarke's garden at Borde Hill, I found the name *B. longifolia* already occupied by a plant from the Peruvian Andes—*B. longifolia* H. B. K. (1818)—which Gagnepain had evidently overlooked. The Yunnan plant being thus left without a legitimate name, I propose calling it *Buddleja pterocaulis* as follows :—

Buddleja pterocaulis A. B. Jackson, nom. nov. *B. longifolia* Gagnepain in Lecomte, Not. Syst. ii. 190, 191 (1912)—non *B. longifolia* H. B. K. Nov. Gen. & Sp. Pl. ii. 349, t. 186 (1818).—A. B. JACKSON.

Cytisus Welwitschii (Boiss. & Reut.) A. B. Jackson, comb. nov. *Sarothamnus Welwitschii* Boiss. & Reut. Pugill. Pl. Nov. 28 (1852).

This plant is cultivated at Mr. H. White's Sunningdale nursery and elsewhere as *C. grandiflorus* (Brot.) DC., having been known for many years as the " woolly-podded broom." It was originally described as *Sarothamnus Welwitschii* by Boissier & Reuter in 1852, but the combination under *Cytisus* does not appear to have been made.—A. B. JACKSON.

OBITUARY.

JOHN FRASER

(1854–1935).

THE death of John Fraser in Charing Cross Hospital on January 24, as the result of being knocked down by a cyclist in Kingsway a week previously, has robbed Horticulture of an old and devoted adherent. Fraser was born at Newdeer, Aberdeenshire, January 31, 1854, and was educated at the Parish School, Monquhitter, and the Grammar School, Aberdeen. He received his early horticultural training in Scottish gardens.

Coming south in 1880 he studied at the Birkbeck Institute, taking honours in botany. After two years with the Royal Horticultural Society at Chiswick, he joined the garden staff at Kew. He became botanical assistant to Sir John Lubbock, later Lord Avebury, in 1885, collaborating with him in his work on seedlings. In this connection he worked in the Jodrell Laboratory, Kew, 1885–6 and again in 1909–10.

Fraser joined the staff of the now defunct ' Gardening World ' in 1885, becoming its editor in 1897. When twelve years later that publication was incorporated with one of the gardening papers published by the Cable Publishing Co., he became a regular member of their staff. For many years he was associated with the work of the Royal Horticultural Society on the Scientific Committee and as External Examiner at Wisley (1908–34); and also acted in a similar capacity at Chelmsford in 1895 where he conducted courses in Horticulture in the early 'nineties. He edited a revised edition of Johnson's ' Gardener's Dictionary ' in 1917, contributed chapters to Thomson's ' Gardener's Assistant ' and other horticultural publications, compiled a series of small handbooks designed for amateur gardeners, and was a regular contributor to the principal horticultural periodicals.

Fraser took up field botany in 1874 and became a keen collector and a good critical botanist. He devoted special attention to *Salix* and *Mentha*, upon which he became an acknowledged authority, and published valuable notes in some of the more recent Reports of the Botanical Society and Exchange Club. Most of his Sundays were spent in solitary botanical excursions, very largely in Surrey, which he scoured from end to end in search of his beloved willows and mints. He was also familiar with most of the Scottish willows in their native habitats.

His services to Horticulture were recognised by the Royal Horticultural Society in 1922, when he became the recipient of the V.M.H., and seven years later when he received the Veitch Memorial Medal and £50 for his work on *Mentha*, *Salix*, and *Pelargonium*. He was elected a Fellow of the Linnean Society in 1889.

Fraser was in many respects a remarkable man, his industry was amazing and his work was characterized by great care and thoroughness. His knowledge of gardening and everything relating thereto was encyclopædic, and was always freely placed at the disposal of anyone who cared to consult him. In spite of advancing years his powers showed no sign of slackening.

His familiar Dickensian figure in top-hat, with shaggy beard, taking voluminous notes, was a constant attendant at the Royal Horticultural Society's shows. He cared but little for the social amenities of life. He lived and worked at Kew in one room surrounded by half-a-century's accumulations of books and specimens, yet everything was in perfect order. His extensive and valuable British Herbarium has at his own request been given to the Royal Botanic Gardens. He was a kindly and lovable man, to whom the writer with many others is indebted for much help and advice, and, having enjoyed his friendship for nearly thirty years, death comes as a personal loss.—A. B. Jackson.

REVIEWS.

International Rules of Botanical Nomenclature adopted by the International Botanical Congresses of Vienna, 1905, and Brussels, 1910, revised by the International Botanical Congress of Cambridge, 1930. Compiled by the Editorial Committee for Nomenclature from the Report of the subsection of Nomenclature prepared by the late John Briquet. 4to, pp. xi, 152. Gustav Fischer: Jena, 1935. Price R.M. 7.

At the International Botanical Congress at Paris in 1930, Dr. Briquet was appointed to act as Rapporteur to a Committee which should receive and report on suggestions and resolutions for the revision of the code of "Laws of Nomenclature," prepared by Alphonse de Candolle in 1867. The exhaustive "Texte Synoptique," prepared by Briquet, formed the basis of discussion at the Vienna Congress in 1905. The revised "Rules," drafted by an Editorial Committee working under Briquet's guidance as Rapporteur Général, were published in 1906. The process of preparation was repeated for the completion of the revised Rules at the Brussels Congress in 1910, and the second edition was published by Briquet as Rapporteur Général in the name of the Editorial Committee in 1912. The experience of twenty-five years of working was brought to bear on the revision, and in part recasting of the Rules, at the Cambridge Congress in 1930, which is still fresh in our minds. Again the brunt of preparation fell upon Briquet, and it was a hard fate that he was not able to set the seal on the work extending over thirty years by preparing the draft of the revised Rules. His colleagues of the Editorial Committee were almost daily expecting to receive Briquet's preliminary draft when the news came of his untimely death.

Briquet's report of the work of the Subsection of Nomenclature was incorporated in the General Report of the Cambridge Congress, published in 1931, and it devolved on the remaining members of the Editorial Committee to prepare the revised draft from this and the notes taken by the Recorders at the Congress. Dr. Harms, Vice-Rapporteur, suggested that, as the "Proposals" presented to the Congress by a group of British botanists were the basis of many of the alterations introduced into the Rules, I, as the English member of the Committee, should prepare the first draft. Owing to the delay in the preparation of the French and German translations it was agreed that the English draft of the Rules, apart from the

Examples, should be published first in order to give botanists due time to consider them before the next Congress. This was done, with a note explaining the circumstances and manner of preparation, as a Supplement to this Journal, in June 1934. The third member of the Editorial Committee, Prof. Al. Mangin, did not feel equal to the task of preparing the French draft and, at his suggestion, Prof. Hochreutiner, Dr. Briquet's successor at Geneva, was asked to undertake the work.

The new edition of the Rules conforms to the two previous editions, also published by Messrs. Fischer of Jena. Dr. Harms has acted as General Editor, and the Editorial Committee share the responsibility for the whole work. As the English draft formed the basis of discussion, this appears first, and is followed by the French and German translations by Prof. Hochreutiner and Dr. Harms. Two only of the seven Appendixes contemplated at the Congress have as yet been prepared, namely the revised list of *Nomina generica conservanda*, and that on the Nomenclature of Garden Plants.

The prefaces to the two previous editions are reproduced, and Dr. Harms writes a Foreword on the preparation of the work, with an acknowledgment of the help received from members of the British subcommittee and other botanists.

A Supplement contains material for consideration at the next Congress in the form of a list of generic names proposed for conservation submitted by various botanists, and the two lists of proposed standard species, by Dr. A. S. Hitchcock and Miss M. L. Green, reprinted from the 'Proposals by British Botanists' (1929). There is an 'Index Analytique' and a short *résumé* of the more important alterations in the Rules as compared with the second edition. There will evidently be plenty of work for the Amsterdam Meeting, which should receive for consideration drafts of the five remaining appendixes, namely, Regulations for determining types, Names of families recommended for conservation, lists of *Nomina ambigua* and *Nomina confusa*, and of recognized representative Botanical Institutions. Further, the last article of the Rules, "Modifications accepted at one Congress remain on trial until the next Congress, at which they will receive sanction, unless undesirable consequences, reported to the Executive Committee, show need for further amendment or rejection" may provide material for discussion. It would certainly seem desirable to reconsider Article 61, which deals with "later homonyms," especially the procedure to be adopted in the case of earlier homonyms which are illegitimate. The difference of opinion among botanists as to the mode of citation required by Article 54, when a specific epithet has been applied erroneously on transference to another genus, indicates that the Rule does not conform to the principle (Article 3) that "the Rules of Nomenclature should be simple and founded on considerations sufficiently clear and forcible for everyone to comprehend."

The work of the Committee has not been easy. But, to quote the final words of Dr. Harms's "Vorwort," we may hope "dass auch diese Ausgabe die Arbeiten der systematischen Botanik fördern möge."—A. B. RENDLE.

Carotinoide. Ein biochemischer Bericht über pflanzliche und tierische Polyenfarbstoffe. By Professor Dr. L. ZECHMEISTER. 8vo, pp. xii, 338, 85 text-figs. Julius Springer: Berlin, 1934. Price R.M. 28.

THE name Carotinoid was first suggested by Tswett in 1911 for the group of yellow or red fat soluble pigments of which the best-known representative was the hydrocarbon carotin, $C_{40}H_{56}$, the pigment of the carrot. Associated in the green leaf with chlorophylls *a* and *b* are invariably found carotin and anthophyll, and in the brown algæ there occurs, in addition, one other member of this group namely fucoxanthin. Within recent years intensive study of the yellow pigments of the plant world has brought to light the existence of some twenty odd members of this group of substances. Of these only carotin and lycopin are hydrocarbons of the empirical formula $C_{40}H_{56}$, all the rest contain varying quantities of oxygen—some of them being alcohols, some acids, and one (namely, rhodoxanthin) a ketone. These substances occur in all kinds of different plant organs, but we have no knowledge whatever regarding their physiological significance. So far as we know at present, only plants are able to synthesise carotinoids, and where they occur in the animal world they are presumed to have been obtained from vegetable food consumed by the animal. The discovery that carotin could be converted by the animal into vitamin A greatly stimulated the study of carotin, with the result that it was found that there were no less than three isomeric carotins α, β, and γ, and that while carotin β has been found to occur alone in several plant materials examined, carotin α never occurs by itself, the pigment of the carrot, for example, being a mixture of the α and β varieties. In the volume under review the author has presented a full and lucid account of the present state of our knowledge regarding the chemistry of this very interesting group of pigments, to which he himself has greatly contributed; he has, moreover, constantly born in mind the biological aspects of the question; the various hypotheses which have been from time to time set up regarding the function of the carotinoids in the plant are also referred to, but it is a melancholy reflection that not one of these hypotheses is backed by any experimental evidence, and we have to admit that we do not know. The book contains a mass of information and will be found of the greatest interest to all, whether chemists or botanists, who are interested in the plant and wish to obtain a comprehensive summary of the subject.—P. HAAS.

Negro Sahara. Von der Guineaküste zum Mittelmeer. By ARNOLD HEIM. 8vo, pp. 160, map, 198 photogr., 20 text-figs. Hans Huber: Berne, 1934. Price not stated.

THERE recently appeared in this Journal (1934, p. 115) a notice of Arnold Heim's 'Minya Gongkar,' a beautifully illustrated account of a journey of exploration in the high mountains of Chinese Thibet. The present volume describes a tour through country of a very different character—a journey by motor car from the Guinea Coast at Abidjan to Algiers, traversing the Ivory Coast Colony, French Soudan, and the long stretch of the Sahara, including a visit to the Hoggar Mountains. The writer is a good observer, and his book gives an interesting account of the natural features of the country and the manners and customs of the natives. His special interests would seem to be ethnology and geology, but his descriptions and photographs enable the reader to picture the general physical features of the country traversed, and while botany in the text is mainly confined to mention of the more striking species met with and their uses by the inhabitants, the photographs give an idea of the variety of the vegetation. Such are those depicting the oil- and *Borassus*-palm associations of the coast-lands and the savannas, the grass-lands, the baobab, and the date-palms of the desert-oases. One's regret is that the author had not a genuine botanist as a companion during his trip. It should be added that the production of the text and illustrations is excellent.

Floræ Siamensis Enumeratio: a List of the Plants known from Siam, with Records of their Occurrence. By W. G. CRAIB, M.A., F.L.S., F.R.S.E. Vol. II. pt. 2. Rubiaceae (concluded) to Dipsacaceae. 8vo, pp. 147–234. The Siam Society, Bangkok; Luzac & Co., London, 1934. Price 12*s.* 10*d.*

A PREFATORY note by Dr. A. Kerr refers to the sad death of the author while this part of his Flora was in the press. Dr. Kerr hopes to carry on the enumeration as nearly as possible on the lines already laid down. Professor Craib had done a great deal of preparatory work on the remaining sympetalous families, full use of which will be made in preparing subsequent parts. The present part is almost entirely occupied with the conclusion of the Rubiaceae, the genera *Ixora*, *Psychotria*, and *Lasianthus* providing each a large number of species. Valerianaceae and Dipsacaceae are represented by single species of *Valeriana* and *Scabiosa* respectively.

A list of Errata in Volume I. is included with this part

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on January 24, the President, Dr. W. T. Calman, F.R.S., in the Chair, Dr. G. S. Carter gave some account of the work of the Cambridge Expedition to British Guiana, 1933, on the physical characters of the rivers and streams, the salinity of which was found to be remarkably low. Mr. T. G. Tutin described the general characters of the vegetation, forest, savanna, and marsh-land. The algal flora of the rivers was very poor, that of the streams somewhat less poor, but the grass swamps showed a rich algal flora with marked seasonal changes. A feature of interest of the swamps was the presence of various species of *Utricularia*, some of which had a very limited distribution.

Prof. R. R. Gates gave a précis of a paper by Mr. P. J. Gregory (now in India), entitled the floral morphology and cytology of *Elettaria Cardamomum* Maton. The vascular structure of the flower had been studied in detail by means of serial sections. The pedicel contains three peripheral groups and one central group of three vascular bundles each. By tracing their history it is shown that the labellum, regarding which there have been different views, consists of three parts, the middle portion with the two staminodes making up the outer staminal whorl, while the two lateral portions of the labellum together with the functional (posterior) stamen make up the inner whorl. The two structures which have been denominated as glands, staminodes, and even stylodes are shown to be true glands having no vascular structure. The three carpels are in a close spiral and not a true whorl. Their development is found to support the classical theory of carpellary leaves bearing marginal ovules, and the carpels are sunk in the stem apex to form the inferior ovary. The development of the ovule and female gametophyte are also described and the cytological history is given. There are 24 pairs of chromosomes and the pollen grains are spiny—a rare condition among Monocotyledons.

The General Meeting on February 7 was devoted to exhibits which included the following:—

Hybrid vigour in embryos of *Zea* (Dr. Eric Ashby); Leaf-polymorphism in the genus *Polypodium* (Mr. F. Ballard); Release of oogonia in the Fucaceae (Dr. E. M. Delf); South Haven Peninsula Survey: the history of the Peninsula and the distribution of the Crambidae (Grass-moths) in relation to types of vegetation (Capt. Cyril Diver); Two submerged 'moss-balls' from Lake Inawashiro, Japan (Mr. H. N. Dixon); Well prepared specimens of Indian Araceae, collected by Professor E. Barnes, Madras (Mr. C. E. C. Fischer); Oländska

Resa (Travels in Öland), by Carl von Linné (Miss M. L. Green); The bud-pollination and self-fertilization of *Melandrium noctiflorum* Fries (Miss A. C. Halket); Germination of *Parinarium* and *Thevetia* as further examples of the germination of seeds enclosed in stony endocarps (Sir A. W. Hill); Living plants of South African Pelargoniums to show the diverse forms of leaf and general habit (Sir A. W. Hill); Cytological preparations illustrating the life history of Plasmodiophorales (Dr. A. S. Horne and Mr. P. C. R. Webb); Various types of leaf-blades of the Gramineae (Mr. C. E. Hubbard); Evolution of the involucre of bracts in the family Saururaceae (Dr. J. Hutchinson); Spiral structure of chromosomes in *Tradescantia* (Mr. L. La Cour); A new British Mint (Mr. H. W. Pugsley); A collection of letters and portraits mainly relating to American botany; together with Wedgwood medallions of Linnaeus and Sir William J. Hooker (Mr. J. Ramsbottom); letter from Dawson Turner to N. J. Winch concerning his visit to Persoon (Mr. J. Ramsbottom); Second edition of Du Petit-Thouars, Hist. Veg. Isles austr. Afrique, 1805 (Dr. T. A. Sprague).

'TRANSACTIONS OF THE BRITISH MYCOLOGICAL SOCIETY.'—Vol. xix, pt. 2, of this journal (January 1935) contains articles from workers at home and abroad. S. R. Bose of Calcutta describes a luminous Agaric (*Pleurotus* sp.) from Tenasserim. The stalks and vegetative mycelium are luminous as well as the fruit body. Eileen Fisher records observations on *Fomes pomaceus* (Pers.) Big. & Guill. infesting fruit trees in Cambridgeshire; and Geo. Potts of Bloomfontein gives the results of experiments on *Plasmodiophora Brassicae*, Finger and Toe disease: the disease has been recorded in most of the genera of Cruciferae, but not outside the family and attempts to infect nearly related plants failed. J. Ramsbottom gives some interesting extracts from the early work of L. G. Windt on heterœcism, 'Der Berberitzenstrauch, ein Feind des Wintergetreides' (1806). The book is very rare, but there is a copy at the British Museum and a manuscript translation in the Department of Botany formerly belonging to Sir Joseph Banks. H. Chaudhuri and Jagtar Singh describe a disease of the Pomegranate in Lahore due to a new species, *Amphichaeta Punicae*; and F. M. Carter gives an account of fungi present in the air over orchards at East Malling and Swanley, Kent, and near Belfast, with special reference to the genera *Pleospora* and *Polyopeus*. It is suggested that disease of apples in storage is chiefly due to fungal inflection from the atmosphere before gathering of the fruit. Finally, D. D. Gupta describes a simple apparatus for the isolation of single spore cultures.

ERICA CILIARIS L. AND *E. WATSONI* BENTH. IN CORNWALL.

BY C. C. VIGURS, M.D., AND F. RILSTONE.

OMITTING the few plants seen near Ding Dong Mine (about 4 miles north-west of Penzance) by Mr. Dymes in 1889, and not found there since, *Erica ciliaris* occurs in Cornwall, so far as is known at present, only within a triangular area with its points at Penhallow Moor (the northern part of Newlyn Downs, near the Mitchell and Newlyn Halt on the Chacewater to Newquay railway), St. Agnes Beacon, and Carclew House in Mylor Parish. The sides of the triangle are about $8\frac{1}{2}$, 9, and $11\frac{1}{2}$ miles respectively. This area occupies parts of Districts 5 and 6 of Davey's 'Flora of Cornwall,' and includes the whole of the small parish of Tregavethan, and parts of Newlyn East, St. Allen, Perranzabuloe, St. Agnes, Kenwyn, Kea, Mylor, and Perran-ar-worthal, but in the last-named parish the plant has never been found, even by Davey, who lived in it.

By far the larger amount grows within a much smaller rhomboidal area bounded on the south-east by the main Newquay–Redruth road between Marazanvose and Blackwater, on the north-west by a line parallel to this road and distant from it about one and a half miles, on the east by a line drawn north from Marazanvose, and on the west by a similar line from Blackwater. The rocks of this area are chiefly soft silty slates.

The headquarters of the plant lie mainly in the large parish of Perranzabuloe, especially on the moors around Carnkief and Ventongimps, with extensions up the valley southward. From Silverwell Moors on the west of the parish it extends into St. Agnes, and a further stronghold is in Penhallow Moor in Newlyn East.

Babington's assignment of *E. ciliaris* to "sandy heaths" does not cover the range of the plant as it occurs in Cornwall. It is quite at home on wet peaty moors, where it grows with *E. Tetralix*, though perhaps less tolerant of the wetter situations. It flourishes equally well on drier ground with *E. cinerea*, and roadside tufts are perfectly happy growing with *Agrostis setacea* from the faces of turfy "hedges" (the earthen banks enclosing the fields) on some of the highest and most exposed ground of the district.

Erica Watsoni Benth. (*E. Tetralix*×*E. ciliaris*) is to be found only on the moors where the two parent species grow in company. In the neighbourhood of Ventongimps and Silverwell it is very plentiful and often a much more noticeable plant than *E. Tetralix*. It is very variable both in form and colour as, indeed, are both the parents. From these moors one might easily collect a graded series of specimens showing gradual transition from the long lax

pointed unilateral raceme of typical *E. ciliaris* to the cluster of small wax-like bells characteristic of the more extreme forms of *E. Tetralix*.

The hybrid ranges from a plant with a short congested truncate spike, oblong in outline, very similar in form and colour to some forms of *E. ciliaris*, to one with a rose-pink cluster just like the larger and more highly coloured flower-heads of *E. Tetralix*. Though in general appearance the transition from parent to hybrid is on both sides gradual, the variation does not extend to the structure of the flowers which in the hybrid are always clearly intermediate.

It is much to be desired that some at least of the main areas of growth of *E. ciliaris* in Cornwall should be acquired as nature reserves. There is, so far as we know, no immediate danger of the ground being reclaimed for cultivation, but there is always the possibility. We learn from a correspondent that one of the best-known small moors in the neighbourhood of Penzance is being trenched preparatory to cultivation.

ON THE ORIGIN OF LUNDY FLORA, WITH SOME ADDITIONS.

By F. R. Elliston Wright.

In taking a general survey of the list of plants occurring on Lundy (*Journal of Botany*, November 1933), which list, though incomplete, is quite sufficient for estimating the type of flora existing there; after removing those plants which have probably been introduced by man in recent times—some purposely, as trees, *Archangelica*, clover and grasses for improvement of pasture; others accidentally, as impurities in grass, corn, and other agricultural seeds, or adhering to imported cattle, horses, goats, etc., men's clothing, and packing materials,—the remaining, or what may be termed native, plants are suggestive that the flora of Lundy may be Oceanic in type, in spite of the close proximity of the mainland. This would mean that Lundy, since its final appearance above the sea and becoming capable of supporting vegetation, has not been directly connected with the mainland. After the Lundy granites were thrust up through the Devonian slaty rocks, the latter, the overlying soft rocks, and the upper part of the intruded granites, were planed off by the sea about Pliocene times, still encased on all sides by the slates.

Subsequent change in level of sea and land brought the land above water; then for marine and subaërial erosion to detach the more easily weathered slaty rocks extending about 16½ miles between Lundy and the mainland, accepting Sir A. Geikie's erosion rate along our coast, would take some 900,000 years.

For various reasons, Dr. A. J. Dollar considers that the period could have been much less. In Pleistocene times, after the phases of the Glacial Epoch, about the late Palæolithic period, sea-caves and beach deposits were formed on the east coast of Lundy, indicating definitely sea between this coast of Lundy and the mainland; though in middle Neolithic times, corresponding to the period when the present "submerged forests" existed about the Bristol Channel, the land rose possibly 60–80 feet above present level, and may have again been connected with the mainland, or was much nearer than at present. And the important discovery by Dr. A. J. Dollar of Neolithic arrow-heads and artefacts on Lundy may support this nearness or connection with the mainland.

The above forests were again submerged in late Neolithic times, leaving the previously mentioned caves and beach deposits now 25–30 feet above sea-level. But, personally, I do not think that the necessity of passage by sea would have prevented Neolithic man from reaching Lundy; and the fact that they were using weapons suitable for the killing of large mammals, which could only arrive overland, does not prove that these animals were there, as I think that these stone implements were regarded as of such great value that the owners never went anywhere without them, and handed them on from father to son. So that in the present state of our geological knowledge, although no definite answer can be given, there is a high probability that Lundy was separated from North Devon by the time that it was capable of supporting vegetation.

This possibility is further suggested by the total absence of reptiles. There is certainly no reason why snakes and lizards should not exist there, and I think the same may be said of toads. Also the absence of stoat, weasel, and badger strengthens this suggestion. The introduction of all the mammals at present living on Lundy can, I think, be readily explained. The presence of the pigmy shrew, which must be one of the oldest inhabitants, perhaps raises some doubt, but this small creature could certainly arrive on drift, packing material, etc. The absence of any trees, except recently planted, suggests the same thing. Acorns and other nuts must be dispersed by small mammals over a land bridge, except in very rare instances where acorns have been carried considerable distances by such birds as Corvidae, and the wind-borne samaras and winged fruits of elm, ash, birch, etc., are only capable of short flight, and quite unable to cross water, even a quarter of a mile in extent.

The question of unsuitability of habitat at once arises here, but there is plenty of suitable ground on the eastern slopes, which, moreover, is the side nearest the mainland, where such trees could obtain a footing. The biological spectrum of the flora on the east side is entirely different from that on the west and

surface of the Island. The hydrotherm figure is also different, owing chiefly to less exposure to the prevailing wind on the east side. And we find planted trees of elm, birch, oak, alder, hazel, beech, ash, and sycamore, not only growing, but looking far less stunted than on the North Devon coast, or than the sycamore and ash on Bardsey.

Before the influence of man, phanerophytic vegetation was far more extensive over the whole mainland, and the examination of peat-remains for pollen might give us some information of past trees. The peat on Lundy is very shallow, and has yielded no evidence to me; but Dr. K. B. Blackburn has kindly consented to examine samples, so that we shall have valuable information on this point later. St. John Harold (Bull. Torr. Bot. Club, 1925) has told us how pollen of *Pinus* has been blown hundreds of miles. In the great dust storm in early summer, 1934, over three tons per square acre of the deposit in Chicago consisted of oak pollen, which had travelled a great distance. Such deposits, even if very rare, must influence our conclusions on the value of pollen remains, though negative results may be important.

The majority of the genera present of what may be termed native plants are represented by one species only, an oceanic characteristic. In the *Junci* and *Carices*, we have the largest number of species, and they are two genera which have been repeatedly observed to be dispersed by birds. *Sagina* is represented by five species, but I think quite rightly many botanists would only admit some as so-called micro-species; their minute seeds, though capable of being blown considerable distances, even on to high buildings, by strong winds on dry ground, could only be carried overseas by birds. Of what may be called the native plants, I think almost the total number have probably been introduced by birds, by viable seeds passed through intestine, seeds of drupes and berries regurgitated from the stomach, seeds adhering to feet and legs in mud, and adhering to feathery plumage. After removing from the list all those species of which there are known records, as having been observed as bird-carried, we have left such plants as *Caltha*, *Sisymbrium*, *Polygala*, *Silene*, *Spergularia*, *Montia*, *Radiola*, *Erodium*, *Trifolium arvense*, *Ornithopus*, *Cotyledon*, *Sedum*, *Drosera*, *Peplis*, *Galium saxatile*, *Jasione*, *Wahlenbergia*, *Lysimachia*, *Euphrasia*, *Pedicularis*, *Thymus*, *Scutellaria*—almost all small-seeded,—which could only be brought by birds.

Lundy is favoured by a large resident population of birds, and great numbers congregate there for nesting. Apart from these, Lundy is greatly used as a resting-place by birds on passage. It lies within the course of the great migratory stream, which passes down the western side of Britain to eastern Europe and Africa. The migrants *par excellence*, which are said usually to travel with empty stomachs, and partly clean themselves

before migration, are not nearly so important for seed-dispersal as the partial migrants, subject to local and seasonal movements. Every cold spell in winter brings us thousands of White-fronted Geese, Barnacle Geese, Widgeon, etc., such birds having a seasonal to and fro movement throughout winter. In autumn numbers of Wagtails, Terns, Gulls, Grebes, Sanderlings, Sandpipers, Phalaropes, and others may be seen working their way down the coast. There is practically no time of the year when there is no movement going on along our coasts.

In considering the carriage of seeds by wind, we find the prevailing S.W. wind, which is strong enough and of steady force, is directed away from Lundy towards the mainland. The E. and N.E. winds are often strong, but more intermittent and gusty, and the first drive down on to the sea finishes the seed's journey. Several normally wind-dispersed fruits are included under observed bird dispersals, such as *Senecio*, *Hieracium*, *Hypochoeris*, etc., and are more likely to arrive on bird-plumage. In wet weather the pappus adheres very readily to trousers. I have found all these in plenty on my own; Cotton Grass fruits when walking over boggy ground in misty rain, and *Armeria* fruits on socks when walking on cliffs. The fruits of grasses, though well wind-dispersed on land, are not sufficiently buoyant by their attached glumes to cross the sea, but by their awns and roughened glumes may readily become attached to plumage; they are often found well buried in one's socks. *Phragmites*, which is the grass best adapted for wind-dispersal, one of the most widely distributed plants in the world, and one of the most adaptable to varying conditions, is absent; *Calamagrostis epigeios*, almost as well adapted for aërial flight, grows plentifully on the mainland coast at Baggy, Fremington, etc., but has not reached Lundy. The Filices have no doubt all arrived by air; wind is not needed, the slightest atmospheric movement being sufficient to carry their spores for great distances. *Orchis* may travel similarly. Mr. H. N. Ridley has shown us that *Pteris* may be introduced by man.

The Equisetums are absent. Prothallia produced from their spores are, I believe, in our species usually dicœcious; consequently, spores travel in little clumps, by entangling their elaters, rendering it possible for prothallia of both sexes to arise near together. Such clumps would have less chance of travelling oversea than single spores; though against this *Equisetum debile* got to Krakatau; but I do not know whether this plant has dicœcious prothallia.

No *Mentha* or *Euphorbia* is native, and, as far as I can find, these have never been recorded as bird-dispersed; but *Vaccinium Myrtillus*, which might well be expected from the floral conspectus on the surface of the island, and which has so frequently been found to be dispersed by birds, is also absent; but we

must remember that often without obvious explanation, equi-conditional regions with the same floristic physiognomy often have widely different floristic compositions.

Regarding the arrival of plants by sea-drift, the steeply rising sea-washed cliffs are in most places unsuitable to give a footing. Common plants usually found on higher parts of beaches are absent. *Crithmum* may certainly have arrived by sea. The cremocarps are large and corky compared with the enclosed seed; they float well and are unharmed by sea water for a long period. I have noticed that either rabbits or rats in late autumn eat the roots of this plant on North Devon cliffs, tearing away masses of the plant, which, with dry fruit on them, fall and may readily be floated away.

An earlier visit in June 1934 has enabled me to add several plants not noticed in 1933 :—

Ranunculus Lenormandi Schultz Previously wrongly recorded as *R. hederaceus* L.

Brassica arvensis O. Kuntze. Appeared where ground was disturbed in making tennis court last winter. Mr. F. W. Gade tells me that it appears when they break up grassland on the farm, but sheep, goats, and deer are very fond of it and destroy it, probably to the advantage of other weeds.

Coronopus didymus Sm. Common south end. Earlier flowering than *C. procumbens*.

Hypericum Androsaemum L. A few plants down the old shoot-way, which was used for conveying granite to the beach.

Trigonella ornithopodioides DC. About quarry-pond near observation-pole.

Potentilla procumbens Sibth. Not uncommon south of Friars Garden.

Pyrus Malus L. There is a large dead crab-apple tree below Quarter Wall quarries which has been " barked " by goats.

Archangelica Hoff. The area of distribution of this plant is far greater than I thought. It extends along the whole east side in damp places, as at the lower end of Gannets Combe, where it ends on the cliff.

Lythrum Salicaria L. One clump down above-mentioned shoot-way.

Eupatorium cannabinum L. In plenty in same shoot-way.

Pulicaria dysenterica Gray. In plenty in same shoot-way.

Senecio sylvaticus L. Common south end.

Leontodon taraxacoides Lacaita. Common.

Samolus Valerandi L. In a few wet places near bottom of cliffs east side; luxuriant in entrance to Queen Mab's Bower.

Euphrasia L. All plants examined by Mr. W. H. Pearsall determined as form known to plant-collectors as *E. occidentalis* Wettst.

Salix atrocinerea Brot. Many bushes about south end and Quarter Wall quarries.

Salix aurita L. One or two bushes near Quarter Wall cottages. I should consider *S. repens* the only native sallow.

Orchis mascula L. A few plants seen by Mr. Turner, north side of Quarter Wall. April 1934.

Orchis praetermissa Druce. About 20 plants seen in St. John's Valley.

Potamogeton polygonifolius var. *cancellatus* Fryer. Determined by Mr. W. H. Pearsall. An extreme form found in two small ponds which do not go dry in summer.

Zannichellia palustris L. In three different ponds, two of which were quite dry in July.

Carex helodes Link. A few plants in the above-mentioned shoot-way, which, with several plants not seen on other parts of the island, must have been introduced during the time this shoot was used for loading vessels. It may be some seventy years since it was used; but there is a sallow tree growing up in the middle of the shoot-way, with a trunk one foot in diameter.

Anthoxanthum odoratum var. *longiaristatum* Čelak. South end, common, smaller plants near cliff very like *A. aristatum*, but strongly odorous.

Agrostis canina L. South end and Pondsbury.

Poa compressa L. A small clump on a wall near farm-buildings.

Bromus sterilis L. At upper end of footpath from beach, where it joins road.

Polystichum aculeatum Roth. Previously included by mistake from material gathered on mainland. I have seen no *Polystichum* yet on Lundy.

Adiantum Capillus-Veneris L. Almost certainly at one time was growing about the entrance to Queen Mab's Bower, but is said to have all been removed by Channel pilots who frequented that part of the island.

CORNISH MICRO-FUNGI.

By F. Rilstone.

The Fungi Imperfecti and Pyrenomycetes recorded in the following lists were collected mainly by Mr. W. B. Grove, the late Dr. Rhodes, and the writer in the neighbourhood of Looe and Polperro in East Cornwall (v.c. 2) and by the writer in the Perranporth neighbourhood (Perranzabuloe Parish) in West Cornwall (v.c. 1). The records from Lostwithiel (v.c. 2) and the area between Helston and the Lizard (v.c. 1) are the results of visits to those parts by Dr. Rhodes.

FUNGI IMPERFECTI.

Macrophoma collabens Cooke; on fallen leaves of *Prunus lusitanica* in garden, Lambourne Hill, Perranzabuloe. *M. passifloricola* Died.; on dead stems of *Passiflora coerulea*, Polperro.

Phyllosticta Forsythiae Sacc.; on leaves of *Forsythia intermedia*, Polperro. *Ph. leucostigma* Allesch.; on leaves of *Euonymus japonicus*, Polperro. *Ph. pirina* Sacc.; on leaves of pear, Lambourne Hill, Perranzabuloe.

Phoma herbarum West.; on dead stalks of herbaceous plants, Polperro. *Ph. Ilicis* (Desm.) Allesch. var. *Euonymi-japonici* Sacc.; on twigs of *Euonymus japonicus*, Polperro. *Ph. Tamaricella* Sacc.; on *Tamarix* sp., Polperro (*Rhodes*). *Ph. minutula* Sacc.; on *Lonicera Periclymenum*, Polperro (*Rhodes*). *Ph. Urticae* Schultz & Sacc.; on stalks of *Urtica dioica*, Polperro.

Asteroma Robergei Desm.; on dead stems of *Heracleum*, Polperro. *A. juncaginacearum* Rabenh.; on *Triglochin maritimum*, Looe.

Phomopsis Arctii (Lasch.) Trav.; on *Arctium*, Polperro. *Ph. Armeriae* Grove; on *Armeria maritima*, Polperro (Grove in Journ. Bot. 1930, 270). *Ph. rudis* (Sacc.) v. Hoehn; on *Cytisus Laburnum*, Perranzabuloe. *Ph. perexigua* (Sacc.) Trav.; on *Carlina vulgaris*, Polperro (*Rhodes*). *Ph. Caryophylli* (Cooke) Grove; frequent on dead stems of *Dianthus barbatus*, Perranzabuloe. *Ph. ramealis* Died.; on twigs and leaves of *Euonymus japonicus*, Perranzabuloe and Polperro. *Ph. scobina* (Cooke) v. Hoehn; on *Fraxinus Ornus*, Lostwithiel (*Rhodes*) and on *F. excelsior*, Polperro. *Ph. Dominici* Trav.; on twigs of *Forsythia intermedia*, Polperro. *Ph.*, sp. nov., Grove ined.; on *Galium Mollugo*, Polperro (*Rhodes*). *Ph. pulla* (Sacc.) Trav.; generally common on dead stems of ivy in both vice-counties. *Ph. asteriscum* (Berk.) Gaum.; on *Heracleum*, Polperro (*Rhodes*) and Perranzabuloe. *Ph. Jasmini* Potrak; on *Jasminum officinale*, Polperro (*Grove*). *Ph. laurella* Trav.; on *Laurus nobilis*, Polperro (*Grove*). *Ph. Leycesteriae* Grove (in Journ. Bot. 1930, 274); on *Leycesteria formosa*, Polperro. *Ph. citriodora* Grove (*tom. cit.* 270); on *Aloysia citriodora*, Lansallos, near Polperro (*Rhodes*). *Ph. Liriodendri* Grove (*tom. cit.* 275); on *Liriodendron*, Polperro. *Ph. cryptica* (Nitschke) v. Hoehn; on *Lonicera Periclymenum*, Polperro. *Ph. moricola* (Sacc.) Grove; on *Morus nigra*, Lostwithiel (*Rhodes*). *Ph. Oleariae* Grove; on *Olearia Haastii*, Polperro (*Rhodes*). *Ph. morphaea* Grove; on *Papaver orientale*, Polperro. *Ph. Landeghemiae* (Nitschke) v. Hoehn; on *Philadelphus coronarius*, Polperro. *Ph. malvacearum* (West.) Grove; on *Sidalcea*, Polperro. *Ph. pardalota* Died.; on *Polygonatum multiflorum*, Perranzabuloe and Polperro. *Ph. Polygonorum* (Cooke); on *Polygonum cuspidatum*, Penhallow, Perranzabuloe, and Polperro. *Ph. Prunorum* (Sacc.) Grove; on *Prunus Laurocerasus*, Par, East Cornwall. *Ph. corticis* (Fckl.) Grove; on *Rubus*, Polperro (*Rhodes*). *Ph. intermedia* (Sacc.) Grove; on *Saponaria officinalis*, Perrancoombe, St. Agnes. *Ph. Sarothamni* (Sacc.) v. Hoehn; on *Sarothamnus scoparius*, Polperro (*Rhodes*), Callestick and Penhallow, Perranzabuloe. *Ph. Dulcamarae* (Nitschke) Trav.; on *Solanum Dulcamara*, Perranzabuloe, frequent, and Longcoombe, Polperro. *Ph. linearis* Trav.; on *Solidago canadensis*, School House garden, Polperro (*Grove*). *Ph. Ryckholtii* (Sacc.) v. Hoehn; on *Symphoricarpus racemosus*, Polperro and Looe (*Rhodes*). *Ph. depressa* (Lév.) Trav.; on *Syringa vulgaris*, Lostwithiel (*Rhodes*). *Ph. Desmazieri* Grove var. *Phlomidis* Grove (*tom. cit.* 272); Polperro (*Grove*). *Ph. Tamaricaria* (Sacc.); on exotic Tamarisk in garden, the Warren, Polperro. *Ph. Veronicae-speciosae* Died.; common on twigs of shrubby *Veronica*, in gardens, Perranzabuloe and Polperro. *Ph. viticola* (Cooke) Grove; on *Vitis vinifera*, Polperro.

Ceuthospora Euonymi Grove; on fallen leaves of *Euonymus japonicus*, Perranzabuloe and Polperro.

Coniothyrium Fuckelii Sacc.; on *Aloysia citriodora*, Landaviddy, Polperro. *C. Tamaricis* Oudem.; on exotic Tamarisk, the Warren, Polperro. *C. Obiones* Jaap; on *Atriplex Portulacoides*, between Looe and Sandplace (*Rhodes*). *C. concentricum* (Desm.) Sacc.; on *Yucca* in garden, Polperro.

Ascochyta Viciae Lib.; on *Vicia sepium*, West Looe (*Rhodes*). *A. ribesia* Sacc. & Fautr.; on leaves of gooseberry, Lambourne Hill, Perranzabuloe. *A. solanicola* Oudem.; on leaves of *Solanum Dulcamara*, Longcoombe, near Polperro. *A. graminicola* Sacc. var. *leptospora* Traill; on *Ammophila arenaria*, Perranporth.

Diplodina Ammophilae Traill; on *Ammophila arenaria*, Perranporth.

Ascochytula Obiones (Jaap) Died.; on *Atriplex portulacoides* between Looe and Sandplace (*Rhodes*).

Diplodia Saccardiana Speg. var. *anglica* Grove; on *Sarothamnus scoparius*, Callestick (Perranzabuloe) and Looe. *D. Humuli* Fckl.; on *Humulus Lupulus*, Polperro (*Rhodes*). *D. pinea* (Desm.); on pine twigs, Bochym, near Helston (*Rhodes*).

Microdiplodia perpusilla (Desm.); on dead stems of *Foeniculum*, Talland Bay (*Rhodes*) and Polperro. *M. Narthecii* (Sacc., Boum. & Rouss.) Allesch.; on *Narthecium ossifragum* Goss Moors (*Rhodes*).

Stagonospora compta (Sacc.) Died.; on *Trifolium minus*, Lambourne Hill, Perranzabuloe. *S. subseriata* (Desm.) Sacc.; on *Molinia coerulea*, Goonhilly Downs near the Lizard (*Rhodes*). *S. maritima* Syd.; on *Scirpus maritimus*, near Sandplace.

Hendersoniella trabicola Sacc.; on wood of *Aloysia citriodora*, Landaviddy, near Polperro.

Hendersonia sarmentorum West.; on *Aloysia citriodora* and other shrubs, Perranzabuloe and Polperro. *H. epicalamia* Cooke; on *Phragmites*, Talland Bay, near Polperro (*Rhodes*).

Camarosporium Stevensii (B. & Br.) Sacc.; on dead stems of bracken (*Pteris aquilina*)—common in Perranzabuloe and in neighbourhood of Polperro.

Septoria (all parasitic on leaves). *S. Unedonis* Rob. & Desm.; on *Arbutus Unedo*, near Perranzabuloe Church. *S. Calystegiae* West.; on *Calystegia*, West Looe (*Rhodes*). *S. Dianthi* Desm.; frequent on *Dianthus barbatus*, Perranzabuloe. *S. Hederae* Desm.; on *Hedera Helix*, Trelawne, near Looe, and Polperro. *S. Hydrocotyles* Desm.; on *Hydrocotyle*, Polperro (*Rhodes*). *S. Lychnidis* Desm. var. *pusilla* Traill; on *Lychnis chalcedonica*, Lostwithiel (*Rhodes*). *S. polygonicola* (Lasch.) Sacc.; on *Polygonum lapathifolium*; Lambriggan, Perranzabuloe, and St. Winnow, near Lostwithiel (on *P. lapathifolium*, collected a quarter of a century ago by Dr. Vigurs). *S. scabiosicola* Desm.; common and noticeable on *Scabiosa Succisa*. *S. Scutellariae* Thuemen; on *Scutellaria galericulata* by West Looe River (*Rhodes*). *S. quevillensis* Sacc.; on *Spiraea Ulmaria*, rather common about Looe and Polperro. *S. exotica* Speg.; on shrubby *Veronica*, Lambourne Hill, Perranzabuloe, and Polperro. *S. Gladioli* Pass.; on *Gladiolus*, Polperro (*Grove* in Journ. Bot. 1934, 267–8).

Rhabdospora caulicola Sacc.; on *Sison Amomum*, Polperro. *R. Junci* (Desm.) Allesch.; on *Juncus maritimus*, West Looe (*Rhodes*).

Polystigmina rubra (Desm.) Sacc.; on *Prunus spinosa*, apparently rather frequent: seen in several places in Perranzabuloe and about Par and Polperro.

Pirostoma viridisporum Grove; on *Phormium tenax*, Falmouth, near Truro, Polperro, Lelant (Grove in Journ. Bot. 1932, 2), the Lizard (*Rhodes*): seems to occur plentifully wherever the *Phormium* is grown.

Leptostroma spiraeinum Vestergr.; on *Spiraea Ulmaria*, Polperro. *L. filicinum* Fr.; on *Pteris* at Bochym, near Helston (*Rhodes*). *L. virgultorum* Sacc.; on *Rubus*, Bochym (*Rhodes*).

Leptostromella hysterioides (Fr.) Sacc.; dead stems of *Kentranthus ruber*, walls, West Looe (*Rhodes*).

Thyriostroma Spiraeae (Fr.) Died.; on dead stems of *Spiraea Ulmaria*, Polperro.

Dinemasporium graminum Lév.; on old hay in stack, Lambourne, Perranzabuloe.

Heteropatella lacera Fckl.; on dead stems of *Foeniculum* at Talland Bay.

Hainesia subtecta (Desm.) Grove; on *Ammophila arenaria*, Perranporth.

Melanconium Arundinis (Corda) Grove; on *Phragmites*, Talland Bay (*Rhodes*). *M. Bambusae* (Bell & Th.) Grove; on *Arundinaria japonica*, Perranzabuloe and Polperro.

Marssonina Rosae (Lib.) Died.; a common leaf-spot disease on roses. *M. Castagnei* (Desm. & Mont.) Sacc.; on leaves of *Populus alba*, Lambourne Hill, Perranzabuloe, and Polperro.

Septogloeum Ulmi (Fr.) Died.; on leaves of *Ulmus hollandica*, Polperro.

Asterosporium Hoffmanni Kunze; on fallen twigs of *Fagus sylvatica*, Perranzabuloe Church, Looe, and Polperro.

Scolecosporium Fagi Lib.; on fallen twigs of *Fagus sylvatica*, Looe.

Hyaloceras comptum (Sacc.) Died. var. *ramulicolum* Berl. & Bres.; on large prickles of *Rosa canina*, between Looe and Sandplace.

Cylindrosporium Pseudoplatani Died.; on leaves of *Acer Pseudoplatanus*, Polperro.

HYPHOMYCETES.

Oidium monilioides (Nees) Link; on *Agropyron repens*, Polperro. *O. erysiphoides* Fries; on *Lamium purpureum*, Lambourne Hill, Perranzabuloe. *O. farinosum* Cooke; on apple leaves, Lambourne Hill. *O. Euonymi-japonicae* (Arc.) Sacc.; common on leaves of *Euonymus japonicus*. *O. quercinum* v. Thuem.; in most parts of the county on young shoots of oak, chiefly on ground-shoots after trees have been felled.

Ovularia destructiva (Phill. & Plowr.) Massee; on leaves of *Myrica Gale* at Ventongimps, Perranzabuloe. *O. sphaeroidea* Sacc.; on leaves of *Lotus major*, fairly frequent in Perranzabuloe and about Polperro and Looe. *O. primulana* Karst.; on leaves of *Primula veris*, Lambourne Hill.

Botrytis cinerea Pers.; on dead stems of *Angelica sylvestris*, Ventongimps.

Didymaria didyma (Unger) Schroet.; on *Ranunculus repens*, Polperro.

Ramularia Parietariae Passer; on *Parietaria*, Polperro (*Rhodes*). *R. Rhei* Allesch.; on rhubarb leaves in garden, Polperro. *R. Geranii* (Westend.) Fckl.; on *Geranium dissectum*, West Looe (*Rhodes*). *R. montana* Speg.; on *Epilobium montanum*, Trelawne, near Looe. *R. calcea* (Desm.) Ces.; rather common on leaves of *Nepeta Glechoma* near Looe and Polperro. *R. Scrophulariae* Fautr. & Roum.; on leaves of *Scrophularia aquatica* near Polperro. *R. Lampsanae* (Desm.) Sacc.; on *Lapsana*, Polperro. *R. Taraxaci* Karst.; on dandelion, Lambriggan, Perranzabuloe.

Hormiscium stilbosporum (Corda) Sacc.; on *Salix*, Polperro. *H. Centaurii* Fckl.; on *Centaurium umbellatum*, Polperro cliffs (*Rhodes*).

Periconia pycnospora Fres.; on decaying twigs and stalks, Perranzabuloe and Polperro.

Fusicladium dendriticum (Wallr.) Fckl.; on apple leaves, Perranzabuloe and Polperro. *F. pirinum* (Lib.) Fckl.; on pear leaves, Lambourne Hill.

Cladosporium fulvum Cooke; on tomato plants, Polperro.

Dendryphium ramosum Cooke; on dead stems of hollyhock in garden, Polperro. *D. toruloides* (Fres.) Sacc.; on *Foeniculum*, Polperro (*Rhodes*).

Sphacelia typhina (Pers.) Sacc.; on *Holcus mollis*, Polperro cliffs (*Rhodes*).

Helminthosporium macrocarpum Grov.; on *Aucuba japonica*, Lostwithiel (*Rhodes*).

Cercospora beticola Sacc.; on leaves of *Beta maritima*, between Looe and Sandplace. *C. depazeoides* (Desm.) Sacc.; on leaves of *Sambucus nigra*, Perranzabuloe and Polperro, fairly frequent. *C. microsora* Sacc.; on leaves of *Tilia vulgaris*, Lambriggan, Perranzabuloe. *C. Lonicerae* Wint.; on leaves of *Lonicera Periclymenum* near Perranzabuloe Church. *C. Mercurialis* Pass.; on leaves of *Mercurialis perennis*, West Looe (*Rhodes*). *C. ferruginea* Feld.; on leaves of *Artemisia vulgaris*, West Looe (*Rhodes*).

Fusarium roseum Link; on *Aloysia citriodora*, Polperro.

ASCOMYCETES.

HEMIASCI.

Protomyces macrosporus Unger; on *Apium nodiflorum*, Polperro.

EUASCI.

PROTODISCINEAE.

Taphrina Alni-incanae (Kuhn) Magnus; on fruits of *Alnus glutinosa*, Polperro. *T. aurea* (Pers.) Fr.; on leaves of "Black Italian" poplars, Perranzabuloe, frequent. *T. deformans* (Berk.) Tul.; on peach leaves (leaf-curl disease), Polperro.

PYRENOMYCETES.

Podosphaera tridactyla (Wallr.) de Bary; on leaves of *Prunus spinosa*. Talland. *P. Oxyacanthae* de Bary; on leaves of *Crataegus Oxyacantha*, Looe.

Phyllactinia suffulta Sacc.; common on leaves of hazel.

Uncinula Salicis Wint.; on willow leaves, Perranzabuloe and Polperro. *U. Prunastri* Sacc.; on leaves of sloe, Polperro.

Erysiphe Cichoriarum DC.; on *Heracleum* and other plants, Polperro.

Capnodium salicinum Mont.; on willow leaves, Polperro.

Melamastia mastoidea Schroet.; rather frequent on dead twigs of *Aloysia*, *Hydrangea*, and other shrubs, Perranzabuloe and Polperro.

Lophiostoma angustilabrum (Berk. & Br.) Sacc.; on *Ulex europaea*, Kynance Cove (*Rhodes*). *L. Arundinis* (Fr.) Ces.; base of dead stems of *Phragmites*, Talland Bay (*Rhodes*).

Stigmatea Robertiani Fr.; common on *Geranium Robertianum*, Perranzabuloe, Polperro, Looe.

Mycosphaerella isariphora (Desm.) Johans.; on *Stellaria Holostea*, Polperro. *M. brassicicola* (Duby) Lindau; on leaves of cabbage and cauliflower in gardens, Perranzabuloe and Polperro. *M. peregrina* Cooke; on *Rubia peregrina*, Kennack Sands, West Cornwall (*Rhodes*). *M. hedericola* (Desm.) Lindau; on ivy leaves, Polperro. *M. Rhododendri* (Cooke) Lindau, on dead leaves of *Rhododendron ponticum*, Polperro (*Rhodes*). *M. Rumicis* (Desm.) Grove f. *caulicola* Grove; on stems of *Rumex pulcher*, Polperro.

Physalospora Phormii Schroet.; on leaves of *Phormium tenax*, Polperro.

Didymosphaeria epidermidis (Fr.) Fckl. ; on dead stems of *Leycesteria formosa*, Polperro.

Leptosphaeria haematites (Rob.) Niessl ; on *Clematis Vitalba*, Bodinnick, near Fowey. *L. Niessliana* Rabenh. ; on dead stems of *Lathyrus sylvestris*, Par. *L. octophragmia* Trav. & Frag. var. *major* Grove (in Journ. Bot. 1933, 282) ; on old thick dead stem of *Aloysia citriodora*, Landaviddy, Polperro. *L. Obiones* Sacc. f. *evolutior* Grove (*tom. cit.* 281 ; on dead stems of *Atriplex* (*Obione*) *portulacoides*, Sandplace, near Looe. *L. arundinacea* (Sowerby) Sacc. ; dead stems of *Phragmites*, Talland Bay (*Rhodes*). *L. Rusci* (Fr.) Sacc. ; on dead stems and cladodes of *Ruscus aculeatus*, Kennack Sands (*Rhodes*), Trelawne, near Looe. *L. Sowerbyi* Sacc. (*L. maculans* Karst.), on *Scirpus maritimus* between Looe and Sandplace. *L. Tamaricis* (Grev.) Sacc. ; on *Tamarix* sp. in garden, the Warren, Polperro. *L. conformis* (Fr.) Schroet. ; on dead stems of nettles, Polperro. *L. culmorum* Auersw. ; on *Dactylis*, Polperro.

Ophiobolus Bardanae (Fckl.) Rehm ; on dead stems of *Arctium*, Polperro. *O. porphyrogonus* (Tode) Sacc. ; frequent on dead stalks of various herbaceous plants (*Anchusa*, *Digitalis*, *Paeonia*, etc.), Perranzabuloe and Polperro. *O. intermedius* Grove (*op. cit.* 1930, 102) ; on dead stems of *Galium Mollugo*, Polperro.

Pleospora vulgaris Niessl ; on dead stalks of various plants (as *Beta*, *Lavatera*, *Matricaria*), Polperro. *Pl. herbarum* Rab. ; common, occurring on dead stems of various herbaceous plants. *Pl. vagans* Niessl ; on *Phragmites*, Talland Bay.

Massarina eburnea (Tul.) Died. ; on dead beech twigs, Looe.

Ditopella ditopa (Fr.) Schroet. ; on *Alnus glutinosa*, Polperro.

Anthostomella ammophila (Pk. & Pl.) Sacc. ; on *Ammophila arenaria*, Perranporth. *A. lugubris* (Rob.) Sacc. ; on *Ammophila arenaria*, Perranporth. *A. tomicoides* Sacc. ; on thin shoots of *Rubus*, Bochym, near Helston ; on dead stems of *Eupatorium cannabinum*, Carnkief and Ventongimps, Perranzabuloe, and Polperro.

Clypeosphaeria Notarisii Fckl. ; sparingly on *Rubus* in Perranzabuloe and near Polperro.

Valsa ludibunda (Sacc.) Wint. ; on dead branches of privet, Perranzabuloe.

Diaporthe perexigua Sacc. ; on dead stems of *Carlina vulgaris* on the cliffs, Polperro. *D. rudis* (Fr.) Nitschke ; on laburnum, Perranzabuloe. *D. Hippophaës* Sacc., Bomm. & Rouss. ; on dead branches of *Hippophaë rhamnoides*, Polperro (*Rhodes*). *D. pulla* Nitschke ; common on dead stalks of ivy ; Perranzabuloe and Polperro. *D. Berkeleyi* (Desm.) Nitschke ; on *Foeniculum*, Talland Bay (*Rhodes*). *D. crustosa* Sacc. & Roum. ; on dead twigs and branches of holly, Perranzabuloe and Polperro. *D. culta* Sacc. ; on *Jasminum officinale*, Polperro (*Grove*). *D. nobilis* Sacc. & Speg. ; on thick branch of a very old tree of *Laurus nobilis* in garden, Landaviddy, Polperro (Grove in Journ. Bot. 1933, 256). *D. Leycesteriae* Grove (*op. cit.* 1930, 274) ; on dead stems of *Leycesteria formosa* in garden, Landaviddy, Polperro (*Grove*). *D. delitescens* Sacc., Bomm. & Rouss. ; on *Liriodendron tulipifera*, Polperro (*Rhodes* : recorded by Grove, *tom. cit.* 275). *D. viridarii* Sacc. ; on dead twigs of *Prunus Laurocerasus* Par. *D. pantherina* (Berk.) Cooke ; on *Pteris aquilina*, Bochym (*Rhodes*). *D. strumella* Fr. ; on dead branches of *Ribes nigrum* and *R. Grossularia*, Lambourne Hill, Perranzabuloe. *D. nidulans* Niessl ; on thin shoots of *Rubus*, Bochym (*Rhodes*). *D. salicella* (Fr.) Sacc. ; on pollard willows, Talland Bay (*Rhodes*). *D. Dulcamarae* Nitschke ; frequent on *Solanum Dulcamara*, Perranzabuloe and Polperro. *D. Sorbariae* Nitschke ; on dead shoots of *Spiraea Menziesii* var. *macrothyrsus*, in garden, Polperro (*Grove*). *D. Veronicae* Rehm ; on dead branches of shrubby *Veronica*, Perranzabuloe and Polperro. *D. viticola* Nitschke ; on *Vitis vinifera*, Polperro.

Diatrype bullata (Hoffm.) Fries ; on *Salix*, Carnkief, Perranzabuloe.

Xylaria Hypoxylon L. ; on stumps of recently felled trees, Lambourne Hill.

Phyllachora graminis (Pers.) Fckl. ; common on *Agropyron* and *Dactylis*, Perranzabuloe and Polperro.

Euryachora Ulmi (Dur.) Schroet. ; on leaves of *Ulmus stricta*, Polperro.

Rhopographus Pteridis (Sow.) Wint. ; everywhere common on dead stems of bracken. *R. Pteridis* f. *macrospora* A. L. Smith ; Bochym, near Helston, and Polperro.

Hyponectria Buxi (DC.) Sacc. ; on leaves of *Buxus*, Polperro.

Nectria cinnabarina (Tode) Fr. ; common on felled wood. *N. ditissima* Tul. ; a common pest on apple trees.

Epichloe typhina (Pers.) Tul. ; on *Holcus mollis*, on cliffs, Polperro.

Lophodermium Pinastri (Schrader) Chev. ; common on needles and cones of *Pinus sylvestris*, Bochym (*Rhodes*), Perranzabuloe.

Aulographum vagum Desm. ; on leaves of *Rhododendron ponticum*, in garden, Polperro (*Rhodes*).

Hysterium angustatum (Alb. & Schw.) Sacc. ; on dead branches of *Betula*, Trelawne, near Looe.

Hysterographium biforme (Fr.) Rehm ; on *Rhododendron*, Perranzabuloe Church ; *H. curvatum* (Fr.) Rehm ; on stems of *Rubus*, Bochym (*Rhodes*), Perranzabuloe, plentiful. Also on *Olearia macrodonta*, Polperro.

DISCOMYCETES.

Clithris quercina (Pers.) Rehm ; on oak, Gollawater, Perranzabuloe, and Polperro.

Trochila Ilicis (Chev.) Crouan ; common on fallen leaves of holly.

A DARWIN RELIC.

By O. J. R. Howarth, O.B.E., Ph.D.

An interesting relic of Charles Darwin, long forgotten, has recently come to light. It consists of a shallow wooden box, measuring some 20 ins. by 6, and containing between 60 and 70 packets of seeds of flowering plants, with some vegetables. Many of the packets bear endorsements in various hands, indicating that they were sent to Darwin by correspondents in different parts of the world : places in the south of France, Freiburg, Algiers, Manila, and Havana are represented, and one packet of *Hillia* seed is marked by Darwin himself as from southern Brazil and bears the name of F. Müller. Several packets are from Kew Gardens, and a few from dealers. Some bear Darwin's own annotations, and sixteen are dated, the earliest 1855 and the latest 1876. While some of the packets had been opened, a large proportion apparently had not ; but some of the seeds have now been extracted in accordance with a selection made by the Director of Kew Gardens, where they will be tested for germination.

The box and its contents, which were presented to the British Association by Mr. Bernard Darwin, will be exhibited in the collection of Darwiniana at Down House, Darwin's home, which the Association now preserves as a national memorial. The contents of the box include an original letter from Alphonse de Candolle, which may reasonably be assumed (though direct evidence is lacking) to have been addressed to Darwin. This letter runs as follows :—

Genève, 28 Sept., 1869.

Mon cher Monsieur,

Je vous envoie des graines qui ont un véritable intérêt au point de vue dont nous nous occupons tous les deux et je viens vous proposer de les semer pour suivre à une expérience commencée et pour la vérifier vous-même,

J'ai fait venir en 1868 des graines de quelques espèces *spontanées* de quatre localités et même cinq localités, très distantes, en Europe, savoir : *Palerme* et *Montpellier*, *Kharkoff* et *Moscou*, *Edinburgh* ; afin de les semer à Genève et de voir si la même espèce était devenue plus précoce ou plus tardive pour avoir eu des ancêtres exposés pendant des siècles à des climats très différents. J'ai choisi des espèces faciles à reconnaître et n'offrant pas des variétés bien distinctes. Malheureusement mes correspondants n'ont pas tous recueilli toutes les espèces demandées et il m'a fallu restreindre l'expérience à peu d'espèces. Malheureusement aussi le jardinier au quel j'avais cru pouvoir me fier pour certains détails, n'a pas élevé convenablement toutes les plantes semées. Néanmoins, il est arrivé dans mes semis de 1869, sur trois espèces, bien comparables, que les *Senecio vulgaris* et *Sisymbrium officinale* originaires du nord, ont été les plus prompts à se développer et à fleurir. Au contraire dans le *Trifolium repens*, les plantes du nord ont été plus lentes, mais elles étaient aussi plus faibles, plus petites dans toutes les parties, et l'on peut dire qu'elles avaient l'apparence d'une variété *minor*.

J'ai semé en 1869 à Genève des *Senecio vulgaris* des 4 origines, et à cette seconde génération, la précocité des plantes du nord s'est maintenue. Combien de temps cela durera-t-il ? Voilà qui n'est pas sans intérêt.

La rigueur de notre climat et le peu de serres et jardiniers dont je dispose ne me permettent pas de recommencer un semis dans cette saison. Peut-être seriez-vous disposé à le faire chez nous et si vous préférez, vous pouvez vous entendre, avec le Dr. Hooker, par exemple, pour faire un semis qu'on observerait soigneusement.

Je vous envoie :

Sisymbrium officinale, de 1868, recueilli à { Edinburgh, Moscou, Kharkoff, Palerme.

Trifolium repens, de 1868, recueilli à { Moscou, Palerme.

Senecio vulgaris, de 1868, recueilli à { Moscou, Palerme.

Id. de 1869, recueilli à Genève, originaires de { Edinburgh, Moscou, Montpellier, Palerme.

Ces derniers sont les plus intéressants.

Vous savez que plusieurs indices font croire que la même espèce ressent différemment les effets de la température selon le climat. Ainsi nos arbres d'Europe se feuillent à Madère sous des températures analogues à celles de l'été de l'Angleterre,

et restent sous feuilles sous la température d'hiver semblable à celle de nos printemps. J'avais cru en trouver la cause dans un repos plus complet des sucs dans les régions froides, repos qui prépare une végétation vigoureuse au printemps des pays du nord, repos qui est imparfait ou qui manque à peu près complètement à Madère, à Naples, etc. Mr. Linsseer, jeune astronome de St. Pétersbourg, a publié depuis dans les Mémoires de l'Académie de St. Pétersb. un mémoire sur les époques de foliaison, floraison, etc., de diverses espèces en divers points de l'Europe, et il arrive à la conclusion d'une qualité différente de la même espèce du nord et du midi pour ressentir la chaleur, les espèces étant plus hâtives au nord, et il croit que cela tient à l'hérédité.

Probablement les deux causes, hérédité et état des plantes en hiver, concourent, au moins dans les espèces vivaies et ligneuses, mais les expériences que je viens de faire sur des espèces annuelles montrent bien l'effet de l'hérédité seule. Le *Trifolium repens* a été différent—Cela vient-il de l'état des graines ou de la différence de variété ? Je ne sais.

J'aurais aimé avoir des espèces plus surement indigènes, les *Senecio*, *Sisymbrium* et *Trifolium* pouvant bien provenir de graines importees avec les marchandises, graines, etc. Cependant j'ai eu soin de recommander qu'on les recueillie hors des jardins, loin des habitations, ce qui a été fait. Ces espèces ont été choisies parce qu'il y a vraiment très peu d'espèces communes à des pays aussi éloignés en Europe, et en même temps faciles à trouver et sans variétés différentes.

J'ai envoyé mes *Senecio* de la recolte de 1869 de Genève, à Florence, où j'espère les trouver semés lorsque j'irai dans cette ville en automne. Mon projet est effectivement d'aller passer 2 mois dans le nord de l'Italie, depuis le milieu d'octobre prochain et je resterai au moins 15 jours à Florence—tout à vos ordres si vous desirez quelque renseignement.

Recevez, Mon cher Monsieur, l'assurance de mes sentiments très devoués.

ALPH. DE CANDOLLE.

OBITUARY.

HENRY JOHN WILKINSON

(1859–1934).

SOME of the botanists who attended the meeting of the British Association at York in 1933 had the pleasure of a visit to Mr. Wilkinson in the herbarium of the Yorkshire Philosophical Society, to the building up and arrangement of which he had devoted much of his leisure for many years. I am indebted to his friend Dr. John S. Gayner for the following sketch of the life and work of this devoted Yorkshire botanist.—A. B. RENDLE.

Henry John Wilkinson, author of an ' Historical Account of the Herbarium of the Yorkshire Philosophical Society (1906) and of a ' Catalogue of British Plants ' of the same Herbarium (published in the Annual Reports of the Society between the years 1894 and 1916), was born in Ogleforth, in the city of York, December 28, 1859, the youngest child of Henry Wilkinson, shoemaker, of York.

As a boy he was introduced to the study of field botany by that excellent Yorkshire botanist, Henry Ibbotson of Ganthorpe, near Malton (1814–1886), and, throughout the whole of his working life, devoted such leisure as came to him to a close study of the local flora. Some of his plant-hunting expeditions would take him as far as Teesmouth or Spurn Point, or to the district round Ingleborough ; but most of his field-work was done within fifteen or twenty miles of York, and of the plants in the immediate neighbourhood his knowledge was intimate and accurate in the extreme—and his memory infallible. Mrs. T. J. Foggitt of Thirsk writes of him under date March 9, 1935, and of his interest in the botanists of Yorkshire :—

" . . . It was quite marvellous the way in which he collected their notes and specimens and brought them together into the Herbarium at York which was really his life's work and monument. The Catalogue alone is a wonderful work and a model of what such a thing could and should be—but to me the most interesting thing of all is his ' Historical Account ' with the lives of the great men themselves. . . "

J. F. Robinson acknowledges his help in ' The Flora of the East Riding of Yorkshire ' (1932), especially in the Rubi, most of the records of which are due to Mr. Wilkinson. He also contributed an account of the flowering plants and ferns of the district to the Handbook of the 1906 meeting of the British Association.

He became Honorary Curator for Botany to the Yorkshire Philosophical Society in 1892, remounted and arranged the herbarium, and more recently incorporated with it his own extensive local herbarium. It is expected that his botanical library, which is rich in county floras, will be handed over by his executors to the Society.

Wilkinson was educated at the Minster Choir School, which he left at the age of twelve and a half, going as messenger boy to Messrs. Cooke's of Bishophill, York, the famous telescope makers. At the age of thirteen he started work with Messrs. Terry, confectioners, of York, and remained on their staff till his death. Beginning in the factory, he was soon transferred to the office, and at the age of eighteen was head clerk, finally

rising to be Managing Director. No man could have led a harder working business life.

As Chairman of meetings of scientific societies he excelled: alike in the business routine and in handling the scientific communications, which not seldom received their chief interest from the Chairman's kindly and illuminating comments. A great lover of his fellow men, he was indeed himself very greatly beloved.

He died, December 6, 1934, in his native city. His wife, whom he married in 1884, died in 1929.—J. S. GAYNER.

SHORT NOTES.

ABNORMAL FLOWER IN SPIRANTHES AUTUMNALIS Rich.—While collecting with me near Cosham, S. Hants, early in September 1934, Dr. W. A. Sledge gathered a specimen of this orchid, one flower of which had two labella side by side. The two labella in this case probably represent the two lateral anthers of the outer whorl, normally obsolete, while the normal labellum is suppressed. The remaining parts of the flower, as well as the other flowers of the spike, were perfect. Once more, as in the case of the three abnormal flowers of *Cephalanthera grandiflora* previously reported in this Journal (Feb. 1934, 49), the abnormality occurred in the lowest flower but one of the spike.—P. M. HALL.

DORYCNIUM GRACILE Jord. IN KENT.—In the issue of this Journal for December 1934 an interesting account was given of the occurrence of this species in Kent, the suggestion being made that this was to be regarded as a relic of a disappeared French flora.

Himantoglossum hircinum Koch was cited, with other species, as being one of the more striking plants of this area of Kent. There is sufficient evidence (*cf.* 1933, Rep. B. E. C. 1934, 670 *et seq.*) to justify a belief that this Orchid is spreading and increasing in S.E. England to a considerable extent. May not other species, including perhaps *D. gracile*, also be colonizing and be not relics of a disappeared flora but the forerunners of a flora in process of arriving ?—P. M. HALL.

RUBUS GYMNOSTACHYS Genevier, in Mém. Soc. Acad. Maine et Loire, tome x. 28 (1861).—Genevier's herbarium, now in the British Museum Herbarium, contains three sheets gathered at Couboureau, près de Torfou, in 1860. One dated 23 Juillet, 1860, bears a good stem piece and leaf and an immature panicle, the other two bear three fully developed panicles. Genevier's description corresponds with these specimens, which were gathered in the locality cited at the end of the description. Accordingly, *R. gymnostachys* Genev. is a legitimate name, clearly defined and based on type-specimens which still exist. The description

in Genevier's monograph (1869) is somewhat amplified, but also agrees with the actual specimens.

Sudre in *Rubi Europæ*, 59 (1908–13), remarks, "Genevier ayant confondu sous le nom de *R. gymnostachys* au moins quatre plantes différentes, ce nom ne saurait être conservé."

The packets labelled *R. gymnostachys* in Herb. Genevier contain, in addition to other specimens of the same plant, a number of specimens which do not agree with the description and type-specimens. But the Rules of Nomenclature do not allow the rejection of a name on the ground that its author subsequently applied the name to other and different plants.

Sudre further states (*loc. cit.*), "Le *R. gymnostachys* Auct. Anglor. n'est pas identique à ceux de Genevier." This statement is correct; we have not *R. gymnostachys* Genev. in Britain.—W. C. BARTON and H. J. RIDDELSDELL.

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

BRITISH ORCHIDS.—A work that has been unaccountably overlooked by British botanists is 'Die Orchideen Deutschlands und der angrenzenden Gebiete,' by Erich Nelson (text by Dr. Hermann Fischer), which was published at Munich in 1931. Its principal feature is its set of twenty coloured plates, in which fifty-nine species are illustrated, These include all of our British species, except the Irish *Spiranthes* and *Neotinea*, and the recently distinguished segregates of *Orchis latifolia*. The plates have been prepared from Herr Nelson's water-colour drawings in facsimile-colour-light-print and are probably the finest representations of European Orchids in existence. They will at once be seen on comparison to be much superior to any similar illustrations produced in this country. A complete life-size plant of every species, with clear floral dissections, is figured, and the uniform combination of exact scientific reproduction with artistic conception is unique. The colour-printing is a revelation of what can be done in Germany at a moderate cost.

Dr. Fischer's text furnishes a concise but complete description of each species and any salient varieties, with local and general distribution; and is prefaced by chapters on the biology of the family and its history in botanical literature.—H. W. PUGSLEY.

NAME CHANGES IN HEPATICAE.—Students of British Hepaticae should study Prof. Y. Horikawa's Monograph of the Hepaticae of South Japan ('Journal of Science of the Hiroshima University,' ser. B, div. 2), as there are certain name changes which should be noted, e. g., *Jungermannia minutissima* Smith, Eng. Bot., is transferred to *Aphanolejeunea minutissima* (Smith), Horikawa. The total number of species treated in the monograph is 301, belonging to 84 genera and 21 families.—E. G. BAKER.

PLANTAGO MARITIMA L. AND ITS ALLIES.—R. Pilger (Beiträge zur Kenntnis der Gattung *Plantago*, in Fedde, Repertorium Sp. Nov. xxxiv. pp. 147–166) deals with *Plantago maritima* L. and its allies.

Var. INTEGRALIS Pilger, comb. nov. (*P. integralis* Gaudin) is widely distributed on the continent, but not recorded for Britain.

Subvar. nov. HUDSONIANA (Druce) Pilger. *P. maritima* L. *γ. serpentina* Brand. f. *ciliata* Williams, and δ. *alpina* Williams, Prodr. Fl. Brit. pt. 6, 361. *P. Hudsoniana* Druce (*P. maritima* L. var. *Hudsoniana* Druce) in Rep. Bot. Exchange Cl. iii. 170 (1913). *P. montana* Huds. sec. Druce, *l. c.* Recorded for Carnarvonshire; Durham, Widdy Bank, *Druce*; Skye, Sgurr Alaster *Druce*; Cumberland, Wastwater, *Miss Cobbe*; Perth, *Druce*; Unst, Balta, *Druce*.

Subvar. nov. PARVULA Pilger. *P. maritima* δ. *alpina* Williams f. *pumila* Kjellmann. *P. maritima* f. *angustissima* Grevillius in Engl. Bot. Jahrb. xxxiii. 85. Recorded from Öland; Shetland, Hoo Field, *Druce*; Unst, *Druce*; Sutherland, Betty Hill, *Druce*.

This is a small form with well-developed rhizome. Leaves thick linear or narrow linear, 2–4 (–6–7) cm. long. Peduncle 3–7 cm. Spike short.

Var. MINOR Hook. Brit. Flora, 67 (1830). *P. maritima* δ. *alpina* Williams f. *hirsuta* Williams, Prodr. Fl. Brit. pt. 6, 362 (non *P. hirsuta* Gilib.). *P. maritima* L. var. *hirsuta* Syme, Engl. Bot. ed. 3, vii. t. 1167, sec. Williams. *P. maritima* var. *lanata* Edmonst. ex Williams. *P. Edmonstonii* Druce in Rep. Bot. Exch. Cl. vi. 41 (1921).

Shetland; Unst, Balta Sound, *Druce*; Muckle Heog, Herb. Druce; Orkney, Hoy, *W. R. Linton*. Hooker records "Among the rocks by the House of Skail, Pomona, Orkney, G. Anderson."

This is a small form with thick rhizome. Leaves linear-lanceolate to lanceolate, 1·5–3 (–4) cm. long, 2–3 (–4) mm. broad, with greyish-white basal wool. Peduncle 4–10 cm. long. Spikes small, 0·5–3 cm. long.

The author considers that *P. serpentina* Vill. may be a variety of *P. maritima* L. It occurs from the Western Alps to the Tyrol.—E. G. BAKER.

PHENOLOGICAL RECORDS.—Prof. Michelangelo Minio ("Le Osservazioni Fitofenologiche della rete Italiana nel 1933," in Nuovo Giornale Botanico Italiano, xli. Nuov. ser. no. 4, 724–43) has collected a number of interesting data on the times of flowering of plants in various parts of Italy. He has had the assistance of a number of collaborators, and records are given for about 165 plants from the following localities:—Tarvisio, Rolzano, Venas, Cles, Trento, Conegliano, Cordenons, Semonzo, Trieste, Treviso, Venezia, Padova, Fiume, Este, Bologna, S. Giovanni Valdarno, Siena, Chieti, Roma, Potenza, and Saracena.

To take an example: *Orchis Morio* flowered at Saracena on May 2, at Potenza on April 18, at S. Giovanni Valdarno on April 12, at Bologna on May 7, at Este on April 7, at Fiume on May 7, at Treviso on April 10, at Semonzo on April 30, at Cordenons on April 6, at Conegliano on April 21. In a short abstract it is impossible to do more than indicate the nature of this paper and the original work should be consulted.—E. G. BAKER.

PROPOSED ADDITIONS TO THE INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE.

SUGGESTED BY BRITISH PALÆOBOTANISTS.

A MEETING of palæobotanists was held on October 27, 1934, at the British Museum (Natural History), at which it was agreed to propose the following additions to the International Rules. The proposals have subsequently been approved by other workers not present at the meeting, and have received the general approval of many American palæobotanists. With the exception of the third paragraph, they have been adopted in essentials by our continental colleagues, Professors Jongmans, Halle, and Gothan, who have recently issued a pamphlet of proposed additions to the Rules (Haarlem, Jan. 1935):—

After Art. 11. Add: Since most of the names of fossil plants are founded on specimens of detached organs, and uncertainty is thus involved in the complete reconstruction of many fossil species, organ genera and artificial genera may be distinguished as categories within which species are recognised.

Add to footnote of Art. 16: In organ genera and artificial genera of fossil plants the valid name is the earliest published name used for a specimen or group of specimens with the same limited circumscription, position, and rank, and this must be applied only to those organs of the plant for which the name was originally used; isolated organs of a different category must be placed in a different organ genus or artificial genus.

Add to Recommendations, Chapter III., Sect. 2: The type of the name of an organ genus is the first species described as showing all the characters on which the group was founded. The type of the name of a species is the first specimen described as showing all the essential diagnostic characters; if the specimen has been lost, the first description accompanied by a clear and satisfactory figure should be taken as the type. Where several specimens have been simultaneously described and figured without indication as to which is to be regarded as the type, the example or figure which shows most clearly and fully the essential characters should be taken.

Add to Section 4 of Chapter III. an additional subsection :—

§ 8. *Names of Artificial Genera of Fossil Plants.*

Art. . An artificial genus is an organ genus, sanctioned by long usage, which is known to contain unrelated species grouped together for convenience and to which specimens may be provisionally referred in the absence of characters indicating their taxonomic relationship. The names of such groups must be used only with their original circumscription and no subsequent alteration of the diagnostic characters is permissible. They are to be regarded as having no type-species. Owing to the mixed and uncertain nature of these artificial genera they should not be associated in larger groups comparable to families.

Note.—A list of artificial genera will be provided.

Chapter III. Add after Art. 57 a new article :—

Art. . Among extinct fossil forms a plant which has been reconstructed by the association of fragments referable to different organ genera and bearing different names must be given a distinct binary name to designate the plant as a whole. A generic name permanently associated with an organ genus must not be used for this purpose.

Note on Recommendation to be added to Section 2, Chapter III. :—

The wording and intention of our proposal differ somewhat from that of our continental colleagues. The object of Art. 18 of the Rules seems to be the permanent attachment of a name to a particular specimen (description or figure). It is especially designed to cover the cases where a genus including more than one species is subsequently divided into two or more genera, and the question arises as to which of these should bear the original generic name. The solution proposed is that the name goes with a particular specimen, preparation, figure, or description. " The nomenclatural type is not necessarily the most typical or representative element of the group ; it is merely that element with which the name of the group is permanently associated."

The question at issue is the framing of a rule for fossil plants which fulfils the object of Art. 18, without giving rise to confusion. The problem of the palæobotanist is quite different from that confronting the student of modern plants. He has not merely to link on a name to a particular plant, but also to make sure that the specimen with which the name is associated can be subsequently used for useful comparison.

The Recommendation of the English palæobotanists associates the name permanently with the specimens used by the original author of the name so long as they show all the characters which he used to differentiate them from other forms. If his diagnosis is emended by a later author a new type may be substituted as

the basis of the altered diagnosis which varies the sense in which the name was originally used.

Para. *a* of the article proposed by the continental palæobotanists seems to aim rather at the choice of a species or specimen by reference to which new material may be identified. This involves the selection of a type of a genus or a type of a species which generally is to be the first described species or specimen showing all the characters necessary for distinguishing the species or specimen from other groups. Such a course would be desirable, but it would leave a very large number of fossil plants without types. If applied to Cretaceous and Tertiary leaf-impressions it could safely be said that few of them show *all* the characters necessary for distinguishing the species from other groups, and at the same time many workers would hesitate before regarding their names as invalid or their genera as artificial.

In view of the difficulties involved, we do not suggest that the recommendation printed above is superior to that of our continental colleagues, but we think that alternative forms of wording are worthy of the serious consideration of all concerned.

H. Hamshaw Thomas, Cambridge.

REVIEWS.

The Natural History of the Hitchin Region. Edited by Reginald L. Hine, F.S.A. Roy. 8vo, pp. 256, 2 maps, frontispiece (coloured), and 39 illustrations. For the Hitchin and District Regional Survey Association by W. Carling & Co., Hitchin, 1934. Price 7*s.* 6*d.*

The Hitchin and District Regional Survey Association are to be congratulated on the admirably produced results of their work on the history, archæology, and natural history of their district. The Editor, Mr. Reginald Hine (author of ' The History of Hitchin ') supplies an historical Introduction, Mr. E. F. D. Bloom the account of the Geology and a chapter on Aromatic and Medicinal Herbs, Miss G. B. Howells the Meteorology, Mr. J. E. Little the Botany, Mr. Ray Palmer, Mr. A. H. Foster, and Dr. F. W. Edwards the Zoology, and Mr. W. H. Lane the Archæology. The region selected for study comprises Hitchin and ten miles of country round about. An excellent one-inch Ordnance Survey Map and a transect chart of the district, supplied in a pocket at the end of the book, facilitate reference. There are also maps illustrating the geology and the drift, and a proportion of the photographs reproduced as plates indicate the more prominent natural features.

The district can claim names of note among naturalists—Dr. Luke Eales of Welwyn, a correspondent of John Ray and responsible for several first records in his ' Synopsis,' James Hack Tuke (the ornithologist), Alfred Reginald Pryor, the author of the ' Flora of Hertfordshire,' James Rodway, who left

Hitchin for British Guiana, Thomas Blow, who is still with us, and many others.

Mr. Little, who has long been interested in the botany of the area, supplies a useful bibliography, and gives a general account of the vegetation and discusses the effect of human activity by which it has been profoundly modified. He gives a list of 27 native Phanerogams and Vascular Cryptogams which have been added to the district since the publication of Pryor's 'Flora' in 1887, and points out that the Mosses, Fungi, and Freshwater Algæ have not been adequately recorded. He also gives some account of the activities of the Hitchin Natural History Club, formed in 1879, with William Ransom, one of a family of local field botanists, as its first President. The Club has been succeeded by the Regional Survey Association.

The book is priced at seven and sixpence, but its production at so low a cost has only been rendered possible by a number of generous donations, which are acknowledged by the Editor.

A List of Flowering Plants, Ferns, and Horse-Tails of the Isle of Man. By CYRIL I. PATON. The Isle of Man Natural History and Antiquarian Society, Proceedings (New Series), vol. iii. no. v. pp. 547–619, 1934. Price 6*s.* 6*d.* [Reprinted from 'The North Western Naturalist' for June and September 1933.]

THE Isle of Man has not produced much in the way of botanical literature. The small catalogue published in 1900 by Rev. S. A. P. Kermode ignored sedges and grasses. Since that time a considerable amount of work has been done, and this publication provides the first complete list of Isle of Man records, so far as the author could trace them. Some species are admitted solely on their inclusion in Watson's 'Topographical Botany,' ed. 2, which shows how great is the need for further work on this interesting little island.

For many years the author has made collections during the summer, and of these parts have been presented to the "Manx National Museum" and to the British Museum. The existence of voucher specimens in these museums is indicated for each species (or variety) mentioned in the list. "Escapes" and records either doubted or needing confirmation are segregated into a separate list, followed by a few addenda due to work since the original publication. A gazetteer of localities is a useful addition.

The Manx popular names are given under the species; an alphabetical list indicating the Latin names would have been a useful addition.

The publication of this list should be a stimulus and help to further work.—A. J. W.

Ferns of North Carolina. By H. L. BLOMQUIST. Pp. xii, 131, illustrated. Duke University Press: Durham, North Carolina, 1934. Price $2.00.

THIS work describes and illustrates the seventy-six species of Ferns and Fern-allies found in North Carolina. The text is in popular style, and the illustrations, which are line drawings, occupy nearly half the work. Reference would have been made easier if the illustrations had been numbered. There are dichotomous keys to the species, and an introduction dealing with ferns in general, their life-history and ecology. The fern flora is evidently much richer than that of this country; though *Ophioglossum vulgatum, Osmunda regalis, Adiantum Capillus-Veneris, Cystopteris fragilis, Dryopteris Thelypteris, D. cristata, D. spinulosa, D. dilatata, Asplenium Trichomanes, Equisetum arvense,* and *Lycopodium Selago* are familiar, there are many genera and species that are unfamiliar to British botanists, notably four species of *Botrychium*, two of *Osmunda*, two of *Adiantum*, seven of *Dryopteris*, three of *Athyrium*, several *Asplenia*, five *Selaginellae*, and the genera *Lygodium, Dennstaedtia, Pellaea, Cheilanthes, Onoclea,* and *Woodwardia*. It is surprising to see *Equisetum scirpoides* Michx. so far south; it is a typically northern and arctic species, but has, according to Milde, a similar isolated locality in Europe, namely, "an der Möll am Heiligenblut in Kärnthen."—A. H. G. A.

Die Pilze Mitteleuropas.—I. *Die Röhrlinge* (*Boletaceae*). By FRANZ KALLENBACH. Lief. 13 (1934). II. *Die Gallertpilze* (*Tremellineae*). By WALTER NEUHOFF. Lief. 1 (1935). Werner Klinkhardt: Leipzig. 5 M. each.

THE present number of the *Boleti* continues with the list of figures and literature relating to *Boletus appendiculatus*. The remainder of the text (7 pages) is occupied with a full account of *Boletus radicans* Fr. ex Pers., of which there is an excellent coloured plate with eleven figures. This is a species with several names. It was figured by Saunders and Smith as *Boletus pachypus*; regarding this figure Fries remarked "Forte nova species, *B. candicans* dicenda"—a name which has been much used, as has also *B. albidus* Roques. It is certain that by the time this monograph is completed we shall be able to reduce the number of species figuring in our flora.

The second coloured plate, which is also excellent, is labelled *Boletus auriporus* Peck. As the text does not mention this fungus one is left to guess the reasons for giving this American name to the European species, which is apparently *B. sanguineus* (With.) Quél., *B. gentilis* Quél., and *B. cramesinus* Secr. A third uncoloured plate gives two photographs and four drawings of microscopic details.

Owing to the delay in the appearance of the parts of vol. i., a beginning has been made with vol. ii. The first half of this is to deal with Tremellineae in ten parts. W. Neuhoff has long been known as an authority on these fungi, and we may expect a valuable account of what is generally admitted to be a difficult group. The treatment cannot be so full as that of *Boletus* for obvious reasons, and the plates are sure to be much less attractive.

The text begins with the characters of the Heterobasidiales and the Tremellaceae, with a key to the genera of the latter. Then follow descriptions of *Ditangium Cerasi*, *Exidia recisa*, *E. umbrinella*, *E. saccharina*, and *E. repanda* (in part).

The scheme of description differs a little from that of Kallenbach, but is of the same general type: popular names, synonymy and literature, figures, exsiccata, original diagnosis, characters (macroscopic, chemical, microscopic), forms, distinguishing characters and misidentifications, history, occurrence, and habitat. The scheme allows of a very full account of a species, and makes comparisons easier. There are three plates—two coloured depicting the five species of the text, one uncoloured with drawings of basidia and conidia of Heterobasidiales, and hypobasidia and epibasidia.

So far as one can judge from the first part of this volume, it will reach a standard comparable with that of Kallenbach's *Boletus*—which is very high praise indeed.—J. R.

The Diseases and Curing of Cacao. By H. R. Britton-Jones. Pp. x, 161, figs. 37. Macmillan & Co.: London, 1934. Price 10*s*.

This book has arisen out of suggestions made at the Imperial Mycological Conference held in London in 1929 that a series of handbooks should be prepared dealing with diseases which affect the major tropical crops.

The chapters are arranged under the headings—Root Diseases, Stem Diseases, Pod Diseases, Witches' Broom Disease, and The Preparation or "Curing" of Cacao.

"Technical and detailed descriptions of the several parasitic organisms causing disease in Cacao have been deliberately avoided wherever possible. This has been done because the handbook has been primarily prepared for Agricultural Officers and Planters. Enlarged drawings of spores and similar microscopical structures, coupled with lengthy descriptions couched in mycological terminology, are of little use to either class of agriculturist in the absence of facilities for actual microscopical examination which are not usually available to them. Furthermore, technicalities of this nature tend to obscure in their minds the main issue, namely, how to diagnose a specific disease from macroscopic symptoms under field conditions and how to control it."

This at first sight is attractive, but one gets a shock on turning to the first page, where the sectional heading is "*Rigidoporus microporus* (Swartz) van Overeem": there is no suggestion why the name *Rigidoporus* is used in place of *Polyporus*. Synonymy is entered upon but not really understood; indeed, the author is generally weak on nomenclature. All the terms of mycology are used somewhere in the book, but there is no explanation of what they are or even of what a fungus is or how it lives. My impression is that only one having a considerable amount of mycology can understand the text.

There is a refreshing individuality in the attitude of the author on certain points. His remarks on Root disease control are perhaps the best example of this. The "mystic spore," which, incidentally, is produced in millions and dispersed efficiently, is out of favour as a source of infection, "The fungi responsible are present in the soil beforehand," and the rest is ecology. There are, however, several suggestions on practice which seem serviceable.

The book has a large number of extracts from other writers: the chapter on Witches' Broom disease (*Marasmius perniciosus* Stahel) has seventeen pages out of twenty-two of a second-hand description.

There are two full "bibliographies"—one of Cacao Fermentation, the other general. The book is attractively produced.—J. R.

Tropische und subtropische Weltwirtschaftspflanzen.—Teil III. *Genuszpflanzen.* Bd. 2. *Kaffee und Guaraná.* By Dr. Andreas Sprecher von Bernegg. 8vo, pp. xi, 286, 54 text-figs. Ferdinand Enke: Stuttgart, 1934. Price 21 R.M.

The first volume of this series of monographs on plants which minister to human enjoyment dealt with Cocoa and Cola, and was reviewed in this Journal. To follow are volumes 3 and 4, which will treat respectively of Tea and Maté, and Tobacco. The greater part of the present volume is devoted to Coffee; the less familiar Guaraná occupies only the last eleven pages. The author has given an informative *résumé* of our knowledge of the two subjects. Coffee has been used in Europe for 300 years, but there is something of legend attached to its previous and earliest use as a beverage. In the section dealing with the botany of the plant the number of species and varieties in cultivation are considered under six group-species, which include, besides the better-known *C. arabica* L. and *C. liberica* Hiern, also *C. excelsa* Chevalier, *C. canephora* Pierre,

C. stenophylla G. Don, and *C. congoensis* Froehner—allied species and natives of tropical Africa. Following the purely botanical section, which deals also with the morphology and biology of the plant, are sections on climate and soil, cultivation, including a long list of diseases which attack the crop, on harvesting the crop and its preparation for market, its chemistry, its uses, with list of substitutes and adulterants, and details of its production and use in the different countries of the world.

Guaraná is the product of the seed of *Paullinia Cupana* H. B. K., a liane of the family Sapindaceae, native of the damp forests of the Amazons and Orinoco. The plant was introduced to botany by Humboldt and Bonpland in their travels in the head-waters of the Orinoco River early last century, and was described from their collections by Kunth in 1821. It was used by the natives much as it is at the present day. Shortly afterwards the source of the drug known as Guaranapasta, which had recently been introduced to Europe, was described by Martius as *Paullinia sorbilis*—the two plants are, however, identical. The lianes are cultivated by the Indians from slips and grown on supports somewhat as are vines in Europe. The seeds, which resemble a small horse-chestnut, lose their viability after eight days unless they are kept moist; sown in the earth they germinate after five months. A plant will yield serviceable fruit for forty years. The seeds are crushed, mixed with meal of the Manioc, and allowed to ferment, forming a kind of beer, as described by Humboldt, or lightly roasted and mixed with meal, Cacao, powdered Cinchona bark (as a preventive of malaria), or other substances to form a paste, which may provide a beverage with water or be cooked in the form of bread by addition of flour of manioc or maize. The Guaraná is the staple beverage of the natives of the interior of Brazil. The active principle is Caffein.

BOOK-NOTES, NEWS, ETC.

THE LINNEAN SOCIETY OF LONDON.—The General Meeting of March 21 took the form of a discussion on Symbiosis between Animals and Plants.

Prof. C. M. Yonge opened with a paper on "Symbiosis between Invertebrates and Unicellular Algae."

The origin of the association is ascribed to the presence of intracellular digestion. Establishment of an association must vary according to whether the animal is herbivorous or carnivorous. Both plants and animals may be modified both structurally and physiologically as a result of association, and this may affect either the individual or the race. The significance

of the association varies greatly in different cases. It can be described as symbiosis only where there is a balanced condition, neither party exploiting the other. This is the case in the corals and other Anthozoa possessing zooxanthellae, also in *Chlorohydra* and *Paramecium bursaria*. The animal is in a better position to exploit the plant than is the plant to exploit the animal. *Convoluta roscoffensis* exploits the plant but to the destruction of the individual animal; *Tridacna* exploits the plant with supreme success because the individual is not destroyed.

Sir Frederick Keeble referred to his earlier work, with the late Prof. Gamble, on *Convoluta*. Nitrogen hunger was an important factor in symbiosis, and he also stressed the importance of the discovery of hormones, auxin, and similar physiological factors as bearing on symbiosis.

Mr. A. D. Cotton exhibited and commented on two examples of symbiosis between filamentous algae and sponges. Prof. Boschma of Leiden, Prof. F. E. Fritsch, Mr. H. G. Smith, and Dr. G. P. Bidder also took part in the discussion.

'JOURNAL OF THE LINNEAN SOCIETY OF LONDON.'—The recently issued number completes volume xlix., and contains the following papers:—On some Marsh Orchids, by H. W. Pugsley, a critical and somewhat revolutionary study, of special interest to British botanists: a morphological study of the tuber of the South African "Elephant's Foot," *Testudinaria elephantipes* by Miss E. N. Sparshott: A descriptive account of the genera *Gaultheria* and *Pernettya* and their hybrids in Australasia by B. L. Burtt and Sir A. W. Hill: and an account of New Zealand *Anemone*, originally referred to *Ranunculus*, by J. Parkin and W. A. Sledge.

'TRANSACTIONS AND PROCEEDINGS OF THE BOTANICAL SOCIETY OF EDINBURGH' (vol. xxxi, pt. 3).—The greater part of this number is occupied by a list of Scottish Uredineae, with details of their distribution, by Dr. Malcolm Wilson. There are also notices of the work of three Edinburgh botanists. R. J. D. Graham gives some account of the brilliant work on vegetative propagation by the late Lawrence Baxter Stewart, and there are obituary notices of Prof. W. G. Craib and H. F. Tagg.

'THE HONG KONG NATURALIST' (v. no. 3, November 1934).—The Editor, Dr. G. A. C. Herklots, continues his descriptions of the Orchidaceae of the Island, figuring and describing *Habenaria rhodocheila* Hance, *Liparis chloroxantha* Hance, *Nephelaphyllum cristatum* Rolfe, and *Acanthephippium sinense* Rolfe. Other articles of botanical interest are some notes on Bird- and Bat-pollinated flowers by L. van der Pijl, and Some Early Notes

on the Natural History of Hong Kong by A. H. Crook and L. Gibbs.

'TRANSACTIONS OF THE BRITISH MYCOLOGICAL SOCIETY' (xix. pt. 3, February 1935).—In this number T. Petch continues his Notes on Entomogenous Fungi, describing and figuring twenty-five species of *Cordyceps* and other genera; several are noted as new species. Albert Pilat of Prague describes a new species of *Poria* (*P. Pearsonii*) from the Carparthians; the species, though distributed throughout Europe and Northern Asia, has hitherto been overlooked. T. H. Harrison and A. F. El-Helaly give an account of the structure and life-history of *Lambertella Corni-maris* von Höhnel, a Discomycete causing Brown Rot in apples and other fruit; and J. Ramsbottom and F. L. Stephens an account of the occurrence in Britain of two species of *Neurospora*, a fungus infecting charred vegetable matter. Evelyn J. Forbes contributes observations on some British Water Moulds; Dorothy Ashworth, an experimental and cytological study of the life-history of *Endophyllum Sempervivi*; and S. P. Wiltshire some further notes on the preservation of Petri dish cultures.

'SINENSIA.'—Vol. iv. no. 12 (June 1934) is devoted to 'Notes on Sphaeriales from China,' by S. C. Teng. More specimens of the members of this order have been collected in China than in any other group of fungi. The present account covers only those species that have already been studied. Illustrations are given of many of the species. A slight difference in form occurs with volume v., the subsidiary title of which becomes Contributions from the Natural Research Institute of Biology, Academia Sinica. Vol. v. nos. 3 & 4 (October 1934) contain a second instalment of "Notes on Chinese Liliaceae," by F. T. Wang and T. Tang, in the form of a study of *Smilax* and *Heterosmilax* in the provinces of Kwangsi and Kweichow, and a revision of Léveillé's species of *Smilax*. Of nineteen new species published by Léveillé six only have been found to be distinct. The authors also show reason for reducing *Pseudosmilax* Hayata, "which is nothing but *Heterosmilax* with multiplication of the number of stamens" as occurs also in *Smilax*.

ELIZABETH GERTRUDE BRITTON.—The January number of the 'Bulletin of the Torrey Botanical Club' (lxii. 1–17) contains a bibliography by Dr. J. H. Barnhart, of the published work of the late Mrs. E. G. Britton. Of most importance are those dealing with Mosses, 170 titles of which are included, but Mrs. Britton was also interested in plants generally and in later years especially in the protection and preservation of wild flowers.

LIST OF PLANTS COLLECTED IN 1934 IN JAN MAYEN ISLAND.

BY C. G. BIRD.

DURING the summer of 1934 an expedition composed of E. G. Bird, R. B. Connell, and myself spent the months of July and August on Jan Mayen. Jan Mayen lies in latitude 71° N., longitude 10° W.—that is, about 400 miles north of Iceland and 300 miles off the east coast of Greenland. The island is about 30 miles long and 3 miles wide; in the north the mountain Beerenberg rises to a height of 7960 feet. There is a backbone of hills down the remainder of the island which rises to 2000 ft. in the south. The island is entirely volcanic, the hills all being craters of former volcanoes.

As Jan Mayen has been visited by few expeditions that have stayed any length of time comparatively little has been written about the vegetation. The more important papers on the flora are (1) Kruuse, C., "Jan Mayens Karplanter," Bot. Tidskr. xxiv. 297–302 (1902); (2) Ostenfeld, C. H., "Contribution à la flore de l'île Jan Mayen, Bot. Tidskr. xxi. 18–32 (1897); (3) Gandrup, Johannes, "A Botanical Trip to Jan Mayen," Dansk Botanisk Arkiv. iv. no. 5 (1924). Less important papers are (1) Dusén, P., "Beiträge zur Flora der Insel Jan Mayen," Bihang till K. Svensk. Vet.-Akad. Handl. xxvi. Afd. iii. no. 13 (1900); (2) Reichardt, H. W., "Flora der Insel Jan Mayen (Die Internationale Polarforschung, 1882–1883)," Die Oesterreichische Polar-station. Jan Mayen, iii. 1886.

One of the purposes of the expedition was to make a full collection of vascular plants and to collect as many other plants as possible.

Of the vascular plants collected by us two species were new to the island—*Cerastium cerastioides* and *Trisetum spicatum*. The following seven species obtained by other collectors in Jan Mayen we failed to collect:—*Calamagrostis neglecta*, *Cardamine pratensis*, *Arabis alpina*, *Cerastium trigynum*, *Alsine biflora*, *Sibbaldia procumbens*, *Cystopteris fragilis*.

After each species localities have been given, but it is not meant that those are the only localities where the species in question may be met with.

I am indebted to Messrs. A. J. Wilmott, G. Tandy, W. R. Sherrin, and I. M. Lamb, of the Department of Botany, British Museum, for the identification of the plants.

VASCULAR PLANTS.

Ranunculus glacialis L. Lucietta Auge, Walross Gat. Very common all over the island.

R. pygmaeus Wahl. Saule Rock, Camp Margareth, Guinea Bay, Barengat, under Sterneck Topp, Blytt's Mountain.

Cardamine bellidifolia L. Near Barengat, side of Bombelles Mt.

**Cochlearia* sp.

**Draba* sp., probably two species.

Silene acaulis L. Blytt's Mt., Walross Gat, Camp Margareth. Very common in most of the central part of the island.

Cerastium alpinum L. Zehn Zelte Bucht, Saule Rock, Carl Stephan Spitze, Camp Helene, Walross Gat, Sterneck Topp, Scoresby Crater (peculiar form), Lucietta Auge. Found in all localities, sea-shore, under bird cliffs, and on the edge of glacier streams.

C. cerastioides (L.) Britton. Camp Margareth, on edge of small freshwater stream. A new record for the island.

Halianthus peploides (L.) Fr. Zehn Zelte Bucht, Walross Gat. Found in huge clumps at high-water mark.

Sagina nivalis (Lindbl.) Fr. Sides of Vogt and adjacent craters at 500 ft., on the lateral moraine of Sudgletscher on Beerenberg, edge of freshwater lagoon in Guinea Bay.

Saxifraga caespitosa L. Blytt's Mt., sides of Vogt and adjacent craters. Lucietta Auge, Saule Rock, Walross Gat, Sterneck Topp. Common in moss under bird cliffs.

S. stellaris L., var. *comosa* Wahl. Sides of Vogt and adjacent craters.

S. nivalis L. Saule Rock.

S. tenuis (Wahl.) H. Smith. Blytt's Mt.

S. oppositifolia L. Lucietta Auge, Walross Gat.

S. cernua L. Saule Rock.

S. rivularis L. Blytt's Mt., Carl Stephan Spitze, Camp Helene, Schiertz Topp, Sterneck Topp, Cap Traill, Saule Rock, Walross Gat, Camp Margareth. Found on the sea-shore, under bird cliffs and on the edge of freshwater streams.

Taraxacum croceum L. Walross Gat and Camp Helene.

Mertensia maritima (L.) Don. Walross Gat, Zehn Zelte Bucht. Especially abundant in Walross Gat—elsewhere sparse. Did not see it on east side of the island. Grows down to high-water mark.

Oxyria digyna (L.) Hill. Camp Dobbel, Walross Gat. Very common all over the island, chiefly at lower levels.

Koenigia islandica L. Under Carl Stephan Spitze, Camp Helene, under Schiertz Topp, south slopes of Danielsen Crater.

* As these two genera are under revision I have omitted specific names; they are both very common genera on Jan Mayen.

Polygonum viviparum L. Saule Rock, Camp Margareth, Cap Traill, sides of Vogt and adjacent craters, under Carl Stephan Spitze, Camp Helene.

Salix herbacea L. Saule Rock, Walross Gat. Found in very large clumps under bird cliffs.

Luzula arcuata (Wahl.) Hook. Sides of Vogt and adjacent craters, Zehn Zelte Bucht.

L. confusa Lindeb. Side of Blytt's Mt.

Carex incurva Lightf. Saule Rock.

C. lagopina Wahl. Seven Hollander Bucht.

Trisetum spicatum (L.) Richt. Lateral moraine of Sud-gletscher, Beerenberg. A new record for the island.

Poa alpina L. forma *vivipara*. Carl Stephan Spitze, Saule Rock, sides of Vogt and adjacent craters, lateral moraine of Sud-gletscher, Beerenberg.

P. pratensis L. var. *alpigena* Fr. Camp Margareth.

Phippsia algida (Sol.) R. Br. Under Sterneck Topp, Camp Margareth, Blytt's Mt.

Festuca rubra L. var. *arenaria* (Osb.) Fr. Saule Rock, Camp Margareth.

F. vivipara L. Lucietta Auge.

F. ovina L. forma *vivipara*. Camp Margareth, west edge South Lagoon.

Equisetum arvense L. forma *arctica*. Camp Dobbel, Walross Gat, Camp Margareth.

Bryophytes.

Musci.

Aulacomnium papillosum Lesq. & James.
Bartramia ithyphylla Brid.
Bryum sp. (?) (sterile).
Calliergon sarmentosum (Wahl.), Kindb.
Ceratodon purpureus Brid.
Dicranoweisia crispula Lindb.
Drepanocladus uncinatus (Hedw.) Warnst., and var. *plumulosus* Schimp.
Grimmia apocarpa Hedw.
Polytrichum alpinum Hedw.
Rhacomitrium lanuginosum Brid.
Tetraplodon Wormskjoldii (Hornem.) Lindb.
Tortula ruralis Ehrh.
Trichostomum tenuirostre Lindb.
Webera cruda Schwaeg.
W. cucullata Schimp.

Hepaticae.

Anthelia julacea (L.) Dumort.

LICHENS.

Cladonia (*Cladina*) *sylvatica* (L.) Rabenh. Walross Gat, side of Bombelles Mt.

C. (*Cladina*) *uncialis* (L.) Web. Lucietta Auge.

Solorina crocea (L.) Ach. Side of Bombelles Mt., Carl Stephan Spitze.

Gyrophora proboscidea Ach. Saule Rock.

Stereocaulon alpinum Laur. Lucietta Auge.

Caloplaca (*Gasparrinia*) *elegans* Th. Fr. Saule Rock.

MARINE ALGAE.

Ulva sp. Walross Gat.

Rhizoclonium riparium (Roth) Harv. Guinea Bay.

Cladophora rupestris (L.) Kuetz. Walross Gat.

Fucus inflatus L. Walross Gat.

Chorda Filum (L.) Stackh. Walross Gat.

Alaria esculenta (L.) Grev. Walross Gat, Polaclippe.

Laminaria Agardhii Kjellm. Walross Gat.

L. longicruris de la Pyl. Walross Gat.

L. digitata (L.) Lamour. Walross Gat.

Halosaccion ramentaceum (L.) J. Ag. Walross Gat, Polaclippe.

Ptilota pectinata (Gunn.) Kjellm. Walross Gat.

FRESHWATER ALGAE.

Palmodictyon varium (Naeg.) Lemm. Freshwater pool above camp (Camp Dobbel).

Tetraspora lubrica (Roth) Ag. Freshwater pool, Neumayen Berg.

Zygnema sp. Still pool near Hochstetter Crater, 150 ft.

RUBUS BAKERI F. A. LEES AND ITS ALLIES.

BY W. C. BARTON AND H. J. RIDDELSDELL.

BABINGTON'S herbarium, now at the British Museum, contains in the *R. hamulosus* packet five gatherings from the *locus classicus*, Gormire, Yorkshire, of the plant to which Dr. F. A. Lees gave the name *R. Bakeri*:—no. 552 coll. Borrer, 1845; no. 256 coll. J. G. Baker, 1851; no. 449 coll. J. G. Baker, 1860; no. 599 coll. J. G. Baker, 1865, labelled *R. hamulosus*; and a sheet unnumbered coll. F. A. Lees, 1887.

The plant is discussed by Babington in his 'British Rubi,' p. 77 (1869), and more fully under the name of *R. hamulosus* L. & M. in Journ. Bot. 1886, 218, where he remarks:—"The credit of determining the true name of this plant belongs to Mr. Baker, who sent it to me as the *R. hamulosus* Müll. in 1865. Probably it will have to be distinguished specifically."

Dr. Lees, in his 'Flora of West Yorkshire' (1888), prints after 260. *R. plicatus* W. & N. "[*R. hamulosus* P. J. Müll. et Lefèvre. Forma sub judice.... Unknown to me and therefore not numbered....]" with a quotation from Babington's Journ. Bot. 1886 paper.

Dr. Lees described his *R. Bakeri* in the 'Botanical Record Club Report,' 1884–6, published in 1887.

The Director of the Bradford Corporation Museum has had a careful search made through the Lees Herbarium, and reports that it contains no sheet labelled *R. Bakeri*. In the parcel of *Rubi* collected during the years 1886–8 there is, in C. Bailey's handwriting, an "Extract from Prof. Babington's letter to Charles Bailey:—January 17, 1888," as follows:—"On looking at the Report I find that he has named a *Rubus Bakeri*. I have his plant before me, and find that I called it *hamulosus* (a name long since published), but on re-examination with his remarks I am led to suspect that he has not got the true plant of Baker, of which I have an abundance. Of those I do not find one exactly like Lees's plant. I find all the leaves 5-nate and much more regularly and finely serrate. I also find *no* setæ on the stem. With Lees's specimen are two bits of stem (1) with small 5-nate leaves and finely serrate lts., the other (2) with ternate leaves and much more coarsely dentate than serrate. (2) * has straight subulate prickles and setæ and aciculi on both stem and petioles, (1)* has somewhat falcate prickles but no setæ nor aciculi on stem or petioles. *Can it be that Dr. Lees has mixed the stems of two plants growing intermixed and much resembling each other in general appearance?* I am in a difficulty. His plant is *hamulosus* by its flowering shoot and one piece of barren stem, but the trifoliate piece of stem sent with it is not *hamulosus* nor as I believe allied to *nitidus* either of us or the true plant."

"I fear I was somewhat to blame for having passed his ternate-leafed bit as belonging to the same plant as his quinate portion. His *Bakeri* cannot stand, even I fear as a synonym of anything, owing to the confusion about the stem. What he means is I believe *R. hamulosus*."

The sentence we have italicised in the above has in the original extract by Bailey been underlined in red ink by Dr. Lees, and he has written below also in red ink:—"No! I was very careful about this; barren stems without panicle branches were scarce. I found one or two undoubtedly belonging & cut those up—I noted the setæ at the time, and suppose they fall off by the 2nd year. There is a *strain* (thro' hybridisation) of *echinatus* (which grew about) in it, I consider. F. A. L."

* The numbers (2), (1) are written (1), (2) in Bailey's extract; fortunately the specimens make it impossible to misunderstand Babington's meaning.

The gathering by Dr. Lees in Babington's herbarium packet mentioned in our first paragraph has been remounted on Babington's paper. On the paper he has written "*R. hamulosus*" and against one stem piece "does this leaf belong to the same plant?" Attached to his sheet is part of another sheet (apparently Lees's previous mount) bearing a label in Lees's handwriting:—"*Rubus nitidus*, f. *Bakeri*, F. A. Lees. Slopes about Gormire Lake, Thirsk, N.E. Yorks (v.c. 62). Aug. 1887. F. A. Lees"; and also a note in the same hand: "No quinate—(all ternate) leaves on the old barren stems which were scarce, as the quinate ones of the young suberect shoots die off second year & flowering branches shoot up from their axils." Above Lees's label is "*R. hamulosus*" in Babington's handwriting.

From the absence of any specimen of *R. Bakeri* in Lees's own herbarium, and the evidence of Babington's letter and herbarium given above, it seems that Lees submitted his 1887 gathering to Babington, who named it *R. hamulosus*, but failed to call attention to the alien stem piece. Lees then described his *R. Bakeri* in B. R. C. Rep. 1884–6 (1887). By January 17, 1888, Babington again had Lees's gathering before him, and on that date wrote to C. Bailey a letter from which Bailey made the extract quoted above. Lees saw and annotated this extract, which is still in his herbarium, but apparently Babington kept the specimen (or it was given to him later), and, cutting up Lees's sheet, remounted it for his own herbarium.

We are thus justified in assuming that the specimen now in Babington's herbarium is the specimen from which Lees drew up his description. There can be no doubt that Babington was right in his suggestion that one stem piece came from a different plant, and that the confusion in Lees's description is due to this mixed gathering. Lees's own comments tend to confirm rather than to weaken this conclusion.

In 1933 one of us visited Gormire, and found growing in the original locality the true plant of Babington's herbarium and with it *R. echinatoides* Rogers; there also occurred a form, presumably hybrid, with characters of both. This seems to establish with certainty the conclusion we had already reached above.

According to the International Rules of Botanical Nomenclature, Art. 64, the name *R. Bakeri* F. A. Lees is a *nomen confusum*, and must be rejected, as the characters were derived from two entirely discordant elements supposed to form part of the individual. This is perhaps less to be regretted, as the name has since been applied to a different plant. In the 'Handbook,' p. 30, Rogers re-described *R. Bakeri* F. A. Lees as a subspecies of *R. rhamnifolius* Wh. & N., basing his description on the south country plant (as he states in his MS. notes in our possession). Later he considered *R. Bakeri* specifically distinct from *R. rhamnifolius*, and in this we agree; but three forms were included under his name, and these we now propose to distinguish and describe.

1. **Rubus pistoris,** sp. nov. *R. Bakeri* F. A. Lees of Rogers' 'Handbook,' pro parte. Turiones angulati, canaliculati, glabrescentes, aculeis multis robustis sat brevibus e basi longa compressa curvis vel rectiusculis instructi. Folia quinata, parva, supra subglabra subtus multis capillis brevibus vestita, dentibus subtilissimis. Foliolum terminale parvum, ovato- vel obovato-ellipticum, longe acuminatum, ad basin vulgo integram attenuatum. Inflorescentia vulgo parva, angusta, pæne usque ad apicem foliosa, apicem versus vix decrescens, supra subracemosa (interdum major et magis composita), ramis omnibus ascendentibus. Rhachis aculeis multis sat parvis e basi longa curvatis reclinatisve armata, pilosa; pedicelli multis aculeis parvis armati. Bracteæ multæ. Flores parvi, pallide lilacini; petala anguste elliptica; stamina stylos parum superantia; sepala brevia latiuscula externe pilosa et cano-viridi-tomentosa, post anthesin ascendentia.

A small round bush, compact and neat; plant small in all its parts. *Stem* rather high arching, *angular, striate,* more or less hairy, *glabrescent. Stem-prickles many, strong, shortish, with long compressed base,* considerably *curved or nearly straight* and declining, seldom patent. Stipules varying in breadth. Petioles with fairly many strong curved prickles. *Leaves quinate,* firm, flat, *small, subglabrous above, with much short hair beneath. Toothing very fine. Terminal leaflet small,* usually rather long-stalked, *ovate- or obovate-elliptic, with longish* cuspidate-acuminate *point and* narrowing to *entire* or ±emarginate *base.* Basal leaflets short-stalked. *Panicle cylindrical, narrow and subracemose above, or broader and more compound*; usually leafy nearly to the top, and at most one-third ultra-axillary, the lowest leaves sometimes 4–5-nate; *all branches ascending,* the lower axillary ones mostly few-flowered. *Rhachis hairy* to densely hairy, but scarcely felted; *prickles many, smallish, long-based,* strong, *strongly curved or* straight *declining; pedicels with many small prickles.* Foliaceous and narrower *bracts many* and conspicuous. *Flowers small,* flat, star-like, *pale mauve; petals narrow elliptic,* long-clawed; *stamens* pinkish, the *outer* ones *somewhat exceeding the styles; sepals greenish-grey felted and hairy, short and broad,* later often greatly lengthening, *rising after flowering* to patent in young fruit. Carpels glabrous or subglabrous.

R. pistoris Bart. & Ridd. is constant in its characters and noticeably small and neat in all its parts. The leaves apparently are not felted beneath, except the topmost leaves and bracts of the panicle and the stem-leaves before maturity. Fasciculation of the axillary branches seems to be common in the larger panicles, and the branches are often divided below the middle. There are sometimes a few subsessile glands on the stem. One specimen in our herbarium, ref. no. 2782, coll. J. G. Baker, Gormire, Sept. 1886 (possibly not quite pure, *vide supra*), shows more hair on the stem (longish isolated and short stellate) than the specimens in herb. Babington, and also some fine short-stalked glands on the panicle; but glands are few and inconspicuous in the species. Though *R. pistoris* is unlikely to be confined to the localities hitherto known, it seems to be absent from the distribution area of the second form described below.

DISTRIBUTION: Warwick, v.c. 38, Sutton Park (frequent, *Bagnall*, 1873, in Hb. Bab.), Brandon Wood (with sepals strongly reflexed, *Riddelsdell*, 1922, ref. no. 4030); Staffs v.c. 39, Fradley (*Bagnall*, 1897, ref. no. 4036, stem pieces cut too low down but flowering shoot shows characteristic prickles); Glamorgan, v.c. 41, Peterston (sepals loosely reflexed, *Riddelsdell*, 1905, ref. no. 4031); Cheshire v.c. 58, Edge (a starved form, *Wolley-Dod*, 1894, ref. no. 4029); N.E. Yorks v.c. 62, Gormire; S.W. Yorks v.c. 63, Mytholmroyd (*Crump*, 1905, in Hb. Mus. Brit.); Argyll v.c. 98, Lochgilphead (leaves strigose above, stamens long, panicle laxer, *C. E. Salmon*, 1897, *vide* Rep. W. B. E. C. 1897–8, ref. no. 4032).

Exsiccata: (in Herb. Bart. & Ridd.) ref. nos. 4351 *typus* (holotype), 4215, 4352 to 4357. Also the gatherings in Herb. Babington mentioned in the first paragraph of this article, excluding the stem piece of Lees's gathering queried by Babington.

2. **Rubus Bakeranus,** sp. nov. *R. Bakeri* F. A. Lees of Rogers' 'Handbook,' pro parte.

Turiones pæne suberecti, hirsuti, aculeis haud crebris longiusculis ±inæqualibus e basi sat longa vulgo rectis instructi. Folia quinata, parva, supra pilosa, dentibus subtilissimis et subæqualibus. Foliolum terminale subrotundum, vulgo cuspidatum longe acuminatum, sæpe cordatum, vulgo longe petiolulatum. Inflorescentia lata, pyramidalis, composita, ramis ascendentibus. Rhachis sat dense hirsuta, aculeis haud crebris e basi longa longiusculis armata. Flores parvi, saturate lilacini; petala late obovata, infra attenuata; stamina stylos superantia; sepala post anthesin laxe reflexa; germina glabra.

Stem almost suberect, with fairly many clustered *hairs* and some sessile or very short-stalked glands, frequently sulcate. *Stem-prickles not numerous, longish, rather long-based, somewhat unequal, usually straight* (patent or declining) or slightly curved. Stipules narrow. *Leaves quinate,* rather thin, *small, strigose above,* paler and hairy beneath. *Toothing very fine and regular,* even when somewhat compound. *Terminal leaflet* broadly elliptic, almost *subrotund* or somewhat obovate, *usually* abruptly *cuspidate with a long point,* sometimes cuspidate-acuminate with shorter point, *base* seldom entire, *frequently cordate; usually long-stalked.* Basal leaflets short-stalked. *Panicle broad,* often *pyramidal, compound,* corymbose-topped, its *branches ascending,* the lower axillary many-flowered. *Rhachis* and pedicels *rather thickly hairy,* its *prickles not numerous,* usually *longish, long-based* and straight or slightly curved. Bracts numerous. *Flowers small,* full *lilac-pink; petals broadly obovate with long claw; stamens exceeding styles; sepals* broad, greenish-grey felted and hairy, *loosely reflexed after flowering. Carpels glabrous.*

R. Bakeranus Bart. & Ridd. is one of the most easily recognized brambles of the London Commons, owing to its neat habit and small leaves. These characters it shares with *R. pistoris*, but it is sufficiently distinguished from that by the more nearly suberect stem, with fewer longer and straighter prickles, the strigose upper surface of the leaves, the often subrotund longer-pointed cordate-based terminal leaflet, the larger and broader-topped pyramidal panicle with rhachis-prickles fewer and straighter, and by its broader and deeper coloured petals.

DISTRIBUTION: W. Kent v.c. 16 (*fide* Rogers); Surrey v.c. 17, the London Commons.

Exsiccata: (in Herb. Bart. & Ridd.) ref. nos. 4376 *typus* (holotype), 2783–2787, 4033–4034, 4374–4375.

Var. **milcombensis,** var. nov. (*vide* Rep. B. E. C. 1925, 1039). Differt a *R. Bakerano*: turionum aculeis magis inæqualibus, foliorum dentibus minus profundis, foliolo terminali obovato brevius acuminato ad basin alte cordato, foliolis infimis manifeste petiolulatis, inflorescentiæ ramis aliquanto patentioribus, rhachidis aculeis vulgo brevibus tenuibus, florum partibus omnibus roseolis, staminibus stylos paullo vel multum superantibus.

Known only from one locality near Milcombe village, Oxon, v.c. 23, at the corner of a copse on rough sandy ground. It obviously belongs to the *Bakeranus* division, and differs from *Bakeranus* by its more unequal stem-prickles, shallower leaf-toothing, shorter point and deeper-cordate base of the obovate terminal leaflet, the longer stalked basal leaflets, the more patent panicle branches, the short slender rhachis-prickles, and pink flowers.

Exsiccata: (in Herb. Bart. & Ridd.) ref. nos. 5116 *typus* (holotype) (coll. *Riddelsdell*, Aug. 30, 1934), 1123, 1898, 2834, 4350, 4744–4748.

3. **Rubus furnarius,** sp. nov. *R. Bakeri* F. A. Lees, forma *elongata* Rogers in Journ. Bot. 1906, 358.

Turiones arcuati, robusti, hirsuti, glabrescentes, aculeis hinc illinc dispositis inæqualibus e basi sæpe brevi compressis rectis instructi. Folia quinata, supra pilosa subtus hirsuta et cano-tomentosa, dentibus subtiliter mucronulatis. Foliolum terminale subrotundum emarginatum, petiolulo foliolum longitudine subæquante. Inflorescentia laxa, angusta, apicem versus vix decrescens, ramis superioribus patentibus 2–3-floris. Bracteæ multæ. Rhachis hirsuta, apicem versus tomentosa, aculeis reclinatis armata. Flores magni, albi; stamina stylos multo superantia; sepala cano-tomentosa, laxe reflexa apicibus ascendentibus.

Stem moderately *high-arching,* striate, furrowed, *stout,* green or pale (in exposure bright claret-red), *with much hair* (of varying length, single and clustered or stellate) and sometimes some very short-stalked glands, *glabrescent. Stem-prickles* few or many, somewhat *scattered, unequal* (some very long), *straight* (patent or declining), often rather *short-based, compressed.* Stipules narrow; petioles long, with many declining or curved prickles. *Leaves quinate,* dark green and *strigose above,* much paler, *with* much close short *hair and grey felt beneath. Toothing* rather regular, simple and compound, *fine-pointed. Terminal leaflet roundish*

or obovate-rotund, *emarginate* or subcordate, *with* cuspidate-acuminate point and *stalk often nearly equalling its own length. Panicle narrow, cylindrical* (or longer and broader, *i. e.*, with longer pedicels), in great part ultra-axillary, *lax*, with distant ascending axillary lower branches and *upper branches patent 2–3-flowered*; foliage all felted beneath. Bracteoles and trifid *bracts many* and conspicuous. *Rhachis* strongly armed *with* longish *declining prickles, hairy and towards the top felted*; peduncles felted and finely aciculate. *Flowers large*, pure *white* or faintly pinkish; petals broadly obovate, rather crumpled; *stamens far exceeding* the greenish *styles; sepals* concave, rather *loosely reflexed* after the fall of the petals, *with rising points*, densely *grey-felted*, hairy, somewhat aciculate. Carpels glabrous.

R. furnarius Bart. & Ridd. was found first by Rogers in 1890 at Aysgarth, and later in other Yorkshire and Lancashire localities. He was at first impressed by its resemblance to Babington's (not yet published) *dumnoniensis*, and Babington thought it "a northern form" of his species; Archer Briggs, however, could not see his way to endorse the name. Dr. Focke suggested "a form of the *Rhamnifolius* group near *R. Lindebergii* P.-J. Mueller"; on which Rogers notes: "This seems to me at least as distinct from *R. Lindebergii* (in whose company it grew in good quantity and without the occurrence of intermediate forms) as *R. Lindebergii* is from .... any other well-marked form of the *rhamnifolius* group." In Dec. 1890 Rogers writes to Babington "I now think it distinct from all." By 1906 Rogers considered it nearer to *Scheutzii* and *Bakeri* than to any other British plant, and described it as *forma elongata* of *R. Bakeri* F. A. Lees in Journ. Bot. 1906, 358.

In 1933 and 1934 visits were paid to three Yorkshire localities in order to study the plant *in situ*. *R. pistoris* does not occur in these localities, but *R. Lindebergii* is abundant. Numerous gathering were taken, and our description has been drawn up from the living plant and specimens in our herbarium; Rogers's own copious notes made in the field have been used to check our work. *R. furnarius* is a larger plant than *R. pistoris* and *R. Bakeranus*; the leaflets are all long-stalked and somewhat concave; the panicle branches are often divided below the middle, and Rogers notes that the filaments are first white, then pinkish. At Aysgarth *R. furnarius* hybridizes with a local *dumetorum* form. A specimen gathered by Riddelsdell, Rhigos, Glamorgan v.c. 41, 1906, and referred by Rogers to *R. Bakeri* f. *elongata*, is in our opinion not *R. furnarius*, but probably a hybrid.

DISTRIBUTION: Midwest Yorks v.c. 64, Giggleswick (*Rogers*, 1890); N.W. Yorks v.c. 65, Aysgarth (*Rogers*, 1890) and Sedbergh to Dent (*Rogers*, 1906); N. Lancs v.c. 69 *b*, Coniston to Ambleside (*A. Ley* and *W. R. Linton*, 1905).

Exsiccata: (in Herb. Bart. & Ridd.) ref. nos. 4378 *typus* (holotype), 2778–2781, 4217–4218, 4377–4380.

The known distribution of the three forms here described is suggestive. *R. Bakeranus* is confined to the commons of S.E. England (with a variety in Oxon v.c. 23). *R. pistoris* occurs from Glamorgan to Yorkshire (and appears in Argyll, v.c. 98). *R. furnarius* occupies a district in Yorks and Lancs adjoining the area where *R. pistoris* is most frequent; *R. pistoris* itself has not been found in this district, but *R. Lindebergii* is abundant.

The relationship of *R. furnarius* with *R. Lindebergii* is at least as close as with the two much more closely allied *R. pistoris* and *R. Bakeranus*. For the present, however, we think it advisable to leave all three together where Rogers placed them.

Our thanks are due to the authorities of the Cambridge University Herbarium and to the Director of the Bradford Corporation Museum for courteous assistance and the loan of papers and specimens, and again to Mr. A. J. Wilmott of the British Museum for invaluable help and guidance.

SPECIES OF *TERMINALIA* FROM THE SOLOMON IS.

BY A. W. EXELL, M.A., F.L.S.

RECENT collections made by L. J. Brass and S. F. Kajewski contain seven species of *Terminalia*, four of which appear to be new. The specimens, for which we are grateful to Mr. C. T. White, of the Queensland Botanic Gardens, are in the British Museum Herbarium. Mr. White informs me that corresponding sets are preserved in the Herbarium of the Arnold Arboretum and in the Queensland Herbarium.

TERMINALIA CATAPPA L., Mant. i. 128 (1767).

San Cristoval: Waimamura, common on sand-beaches and rocky foreshores, *Brass* 2833.

"A very large and handsome tree with rough scaly bark. Seeds eaten by the natives. Native name 'Aliti.'"

T. COMPLANATA K. Schum. in K. Schum. & Hollr., 'Flora von Kaiser Wilhelms Land,' 83 (1889).

Bougainville: Kugumaru, Buin, common in rain-forest at 150 m. alt., *Kajewski* 1868. Guadalcanal: Berande, common in rain-forest, at sea-level, *Kajewski* 2431.

"A large tree, 20–25 m. in height. Fruits plum-coloured when ripe. The trunk is used for making canoes. Native names 'Clenige' (in Bougainville), and 'Gaurrasu' (in Guadalcanal)."

T. cf. SAMOENSIS Rech. in Fedde, Rep. Nov. Sp. iv. 229 (1907).

Owa Raha, sandy foreshore, *Brass* 3095.

"Handsome, spreading, thickly foliaged tree, with hard, grey, scaly bark. Fruit flat when young, fleshy, unevenly shaped and red in colour when ripe."

The specimen agrees well with the description of *T. samoensis* Rech. (of which I have seen no specimen) except that the fruits are rather larger than in the Samoan plant. A sterile specimen collected by Jensen in the Ellice Is. agrees tolerably well with *Brass* 3095 and forms a connecting link between the Solomon Is. and Samoa.

Terminalia megalocarpa Exell, sp. nov. *Arbor* 15 m. alta, ramulis glabris. *Folia* petiolata, petiolo supra sulcato, 2–3 cm. longo, glabro, lamina elliptica vel lanceolato-elliptica, apice acuta basi cuneata vel rotundata, supra minute verruculosa, omnino glabra, 9–20×4·5–9·5 cm., costis lateralibus utrinque 10–12 supra subtusque prominulis. [*Flores* desunt.] *Fructus* grandis pyriformis brunneo-viridis (in sicco fere niger) apice apiculatus, 10–11×5·5–6·5 cm.

Hab. Bougainville: Koniguru, Buin, common in rain-forest at 950 m. alt., *Kajewski* 2087 (*typus* in Herb. Mus. Brit.).

"A medium-sized tree up to 15 m. high. Fruit very large, pear-shaped, shiny green with a touch of brown. The leaves are bruised and applied to relieve head-aches. Native name 'Kariruru.'"

This species is probably related to the remarkable *Terminalia okari* C. T. White from New Guinea, which has even larger fruits (up to 17·5 cm. long). Unfortunately no flowering material of *T. megalocarpa* has been collected.

Terminalia solomonensis Exell, sp. nov. *Arbor* ad 30 m. alta, ramulis crassiusculis glabris. *Folia* petiolata, petiolo 3–4 cm. longo supra applanato glabro, lamina elliptica vel obovato-elliptica apice breviter acuminata basi cuneata, 15–24×7–9 cm., omnino glabra et minute verruculosa, costis lateralibus utrinque 10–14. *Fructus* ovoideus vel ellipsoideus apice acutus, 3·8–4×2–2·5 cm., glaber.

Hab. Guadalcanal: Berande, in rain-forest at sea-level, *Kajewski* 2447 (*typus* in Herb. Mus. Brit.).

"A large tree, up to 30 m. high, with medium-sized flanges going a long way up the trunk. Fruit plum-coloured when ripe, lime-shaped. This tree is used in making canoes, being very free in splitting to make planks. Native name 'Ngar.'"

This species seems to be nearest to *T. kangeanensis* Van Slooten, but with glabrous leaves and broader less markedly asymmetrical fruits.

The following specimens may also belong here but are in a much younger stage. As the fruits are of primary taxonomic importance in this genus I have described the species entirely from *Kajewski* 2447, and refer the other specimens here tentatively until ripe fruits are obtained.

Malaita: Qouimonapu, in rain-forest on mountain-top at 300 m. alt., *Kajewski* 2359.

"A medium-sized tree, up to 25 m. high. The natives eat the pulp of the fruit. They say it is black when ripe. Native name 'Tauma.'"

Ulawa: coast, *Brass* 2989.

"Handsome pyramidal tree, 15 m. tall, with pale grey bark. Flowers cream-coloured. Fruit said to be edible. Native name 'Tramu.'"

Isabel: Suwa, planted near village, at 300 m. alt., *Brass* 3232.

"Tree of 20 m. alt., with flatly spreading, whorled branches. Fruit said to be edible."

Terminalia Kajewskii Exell, sp. nov. *Arbor* ad 30 m. alta, ramulis juventute rufo-tomentellis demum glabrescentibus. *Folia* petiolata, petiolo rufo-pubescenti ad 1·5 cm. longo, lamina anguste elliptica, elliptica, oblongo-elliptica vel oblonga, apice acuta nonnunquam brevissime apiculata, basi rotundata, 4–12×2–5 cm., primo rufo-sericea demum supra fere glabra subtus appresse-rufo-pubescenti, costis lateralibus numerosis utrinque 25–40, costa media subtus prominente. *Flores* pentameri pallido-virides in paniculas axillares 10 cm. longas dispositi. *Rhachis* dense pubescens. *Receptaculum* superius cupuliforme, 1×1·2 mm., extus pubescens vel nonnunquam fere glabrum lobis acutis persistens, inferius primo fusiforme pubescens, 2 mm. longum, mox accrescens elongato-fusiforme, 4–8 mm. longum. *Discus* crassiusculus, 1 mm. in diam., rufo-pilosulus. *Stamina* 10, 2·5–3 mm. longa. *Stylus* 2·5 mm. longus. *Fructus* (immaturus) ambitu obovato, 5-alatus, alis duobus ad 4 mm. latis alteris angustissimis vel fere obsoletis, ad 10 mm. longus et 8 mm. latus, receptaculo persistenti coronatus.

Hab. Bougainville: Marmarromino, common in rain-forest at 50 m. alt., *Kajewski* 2196 (*typus* in Herb. Mus. Brit.). Koniguru, Buin, common in rain-forest at 900 m. alt., *Kajewski* 2119.

"A very large tree, up to 30 m. high; stems and flowers light green, calyx pink-green, style very persistent. It may have possibilities as a timber-tree. Native names 'Oieguy' and 'Koilicka.'"

This is apparently not closely related to any of the species as yet collected in New Guinea. It is remarkable for its leaves with very numerous parallel secondary nerves and for the small winged fruits (immature in the specimens) in which two wings are well developed and three are very narrow. The leaves are somewhat reminiscent of some Indian species, such as *T. Arjuna* (Roxb.) Wight & Arn. The fruits are unusual for the genus. *T. sepicana* Diels from New Guinea is described as having fruits with two complete wings and two to three subapical incomplete ones, but the fruits are here 4 cm. long, which could scarcely be

attained in *T. Kajewskii*. A South American species, *T. obovata* (Ruiz & Pav.) Steud., has a similar arrangement of the wings (two and three), but in this case the well-developed wings are much broader than long.

Terminalia Brassii Exell, sp. nov. *Arbor* ad 50 m. alta, ramulis fere glabris. *Folia* petiolata, petiolo supra sulcato, ·8–1 cm. longo, apice biglanduloso, lamina oblonga apice acuta plerumque leviter acuminata basi rotundata vel subcordata nonnunquam inæquali, 10–19×4–6 cm., omnino minute verruculosa glabra, costis lateralibus numerosis utrinque 25–35, costa media subtus valde prominenti. *Flores* pentameri pallido-virides in paniculas axillares ad 9 cm. longas dispositi. *Receptaculum* superius cupuliforme, 1–2×1 mm., extus sparse puberulum, lobis acutis, persistens, inferius primo fusiforme dense pubescens, 1·5–2 mm. longum, mox accrescens demum 5–8 mm. longum. *Discus* crassiusculus pilosulus, 1 mm. in diam. *Stamina* 10, 2·5–3·5 mm. longa. *Stylus* 2·5 mm. longus. *Fructus* (immaturus) ambitu obovato 5-alatus, alis duobus ad 4 mm. latis, alteris angustissimis vel obsoletis, receptaculo superiore coronatus.

Isabel: Garona, common in the lowlands, in riverine rainforest, *Brass* 3354 (*typus* in Herb. Mus. Brit.). San Cristoval: Magoha R., common in the lowlands, *Brass* 2743).

"A tall straight-boled, flange-buttressed tree, up to 50 m. high, with scaly brown bark, sending out stiff, horizontal, adventitious roots high above the ground. Flowers greenish-white."

This is very near to the preceding species, *T. Kajewskii*, and resembles it closely in the structure of the flowers and fruit. It can be at once distinguished from it, however, by the conspicuous glands at the apices of the petioles and by the larger glabrous leaves.

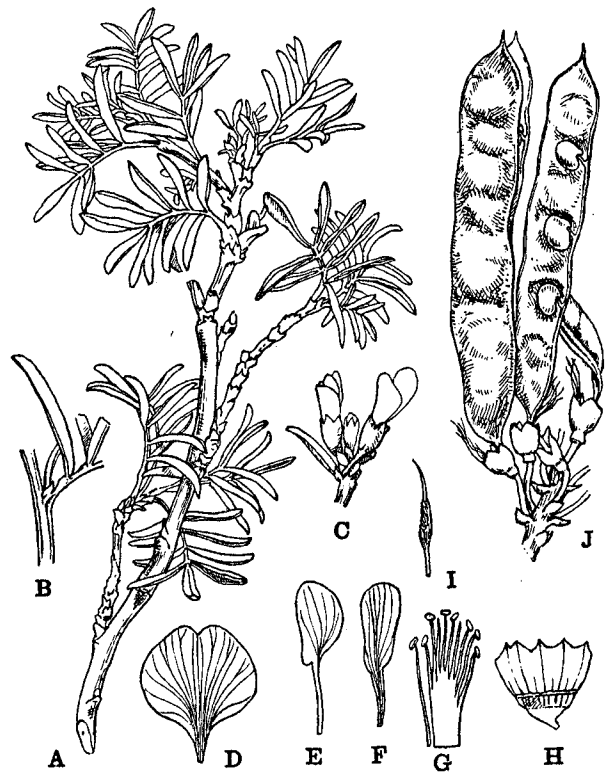
NEW GENUS OF *LEGUMINOSAE* FROM TIBET.

By E. G. Baker, F.L.S.

SALWEENIA, gen. nov.

Calyx campanulatus dentibus 5 brevibus deltoideis, 2 superioribus partim connatis, tubo pluries brevioribus. *Discus* ad basin calycis adnatus. *Vexillum* obovatum vel orbiculari-obovatum apice emarginatum. *Alæ* oblongæ longe unguiculatæ. *Carina* navicularifformis basi unguiculata. *Stamen* vexillare liberum, stamina cætera connata; antheræ dorsifixæ uniformes. *Ovarium* stipitatum. *Legumen* submembranaceum stipitatum lineari-oblongum, seminibus applanatis. *Frutex*. *Folia* imparipinnata, foliolis integerrimis exstipellatis. *Stipulæ* minutæ herbaceæ. *Flores* ad apices ramorum aggregati, pedicellis brevibus. *Bracteæ* et bracteolæ minutæ.

Salweenia Wardii. Species unica. *Frutex* erectus 1–2½-, rarius 3–5-pedalis altus, cortice griseo obtectus, ramis junioribus canescentibus. *Stipulæ* 1–2 mm. longæ deltoideæ persistentes. *Folia* 3–7-juga cum impari; foliolis 1–2·5 cm. longis, 3–5 mm. latis, anguste linearibus vel oblongo-linearibus minute pubescentibus subcrassis sæpissime complicatis, marginibus involutis.



Salweenia Wardii Baker fil.

A. Branch with leaves. B. Branch showing stipule. C. Flowers. D. Vexillum. E. Carina. F. Wing. G. Stamens. H. Inner side of calyx split open. I. Ovary. J. Pods. A, B, C, J, ⅔ nat. size; D–I, nat. size.

Bracteæ 3–5 mm. longæ deltoideæ. *Flores* flavi. *Calyx* in toto 8–9 mm. longus. *Vexillum* 16–18 mm. longum. *Alæ* cum ungue ±20 mm. longæ. *Carina* cum ungue ±19 mm. longa. *Legumen* pubescens 6–9 cm. longum, 8–12 mm. latum, seminibus 5–7.

Hab. Tibet: Salween gorge, Chando district, alt. 9000–11,000 ft. August 3, 1933, *Kingdon Ward* 10,680 (*typus* in Herb.

Mus. Brit.). "A small bushy shrub scattered with *Sophora viciifolia* on the dry rocky slopes and gravel fans, usually in more sheltered positions than *S. viciifolia*. Flowers yellow. The pods are too flattened and not sufficiently constricted for *Sophora*. Normal on the arid slopes, 1–2½ ft. high. By streams, exceptionally 3–5 feet high and as much through."

This belongs to the tribe *Galegeae*, and is allied to *Caragana*, from which it differs in the non-spinous stipules and sub-membranous stipitate pods. It differs from *Astragalus* by having a flat pod not at all turgid nor longitudinally 2-celled; also in the petals; the standard is shorter than the wings and keel. It is also allied to *Sophora* and *Calpurnia* in the *Sophoreae*, but has diadelphous stamens. *Salweenia* is now in cultivation.

ORCHIS MILITARIS L. IN ESSEX: A CORRECTION.

By Patrick M. Hall, F.L.S.

While examining recently in the British Museum Herbarium the British specimens of *O. militaris* L. my suspicions were aroused by an alleged example of this species from the Herbarium of Samuel Dale. The First Supplement of 'Topographical Botany' records this species for N. Essex, v.c. 19, on the authority of *Journal of Botany*, 1883, 231, which refers to a lengthy biographical note on Dale by G. S. Boulger.

In the course of this note Boulger referred to Dale's careful and critical work, citing as an example and quoting *in extenso* the label attached to his specimen of *Orchis militaris* L., from Walter Belchamp, Essex, May 13th, 1738; as a result "*Orchis militaris* L. in Essex" appears in the Index.

The specimen is an indifferent one, and its true identity might escape notice in a cursory examination; but the label is an excellent example of Dale's industry, and the numerous synonyms cited on the label itself make it quite clear that the plant is not *O. militaris* L., but *O. purpurea* Huds.

"Cynosorchis militaris major," for example, of C. B. *Pinax*, 81, is there contrasted with "Cyn. mil. media," of which Clusius's "Orchis flore rubro elegantissimo" is a synonym. Again, "Cynosorchis militaris seu Strateumatica major" of Park. Theat. 1345 is separated from "Cyn. militarius rubra," which is *O. militaris* L.

Dale's words "the lable resembles that figured by Dr. Dillen. Tab. 19 f. 2 Raij Synop. iii, 379" are conclusive; this figure is certainly of *O. purpurea* Huds., and relates to species *11 of the text, "Orchis magna latis foliis, galea fusca vel nigricante .... Northfleet, near Gravesend Junio; Mr. J. Sherard." (This record of Sherard's is commonly quoted as the first British record of *O. purpurea*.) In the Linnæan copy of Ray's Synopsis "O. militaris" is written in Linné's hand in the margin against the preceding species 10 "Orchis galea et alis fere cinereis."

The wording of Dale's label "This I take to be the plant which was on the 13th of May 1738 shewen me by Mr. Jos. Andrews in Walter Belchamp Parish Essex....." leaves it uncertain whether the specimen in Herb. Mus. Brit. was actually gathered at that locality. From internal evidence it cannot have been gathered there on the 13th of May, 1738, for Dale says of it "not being all blown out," a condition to be expected at such an early date; the specimen as preserved is overblown, having two swollen capsules. The presumption is strong that the specimen did actually originate from Essex, Dale having gone back to gather it at a later date. In any case it may be considered certain that Dale saw *O. purpurea* Huds. in Walter Belchamp Parish, N. Essex.

Mr. A. J. Wilmott concurs in my identification of the specimen as *O. purpurea*, and I am glad to have the opportunity of acknowledging his helpfulness in this and other matters.

OBITUARY.

Ugolino Martelli

(1860–1934).

By the death of Count Ugolino Martelli on November 25, 1934, Italy has lost a distinguished botanist. Born in 1860, of a family which claims to have been established at Florence since 1000 A.D., and which in the fifteenth century produced the poets Lodovico and Vicenzo Martelli, the Count began to study plants in his 'teens and remained keenly interested to the end.

His publications, beginning in 1883 with an enumeration (Nuovo Giorn. Bot. Ital. xv.) of Malayan *Compositae* collected by his "Maestro ed Amico carissimo" Odoardo Beccari, cover a variety of subjects—general anatomy and physiology, mosses, fungi, lichens, and the taxonomy of flowering plants—and include revisions of the Italian species of *Statice* (1887), *Androsace* (1890), and *Astragalus* (1892), and a continuation ('Monocotyledones Sardoae,' 3 fasc., 1896–1901) of Moris's 'Flora Sardoa'; but it is chiefly for his work on the Pandanaceae that Martelli will be remembered. Warburg's revision published in 1900 (Engler, 'Das Pflanzenreich,' iv. pt. 9) did not satisfy him, and he devoted much time during the last thirty years to the elaboration of a monograph of the group, visiting the principal European herbaria, and forming a fine collection of his own. About a third of his eighty-odd papers deal with the Pandanaceae; they include a general synonymic enumeration ('Webbia,' iii. 1910); enumerations of the species inhabiting

Fiji (Univ. Calif. Publ. Bot. xii. no. 9, 1930), Tonga (*tom. cit.* no. 12, 1930), Tahiti and Raratonga (*op. cit.* xvii. nos. 7–8, 1933), the Philippines (Philip. Journ. Sci. Bot. iii. 1908), Samoa and New Caledonia (in Sarasin and Roux, 'Nova Caledonia,' i. 2, 1920); a consideration of their geographical distribution (Atti Soc. Tosc. Sci. Nat. xliii. 1933) and many scattered descriptions of new species; but unfortunately he did not live to publish the complete monograph.

When Beccari died in 1920 his rich palm herbarium was bought by Martelli, who took upon himself to complete, translate into English, and see through the press Beccari's great work on the tribe *Corypheae* of Asiatic palms (Ann. Calcutta Bot. Gard. xiii., 2 vols., 1931); Martelli also edited Beccari's 'Palme della tribe *Borasseae*' (1924). These tasks occupied much of the time that might have been spent on his own *magnum opus*, but, despite recent ill-health, he still hoped to finish this when I met him a few months before his death. Martelli's herbarium and books were housed in his villa at Soffiano near Florence and included about 1030 herbarium-packets, many containing up to 200 specimens, while a glass case held bulky fruits and leaves.

From 1897 to 1931 Martelli was attached to the University of Pisa, for many years as "professore libero-docente," later as Director of the Botanic Garden; from 1933 to his death he was honorary conservator of the important Florentine herbarium in which he had always taken so keen an interest and which, it may be noted, houses the library and collections of our compatriot Philip Barker Webb to whom Martelli dedicated the four volumes of his periodical 'Webbia' (1905–1923).

During the Great War he served as a captain in the Italian army.

W. T. Stearn.

BRITISH BRYOLOGICAL SOCIETY.

The Society held its Annual Meeting and Excursion at Ingleton, Yorkshire, from August 11 to 18, 1934. President, Mr. H. H. Knight, M.A. Over thirty members and friends were present.

The first ramble explored the Limestones from Austwick, by Oxenber and Moughton, also Helwith Moss for Sphagna and Hepatics. Next day Penyghent was climbed from Horton-in-Ribblesdale by Hull Pot and Hunt Pot, for the Carboniferous Limestone and Gritstone. Then a day up the Ingleton Glens for their fine waterfalls. The golden-brown peat water rushes down the deep narrow Limestone gorges. The way led up the River Doe, and, crossing the top of the Glen, the return was made down the River Twiss. On Wednesday the drive took us out of Yorkshire into Lancashire, through High Bentham to

Hindburndale, on the Millstone Grit, among the moors, bogs, woods, and streams of Moorcock, Botton Mill, and Hindburn—an interesting country. Next day Clapdall was visited from Clapham, some members returning over Ingleborough. The last outing was to the Bolton Woods on the River Wharfe. Entering the dale at the Strid Cottage, the path winds through the wooded gorge. The river flows rapidly through the deep narrow clefts in the broad horizontal sheets of the Millstone Grit at the Strid; farther on the valley widens out till Bolton Abbey is reached. Members were greatly indebted to their Yorkshire friends, Messrs. Milsom, Burrell, and Cheetham, for guidance on the rambles.

The General Meeting was held on August 15, when Mr. D. A. Jones, M.Sc., A.L.S. was elected to the Presidency of the Society. The West of Ireland was suggested for the meeting of 1935, probably in August.

As the Society had met at Ingleton in 1926, there were not many new records to make, but a number of interesting Bryophytes were met with, some of which are enumerated below, those new to v.c. 60 (West Lancs) and v.c. 64 (mid-West Yorks) are starred :—

Sphagna.—*Sphagnum Warnstorfii* 64*, *S. fallax* var. *robustum* 64*, and *S. medium* 64* at Helwith Moss. *S. squarrosum* var. *subsquarrosum*, c.fr., *S. pulchrum*, and *S. cuspidatum* var. *falcatum* 64*, at Austwick Moss. *S. obesum* var. *plumosum* 64* on Penyghent. *S. compactum*, *S. recurvum* var. *robustum*, and *S. obesum* var. *canovirens* 60*, Hindburn Moor.

True Mosses.—Mid-West Yorks (64). Moughton and Oxenber; *Pleurochaete squarrosa* (only Yorkshire station); *Thuidium delicatulum*. Penyghent; *Encalypta rhabdocarpa*, *Myurella julacea*, *Pseudoleskea catenulata*. Ingleton Glens; *Campylopus subulatus**, *Webera calcarea**, *Barbula ferruginascens*, *Hypnum incurvatum*. Clapdale and Ingleborough; *Seligeria tristicha*, *Campylopus atrovirens* var. *muticus*, *Zygodon gracilis*, *Bryum capillare* var. *elegans* Braithw. (var. *Ferchelii* B. & S.). Bolton Abbey; *Fissidens rufulus*, c.fr., *Philonotis caespitosa**, *Orthodontium gracile*, *Plagiothecium elegans* var. *collinum*. Hindburndale; W. Lancs (60); *Tetraphis Browniana*, *Catharinea crispa*, *Discelium nudum*, *Hypnum stramineum*, c.fr.

Hepatics.—V.c. 64. Ingleton Glens; *Lophozia Muelleri*, *L. attenuata* forma *eflagellis*, *Plagiochila tridenticulata*, *P. asplenioides* var. *minor* forma *laxa*, *Cololejeunea calcarea* and *C. Rossettiana*, *Marchesinia Mackaii*. Bolton Abbey; *Sphenolobus exsectiformis*, *Cephalozia media*, *Calypogeia Neesiana*. Hindburndale, W. Lancs (60); *Blasia pusilla*, *Harpanthus scutatus**, *Lepidozia reptans* var. *julacea**, *Blepharostoma trichophyllum*, *Microlejeunea ulicina*.—Eleonora Armitage.

REVIEWS.

The Structure and Reproduction of the Algae. Vol. I. *Introduction, Chlorophyceae, Xanthophyceae, Chrysophyceae, Bacillariophyceae, Cryptophyceae, Dinophyceae, Chloromonadineae, Euglenineae, Colourless Flagellata.* By F. E. Fritsch, D.Sc., F.R.S. 8vo, pp. xviii, 792, with frontisp. and 245 text-figs. Cambridge University Press, 1935. Price 30*s*.

In the preface to this volume it is recorded: "There has never been a comprehensive account of the morphology of the Algae in the English language; in fact prior to Oltmann's epoch-making work nothing of the kind was available." If we add "in any language" we shall remedy the ellipsis and produce a statement with which no phycologist can seriously disagree. It is difficult to think of anyone better qualified to fill the gap than is Professor Fritsch. It is, therefore, to be understood that the volume reviewed here is one which no student of Algae can afford to be without.

On p. xvi the author states: "Nor is this in any sense a taxonomic work." This is somewhat misleading, for if the book were not, in several senses, a taxonomic work, it would be a most unusable assemblage of unrelated observations. Without taxonomy it is practically impossible to take our understanding of the living world beyond the individual organism. Prof. Fritsch very obviously goes beyond that. He does, in fact, consider the relation of species to species, genus to genus, family to family, order to order, and even class to class. There is, in fact, so much good taxonomy in the book that it is not easy to see the necessity for disclaiming it.

A noteworthy feature of the work is the comprehensive bibliography. For the elaboration of this no praise is too high. An an indication of the labour involved it may be mentioned that there are over 2500 entries divided into eighteen separate blocks according to taxonomic requirements. Volvocales and Bacillariophyceae tie for first place with 238 entries each, Chlorococcales and Siphonales following with 235 and 233 respectively. There is a separate and comprehensive index of authors as well as an index of contents, thus making this great mass of bibliographic material unusually and pleasurably accessible.

It will be noticed that instead of the five Classes of the older taxonomists the author recognises eleven. Concerning them he says (p. 11): "It is not improbable that in the future the number of classes will have to be increased. There is still a considerable residue of colourless Flagellata that cannot be assigned to any one of the eleven preceding classes and whose exact relationship to the other forms is unclear. They are, therefore, given a brief separate treatment at the end of this volume." A strong case

is made out for this degree of separation, though it may be doubted if all the groups are equal in rank.

Criticism is somewhat disarmed by the statement that "there are many aspects of the study of Algae into which I have never entered save as an interested spectator." The author's pre-eminence in the study of freshwater species may perhaps explain some mishaps in the selection of illustrations for the marine species. For instance, in figs. 132 & 133 the plants are displayed upside down; and in fig. 118, F is *Caulerpa clavifera* (Turn.) C. Ag. and J is *Caulerpa racemosa* var. *clavifera* (Turn.) van Bosse, both based on the same type: this is accurate, but calculated to mislead the ingenuous.

Much praise is due to the Cambridge University Press for the excellent typography and format. Author and press are to be congratulated on filling a great gap in the English literature of Botany.—Geoffrey Tandy.

Phytography as a Fine Art, comprising Linnean Description, Micrography, and Pen-portraits. By Dr. J. W. Moll, late Professor of Botany in the University of Groningen. Roy. 8vo, pp. xix, 534, 7 pls. E. J. Brill: Leyden, 1934. Price 15 florins.

The late Professor Moll was impressed by the want of conciseness in botanical description, and his book embodies an attempt to extend to morphological, anatomical, and micrographical studies generally the "telegrammatic" method adopted by Linnæus in the 'Species' and 'Genera Plantarum.' The work is dedicated to the memory of Alphonse de Candolle, "author of the celebrated book entitled 'La Phytographie,' which originated the present work." The manuscript was complete when Prof. Moll died in 1933 at the age of 82: the work of proof-reading had, owing to the author's blindness, been entrusted to his pupil and successor, Prof. J. C. Schoute, who has also carried out some necessary final retouching.

The text is divided into three Books. Book I. is introductory, explaining the general plan of the scheme which is developed in the following Books. A concise system of Phytography demands a definite terminology and this is dealt with in Book II., "Synopsis of General Morphology, Morphological Notes, Guiding Schemes," which occupies the greater part of the volume. The Synopsis contains sections on Organography and Anatomy, including Cytology and Histology, and is a classified synopsis of botanical terms with definitions and examples. An elaborate system of numbering the paragraphs allows ready cross-reference. For example, under "Caulome" are two sections: 1. "General Description," including 1 *a* life-time, 1 *b* medium in which they live, 1 *c* direction, 1 *d* direction of branches, 1 *e* shape of transverse section, 1 *f* character of surface; each of the

subheadings has its own section, which includes definitions of the various kinds with illustrative examples. Section 2, "Special kinds of Caulomes," is similarly divided. Then follows "Phyllome," treated in the same manner. The Synopsis might be described as a classified elaboration of Daydon Jackson's "Glossary of Botanical Terms."

The "Guiding Schemes" indicate the order and method of description for the various subjects and organs; and their use in the production of concise pen-portraits is elaborated in Books III. and IV. As the author himself admits and Prof. Schoute emphasises in his Foreword, doubtless "many botanists, especially those of the older generation, will shrink from the amount of work the recommended method of description brings with it. Yet even for such botanists the work may be a most valuable reference book." With the second statement we are in hearty agreement. Younger botanists would find that a trial of the system will be repaid by an increased precision and conciseness in the presentation of the results of their work.—A. B. R.

BOOK-NOTES, NEWS, ETC.

THE ROYAL SOCIETY.—A Discussion on the Origin and Relationships of the British Flora was held on March 28. It was opened by Prof. A. C. Seward, F.R.S., who indicated the scope of the discussion. Mrs. E. M. Reid discussed the relationship of the Tertiary floras. The Pliocene floras of Europe represent an extinct link between the living floras of East Asia and North America; and all three are the outcome of southward migrations of circumpolar floras under stress of cooling polar regions, resulting in extinction where latitudinal barriers occur, survival where they do not. The London Clay flora, however, was of an Indo-Malayan type and had presumably migrated along the northern shores of the Tethys Sea. With the recession of this sea the flora gradually died out and the present West European flora entered.

Prof. P. G. H. Boswell gave an account of the physical geography of the British Isles during the period comprised within the Ice Age, including four successive periods of glaciation and interglaciation, and Miss M. E. Chandler discussed the nature of the flora as revealed by plant remains associated with glacial and interglacial deposits. Evidence is incomplete and fragmentary, there is no continuous sequence in space or time, but there are four outstanding features: (1) the floras may contain elements no longer native to Britain, or if still occurring greatly restricted in range; (2) they are not all uniform; (3) a given flora may differ in general character from the living flora now growing in the same locality; (4) floras which indicate marked differences in climate are found to differ in age, although floras which indicate similar climatic conditions need not be of the same age. The Pleistocene flora of Britain was continually changing, the composition of successive floras varying with changing conditions, opportunities of migration, and ability of the plants to migrate.

Dr. H. Godwin indicated the value of pollen-analysis of peat as showing the order and date of the spreading of the different British trees as important parts of the vegetation. The earliest forest phase (Boreal) was characterized by dominance of pine and birch and the entry of elm, oak, and lime. Later came alder succeeded by mixed oak-forest and alder. The late Boreal period showed high percentages of hazel-pollen. Beech and hornbeam occur in pre-Roman peats. Lime (*Tilia cordata*) and alder are abundant in British post-glacial peats.

Mr. A. J. Wilmott discussed the evidence in favour of the survival of plants in Britain during the Ice Age. This is afforded by the existence of endemics which cannot be post-glacial immigrants and of refuge areas in which unrelated relics occur together. Prof. E. J. Salisbury considered the probability of most of the present British plants being post-glacial immigrants from extra-British regions with possibly some human introductions. The British flora is to be regarded not as an historical event but as a continuing process. A general discussion followed.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on April 4, the President, Dr. W. T. Calman, F.R.S., announced that the Council had unanimously resolved to award the Linnean Gold Medal for 1935 to Sir David Prain, C.M.G., C.I.E., F.R.S.

A Symposium on the Species Problem in Phanerogams was opened by the reading of several papers. Mr. J. S. L. Gilmour put forward the General Problem. Dr. W. B. Turrill, discussing the investigation of plant species, distinguished an alpha taxonomy and an omega taxonomy. The aim of the former is to complete the preliminary and mainly morphological survey of plant-life, much of which still remains to be done, but, it is suggested, the time has come when the student of floras whose taxonomy on the old lines is relatively well known should attempt to investigate species by much more complete analysis of a wider range of characters than is now the rule. Mr. Ronald Good suggested the elimination of the word species as an out-of-date conception, and the use of some such word as phenotype or morph, "these words being solely concerned with visible differences between individual organisms and carrying no implication of anything more than can be demonstrated by the examination of specimens." An entirely new classification of the British flora on such phenotypic lines was a *desideratum*. Mr. E. M. Marsden-Jones discussed the genetics of the four colour-varieties of *Anagallis arvensis* L. found in the wild; also of *A. foemina* Mill. A number of botanists took part in the discussion which followed.

IMPERIAL BOTANICAL CONFERENCE, LONDON, AUGUST 1935.

President: Sir ARTHUR W. HILL, K.C.M.G., F.R.S.

It has been decided to hold a short Imperial Botanical Conference from August 28 to 30, 1935, in the rooms of the Linnean Society of London, Burlington House, Piccadilly, W. 1, by kind permission.

The Conference will be preceded by an evening Reception on Tuesday, August 27, at 8.30 P.M. in the rooms of the Society, and will be formally opened on Wednesday, August 28, at 10.30 A.M. at Burlington House.

The following provisional programme has been arranged :—

Wednesday, August 28.

10.30 A.M. Opening Address of Welcome by the President.

10.40 A.M. Discussion on "Pasture Research in different Parts of the Empire."

2 P.M. Discussion on "Succession of Tropical Forest Types."

Thursday, August 29.

10 A.M. Discussion on "Problems of Fruit Storage and Transport."

Friday, August 30.

10 A.M. Papers, including the following :

(*a*) Collection and Classification of Crop Varieties and Related Species.

(*b*) The Application of Ecological Methods to the Study of Tropical Agriculture.

(*c*) Furtherance of Scheme for Creation of Liaison Officers.

(*d*) Other matters of organization.

On the afternoon of Thursday or Friday it is proposed to arrange for visits to Kew and to the Natural History Museum.

No subscription will be required.

Notice of proposal to attend should be sent to the Hon. Secretary, Prof. W. BROWN, Imperial College of Science and Technology, Prince Consort Road, South Kensington, London, S.W. 7.

RESERVOIR VEGETATION DURING DROUGHT.

BY H. STUART THOMPSON, A.L.S.

DURING the long and serious drought of 1933 various autumnal visits were made by the writer to four of the Reservoirs in North Somerset owned by the Bristol Waterworks Company. Two of these were again visited during the dry season of 1934. A few of the observations on the vegetation may be worth recording, and compared not only with my note on "Drought and Vegetation at Blagdon Reservoir" (Journ. Bot. 1929, 46) but with observations made by botanists elsewhere and in previous years.

There would appear to be much similarity in most of the more dominant phanerogamic and some of the bryophytic flora which appears on the dry muddy or sandy beds of lakes and reservoirs in the southern half of England, including Worcestershire and Warwickshire, where in 1893 and 1894 I did a little investigation, as mentioned in 1929. But *Elatine hexandra* has yet to be found in Somerset, and *Limosella* has not been recorded in N. Somerset since the time of Sole. Whereas these two minute aquatics were seen during drought by the late J. E. Bagnall and me on the beds of lakes and reservoirs in the two above-named counties forty years ago. Then also we found *Riccia glauca* and the rare *R. crystallina* on the mud of Rotten Park Reservoir, within the city of Birmingham ('Midland Naturalist,' 1893, 260 *et seq.*).

The reservoirs visited in North Somerset are Blagdon in 1933 and 1934 ; the upper two of the three Barrow Gurney Reservoirs, adjoining the main road from Bristol to Bridgwater, Oct. 6, 1933 ; and the much smaller Chew Magna Reservoir, through which flows a tributary stream of the River Chew, which joins the Bristol Avon at Keynsham. Several visits were made to Chew Magna in September and October, 1933, and another on May 15, 1934. On Oct. 13, 1933, at Chew Magna, I had the company of Mrs. Sandwith, who drove me on to Blagdon in the afternoon.

The most interesting object at Blagdon that day was a great quantity of young plants of *Stellaria aquatica* with the leaves blotched with dark purple, growing freely with the normal plant. A few were in flower, but none more than a foot high. Dr. Campbell, the Mycologist at the University of Bristol, found no sign of fungus attack, and regarded as feasible the suggestion of Dr. Nierenstein, the Biochemist, that the dark purple stains were due to traces of tannin in the plant, owing to traces of iron in the water. But after I sent to Kew fresh specimens of the *Stellaria* gathered at Blagdon, May 4, 1934, Mr. Gilmour kindly reported : "We have done a few rough experiments on it to test whether the purple colour of the blotches is due to anthocyanin pigment, and I think we can say definitely that it is. This makes the tannin and iron theory of the coloration highly improbable.

Further one would imagine that all plants growing in that particular habitat would be similarly affected if it were due to a local habitat condition. It seems to me more probable that it is either a genetical form, or, conceivably, a bacterial disease which sometimes, in other plants, takes this particular form."

In September 1933 I took photographs of a peculiar feature of the vegetation on the dried up Chew Magna Reservoir. This was a strange growth on masses of *Polygonum amphibium*, both decumbent and in a few cases upright, on the dry mud. Portions of these strange pale brown and light corky masses surrounding the long stems, and frequently an inch in diameter, were sent to the British Museum (Nat. Hist.) and were examined by Miss A. B. Hastings who pronounced them as due to the Polyzoon *Plumatella fungosa*. Some of these growths extended a yard or more in length, with occasionally an inch or two of the *Polygonum* stem left exposed.

Chew Magna Reservoir was cleared out in the spring and summer of 1934, and on May 15 that year a vast extent of *Barbarea vulgaris* was in flower on the upper uncleared portion, though in 1933 this plant was scarcely seen there. In the autumn of 1933 large areas were covered with dried up Watermoss (*Fontinalis antipyretica*). Many seedlings were collected, and some of them distributed, of *Hippuris*, *Epilobium angustifolium*, *E. parviflorum* (?), *Arctium minus*, *Scrophularia aquatica*, *Veronica aquatica*, *V. Beccabunga*, *Chenopodium rubrum*, *Polygonum Persicaria*, etc., together with small rosettes of *Nasturtium palustre*, *N. sylvestre*, and a few *N. amphibium*. The last species is scarce or wanting on all these reservoirs.

The dominant phanerogams at Chew Magna were *Nasturtium palustre*, *Chenopodium rubrum*, as usual in various forms, *Polygonum amphibium*, *P. Persicaria*, and a *Callitriche* not in fruit, which Mr. W. H. Pearsall thought probably *C. polymorpha*. Sub-dominant were *Hippuris*, *Mentha aquatica*, especially at the west (top) end, *Veronica aquatica* Bernh. in several forms, *V. Beccabunga*, *Gnaphalium uliginosum*, and *Myosotis palustris*. Among the occasional or local species were Tomato (*Lycopersicum*), *Solanum Dulcamara*, *Apium nodiflorum*, *Mentha arvensis*, and *Nasturtium officinale*. One seedling elm, three inches high with the root, was collected on Oct. 13.

The main constituents of the vegetation at Blagdon in Sept. and Oct. 1933 and in 1934 were for the most part similar to those during the drought of 1929. I did not visit the upper (eastern) end of the lake in 1933, and only once, when fishing, in the autumn of 1934. In 1929 it was noted that *Littorella* had " of late become well established at Blagdon, though so rare in the county of Somerset." By 1933 its extended colonies were evident on several shores, and *Hippuris* had become less scarce. A feature in Oct. 1933 was an acre or more of *Polygonum nodosum* Pers., pink (crushed strawberry colour) with the flowers.

The suggestion made in 1929 that the *Veronica Anagallis-aquatica* was " probably var. *montioides* Boiss." was hardly correct. It is *V. aquatica* Bernh. and the form with glandular inflorescence, var. *glandulifera* Čelak. This Veronica is very variable at Blagdon, and at Chew Magna and Barrow Gurney. The top petal is veined darkest at Blagdon, with no streaks on the lowest petal; while at Chew Magna the always minute corollas were extremely pale, and even the top petal little streaked with red. *V. aquatica* Bernh. is much less frequent at the two Barrow Reservoirs visited.

The three Barrow Gurney Reservoirs, all somewhat oval in shape, are situated about four miles from Bristol on the Bridgwater road, below the west end of Dundry Hill with its imposing church tower. The largest, not visited, is north of the road, and was constructed in 1884. The two others are on the opposite side of the road, and were made in 1848 (smallest) and 1864 respectively. Their altitude is about 325 ft. Chew Magna Reservoir, 4½ miles to the south-east, is 179 ft. s.m., and Blagdon Lake 147 ft., and it is 4 miles south-west of Chew Magna.

The Barrow Reservoirs are frequented by large numbers of birds and waterfowl. See " The Birds of Barrow Gurney Reservoirs," by A. C. Leach, M.A., in Proc. Bristol Nats. Soc. for 1933 (1934).

The following is a summary of some of the observations made at the middle (no. 2) and the upper (no. 1) reservoir at Barrow when the water was about 12 ft. below winter level, and at the upper reservoir more than 17 ft. below.

At no. 2 Reservoir near the north-east corner, below the sloping oolitic stone embankment, were great masses of half-dried *Potamogeton pectinatus* var. *diffusus* Hagst. with copious fruit on long filiform peduncles up to eight inches in length. Here also was much *Myriophyllum*, both dried up and growing in the shallow water with more of the *Potamogeton* and *Chara*. In the actual corner was an acre bed of *Hippuris*, much of it stranded on stems 3–4 ft. long, with the flaccid leaves on the upper half.

The dominant plants on the east embankment are *Mentha arvensis*, *Potentilla Anserina*, and especially *P. reptans*, which last is mixed with a dwarf growth of *Rubus* in places. *P. reptans* continues dominant along the weathered oolite of the east bank. Both in and just above the shallow water here were *Polygonum amphibium* in fruit, *Alisma Plantago*, *Sparganium ramosum*, and a few Reed-mace (*Typha*) in the extreme south-east corner where a small stream from Dundry Hill enters. On the south side, among or near beds of *Scirpus palustris*, are large patches of *Sparganium simplex* and many *Veronica aquatica* Bernh. with very pale, little-veined flowers, some of the plants having hairy rhizomes 1–2 ft. long and then rooting in the mud. Near by

were great beds of *Fontinalis antipyretica*, mostly dried up, and mingled here and there with Batrachian Ranunculus.

Towards the south-west corner, and the upper Reservoir, is a good colony of *Hippuris*, 20–60 yards wide and some 80 yards in length. An inlet of fresh water enters at the south-west corner. Extremely little *Nasturtium palustre* was seen in this reservoir, whereas it is a salient feature in the adjoining one.

The top (no. 1) Reservoir is the smallest, but perhaps the deepest when full; and the great stony banks are steeper (at an angle of about 45°) and taller. There was practically no visible vegetation on the then very shallow water on the east side. But on the eastern embankment *Mentha aquatica* extends several hundred yards, only 2 feet below the *normal* high-water level. Especially just below the Mint, *Potentilla reptans* is rampant along the east side to within three vertical feet of the stone wall at the top of the embankment. Rosettes and seedlings of *Nasturtium sylvestre* grew among the loose stones on the slope, with species of *Atriplex*, *Chenopodium*, and *Polygonum Persicaria*.

Near the south corner some young plants of *Plantago media* grew on the stone bank and the mud at its foot. Acres of bare mud were exposed here and along the southern end of the west bank, which gets less sun. There was no sign of *Riccia* anywhere on the mud; and but little visible vegetation in the shallow water further north.

At or near the south corner *Mentha aquatica* was again on the steep, high bank. *Chenopodium rubrum*, *Atriplex*, *Polygonum nodosum* and other species, *Nasturtium palustre* and *N. sylvestre* increased in size and quantity along the western embankment, which continues very high and steep. Vegetation became thicker and thicker as the embankment got more sun. *Sonchus arvensis* was a showy plant as one got nearer the house hard by the main road and the deep end.

Just below here a great quantity of the fruits of *Potamogeton pectinatus* were floating in the shallow water. Apparently no *Potamogeton* grew on the other sides of this lake.

On the mud about here especially were thousands of minute half-inch seedling *Chenopodium rubrum*, often with reddish flower-buds. I collected a series for the Watson B. E. C., and another series of one-inch high cotyledons from adjoining cracks in the mud, where they became slightly elongated in their search for light. After years of observation I am inclined to agree with White ('Flora of Bristol,' 508) when he said: "These diminutive specimens may come under the var. *pseudo-botryoides* Watson, which seems to be only a dwarf state dependent on deficient nutrition. Dr. Blomfield stated (Phytol. iii. p. 751) that its seeds, when sown in a garden, produced the typical erect form of this species."

LICHENOLOGICAL NOTES.—VIII.

By Walter Watson, D.Sc.

As in former notes new records for the botanical vice-counties are indicated by asterisks. For those from N. Somerset (6) and W. Gloucester (34) the field-work was done by Mr. D. A. Jones and myself in the neighbourhood of Weston, Yatton, and Bristol. Mr. Jones is also partially responsible for the records from the Ingleborough district (64) and the Keswick district (70). During the foray of the British Mycological Society at Norwich, Mr. H. H. Knight was of great assistance in adding the records for E. Norfolk (27). Mr. W. Young, whilst arranging the lichens in the herbarium of the Royal Botanic Gardens, Edinburgh, found a number of plants which were new records. He also sent me a number of unnamed lichens collected by Lauder Lindsay in 1866 and also some plants collected by J. McAndrew and others. The plants listed from vice-counties 73, 110–112 are from this source. More detailed reports of the lichens from Ingleton, Norfolk, and Scotland will appear elsewhere, only the more important being included here. Plants new to the British Isles are indicated by small capitals. Five new species are described, belonging respectively to the genera *Lecidea*, *Catillaria*, *Cladonia*, *Leptogium*, and *Belonia*. No species of *Belonia* has hitherto been recorded from our islands.

Usnea protensa Stirt. in Scott. Nat. 76 (1886). Garrock Wood, New Galloway (73), *leg.* McAndrew, 1882; in herb. Edinburgh. The specimens have a general resemblance to plants which have been included under *U. ceratina* by British lichenologists. The thallus is pendulous, rigid, and often darker in colour than in *U. ceratina*. The reaction of the medullary fibrils to potassium hydrate is very distinctive. At first the medulla becomes yellow, then deep orange-yellow, and finally red. The chondroid axis is usually pale, but in older portions becomes darker. Apothecia are absent. There is a general resemblance, both in colour and branching, to specimens which have been named *U. sublurida* Stirt. by Motyka, but in this, according to Stirton's description (Scott. Nat. vi. 1881–2), the medullary fibres have merely a yellowish reaction to potassium hydrate.

Evernia prunastri f. *retusa* (Ach.) Cromb. On tree, Ingleton (*64).

Parmelia dubia Schaer. This plant usually occurs on trees, but saxicolous plants have previously been noted (Lich. Not. iv.). It has recently been noted on tiles at Nailsbourne near Taunton (5).

P. revoluta var. *rugosa* Cromb. Burnham Beeches (*24).

Parmeliopsis ambigua Nyl. On beech, Cleeve Combe (*6). On pine, Seatoller (*70).

P. hyperopta (Ach.) Zahl. On pine, Seatoller (*70).

Cetraria aculeata Fr. form. *edentula* Ach. Ingleborough (*64). A pale-coloured form of the species was collected at Blakeney Point (27) many years ago. It was considered by Miss A. Lorrain Smith and Messrs. Wheldon and Paulson to be an exceptional form and perhaps an accidental state due to the battering effects of sea-water. Last October the plant was found to be very abundant on the Marrams (on low shingle bound with much earth and with remains of *Suaeda fruticosa*) and to maintain its characters over a large area. No intermediates to the type were noticed and it seems well worth a varietal name. I therefore propose to distinguish it as var. nov. **cinerea.** Differt a typo colore pallido cinerascente et spinis paucioribus. The grey colour is fairly uniform and the plant looks very distinct from the usual shining brown plants of the type. Harmand (Lich. de France, 424) has a sub-form *pallescens* under var. *muricata* Schaer. (var. *hispida* Cromb.), but the Blakeney plant has the branches compressed as in the type. When it was first obtained it seemed such a peculiar form that some lichenologists placed it under *Alectoria* or *Ramalina*.

Lecanora badia Ach. Stromness (*111); var. *cinerascens* Nyl., near Keighley (*63), below Pen-y-Ghent (*64), Oxendale, Langdale Pikes (*69), Honister and Eel Crags (*70).

L. conizaeoides Cromb. Letchworth (*20), Hillingdon (*21) Burnham Beeches (*24), Sprowston (*27), Marshfield (*35, *A. E. Wade*), Penylan (*41), Botton Mill, Hindburndale (also the form *tenuis* which Erichsen described under *L. pityrea*, *60), near Darlington (*66).

L. cenisia var. *atrynea* (Ach.) Harm. Galmpton near Totnes (*3), Scrabster (*109).

L. Sambuci Nyl. On elder, Cothelstone (5), Uphill (6), Winchcomb (*33, H. H. K.), Llangollen (*50, H. H. K.).

Aspicilia complanatoides (A. L. Sm.), comb. nov. (*Lecanora complanatoides* A. L. Sm., Mon. i. 326, 1918). On siliceous rocks, Stronsay (*111).

A. lacustris Th. Fr. Hindburndale (*60), Seatoller (*70).

A. Prevostii Th. Fr. and form *melanocarpa* Kremp. On Carboniferous limestone, Horton-in-Ribblesdale (*64).

A. epiglypta (Nyl.) Hue. On boulder in Nant Francon (*49).

Biatora micrococca Krb. Cleeve Combe (*6), Blaise Castle Woods (*34). This is sometimes put under *Biatorina* (or *Catillaria*) because of the occasional occurrence of a septum in the spore.

B. mutabilis Mont. On yew, Cleeve Combe (*6).

Lecidea atroides, sp. nov. *Thallus* effusus, areolato-diffractus aut areolæ dispersæ, ochraceus, rubesco-flavescens cum hydrate kalico, gonidiis viridibus circa 10 μ diam. *Apothecia* parva, nigra, sæpe subnitidula, lecideoidea, primum innata demum convexa et immarginata, epithecio nigro, hymenio intense violascente, ascis clavatis, hypothecio pallido aut incolorato. *Paraphyses* cohærentes modice crassæ, septatæ, manifeste apicibus inflatis. Sporæ simplices, hyalinæ, octonæ, 11×6 μ, sæpe videre uniseriatæ et subglobosæ ($8\times7\mu$) muris distinctis. *Gelatina hymenia* coerulescens demum sordida cum iodo.

Hab. Siliceous rocks with *Rhizocarpon confervoides* DC., Hill of Hoy (111), *leg.* Lindsay, 1866.

Type in Edinburgh Herb.

The intense violet colour of the hymenium is so reminiscent of that shown in *Lecanora atra* that it might almost pass for a lecideoid form of it were it not for the ochraceous thallus and the somewhat redder coloration with potassium hydrate. The latter was slightly suggestive of *Lecidea armeniaca* Fr., whilst the external appearance has some resemblance to forms of *L. fuscoatra* Ach., but there is no reaction to calcium hypochlorite and the internal characters are different.

L. goniophila Schaer. Bisley (var. *acervata* Mudd, *33, H. H. K.), May Hill (*34), Cullingworth (*63), Balerno etc. (*83), Aberfoyle (*87), Scrabster (*109), Stronsay (*111). According to Vainio (Lich. Fennica, iv. 258–262) *L. goniophila* usually occurs on siliceous rock, whilst the allied *L. subsequens* Nyl. is calcicolous. Except for the habitat the differences between the two plants are vague and uncertain. The external characters are somewhat variable, but *L. subsequens* is usually whiter in colour and may give a more decided yellowish coloration with potassium hydrate. The internal characters of the apothecia are similar. In both there is some bluish or purplish colour in the epithecium or/and hymenium and this may give a violet or reddish coloration with K, though the bluish-green colour certainly seems more constant and pronounced in the silicicolous plant. Plants with the characters more definitely associated with L. SUBSEQUENS have been seen from limestone rocks at Uphill (*6) and Scrabster (*109).

L. auriculata Th. Fr. Stromness (*111). One of the specimens corresponds with the plant named *L. sarcogyniza* Nyl., which is considered to be merely a form of *L. auriculata* with the apothecia less flexuose than usual. It is not an uncommon form in the mountainous regions of Scotland.

L. auriculata subsp. *brachyspora* Th. Fr. Stromness and top of Whiteford Hill, Kirkwall (*111), *leg.* Lindsay in 1866. The spores are globose or subglobose about 4–5 μ diam., otherwise the plant agrees with forms of *L. auriculata*.

L. restricta Stirt. Horton-in-Ribblesdale (*64).

"*L. neglecta* Nyl." The apothecia of this are considered by Lynge and some other lichenologists to belong to a parasitic fungus, *Nesolechia neglecta* Vain. In the herbarium of Jas. McAndrew, now in the Royal Botanic Gardens, Edinburgh, there is a specimen to which Nylander gave a new specific name, but I can find no record of its publication. The apothecia (and spores) correspond to those described for "*L. neglecta.*" They are, however, on two hosts, *Diploschistes bryophilus* and another thallus which recalls that of *Stereocaulon condensatum*. On the *Diploschistes* the internal structure of the apothecium is badly shown, but on the other (which appears to be the proper host) normal development of the spores and paraphyses occurs. This certainly confirms the view that the apothecia of "*L. neglecta*" are parasitic on the thallus of a lichen. On this account there seems no reason for maintaining Nylander's name for the slightly different combination which McAndrew collected in New Galloway (*73). The thallus of the plant to which Nylander gave the name of "*L. neglecta*" has been called *Crocynia neglecta* Hue. The description of the thallus of the British plants of "*L. neglecta*" does not suggest a *Crocynia* and the thalli of Nylander's proposed species are not referable to *Crocynia*.

L. jurana Schaer. On Carboniferous limestone, Goblin Combe (*6), Chapel-le-Dale (*64, H. H. Knight).

L. crustulata Krb. Aber Edw (*43), Dolgelley etc. (*48), Wildmoor Clough (*57), Errwood (*58), Stronsay etc. (*111); form *lignicola* Sands., Penzance (*1, H. H. K.). Var. *meiospora* (Nyl.) Oliv. Ingleton (*64), Kirkwall (*111), Lerwick (*112). This seems to be the plant to which *L. cinereoatra* Ach. usually refers.

Var. nov. **viologranulata.** Typo similis sed hymenio corpuscula violacea continente. This agrees with the type, except that it is very peculiar in the occurrence of granules, similar to those of *L. sanguineoatra* and its allies, in the hymenium. The granules are often somewhat fuliginous, as in *L. sanguineoatra*, but are usually fewer and less constant. On slaty rock, Clatworthy (5).

L. sorediza Nyl. *L. subconfluens* Th. Fr. Lich. Scan. 598 refers to this. *L. subconfluens* was previously used by Anzi for another plant, so Zahlbruckner (Cat. Lich. iii. 698) renamed Th. Fries's plant *L. subconfluescens*. It appears to be common in our islands. Penzance (*1), Becky Valley (*3), Burwarton (*40, H. H. K.), Brecon (*42), Aberystwyth (*46), Harlech etc. (*48), Goyt's Bridge (*57), Errwood (*58), Horton (*64), Hawkshead (*69), near Ardlui (*99).

It is often the host of *Discothecium gemmiferum* (Tayl.) Vouaux.

L. tenebrica Nyl. Malham and Clapdale (*64). A specimen collected by Lindsay from Garrynahine, Lewis (110), in 1866, probably belongs here, but it is too incomplete for definite determination.

L. aglaea Somm. The record from v.c. 5 given in Wats. Lich. Somerset, 57 (1930), is incorrect.

Pertusaria amara forma ISIDIATA Harm. Lich. de Fr. 1111 (1918). "Thallus pourvu d'un isidium blanc, disséminé, analogue aux granulations allongées qu'on trouve dans les sorédies." On tiles, Nailsbourne, near Taunton (5).

P. pertusa f. *polycarpa* Boist. The fertile verrucæ are prominent, somewhat scattered, and contain many apothecia. East Dean (*13), Llanbedr (*48); f. *rupestris* DC. Buckden (*64). Var. *leiotera* (Nyl.) Zahl. Cleeve Combe (*6, and f. *plumbea* Dub.), Portland (*9), Stratton Strawless (*27), Blaise Castle Woods (*34).

P. concreta Nyl. Lynmouth (*4), Talsarnau (*48), Garrynahine (*110); form *Westringii* Nyl. Fort William (*97).

Acarospora smaragdula (Wahl.) Hav. Ingleton (*64), Garrynahine (*110), Stronsay (*111). Many of the British records are doubtful. The above refer to the plant which Magnusson considers to be the true *smaragdula*.

A. veronensis Mass. Taunton (*5), Saltwick (*62).

A. ATRATA Hue. Thallus similar to that of *A. fuscata*, but with negative reactions to C or KC. The thallus is dark at the margin, but pale where it is attached to the stone. Apothecia sunk in the thallus, usually with a distinct margin; epithecium darkish brown; hymenium under 90μ thick, wine-red, with iodine; hypothecium colourless, bluish green with iodine; paraphyses $\pm$discrete apparently slightly beaded; spores numerous and minute. On arenaceous rock, Stromness (111).

Lecania dubitans (Nyl.) A. L. Sm. On pine, Seatoller (*70).

Catillaria ooliticola, sp. nov. *Thallus* effusus, tenuis, non areolato-diffractus, æruginosus aut sordide cinereo-viridescens, inæqualis plus minusve rugulosus aut minute granulosus cum gonidiis viridibus circa 10μ diam. hyphiis intertextis et prope cellulosis. *Apothecia* atrofusca, vulgo atra, interdum plus minusve nitida, adpressa, plana, margine tenuissime deinde convexa et immarginata, epithecio pallido-fusco aut atrofusco, hypothecio inferne atrofusco superne pallidiore. *Hymenium* altum 50μ, incoloratum aut fuscescentem sed sæpe corpuscula continens et obscure, præcipue in sectione, crassa, purpureo-rubescens cum iodo, incoloratum cum hydrate kalico aut acido nitrico, ascis plus minusve clavatis aut ovato-ellipsoideis circa 50×18μ, paraphysibus cohærentibus. *Sporæ* octonæ uni-septatæ, hyalinæ, 16–18×6μ, cellulis inæqualibus, loculo superiore circa 4μ lato angustiore quam loculo inferiore.

Hab. Oolitic limestone, Penylan Hill near Cardiff (41), *A. E. Wade*, Dec. 1933. Type in Welsh National Herbarium, Cardiff.

Biatorina erysiboides (Nyl.) Th. Fr. At bases of stumps, Sprowston and Framingham (with form *pallida* Nyl., *27). On *Ulex*, Minehead, and on fir, Thurlbear (*5). On fir, Buttermere (with f. *pallida*, *70).

B. nigroclavata (Nyl.) Arn. On alder by side of Knocknarling Burn, east of Darsallock, New Galloway (*73). This was collected by J. McAndrew in 1889 and is in his herbarium as a new species of *Lecidea* of Nylander. I can find no record of its publication, and the plant corresponds to *L. nigroclavata* Nyl. (1853). Apart from the corticicolous habitat and the less infrequent presence of a septum in the spore it agrees with *B. lenticularis* and, as is usually done by Continental lichenologists, is put in the same genus. The saxicolous forms *baliola* and *spodoplaca* mentioned by Lorrain Smith, Mon. Br. Lich. 38 (1926), are better placed under the saxicolous plant *B. lenticularis* especially as the septum of the spore in the latter is often very faint or indistinct.

Microphiale diluta (Pers.) Zahl. On trees, Cleeve Combe (*6); Oaksey (*7, H. H. K.), Landslip (*10, H. H. K.), Plumstead and Framingham (*27), Blaise Castle Woods (*34), Rhossili (*41, D. A. J.). This lichen is not confined to a corticicolous habitat: on Brean Down (6) it occurs on mossy soil and in Blaise Castle Woods it is even found on stones near the trees on which it occurs.

Bilimbia Nitschkeana (Stiz.) Lahm. On stump, Blaise Castle Woods (*34).

B. albidocarnea var. *alborubella* (Nyl.) A. L. Sm. Cleeve Combe (*6).

Bacidia flavovirescens Anzi. Ingleton (*64).

Xanthoria polycarpa Oliv. is usually corticicolous. At Blakeney Pt. (*27) it is frequent, not only on *Suaeda fruticosa* but also on the pebbles in the vicinity.

Placodium cirrochroum Hepp is abundant on the Carboniferous limestone rocks near Weston (6) and at Durdham Downs (*34).

P. medians Nyl. Avebury and Marlborough (*7), Lewes (*14, D. A. J.) Westbury-on-Trym (*34).

P. murorum var. *pusillum* Flag. Uphill (*6), Stevenage (*20), Cheltenham (*33, D. A. J.), Old Castle Down (*41), Tenby (*45).

P. lobulatum A. L. Sm. A terricolous state of this occurs on soil over bound shingle on the Marrams, Blakeney Pt. (27).

Callopisma lacteum (Mass.), comb. nov. (*C. luteoalbum* var. *lacteum* Mass. Sched. 133, 1855). On Carboniferous limestone rocks, Cleeve Combe (*6), Durdham Downs (*34).

Anaptychia ciliaris var. *saxicola* (Nyl.) Harm. is abundant on the ground containing small pebbles and bits of wood on the Marrams, Blakeney Pt. (*27).

Buellia coniops Th. Fr. Eel Crags near Keswick (*70).

B. colludens Tuck. On wall, Botton Mill, Hindburndale (*60).

B. Parmeliarum Somm. On the thallus of *Parmelia fuliginosa* var. *laetevirens*, Cleeve Combe (*6).

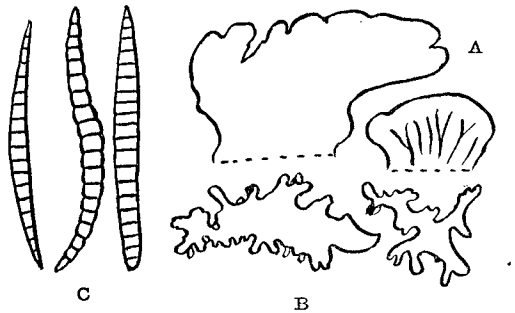
B. advenula (Leight.) A. L. Sm. (*Lecidea advenula* Leight., *Karschia advenula* Zopf). On the thallus of *Pertusaria concreta*, Garrynahine (*110). Agrees with the description in Mon. Br. Lich. 200 (1926), except in having eight spores in the ascus instead of four. Keissler's 'Flechtenparasitien' also gives the spores as 4-næ. Leighton, the author of the species, gave the spores as 8 in Lich. Fl. ed. 3, 338 (1879). Through the kindness of the Director of the Royal Botanic Gardens, Kew, I was able to examine Leighton's original specimen from Llanbedrog. The spores were seldom less than eight in the ascus, but were more variable in size (15–24×9–13μ) than described by him. In both the type-specimen and in that from Garrynahine the dark apices of the paraphyses became purplish with K, and the hymenium when treated with iodine gave a blue and then a darker coloration, though the latter reaction was sometimes indefinite. Leighton does not mention the former character and gives the hymenial reaction as negative.

B. confervoides Kremp. On shingle, Blakeney Pt. (*27), Scolt Head (*28).

Rhizocarpon alboatrum var. *venustum* (Krb.) A. L. Sm. Purn Hill (*6).

Thelotrema lepadinum var. *scutelliforme* Ach. Bolton Woods (*64).

Cladonia cyathomorpha, sp. nov. *Squamulæ* magnæ, 5–10 mm. latæ, interdum depressæ vulgo plus minusve erectæ et incurvo-convolutæ (cyathomorphæ), pallido-fulvescento-flavescentes, hydrate kalico paululum flavidæ, hypochlorite calcico non mutatæ, subtus albæ reagentibus immutatæ cum venis *Peltigerae* similibus, sed obscurioribus et hydrate kalico leviter rubescentibus. *Podetia* ad squamulas affixa, 4–10 mm. longa, 1–1·5 mm. diam., sæpe leviter squamulosa aut irregulariter verrucosa, scyphifera scyphiis intus plus minusve granulatis, apotheciis parvis aut minutis in marginibus. [*Sporæ* nondum visæ.] (Fig. A.)



A. Two squamules of *Cladonia cyathomorpha* Wats., upper and lower surfaces, ×3. B. Two portions of the thallus of *Leptogium crenulatum* Wats., ×10. C. Three spores of *Belonia calcicola* Wats., ×500.

Hab. Near Loch Dungeon, New Galloway (73), *J. McAndrew*, 1881. Provisionally named *cyathomorpha* by Dr. Stirton, but I can find no record of its publication.

Near *C. foliacea* Willd., but quite distinct in the veining beneath and in the cup-like shape which the ±erect and convoluted squamules often assume.

C. luteoalba Wh. & Wils. Ingleborough (*64), near Patterdale (*69, A. Wilson).

C. macilenta var. *ostreata* Nyl. Tredagar (*35), Rhossili (*41), near Maesmynis (*42, A. E. Wade), Goyt's Clough (*58).

Pycnothelia papillaria Duf. Near Johnshaven (*91), east of Sligachan (*104), Stornoway (*110).

Stereocaulon evolutum Graewe. Lakenheath (*26). This has not previously been recorded east of a straight line drawn from Exmouth to Spurn Pt. Wildmoor Clough (*57), Castedge (*58), Langdale Pikes (*69), Tholt-y-Wills (*71), Tarbert (*101).

Gyalecta carneolutea (Turn.) Boist. On Carboniferous limestone rocks, Cleeve Combe (*6), Blaise Castle Woods (*34). Despite the saxicolous habitat I see no reason for regarding this as a new species or variety, as there is little difference, either externally or internally, from corticicolous specimens. To denote its habitat it may be called f. *saxicola*.

Parmeliella perfurfurea (Nyl.) Zahl. On mosses, Burnfoot Hill, New Galloway (73). Collected by J. McAndrew and seen in his herbarium. Described as *Pannularia perfurfurea* by Nylander (Acta Soc. Fenn. xxvi, 29, not. (1900). "Thallus fuscus tenuiter furfuraceus effusus; apothecia fusca plana mediocria (latit. 0·5 mm.) margine non prominulo subpallescente; sporæ breviter ellipsoideæ, long. 0·009–0·010, crass. 0·005 mm. I. gel. hym. fulvescens. Muscicola in Scotia (James McAndrew)." Examination of the type-specimen yielded the following supplementary information. Thallus of minute brown squamules, non-gelatinous. Apothecia sometimes ±concave or ±convex with a paler, proper, entire, sometimes slightly flexuose margin. Hypothecium pale tawny brown, about 40 μ thick. Hymenium about 50μ thick, colourless, but merging into the brownish hypothecium below and into the brownish epithecium (with many dispersed granules) above. Ascus clavate, but sometimes more cylindrical or broader at apex. Spores 8, irregularly arranged (sometimes horizontally) in ascus, colourless, simple, 9–10×4·5–5μ. This species has apparently hitherto escaped the notice of British authors.

Leptogium cretaceum Nyl. Pinhay Bay (*3, H. H. K.), Purn Hill (*6), near Ayton (*62).

L. fragile Nyl. Ebbor Gorge and Goblin Combe (*6), Durdham Downs (*34).

L. biatorinum Leight. On soil-capped wall near Taunton (*5).

L. MASSILIENSE Nyl. in Flora, 1879, 354. On Carboniferous limestone rocks, especially on the talus from these, Cleeve and Goblin Combes (*6), Durdham Downs (*34), Warton Crag (*60). This is a plant which has puzzled British lichenologists for many years. It was first known to me from a plant from Warton Crag sent to the Lichen Exchange Club as *Ephebe pubescens* and corrected by the referee to *Synalissa intricata*. In Cleeve Combe it was associated with *L. diffractum*, was considered as possibly a slender form of that species, and specimens are in the British Museum under that name. Recently I came to the conclusion that it was *L. massiliense*, but could not find any plants under that name in the British Museum Herbarium, though there was a similar plant from St. Denis in herb. Boistel under *L. cretaceum*.

I therefore sent a specimen to Dr. Bouly de Lesdain, who was kind enough to compare it with authenticated specimens and confirm my determination, " votre détermination est exacte. Je l'ai comparé aux exemplaires de mon herbier prevenant du midi de la France, notamment des environs de Marseille, ainsi qu'un No. 1083 de l'exsiccata d'Arnold du Wurtemberg et au No. 2264 des Kryptogamæ exsiccatæ (du Muséum de Wien) de la Hongrie." Dawson Turner recorded *Parmelia pubescens* from the Mendip (6) in his Bot. Guide (1905). This is a very improbable plant to find there, and I have little doubt that the plant referred to was *L. massiliense*.

Thallus sordid-chestnut or chestnut-grey, fruticulose with filiform divisions forming rosettes ±horizontally placed on the stone ; filaments 0·1–0·2 mm. thick and subacute at the apices, terminal filaments dichotomous ; cortex pseudoparenchymatous. Apoth. reddish, 0·3–0·4 mm. ; spores 8, muriform, 18–24 × 10–11 μ. All our specimens are without apothecia.

Leptogium crenulatum, sp. nov. Laciniæ tenues, crenulatæ, aridæ fuscescentes aut fusco-nigricantes, humefactæ gelatinosæ, olivaceo-nigricantes, vulgo plus minusve planæ, sæpe concavo-convexæ in sectione, immutatæ cum iodo, circa 0·16 mm. crassæ, intricatæ ubique ; medullarum hyphæ satis laxæ, cortex flavescentior compactior, leviter pseudoparenchymatus ; algæ (catena 4–15) in formam monilium undulantium concatenatæ. [Apothecia non visa.]

Hab. Ben Lawers (88), July 1885, in herb. McAndrew, where it is assigned by Nylander to *Collemodium*, but his combination does not appear to have been published.

Differs from *L. Schraderi* Nyl. in the flatter and more crenulate laciniæ (often ±concavo-convex in section), which are arranged in a less erect but more intricate manner and are less wrinkled when dry, in the less definite pseudoparenchymatous cortex (both in section and in surface view), and in the negative reaction to iodine. (Fig. B.)

Collema pulposum var. *pulposulum* Nyl. On limestone rocks, Horton (*64).

C. cristatum Hoff. Cefn On (*41), Warton Crag (*60), near Ayton (*62), Horton (*64).

Ephebeia hispidula Nyl. Near R. Towy at Ystrad-ffin (*44, H. H. K.), Oxendale (*69), Buttermere (*70), L. Tulla (*98).

Dirina repanda Nyl. Cleeve Combe (*6), common but sterile.

Arthonia didyma Krb. Cleeve Combe (*6), East Dean (*13), Penmanshiel (*81).

Allarthonia patellulata (Nyl.) Zahl. On yew, Cleeve Combe (*6), on pine, Seatoller (*70).

Opegrapha Leightonii Cromb. On Carboniferous limestone, Blaise Castle Woods (*34).

Staurothele rupifraga (Mass.) Arn. Cefn On (*41), frequent about Horton and Ingleton (*64).

S. BACILLIGERA Arn. On limestone rocks above Gaping Ghyll, Ingleborough (*64). Not previously recorded from our islands. It differs chiefly from *S. rupifraga* in the hymenial algal cells being bacillar and not globose, the rather smaller spores (28–35 × 14–16 μ), and the less definite thallus.

Verrucaria microspora Nyl. Lulworth (*9), Beachley (*34, D. A. J.), (*35, A. E. Wade), Lavernock (*41, A. E. W.), Whitehaven (and v. *mucosula*, *70), Stronsay (*111).

V. coerulea DC. Coldwell Rocks (*34), Michaelston-le-Pit (*41, A. E. W.), near Harlech (*48), Seatoller (*70).

V. aethiobola Wahl. On stones in streams, Penzance (1), Malsmead (*4), R. Perddyn (*41), Brecon (*42), Nant-y-Ffrith (*50), Buckden (*64), near Keswick (*70), near Ardlui (*99).

Var. *acrotella* (Ach.) A. L. Sm. Hurstpierpoint (13), Borrer's " Sussex " locality.

Var. *submersa* (Schaer.) Wats. Cawsand (*2), near Martinhoe (*4), R. Perddyn (*41), Talsarnau etc. (*48), Buckden and Horton (*64), Hawkshead (*69), Keswick etc. (*70).

V. macrostoma DC. Portland (*9, H. H. K.), Clifton (*34), Pyle (*41, D. A. J.), Caldey I. (*45), near Keighley (63–*64), Goyt's Bridge (*57), Bracklinn Br., Callander (*87). The specimen collected by Mr. Jones at Clifton (34) was chiefly on soil. Form *aphanostoma* Shack. & Hebd. Purn Hill (*6), St. Athans (*41), near Wrexham (*50, D. A. J.).

Normandina pulchella (Borr.) Cromb. On beech, Cleeve Combe (*6), Park Mill etc. (*41, D. A. J.). Ingleton (*64, c.fr., D. A. J.), Dulaw (*81).

Thelidium mesotropum (Ach.) Mudd. On limestone rocks, Sand Bay and Purn Hill (*6), Leet (*51, D. A. J.).

Arthopyrenia saxicola Mass. Frequent on the Carboniferous limestone rocks about Weston (6). Durdham Downs (34). Ingleton (*64).

A. foveolata A. L. Sm. The locality from Cornwall (v.c. 1) for this plant was Kynance ; it was given as Penzance in Lich. Not. v. 269.

Leptorhapis Carrolii A. L. Sm. On ash and hazel, Cleeve Combe (*6), Guiting's Wood (*33, H. H. K.).

Porina olivacea (Pers.) A. L. Sm. Cleeve Combe (*6), Blaise Castle Woods (*34).

Belonia calcicola, sp. nov. *Thallus* albido-cinerascens interdum subflavescens, tenuis, effusus, plus minusve tartareus vel leviter pulverulentus vel indistinctus, gonidiis trentepohloideis. *Apothecia* parva, 0·3 mm., semiglobosa, cum base innata, albida aut pallido-rosacea, ostiole leviter depressa. Paraphyses discretæ, simplices, persistentes, circa $100\times2\mu$, hydrate kalico septatæ. *Ascus* elongato-clavatus, $100\times11\mu$, angustior inferne, muro mucilagine evanescente. Sporæ hyalinæ, vulgo 4-næ sed interdum plures, septatæ cellulis numerosis in ordinibus transversalibus 15 aut pluribus, $50–75\times4–6\mu$, sæpe apicibus acutis. *Subhymenium* pallidum e plectenchymatibus parvis consistens. *Gelatina hymenia* cœrulescens (præsertim asci) demum fulvescens cum iodo. (Fig. C.)

Carboniferous limestone rocks, Goblin Combe, Somerset (6), June 1934. Type in British Museum Herbarium.

The genus *Belonia* has not been recorded previously from the British Isles. It differs from *Porina* in the many-celled needle-shaped spores and in the ascus-wall becoming mucilaginous and disappearing. In *B. calcicola* the spores sometimes become 20-septate and may be thinner at one or both ends. The wall of the ascus is fairly definite at first, but eventually disappears, so that the spores appear to be free in the hymenium.

It may be convenient to give a list of my previous Notes on Lichens in the *Journal of Botany* :—

New, rare, or critical Lichens. 1917, 107–111, 204–210, 310–316.
Lichenological Notes. I., 1925, 130–132; II., 1927, 109–113; III., 1928, 17–21; IV., 1929, 74–79; V., 1930, 265–270; VI., 1932, 67–72, 96–100; VII., 1933, 314–318, 327–338.

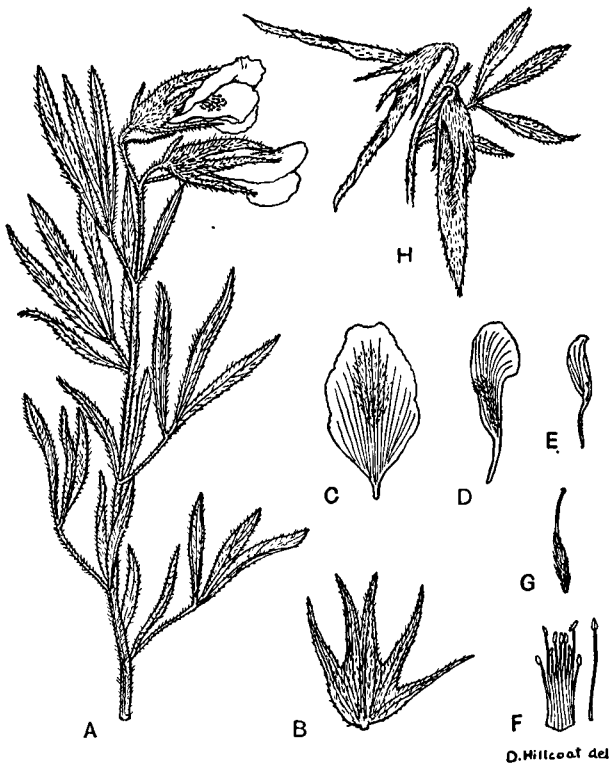
NEW GENUS OF LEGUMINOSAE FROM NORTHERN RHODESIA.

By E. G. Baker, F.L.S.

GAMWELLIA, gen. nov.

Calycis lobi lanceolati longiusculi hirti quam tubo longiores subæquales, 2 superiores leviter connati. *Petala* a tubo stamineo libera. *Vexillum* obovatum, basi breviter unguiculatum; alæ oblongo-oblanceolatæ, basi graciliter unguiculatæ; carina oblonga, apice leviter sursum curvata, basi graciliter unguiculata. *Stamen* vexillare liberum; filamenta inæquilonga non apice dilatata; antheræ dorsifixæ. *Ovarium* hirtum pluriovulatum; stylus supra ovarium leviter curvatus, stigmate terminali. *Legumen* rectum lineari-oblongum, plano-compressum plurispermum apicem versus attenuatum.

Herba perennis diffusa hirta. *Folia* sæpissime 3-foliolata. *Stipulæ* lineari-lanceolatæ. *Flores* flavi sæpissime 2, ad apicem ramulorum dispositi. *Pedicelli* calyce breviores. *Bracteæ* et *bracteolæ* lineares.



Gamwellia flava Bak. fil.

A. Portion of plant. B. Calyx split open. C. Vexillum. D. Wing. E. Carina. F. Stamens. G. Ovary. H. Fruit. A & H, ⅔ nat. size; B–G, nat. size.

Gamwellia flava, sp. unica. *Herba* perennis. *Caules* diffusi 20–35 cm. longi. *Stipulæ* 15–22 mm. longæ, hirtæ. *Foliola* angusta linearia vel lineari-lanceolata hirta, 20–33 mm. longa, 2–3 mm. lata. *Pedunculi* 2 cm. longi. *Bracteæ* lineares ±1 cm. longæ; bracteolæ ±8 mm. longæ. *Calyx* 18–20 mm. longus, segmentis 2 superioribus leviter connatis. *Vexillum* 20–22 mm. longum, 12 mm. latum. *Alæ* ±22 mm. long., ungue 5–6 mm.

longo. *Carina* cum ungue 14–15 mm. longa, ±3 mm. lata, unguibus gracilibus 5–6 mm. longis. *Legumen* ±4 cm. longum, 5–6 mm. latum, intus continuum non septatum.

Hab. NORTHERN RHODESIA: Abercorn District, sandy or rocky spots in open bush, alt. 5800 ft., March 1934, *Miss A. H. Gamwell* 198. "A neat bushy herb, spreading from base about 8 in. Flower yellow."

This plant is allied to *Lotus* in the tribe *Loteae*, but differs in the filaments of the stamens, which are not dilated at the apex, the large calyx with long lobes, and the pod which is compressed. It is also allied to *Lotononis* and *Pearsonia*, but differs in the diadelphous stamens and the calyx.

Interesting points in *Gamwellia* are the stipules, which are similar to the leaves, and the diadelphous stamens, 9 and 1, in which the filaments in the cluster of 9 are unequal in length; the two outermost are shortest and the next two longest (see fig.).

SALCOMBE PLANTS.

BY H. W. PUGSLEY, B.A., F.L.S.

THE plants shown in the following list were seen during the first three weeks of last September, when I was staying at Salcombe, near Kingsbridge, in South Devon. Owing to the two years' drought that was then prevailing, the flora was much poorer than in a normal season, and indeed the vegetation of some of the sea-cliffs was completely destroyed. The inland country of this part of Devon is of relatively little interest to the botanist, almost every acre of land being farmed; and the hedgebanks of the main roads and unused lanes alike are so ruthlessly cut back that only the lowliest plants have a chance of surviving. Shrubs like wild roses and tall herbaceous plants such as foxgloves and mulleins are practically banished from the roadsides. A species that seems to benefit by this new procedure is the bracken.

Fortunately the coast cliffs, several parts of which have been taken over by the National Trust, are largely unspoiled. The archaic rocks, extending from Start Point to Bolt Tail, might be expected to produce some interesting plants, but few have been recorded, and this fine coast does not seem to have been exhaustively explored. Briggs and Marshall each reported a few species for the district, and little appears to have been subsequently added. The line of cliffs from Bolt Head to Bolt Tail, especially, has several broken slopes, not very easy to traverse but by no means inaccessible, where some uncommon southern species might well occur.

My botanising extended from Bigbury, on the west, round the coast to Torcross and as far north as Kingsbridge; and a few

records are added for plants which I collected between Slapton and Babbicombe during a holiday at Paignton in 1907. A few vice-county records are marked with an asterisk.

Clematis Vitalba L.: scarce, hedges near Batson.

Glaucium flavum Crantz: Hallsands, Beesands.

Fumaria capreolata L. var. *Babingtonii* Pugsl.: not seen at Salcombe, probably owing to the drought; Paignton, 1907. *F. *Martinii* Clav.: in some quantity on an allotment, Salcombe, with *F. Boraei*. *F. *muralis* Sond.: a single plant of the typical form at Hope, with *F. Boraei*. *F. Boraei* Jord.: Hope, Salcombe, S. of Kingsbridge, Hallsands; Slapton and Ilsham, 1907. Var. *britannica* Pugsl.: Hope; Broadsands and Roundham Head, 1907. *F. officinalis* L.: one plant seen at Salcombe, apparently much scarcer than *F. Boraei*.

Brassica nigra Koch: Hope Cove, Salcombe. *B. alba* Boiss.: a plant of hedgebanks and roadsides about Salcombe. *Diplotaxis muralis* DC.: Paignton, 1907. *Lepidium Smithii* Hooker: Hope, Prawle Point, Hallsands; probably common in the district. *Crambe maritima* L.: one young plant seen at Beesands. *Cakile maritima* Scop.: Bantham Sandhills, Salcombe, Hallsands, Beesands.

Reseda lutea L. and *R. alba* L.: Paignton, 1907. *R. luteola* L.: Gara Rock, near Salcombe.

Viola odorata L.: lanes about Salcombe. *V. hirta* L.: cliffs east of Salcombe.

Silene maritima With.: Hallsands, Torcross; not generally abundant on the cliffs. *S. anglica* L.: Dartmouth, 1907. *S. noctiflora* L.: Stoke Fleming and Hope's Nose, 1907. *Arenaria leptoclados* Guss.: Ilton Castle. *Spergularia marginata* Kittel: by Collapit Bridge.

Hypericum Androsaemum L.: Splat Cove, near Blankmill Bridge. *H. elodes* L.: small bog on cliff near Sewer Mill Cove.

Lavatera arborea L.: cliff by Hope Cove, perhaps native, Hallsands, Beesands.

Tilia cordata Mill.: above Elbury Cove, Churston, 1907.

Linum angustifolium Huds.: Galmpton, Gara Rock.

Geranium sanguineum L.: Sharp Tors, low cliff opposite Salcombe. *G. columbinum* L.: East Portlemouth. *Erodium moschatum* L'Hérit.: East Portlemouth. *E. maritimum* L'Hérit.: frequent on exposed cliffs, Bolt Tail, Bolt Head to Sharp Tors, Start Point.

Ilex Aquifolium L. : frequent on cliffs and in copses round Salcombe.

Medicago arabica Huds. East Portlemouth. *Melilotus alba* Desr. : Beesands.

Anthyllis Vulneraria L. : Hope Cove, sparingly about Salcombe. *Trifolium procumbens* L., with var. *majus* Koch : Paignton, 1907. *Lathyrus sylvestris* L. : Bantham, Start Point.

Prunus insititia L. : frequent about Salcombe, Beesands. *P. Avium* L. : near Batson, near Hallsands. *Rosa spinosissima* L. : East Portlemouth. *R. micrantha* Sm. : Salcombe, East Portlemouth.

Chrysosplenium oppositifolium L. : cliff at Starehole Bay, by Bolt Head.

Epilobium lanceolatum Seb. & Maur. : by South Sands, wall in Salcombe ; near Street, 1907.

Eryngium maritimum L. : Bigbury, Bantham Sandhills, Beesands. *Carum Petroselinum* Benth. & Hook. f. : East Portlemouth. *Sison Amomum* L. : frequent at Salcombe, Blankmill Bridge, East Portlemouth. *Foeniculum vulgare* Mill. : Hope, Salcombe.

Dipsacus sylvestris Huds. : near Hallsands.

Eupatorium cannabinum L. : extremely abundant in hedgebanks etc. around Salcombe. *Solidago Virgaurea* L. : Sharp Tors, on exposed rocks. *Inula crithmoides* L. : cliff by Sewer Mill Cove, where it was noticed by Briggs in 1878. *Matricaria inodora* L. var. *salina* DC. : Torcross shingles, a prostrate form. *M. suaveolens* Buch. : common about Salcombe ; at Paignton in 1907. *Tanacetum vulgare* L. : common at Salcombe, East Portlemouth. *Artemisia Absinthium* L. : Torcross. *Senecio sylvaticus* L. : beach at Hallsands. *Carlina vulgaris* L. : Salcombe. *Carduus nutans* L. : Torcross. *Centaurea nemoralis* Jord. : Salcombe, Start Point ; only the rayed form seen. *Cichorium Intybus* L. : Hope. *Picris echioides* L. : Salcombe, Ilton Castle. *Crepis taraxacifolia* Thuill. : Paignton, 1907. *Hieracium serratifrons* Almq. : Blackpool, 1907. *H. umbellatum* L. var. *monticola* (Jord.) : Salcombe (scarce), lane south of Kingsbridge, below East Portlemouth.

Legousia hybrida Del. : Stoke Fleming, 1907.

Jasione montana L. : below East Portlemouth, Prawle Point ; only the type seen.

Limonium binervosum C. E. Salmon : Hope Cove, Sharp Tors, Start Point.

Glaux maritima L. : cliff-face at Sewer Mill Cove, by Collapit Bridge. *Anagallis arvensis* L. : apparently native on exposed cliffs at Sharp Tors. *A. tenella* Murr. : small bog on cliff near Sewer Mill Cove. *Samolus Valerandi* L. : Sewer Mill Cove, Hallsands.

Erythraea Centaurium Pers. var. *capitata* Koch : cliff near Prawle Point.

Anchusa sempervirens L. : Salcombe, near Collapit Bridge.

Calystegia Soldanella Br. : Bigbury Sandhills. *Cuscuta Epithymum* Murr. : East Portlemouth, on furze.

Hyoscyamus niger L. : Bigbury Sandhills, Beesands.

Verbascum Thapsus L. : Sewer Valley, cliffs east of Salcombe. *V. virgatum* Stokes : two plants only seen, near East Portlemouth ; Slapton, Stoke Fleming, Dartmouth, and Paignton, 1907. *Linaria Elatine* Mill. : Ilton Castle. *L. purpurea* Mill. : Salcombe. *Antirrhinum Orontium* L. : Hallsands. *Scrophularia nodosa* L. : near Beesands. *S. Scorodonia* L. : Huckham, near Beesands. *Mimulus moschatus* Dougl. : naturalised, near Lustleigh, 1907. *Euphrasia nemorosa* Löhr : near Hallsands. *E. confusa* Pugsl. (f. *albida*) : hilly pasture near North Sands, Salcombe. *Mentha rotundifolia* Huds. : frequent and probably native around Salcombe. *M. *Muelleriana* F. Schultz var. *serratifolia* Pugsl. : Salcombe ; this plant has already been dealt with (see above, p. 77). *Origanum vulgare* L. : Salcombe. *Clinopodium vulgare* L. : Salcombe. *Calamintha ascendens* Jord. : common in hedgebanks around Salcombe. *Salvia horminoides* Pourr. : Hope Cove. *Galeopsis angustifolia* Ehrh. : Broadsands, 1907 ; seemingly absent from the shingles at Torcross, Beesands, and Hallsands. *Lamium amplexicaule* L. : Stoke Fleming and Roundham Head, 1907.

Verbena officinalis L. : Beesands.

Chenopodium Vulvaria L. : shingles at Beesands. *C. murale* L. : Salcombe, Beesands. *C. rubrum* L. : Torcross. *Salicornia ramosissima* Woods : by Collapit and Blankmill Bridges. *Suaeda maritima* Dum. : by Collapit Bridge. *Salsola Kali* L. : Bantham Sands.

Rumex rupestris Le Gall : still at Sewer Mill Cove ; first noticed by Briggs. *R. pulcher* L. : Salcombe, East Portlemouth, Prawle Point.

Daphne Laureola L. : copse at Salcombe, looking wild.

Euphorbia Peplis L. : I was unable to find this either near Torcross, where it formerly grew, or on Beesands. *E. portlandica* L. : plentiful on cliffs of Sharp Tors.

Spiranthes spiralis Koch : downs near Bolt Tail.

Iris foetidissima L. : Salcombe.

Tamus communis L. : Salcombe.

Ruscus aculeatus L. : on exposed cliffs of Sharp Tors and rocks and stacks of Splat Cove, apparently native. *Scilla verna* Huds. : fruiting on Prawle Point, with *S. autumnalis* L.

Typha angustifolia L. : Torcross.

Potamogeton polygonifolius Pourr. : small bog on cliff near Sewer Mill Cove.

Scirpus maritimus L. : shore at Batson. *Carex paniculata* L. : Starehole Bay, near Bolt Head, and valley above. *C. extensa* Good : by Collapit Bridge (possibly Briggs's station " Between Kingsbridge and Salcombe ").

Avena strigosa Schreb. and *A. fatua* L. : cornfield weeds near Stoke Fleming, 1907.

Pteris aquilina L. : often the dominant plant of the roadside hedges near Salcombe. *Asplenium lanceolatum* Huds. : sparingly on the cliffs west and east of Salcombe. Noticed on one rock growing with *A. marinum*. *A. marinum* L. : frequent but by no means general on the sea-cliffs. *Athyrium Filix-foemina* Roth : rather rare round Salcombe, in some damp lanes south of Kingsbridge, Starehole Bay. *Ceterach officinarum* Willd. : seen in one locality only south of Kingsbridge. *Phyllitis Scolopendrium* Newm. : remarkably abundant at Salcombe. *Polystichum aculeatum* Roth : I failed to find this species, which is sometimes confused with luxuriant young plants of *P. angulare* Presl. This latter plant is ubiquitous in the roadside hedges and lanes round Salcombe and is far commoner than the Male Fern. *Ldstrea aristata* Rendle & Britten : not common round Salcombe, seen only in a few small woods and copses. *Polypodium vulgare* L. : often common on cut-back hedgebanks.

OBITUARIES.

Harry Fisher

(1860–1935).

There passed away on 21 January last a botanist who had made a lifelong study of the British Flora, Harry Fisher, of Grantham. Fisher was born at Nottingham on June 3, 1860, and educated at Loughborough Grammar School. On leaving school he became a pharmaceutical chemist, and was for some years with the firm of Giles, Schacht & Co., of Clifton, Bristol, of which the late J. W. White was then a junior partner. At that time, possibly influenced by White, he was already an ardent botanist. In 1886 he acquired a chemist's business at Newark,

and made an extensive study of the flora of Nottinghamshire. He joined the Jackson-Harmsworth Polar Expedition in 1894 as its botanist, and spent two and a half years in Franz Josef Land. On his return he worked at the Arctic flora, and particularly the genus *Poa*, which he partially monographed ; and a little later he wrote the botany for the Victoria Histories of the counties Lancashire and Leicestershire. In 1911 he became a director and secretary of the Grantham Journal Co., a post which he held till his death.

Throughout his career Fisher showed a " penchant " for the more critical groups of flowering plants, especially *Rubi*, of which he amassed what is perhaps a unique collection. He was also a keen fisherman. While of a retiring disposition and averse to publicity, he was an accurate and critical botanist as well as an excellent collector, and his knowledge of the British *Rubi* was perhaps hardly surpassed. His herbarium has been presented to Wollaton Hall, Nottingham. He married in 1886 Sara, daughter of the late Henry Escritt, of Grantham, and leaves two daughters.

The news of Fisher's death came to me as a personal bereavement, for it was through his influence that I first, as a boy of sixteen, put to practical use what I had learned at school from Oliver's ' Lessons in Elementary Botany.'—H. W. Pugsley.

William Robinson

(1838–1935).

William Robinson, who died on May 12 at the age of 96, at his home, Gravetye Manor, East Grinstead, would have made no claim to the style of botanist, but he had a wonderful knowledge of plants, and by his example and numerous writings exercised a remarkable influence on horticulture. He was the leader of the revolution against the formality of the Victorian age, a striking example of which was the carpet bedding, that we remember as the delight and wonder of our childhood in the London Parks. Among his earliest supporters was the late Gertrude Jekyll, herself an apostle of natural gardening.

Born in Ireland, July 15, 1838, of peasant stock, Robinson started as a garden-boy, and in 1861 came to the Royal Botanic Gardens, Regent's Park, as under-gardener. In 1867 he broke away from official work, and a tour through France to study French methods was followed by a visit to North America, including the Rockies and California. On his return in 1871 he started the ' Garden,' and in 1879 ' Gardening Illustrated,' and later ' Farm and Home.' His ' English Flower Garden ' (1883), a practical dictionary of hardy plant life, passed through many editions. He was directly or indirectly responsible for

many other works of horticultural interest. His own estate at Gravetye in Sussex was a place of pilgrimage for garden-lovers.

Robinson was the Father of the Linnean Society, to the Fellowship of which he was elected in 1866.—A. B. RENDLE.

SHORT NOTES.

CREPIS MOLLIS Ascherson IN IRELAND.—While recently looking through some plants in the herbarium of Mr. Bernard Reynolds, I came across a sheet of this species which he had collected in County Down in 1914 and identified with *C. paludosa* Moench. In Great Britain the two species grow in similar situations and sometimes in company, and it is very easy indeed to confuse them—more so, I think, when growing than when dried in the herbarium. *C. paludosa* is recorded in Dr. Praeger's recent book as frequent in the district where *C. mollis* was found by Mr. Reynolds, and it seems likely that there, as in Teesdale and elsewhere, *C. mollis* also occurs and has not hitherto been distinguished. Dr. Praeger hopes to confirm this addition to the Irish flora during the coming summer.—H. W. PUGSLEY.

EMPETRUM HERMAPHRODITICUM Hagerup.—In August 1933, while staying at Saas, in the Swiss Valais, I collected excellent material of this species on the summit of the Plattje (about 8500′ alt.). My specimens were flowering and fruiting abundantly, just as the plant is said to do in the Faeroes by Hagerup (Dansk Bot. Arkiv. v. 2, 1; 1927), and it was readily seen that the faded stamens with their anthers remained fixed below the fruit until after it had ripened, as stated in the description. In contrast to this the *exsiccatæ* in the British Museum Herbarium and at Kew, both Continental and British, usually show very few fruits, and it is often difficult to be sure whether the plants are hermaphrodite or not.

Although it has long been known that *Empetrum nigrum* L. is not regularly dicœcious, the only synonym that Hagerup was able to cite, when describing *E. hermaphroditicum* as a new tetraploid, bisexual species, is *E. nigrum* f. *hermaphroditica* Lange, Consp. Fl. Groenlandica, 3, 18 (1880). There is, however, an earlier though invalid name. A sheet in the Kew Herbarium (Herb. Hooker.) has a specimen labelled "Highlands of Scotland, 1807," which shows a ripe fruit with attached stamens and is clearly identical with *E. hermaphroditicum*. Attached to this sheet is a slip with an enlarged drawing of the flowers by Sir William Hooker, and a notation in his hand "hermaphrodite! *E. scoticum*." This name is printed in Hooker's 'British Flora,' 434 (1830), under *E. nigrum* L., thus :—"A smaller, bushy var. is cultivated in gardens, under the name of *E. scoticum*, on which I have found perfect flowers." As Hooker's Scottish

specimen was presumably taken from a wild plant, it would appear to have been identified after the publication of the flora, and I have not traced any later allusion to the occurrence of *E. scoticum*. Under Art. 37 of the Rules of Nomenclature this seems to be a case of incidental mention of a name which is not effective publication, and *E. scoticum* Hooker is therefore invalid. But the existence of an early Scottish example of *E. hermaphroditicum*, which was distinguished as a separate species or variety about a century ago, is of some interest.

The specimen of *E. nigrum* in the Linnean Herbarium is a good example of the male plant and still shows an abundance of stamens.—H. W. PUGSLEY.

HUXLEY MEMORIAL LECTURE.

"VIRUSES AND HETEROGENESIS" was the subject of the Huxley Memorial Lecture by Sir Henry Dale, C.B.E., F.R.S., on May 2. In an address in 1870, Huxley, reviewing the evidence, suggested that, though "biogenesis," *i.e.*, the production of living organisms from organisms of the same kind, held the field, it was not to be supposed that life could never originate from lifeless matter. A process of this kind, which he termed Xenogenesis (better known as Heterogenesis), might be found to be responsible for certain infective or pathological conditions. Reviewing the history of our knowledge of viruses the lecturer demonstrated a series descending from small bacteria just visible under high powers of the microscope, through the viruses of *Psittacosis* and *Vaccinia*, visible microscopically or by photomicrography with a single ultra-violet wave-length, which cannot logically be refused the status of very small organisms, to a series of filtrable viruses, beyond the reach of differentiation by the microscope, but whose successively diminishing size had been estimated by differential ultra-filtration. The average diameter ranged from 275 mμ (*Psittacosis*) to 10 mμ (Foot-and-Mouth disease), the latter approaching closely the estimated size of a protein molecule. The question arises as to whether the virus is organised and self-propagating (homogenetic) or is a product of the infected cells of the host in which it is parasitic (heterogenetic). Choice between these rival conceptions of its nature "must have the characters of a prophecy rather than a conviction, dealing with probabilities rather than with established facts." Biogenesis has been repeatedly on its trial and has hitherto won at each successive stage, and improved methods may yet again establish its validity in cases where the smallness of the units concerned can be used as an argument against their self-propagation.

REVIEWS.

Rabenhorst's Kryptogamenflora von Deutschland, Oesterreich und der Schweiz. X., Abt. 3. *Dinoflagellatae (Peridineae)*, 2 Teil, Lief. 1, 2. By J. SCHILLER. 8vo, pp. 320, 336 figs. Akad. Verlagsgesellsch. m.b.H. Leipzig, 1935. Price 31.60 R.M.

THE opening pages of the second volume devoted to Peridineae deal with a family Gymnosclerotaceae included as an addendum to the Gymnodiniales which formed the subject-matter of the latter part of the first volume. The Gymnosclerotaceae are the Amphilothioidae of Kofoid and Swezy, which Schiller, following Zimmermann, regards but as a special development of the Gymnodiniales. In view of the presence of an internal skeleton and of other points of resemblance to the Radiolaria, this attitude may perhaps be questioned. The treatment of this small family is followed by a comprehensive account of the Blastodiniales, based essentially on Chatton's monograph. This will be specially welcomed, since the literature relating to this interesting series of parasitic forms is rather scattered and in part not easy of access.

The greater portion of the two parts under review is occupied by the Peridiniales, the treatment of which is based not only on the existing literature, but also on collections of Ginzberger's from the Atlantic and of Molisch's and Ruttner's from the Red Sea and Indian Ocean; a number of new species are described. Schiller advances the view that the diverse processes and other enlargements of the body met with among Peridiniales are not only to be regarded as flotation-mechanisms, but also as organs for the interchange of material with the environment. This is based, *inter alia*, on Peters's (1929) observation that the Atlantic species of *Ceratium* are in general short-horned in waters rich in mineral nutriment, but long-horned in those which are oligotrophic. Additional data of the same kind are furnished by the author (pp. 72, 128), and this interesting view-point will merit further investigation to test its general application.

The families of Peridiniales (Ptychodiscaceae, Glenodiniopsidaceae, Glenodiniaceae, Peridiniaceae, Goniaulaceae, dealt with in the parts under review) are arranged according to the principle that the structure of the envelope has become progressively simpler in the course of evolution, the Glenodiniopsidaceae thus representing the most primitive and the Podolampaceae the most specialised forms. The Ptychodiscaceae, in which no plates can be recognised in the envelope, are the Kolkwitziellales of Lindeman (1928), which are not regarded as meriting ordinal rank. In view of the increasing evidence of variability in the number and arrangement of the plates in the envelope of the other Peridiniales, the limits of the genus *Glenodinium* (Glenodiniaceae) are widened to include *Diplopsalis* and *Peridiniopsis*, as well as a number of species of other genera. On the other hand, in the genus *Peridinium* only some 160 of the 600 described species are adopted and numerous synonyms are recognised. Chodat's *Bernardinium* is regarded as a deformed specimen of *Hemidinium*.

Quite apart from the detailed taxonomic treatment, the value of Schiller's contribution lies in the several new points of view that are put forward and that are certain to have a stimulating effect on the study of the group. From the systematic point of view the absence of keys to the genera and families is again to be regretted. The illustration is ample and for the most part clear.—F. E. FRITSCH.

Die Stoffausscheidungen der Höheren Pflanzen. By A. FREY-WYSSLING. (Monographien aus dem Gesamtgebiet der Physiologie der Pflanzen und der Tiere, Bd. 32.) 8vo, pp. xii, 378, 128 text-figs. Springer: Berlin, 1935. Price R.M. 28.

IT is difficult to find a suitable English equivalent for the German word "Stoffausscheidungen" as it is used by Dr. Frey-Wyssling. He classifies the substances with which he deals as follows: (1) "Gerüstsubstanzen," organic skeletal material; (2) "Rekrete" mineral salts, such as calcium carbonate, which have not been assimilated; (3) "Exkrete," the end products of catabolic processes; and (4) "Sekrete," metabolic products which, after their separation, perform definite physiological functions. A net so widely cast has brought in a rather heterogeneous catch, but the result is a book of great and varied interest.

A long section is devoted to the cell-wall, a subject to our knowledge of which the author has made important contributions. The results of modern methods of investigation by polarised light and by X-ray analysis are fully dealt with and lead to a valuable account of cell-wall structure. Full consideration is given to the nature of the secondary changes which take place in the structure of the fundamental cellulose wall. The physiology of growth and permeability—as it affects the wall—are also fully treated. The short section on the cuticle suffers from the absence of any mention of the work of Chibnall and Piper.

A second long section is devoted to the crystalline salts of calcium and to silica crystals, and this, too, deals with the physiology of the formation of these inclusions. The section on "Exkrete" deals chiefly with the various terpenes.

The final section includes such various topics as the secretions of root-hairs, guttation, nectaries, enzymes, and hormones. The section seems rather out of place in this book and the treatment is brief.

In the first three sections a great deal of modern work is brought together for the first time. The writing is everywhere lucid and stimulating, and the book must be recommended as a most important contribution to the literature of the cell-wall and of certain aspects of plant physiology.—M. SKENE.

Flora of the Niagara Frontier Region. By CHARLES A. ZENKERT. Bulletin of the Buffalo Society of Natural Sciences, xvi. 8vo, pp. x, 328, frontsp., folding map, and text-figs. Buffalo, New York, 1934.

IN his Introduction the author, who is Research Associate in Botany at the Buffalo Museum of Science, describes the reason and origin of his account of the botany of the territory which, formerly the country of the Iroquois, has in less than a century been transformed from primitive to cultural conditions. When 'The Plants of Buffalo and its Vicinity,' by David F. Day, appeared in 1882, the region had long ceased to be the wilderness that it still had been seventy-five years earlier when Michaux, the French botanist, visited Buffalo and the Niagara Falls. In the fifty years that have since elapsed local changes in environment and phyto-geographic relations have continued, and the present work embodies the record of local botanical search of a number of workers extending over the later period. A brief account is given of work of exploration in the area—that is, within a radius of about fifty miles of Buffalo, and including the south-eastern extremity of the province of Ontario, Canada.

The "Flora" is not a mere list of plants, but includes also an interesting account of the vegetation and the conditions under which it has developed. In a chapter entitled "Regional Environmental Conditions" the author describes the topography and geology, tracing the changes which have occurred in Pleistocene times and the effects of glacial action in bringing about present-day topography. Climatic factors and data are discussed, and the zonal relations of the flora. A feature of special interest is the existence of a southern or austral element in Southern Ontario, which finds its most typical development in the Niagara Peninsula and along the shore of Lake Erie. Botanists who have visited the beautiful Niagara Glen may recall this feature. "Human Agencies and Man-wrought Changes," especially in the form of deforestation since the times of Indian occupation, and later the introduction of immigrant plants, have wrought great changes in the natural environmental conditions.

The Systematic list of Flowering Plants and Ferns is arranged according to the Englerian System. Under each species degree of frequency is noted and local distribution is given in detail. A proportion of the species are illustrated by good photographic reproductions. From the tabular conspectus we learn that the flora contains 1187 native species and 400 introduced. A concluding chapter is an account of the various ecological areas and plant-societies represented.—A. B. R.

Gardening in East Africa: a Practical Handbook. Ed. by A. J. JEX-BLAKE, M.D., F.R.C.P. Foreword by Sir ARTHUR W. HILL, K.C.M.G., F.R.S. 8vo, pp. xv, 350, 6 col. pls. 6 text-figs. Longmans, Green & Co.: London, 1934. Price 12*s.* 6*d.*

THERE are twenty chapters in this book, a preface, and an index, and at least as many members of the Kenya Horticultural Society and of the Kenya and Uganda Civil Services have contributed to it. Thus Mr. Walter, of the B. E. A. Meteorological Service writes of the climates of Kenya, Tanganyika, Uganda, and N. Rhodesia; Mr. V. A. Beckley, the Senior Agricultural Chemist, of the Soils, of Manuring and of Tillage; Messrs. T. J. Anderson and J. McDonald, respectively Entomologist and Mycologist, of the Insects and Fungi liable to attack plants in the area; and various others deal with particular groups of plants and their use in the garden. With so many authors the treatment is of course somewhat unequal, but each has done his part of the work well and a book of great value to the new-comer to the region has been produced.

It is a good sign that out of the disappointments and perhaps rare triumphs of the pioneer, his efforts to bring around his new home the plants familiar to his old, and his gradual selection of the striking and more amenable of the native plants to grace his garden and beautify his surroundings, have so quickly produced so trustworthy a guide.

The only thing that seems to call for adverse comment is the title of Chapter 11. The previous chapters and those that immediately follow deal with such things as annuals, perennials, roses, climbing plants, trees and shrubs, indigenous plants, lawns, hedges, vegetables, and so on. Chapter 11 is headed "Bulbous-rooted plants." We may forgive the botanical anomaly in the title, but less easily the assemblage under it of such a diverse collection of plants as Bilbergias and their like, *Arundo Donax*, Dracænas, Asparagus, Aloe, "Liliums" of course (but why not "Lilies"?), Yucca !, Aquilegia ! !, *Eichhornea crassipes* ! ! ! What a pity the chapter heading was not "Every other kind of Plant"? Nevertheless, so long as the competitor at the local flower show does not interpret the Schedule according

to this chapter and show Yuccas and Columbines in the class intended for Lilies and Tulips, not much harm will be done. But this is not to cast doubt upon the soundness of the information the book sets out to give.

At times it is not only sound but entertaining, and even humorous, as for instance Mr. Sharpe's chapter (XVII.) "Gardens at the Coast," the story of the author's efforts at making gardens in one of the least possible of the areas included and their results.

Vegetables and garden fruits are also dealt with, and thus an excellent book has been provided for the novice. Paper, print, and general "get-up" leave nothing to be desired, and there are very few of those misspellings of botanical names which so often occur in books prepared for popular use.—F. J. CHITTENDEN.

Elementary Microtechnique. By H. ALAN PEACOCK, M.Sc. Sm. 8vo, pp. vii, 200, 15 text-figs. Edward Arnold & Co.: London, 1935. Price 5*s.* 6*d.*

THIS book differs from others on practical botany and zoology in being inexpensive, concise, and "something between the instruction sheet and the large reference books." Written for sixth form and first year University students, it includes in an appendix books dealing with more advanced methods.

The author begins by giving a short tabulated account of the structure and contents of animal and plant cells, and of the various processes concerned in making temporary and permanent preparations together with the theories and principles involved. The next section deals with details of these processes, and tables are added which summarize the methods at a glance. This is followed by methods to be employed for specific purposes which are given alphabetically. Next come the uses of stains and formulæ, and hints which include a rough account of the compound microscope, how to determine the magnification of objects examined microscopically, and how to sharpen a razor. Methods particularly suited to animal or plant tissues are indicated and, besides the appendix on advanced books, there are two others. One is headed "Sources and Culture of Material" and the other deals with the preservation of material.

The only disadvantage of the book lies in the arrangement of the matter, *e. g.*, the result of describing the microtechnical processes alphabetically leads to a good deal of repetition and to unnecessary searching through the pages to find the next step. The frequent tabulation is a little confusing at first. But these are minor drawbacks, and the book cannot fail to be a real help to teachers and students alike.—F. L. STEPHENS.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting of April 25, the President, Dr. W. T. Calman, F.R.S., in the Chair, a loyal Address from the Council and Fellows to His Majesty the King, our Patron, on the completion of twenty-five years of his reign, was laid before the Society and read by the Assistant Secretary.

The proposed alterations to the Bye-Laws, instituting a scale for compounding for the annual subscription by the Fellows, was accepted by ballot.

Mr. A. W. Exell gave an account of the botany of the Islands of the Gulf of Guinea, which he had recently visited. The vegetation of Fernando Po, S. Thomé, Principe, and Annobon, all islands of volcanic origin, was described in some detail with the help of a series of lantern-slides, and the special features of each were discussed.

Dr. F. G. Brieger described with the aid of lantern-slides and diagrams the developmental mechanics of normal and abnormal flowers in *Primula*. Of special interest was the succession of flowers developed vertically from the centre of the flower of *Primula kewensis*, as demonstrating the axial character of the structure bearing the free-central placentas, and the remarkable development of pistillody of the stamens in another species. The latter phenomenon was ascribed to displacement of the primordia at the growing point, resulting in the diversion from their normal path of the hormones responsible for the development of a given organ.

A revision of the genus *Pariana* (Gramineae), by T. G. Tutin, was read in title.

At the General Meeting on May 9, the President in the Chair, seven new Ordinary Fellows were elected, and Arthur Augustine Dallman and Arthur Patterson were elected to the Associateship. Albert Francis Blakeslee, Department of Genetics, Carnegie Institute of Washington, U.S.A., Christen Raunkiaer, of Copenhagen, Pierre-Auguste-Clément Dangeard, Faculté des Sciences, Paris, and Gustav Senn, Director of the Botanischen Anstalt, Basel, were elected Foreign Members.

Miss E. R. Saunders read a paper entitled "On Rhythmic Development and Radial Organisation in the Flower," which was illustrated by lantern-slides. The form of a flower is not an invariable guide to its morphology, and, adopting the view of exigencies of space in floral development, the author sought an explanation of the ultimate arrangement in the origin and character of the vascular strands which supply its members. Departure from the normal arrangement of alternating whorls, such as obdiplostemony were explained as the result of pressure by the developing carpels, assuming the author's hypothesis of duplicate whorls of carpels. In the discussion which followed, Dr. Rendle

questioned the view that the position and course of the vascular tissue determined the arrangement of the floral members and Mr. Garside could not agree that the later-developing carpels influenced the position of the stamens.

At the Anniversary Meeting on May 24, the President, Dr. W. T. Calman, F.R.S., was in the Chair. The Treasurer, in presenting his financial report for the past year, noted a slight fall in the amount of contributions from Fellows due to a corresponding decline in numbers. He also referred to the recent decision by the Council to restore the system of allowing Fellows to compound for future subscriptions. The Society's investments showed an appreciation in market value. The Assistant Secretary and Librarian then gave his report: there was a loss of 44 Fellows during the year, and 39 new Fellows had been elected; the number now stands at 739.

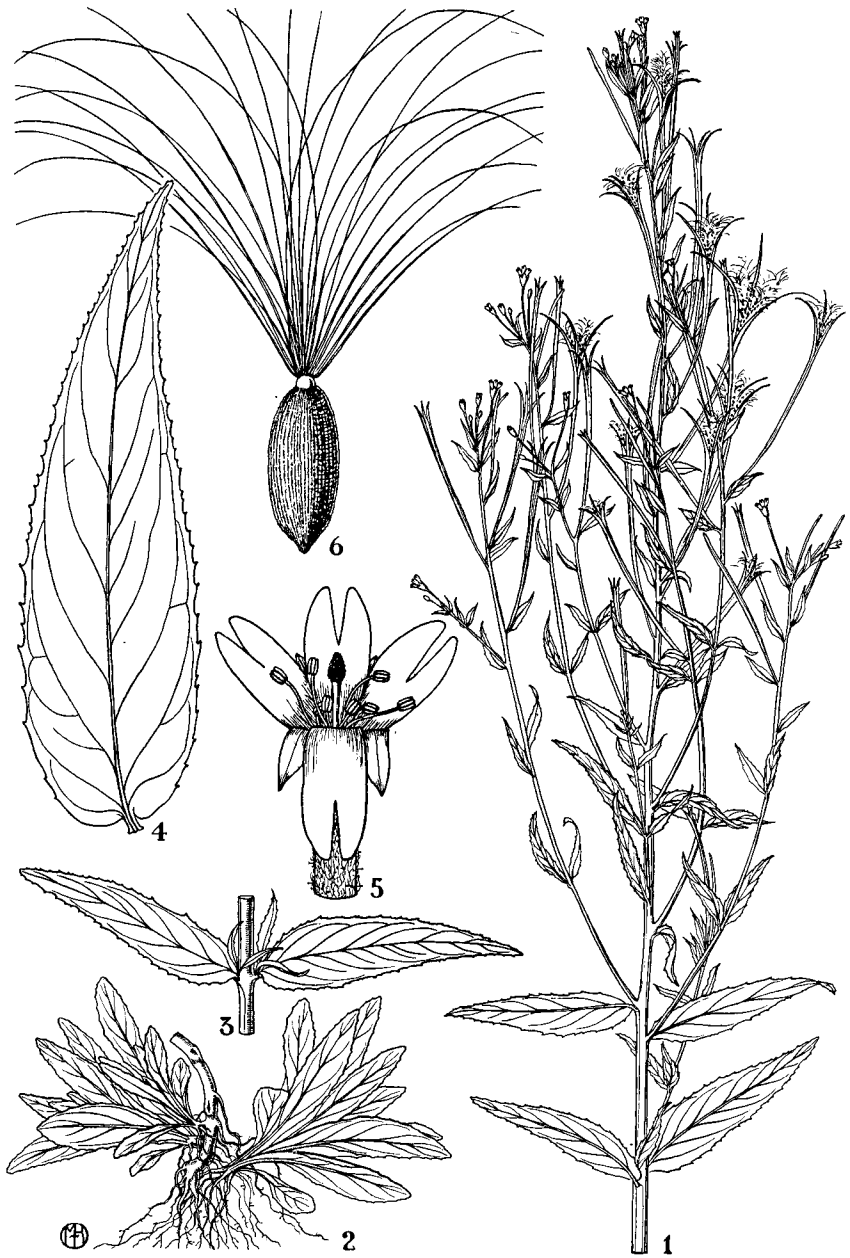
Dr. Calman, in presenting the Linnean Gold Medal to Sir David Prain, referred to his outstanding services in administration as Director of the Royal Botanic Gardens at Calcutta and Kew, to botanical research, and to the Royal and Linnean Societies as Treasurer and President respectively. In an erudite Address entitled "The Meaning of Biological Classification" the President brought forward irrefutable evidence for the claim that convergent evolution is the exception not the rule in phylogeny.

After the meeting the Medallist and other Fellows were guests at the dinner of the Linnean Club at the Washington Hotel.

ROYAL SOCIETY.—Botany claims representation in three of the Fellows elected on May 16. Mr. G. E. Briggs, Lecturer in Plant Physiology in Cambridge University, Dr. B. A. Keen, Assistant Director, Rothamsted Experimental Station, whose work on the physical properties of the soil is of great practical value in Agriculture, and Mr. R. N. Salaman, whose researches on virus-diseases of the potato have enlarged our knowledge of these "organisms."

POLISH BOTANISTS.—To Prof. Dr. Hryniewiecki of Warsaw we are indebted for a 'Précis de l'histoire de la botanique en Pologne,' published by the Botanical Society of Poland on the occasion of the Third Congress of Slav Botanists held at Warsaw in June 1931, and augmented in 1933 by fifty-seven portraits. The historical sketch includes five periods from the Middle Ages to 1918. The portraits, which are arranged chronologically, begin with Simon Syrenski (Syrenius) (1540?–1611) "premier professeur de l'Université Jagellonienne" and the author of a folio Herbal in eight volumes, published at Cracow, after his death, in 1613.

It is an interesting collection and contains many familiar botanical names. A pleasing early portrait of Edouard Strasburger recalls the fact of a period of service at the Ecole Supérieure at Warsaw, whence he migrated to Germany.



EPILOBIUM ADENOCAULON HAUSSKN.

EPILOBIUM ADENOCAULON HAUSSKN. IN BRITAIN.

BY G. M. ASH AND N. Y. SANDWITH.

(PLATE 609.)

A FEW years ago in South-west Surrey an *Epilobium* was noticed growing abundantly with several characters which clearly distinguished it from any of the native species. Specimens were sent to several botanists, and eventually Prof. G. Samuelsson of Stockholm confirmed it as the North American *Epilobium adenocaulon* Haussknecht in Oesterr. Bot. Zeitschrift, xxix. 119 (1879); Mon. Epilobium, 261 (1884).

The following is a short description of the plant as it occurs in Surrey:—

Root fibrous, *with dense sessile or subsessile rosettes formed late in the summer*; the rosettes at first with small, somewhat fleshy, rounded, spathulate innovation leaves, but shortly producing an abundance of true leaves up to $2\frac{1}{2}$ inches or more in length, the original innovation leaves generally shrivelling and disappearing before the winter. *Stem* up to 6 ft., generally 2 to 3 ft., high, strictly erect, much branched above and frequently of a reddish hue; for the greater part with four distinct raised lines, reduced to two towards the base, where the petioles join across the stem; the lower part glabrous except for a few hairs on the raised lines, *the upper parts more or less provided with crisped hairs and short patent-glandular ones. Leaves*, except the uppermost, opposite, *oblong-lanceolate, gradually tapering to an acute apex and suddenly contracting at the base into a short but distinct petiole, up to* 10 *cm. long by* 3 *cm. broad*, the proportion of greatest breadth to length being about 1 : 3·75, all except the uppermost *practically glabrous*; teeth acute, numerous, small, irregular, and directed towards the apex. *Flowers* abundant, always erect, *up to* 6 *mm. long, generally much less*, of a distinctive colour, pale pink edged with a deeper shade. *Stigma* shortly *clavate, less than half the length of the style. Capsules* spreading, covered with crisped and also with numerous patent-glandular hairs, when ripe varying from 4 to 6·5 cm. in length. *Seeds* tapering at both ends, *with a peculiar chestnut-coloured or almost colourless pellucid beak or appendage below the pappus, the base acute.*

A number of general characters are noticeable in *Epilobium adenocaulon*, and give it a distinctive appearance in the field. Usually, with its stem and leaves more or less red-coloured, its strict upright growth much branched above, and its abundance of flowers and patent pods, it is recognizable even from a distance. The short entire stigma immediately connects the plant with the "*tetragonum*" group, and the patent glandular hairs of all the

upper parts are very noticeable, particularly in the sunshine, though in shadier situations the indumentum is much less. The seeds, by reason of the minute pellucid apical beak or appendage, which is said by Haussknecht to be due to a prolongation of the inner testa, are probably the most positive character by which to recognize the plant, since the only other British species with this appendage are *Ep. alpinum*, *Ep. alsinefolium*, and *Ep. palustre*; unfortunately, however, the appendage is small and at times, perhaps when the seed is immature, difficult to see.

Of the other British species with an entire stigma, *Ep. roseum* is the most likely to be confused with *Ep. adenocaulon*. The glandular pubescence of both is similar, but *Ep. roseum* has a much more copious supply of crisped whitish hairs in the upper parts, and when in flower the white-turning-to-pink colour of the flowers of *Ep. roseum* make it very distinct. The leaves, too, of *Ep. roseum* with their long (3 to 20 mm.) petioles and cuneate base are very different from the short petioles (1·5 to 3 mm.) and almost cordate base of the leaves of *Ep. adenocaulon*.

Pubescence is the easiest character by which to distinguish *Epp. tetragonum*, *Lamyi*, and *obscurum* from *Ep. adenocaulon*. These three species have only sleek silky adpressed hairs with rarely a glandular hair, and their stigma, too, is much longer and roughly equal to the length of the style, whereas in *Ep. adenocaulon* the stigma is short on a comparatively long style. The leaves of *Ep. tetragonum* are much narrower than those of *Ep. adenocaulon*, with their length to greatest breadth anything from 1 : 6 to 1 : 8 or more, and the blades are decurrent owing to the raised lines of the stem. The pods, too, in *Ep. tetragonum* are much longer than in *Ep. adenocaulon*, being rarely less than 7 cm. long except in small starved examples, generally about 8 cm. and occasionally up to 11 cm. or even longer. Apart from pubescence, *Ep. Lamyi* may be distinguished by the smallness of its narrower leaves, rarely reaching 5 cm. in length, generally considerably less, and with their base not cordate. *Ep. obscurum* may be distinguished by its æstival stolons and absence of rosettes, though here again the pubescence will afford the readiest clue.

In actual leaf-shape *Ep. adenocaulon* most nearly approaches the hybrid *Ep. montanum* × *obscurum*, which, however, may be distinguished by the fewer glandular hairs, the larger flowers, the intermediate stigma, and the fewer, less acute, teeth of the leaves.

A few hybrids of *Ep. adenocaulon* with *Epp. montanum*, *parviflorum*, *obscurum*, and *palustre* have been noticed, but it is as yet too soon to give a reliable description. From the few plants we have seen it would appear that the leaf-shape of *Ep. adenocaulon* is well maintained in the hybrids, particularly

in the attenuated apex, but the glandular pubescence is not so noticeable; all are usually well-grown plants. The hybrids with *Epp. montanum* and *parviflorum* have the intermediate stigma.

In England *Ep. adenocaulon* is met with in damp woods, copses, and along stream-sides far from houses, as well as on railway-banks and in gardens, timber yards, and waste places.

The species is at present known from the following vice-counties :—

SURREY, v.c. 17 : heaths north of Woking, *J. Fraser*, 26th June, 1921 (Herb. Kew. ; earliest evidence of the occurrence of the species in Britain) ; Witley, 1931 ; Grayswood, *G. M. Ash*, 1931 (Herb. Mus. Brit.) ; Easbing, 1931 ; Godalming, 1932 ; Westcott, *E. C. Wallace*, 1932 ; Brook, Godalming, 1933 ; near Virginia Water, 1934 ; Whitmoor Common, 1934 ; Worplesdon, 1934 ; Guildford, 1934 ; White Hill, Mickleham, *R. E. Brinton*, 1934 (Herb. Mus. Brit.). Specimens from Witley were distributed through the Watson Botanical Exchange Club in 1933–34, and a note on the species appeared on pp. 218–219 of the fiftieth Report of the Club.

WEST KENT, v.c. 16 : Ryarsh Wood, *A. R. Horwood*, 1929 (Herb. Kew.).

NORTH HAMPSHIRE, v.c. 12 : Hook Common, 1934 ; Fleet Pond, 1934.

WEST SUSSEX, v.c. 13 : Lurgashall, 1934.

The following is a list of the hybrids found up to the present, the localities being all in Surrey, except where otherwise stated :—

Ep. adenocaulon × montanum : Witley, 1933 ; Brook, Godalming, 1934.

Ep. adenocaulon × obscurum : Brook, Godalming, 1934 ; Worplesdon, 1934.

Ep. adenocaulon × palustre : Fleet Pond, N. Hants, 1934.

Ep. adenocaulon × parviflorum : Whitmoor Common, 1934 ; Brook, Godalming, 1934.

Ep. adenocaulon Hausskn., which must not be confused with the variety *adenocaulon* Hausskn. of *Ep. hirsutum*, has evidently been growing on the Continent of Europe for upwards of thirty years. Swedish specimens date back to at least 1900, and an account of the appearance of the species in Sweden, with a list of localities from Stockholm, Götland, and Södermanland, was given by H. Hafström in Svensk Bot. Tidskrift, iii. (174) (1909). The plant was said to grow in ditches and by rivers, and the writer noted that in his own locality (near Nynäs) it bore white

flowers, the colour of the flower being the only character by which it differed from specimens in the Stockholm Herbarium. Subsequently, as we shall show, some of the Swedish plants were referred to two other North American species.

The history of the appearance of the species in Central Europe is given in Hegi's 'Illustrierte Flora von Mittel-Europa,' v. ii. pp. 807, 808 (1925), and *Ep. adenocaulon* is wisely included in the key to the Central European species of *Epilobium*. It may be worth while to summarise Hegi's remarks, and those of other continental writers, for the benefit of British botanists who do not possess his book or have access to current foreign botanical literature. In Central Europe *Ep. adenocaulon* was first found by Dr. Konrad Rubner in 1917, in the company of other Willow-herbs as a weed in woods in Poland; the locality lies to the east of Warsaw, in the forest of Bialowies between Brest Litovsk and Bialystok. In the following year the plant was seen in masses in woods on the Baltic coast in Courland, and in ditches in the neighbourhood of Riga (*i. e.*, in modern Latvia). As the plant agreed with no known European or Asiatic species, Dr. Rubner described it as new (in Fedde, Repert. Sp. Nov. xv. 179; 1918) naming it *Epilobium Graebneri*, after Dr. Paul Graebner, of the Botanical Garden at Berlin-Dahlem, who in August 1917 was studying the flora of the Bialowies forest behind the invading German armies. After the war Rubner was able to compare his material with specimens of *Ep. adenocaulon* from "wild" localities in Sweden. He realised that his species was "shaky," but the question was (and is) complicated by the critical relationship of *Ep. adenocaulon* with several other North American species. However, there could really be no doubt that the name *Ep. Graebneri* must disappear into synonymy under *Ep. adenocaulon*, and the same conclusion was reached by Prof. G. Samuelsson of Stockholm, and by Dr. J. Bornmüller of Weimar. The latter, indeed, cultivated both Polish *Ep. Graebneri* and North American *Ep. adenocaulon*—received from the State of Washington, U.S.A.—in the garden of the Haussknecht Herbarium, where they became troublesome weeds (see Mitteil. Thüring. Bot. Ver. 1925, 40, 41). Hegi could not account for the arrival of the species in Europe, but was much impressed with the great rapidity with which it had colonised large areas in Sweden and in Poland; up to the time of writing (1925) it had not been found in German territory, but its eventual appearance was to be expected.

Reference must now be made to the account of *Epilobium* in Sweden in Lindman's 'Svensk Fanerogamflora' (1918). In this the author and Prof. Samuelsson include no less than three introduced species from North America, *Ep. glandulosum* Lehm., *Ep. rubescens* Rydb., and *Ep. adenocaulon* Hausskn. Of these three, *Ep. rubescens* Rydb. was characterised by its

author (in Bull. Torr. Bot. Club, xxxi. 568; 1904) as having a strict, simple, stem, 3–4 dm. high; perfectly sessile, lanceolate leaves, 3–4 cm. long; white flowers, about 4 mm. long; and seeds "without a neck." It is a local species of Colorado and Utah, and does not concern us further at present, although we may remark that the Swedish specimens, the seeds of which have a beak, hardly agree with the description and seem to be doubtfully distinguishable from *Ep. adenocaulon*. The question of the relationship of the other two, *Ep. glandulosum* Lehm. and *Ep. adenocaulon* Hausskn., is a very troublesome problem, which has for long puzzled botanists on both sides of the Atlantic, and is not yet solved. Haussknecht, in his 'Monograph of *Epilobium*,' admitted the close affinities of the two species, but distinguished *Ep. glandulosum* by the adpressed (not glandular-spreading) pubescence of the inflorescence, by the leaves (except the lowest) being more abruptly rounded and sessile at the base and more coarsely toothed, and by the larger seeds. Trelease, in a revision of North American *Epilobia* (Report Missouri Bot. Gard. ii. 1891), separated the two on characters of the innovations, *Ep. adenocaulon* producing sessile rosettes of foliage leaves in late summer or autumn, while *Ep. glandulosum* was placed in a group with globose subterranean winter bulblets with fleshy scales. He restricted the range of *Ep. glandulosum* to Alaska and across the islands of the north-west to Asia, but admitted "forms too near this also in British Columbia." Then, in an important paper in 'Rhodora,' xx. (1918), entitled "*Epilobium glandulosum* and *E. adenocaulon*," Prof. M. L. Fernald discussed the interpretation of the two species, and stated that typical *Ep. glandulosum* of the colder districts of North America (var. *typicum* Fernald) is a comparatively simple plant with few short branches, the pubescence as in *Ep. adenocaulon*, the leaves of similar outline, but much more crowded and not conspicuously decreasing in size into the inflorescence, which is crowded and not open, and larger petals, 7–9 mm. long. He concluded, from studies in the field, library, and herbarium, that the two are pronounced geographic varieties of a single species, and accordingly Haussknecht's species became *Ep. glandulosum* Lehm. var. *adenocaulon* (Hausskn.) Fernald. His interpretation has been accepted in Hulten's recent 'Flora of Kamtchatka,' iii. 145 (1929). This conclusion was first suggested by Britton in Britton and Brown's 'Illustrated Flora of the Northern States and Canada,' ii. 484 (1897), where, however, the specific rank of *Ep. adenocaulon* was maintained. Finally, Prof. Samuelsson, in Lindman's 'Swedish Flora,' separates *Ep. glandulosum* from *Ep. adenocaulon* by the elliptic outline of the leaves of the former.

A complete elaboration of the ramifications of this problem would make tedious reading for British botanists. It is, however, clear that the writers who have discussed it have been relying

more or less on the original description and locality of *Ep. glandulosum*. There is no evidence that any of them, when they wrote, had seen Lehmann's type-specimen, and it is doubtful if those who followed Haussknecht have ever examined all his own authentic specimens of *Ep. adenocaulon*. Prof. Fernald mentions the plate of *Ep. glandulosum* published by the Abbé Leveillé in his 'Iconographie du genre *Epilobium*' (t. 164, 1910), but this was taken from a specimen in the Herbier Boissier which is certainly not the type, the same objection being applicable to the plate of *Ep. adenocaulon*.

Epilobium glandulosum was described by Lehmann in his 'Second Pugillus,' p. 14 (Hamburg, 1830). The description was reprinted in 1834 in Hooker's 'Flora Boreali-Americana,' i. 206. The type-specimen, which had been communicated to Lehmann by Sir William Hooker, was collected by Drummond at Cumberland House Fort, on the Saskatchewan. The stem was described as simple; the leaves as sessile, ovate-lanceolate, and subdecurrent, the upper ones scattered; and the petals as white, and longer than the calyx. These are characters which hardly accord with some later interpretations of *Ep. glandulosum*, but the apparent discrepancies are perhaps due to inaccurate description on the part of Lehmann himself, or to his use of a term in a sense opposed to that of modern usage, or to the possibility that the type is not a "typical" example of the group it has been taken to represent. Haussknecht explains in his Monograph that Lehmann's plant was the *Ep. tetragonum* of the early North American botanists Michaux and Pursh, and points out that neither Hooker himself nor Torrey and Gray could separate *glandulosum* from this false conception of *tetragonum*; thus Lehmann's plant appears as a variety of North American "*tetragonum*" in Torrey and Gray's 'Flora of North America' (1838).

The type-specimen of *Ep. glandulosum* Lehm. is not in the Kew Herbarium, where it might have been looked for, although there are some other specimens, apparently collected by Drummond in Saskatchewan, which Hooker has labelled "*Ep. glandulosum* Lehm. in Fl. Bor. Am. An *E. tetragon.*?" These specimens were seen by Haussknecht, and were probably assumed by him to be the type-sheet, or at any rate part of the type-collection. The type-specimen, however, which was sent by Hooker to Lehman in 1829, has been recently discovered by Prof. Samuelsson in the Stockholm Herbarium, parts of Lehmann's herbarium having been sold to Stockholm after his death. Prof. Samuelsson writes to us that the specimen—duly written up by Lehmann—is very young and just beginning to flower, but that, so far as he can see, it belongs to the same species as the specimens at Kew; the latter are also represented at Stockholm, having been sent by Hooker to Lehmann on the same occasion, and have been

labelled *Ep. tetragonum* by Lehmann. The Kew specimens, as Prof. Samuelsson remarks, are certainly conspecific with British and Swedish *adenocaulon*; in fact, they agree extremely well with Mr. Fraser's sheet from Woking. The leaves of these specimens are ovate-lanceolate and shortly petiolate, and the flowers are small (mostly 4–5 mm. long).

From this it is evident that *Ep. adenocaulon* will probably have to be reduced to the earlier described *Ep. glandulosum*, either losing all status, or, if Fernald's view is correct, being treated as var. *adenocaulon* (Hausskn.) Fernald. This important point can perhaps only be decided with complete satisfaction after an examination of the type-specimens* of both species by some botanist who is fully acquainted with the plants in all stages and variations in their native localities. Meanwhile, we may safely name our British plant *Ep. adenocaulon* of Haussknecht. It agrees fully with his description and with specimens cited and seen by him, and comes into the range of the many North American sheets at Kew. The species, in the wide sense, is widely spread over North America, where it occurs in moist ground. Apart from the usual Haussknechtian forms "*aprica*" and "*umbrosa*," two varieties, *occidentale* and *perplexans*, were described by Trelease; these, with *adenocaulon* itself and some new varieties, have all been placed by Fernald under an aggregate species *glandulosum*. Prof. Samuelsson also informs us that *Ep. boreale* Hausskn. Mon. 279, which was described from specimens cultivated at Berlin from seeds collected in Alaska, agrees with Swedish *adenocaulon* and will therefore fall into the synonymy of this group; *Ep. boreale* occurred as a casual in a gravel-pit near Erfurt, Germany, in 1896, but apparently did not spread (see Mitteil. Thüring. Bot. Vereins, 1897, 10).

In the absence of evidence the reason for and date of the arrival of the species in Britain are no more clear to us than were those of its appearance on the Continent to Hegi. We may, however, recall the existence during the Great War, between 1915 and 1918, of a large Canadian camp at Witley. It is certainly a strange coincidence that the species should be so particularly plentiful around Witley, which was the centre of the Rev. E. S. Marshall's activities in the study of this genus in the 'nineties. No specimen collected by him has been found, nor any British gathering prior to 1921, and it is probable that the species was not growing at Witley when Marshall lived in the neighbourhood. Small examples of *Ep. adenocaulon* are grown in the Herbaceous Ground at Kew, but it is most unlikely that these are the origin of the introduction of the species. The

* Haussknecht cited four collections under his original description of *Ep. adenocaulon*, viz.:—Ohio, leg. *Drège*; Prov. Aconcagua (Chile), leg. *Philippi*; Cumberland House, *Herb. Hooker*; New York, leg. *A. Gray*. The Chilean specimen was almost certainly misidentified, see Samuelsson in Svensk Bot. Tidskrift, xvii. 292 (1923).

fact remains that we have here one of the most interesting and significant arrivals for many years, a plant which for some time has been secretly spreading, and has been overlooked by almost everyone, and which, while remarkably distinct itself, has also been giving rise to hybrids with our native species.

Our thanks are due to Mrs. O. Milne-Redhead for the drawing of the Plate.

EXPLANATION OF PLATE 609.

1. Portion of plant with upper stem-leaves and inflorescence, ½ nat. size. 2. Base of stem with rosettes, ½ nat. size. 3. Pair of intermediate stem-leaves, ½ nat. size. 4. Typical leaf, nat. size. 5. Flower opened to show stamens and stigma, × 5. 6. Seed, × 25.

NOTES ON BRITISH HYPOCREACEAE.

By T. PETCH, B.A., B.Sc.

1. HYPONECTRIA BUXI (Desm.) Sacc.

Albertini and Schweinitz (' Conspectus Fungorum,' 48; 1805) described *Sphaeria atrovirens*, with a variety *Visci* on *Viscum* and a variety *Buxi* on Box. Their description is " S. (simplex astoma) in quincuncam sparsa e viridi nigricans, sphærulis majusculis immersis globosis ovatisque, vertice subdepresso ruguloso cirrhifero, demum irregulariter rimis transversalibus rupto." Variety *Buxi* had the internal mass rather the more solid, and ruptured the epidermis substellately. De Candolle (Fl. Franç. vi. 146; 1815) instituted *Sphaeria Buxi* for *Sphaeria atrovirens* var. *Buxi* A. & S., but made no addition to the description. Berkeley (Engl. Fl. v. pl. 2; 1836) recorded *Sphaeria atrovirens* for England, and stated that two distinct forms of var. *Buxi* occurred. He distributed specimens of the latter in ' British Fungi,' no. 180.

In Plant. Crypt. ed. i. no. 1280, Desmazieres issued specimens under the name " *Sphaeria Buxi* nobis," with a long note which was reproduced in Ann. Sci. Nat. sér. 2, xix. 354; 1843. He stated that three distinct species had been confused under the name *Sphaeria atrovirens*; that his species was not the same as *Sphaeria Buxi* DC., which was probably not a *Sphaeria*; and that the specimens distributed by Berkeley in ' British Fungi,' no. 180, also did not appear to be a *Sphaeria*. His description is :—

Sphaeria Buxi nob. Hypophylla; peritheciis dense sparsis, minutis, subglobosis, rufo-olivaceis, in parenchymate folii nidulantibus, epidermide nigrifacto tecta, poro pertusis; ascis clavatis, medio subinflatis; sporidiis oblongis, obtusis, subhyalinis.

Berkeley and Broome (' Notices of British Fungi,' no. 423; 1850) recorded that Berkeley, ' British Fungi,' no. 180, issued as *Sphaeria Buxi* DC., was *Sphaeropsis Candollei*; while in ' Notices etc.,' no. 639* (1852), they added that no. 180 also contained *Sphaeria Buxi* Desm. Currey examined a specimen of *Sphaeria Buxi* collected at Milton, Northants, by Berkeley, and (in Trans. Linn. Soc. xxii. 283) described the perithecia as light yellow, rather longer than broad, with a small mammillate ostiolum.

In 1869, Fuckel transferred *Sphaeria Buxi* Desm. to *Sphaerella*, as *Sphaerella Buxi* (Desm.) Fuckel (Symb. Mycolog. 100).

Cooke (Handb. Brit. Fungi, pt. 2, 922; 1871) published " *Sphaerella Buxi* DC.," bringing together under that name nearly all the previous British references to fungi on Box leaves. His description of the alleged pycnidia was taken from Berkeley's description of *Sphaeria atrovirens* var. *Buxi* in ' English Flora,' while his description of the perithecia was taken from Currey. But he made no reference to Desmazieres.

Auerswald (in Gonnermann and Rabenhorst, Mycolog. Europ. no. 940) had transferred *Sphaeria Buxi* to *Sphaerella*, and in ' Synopsis Pyrenomycetum ' (1869), p. 2, he gave the synonym, *Sphaeria Buxi* Desm. *nec* DC. He described the perithecia as rufous, covered by the browned or blackened epidermis.

Saccardo (in ' Michelia,' i. 51; 1877), commenting on the specimens issued by Cooke and Plowright as *Nectria Rousseliana*, remarked that they appeared to be *Sphaerella Buxi* (DC.) Auersw., and that the latter should rather be referred to the Hypocreaceae, because of the softer, rosy, yellow or rufous context. Accordingly (in ' Michelia,' i. 250; 1878), he instituted the genus *Hyponectria*, with the type-species, *Hyponectria Buxi* (DC.) Sacc. In his description in ' Sylloge Fungorum,' ii. 455 (1883), Saccardo again styled his species, *Hyponectria Buxi* (DC.) Sacc., citing both *Sphaeria Buxi* DC. and *Sph. Buxi* Desm. as synonyms. He described the perithecia as at first sordid rose, then rufo-olivaceous.

Meanwhile, Cooke, after the issue of ' Sylloge Fungorum,' i. (1882), had published (in Journ. Bot. 1883) a list of species of *Sphaerella* and *Laestadia* which had been omitted from, or were incompletely described in, that volume, and among these he included *Sphaerella* (*Laestadia*) *Buxi* Fuckel, with the synonym, *Sphaeria Buxi* Desm. This was accepted by Saccardo in the Addenda to vol. i. of the ' Sylloge,' published with vol. ii., as *Laestadia Buxi* (Fuckel) Sacc., but he queried the reference to *Sphaeria Buxi* Desm.

Summarising the foregoing we have the following results :—

Sphaeria Buxi DC., on the authority of Desmazieres, is not *Hyponectria Buxi*.

Sphaeria Buxi Desm. is *Hyponectria Buxi*. Some of the spots in Desm. Plant. Crypt. ed. i. no. 1280, are darker than usual, but the underlying perithecia are normal.

Sphaeria Buxi in Currey, *loc. cit.*, and *Sphaerella Buxi* Auersw. are *Hyponectria Buxi*.

Sphaerella Buxi Fuckel is *Hyponectria Buxi*. Von Höhnel compared Fuckel, 'Fungi Rhenani,' no. 846, with Desm. no. 1280, and found that these were the same (Ann. Myc. xvi. 52; 1918).

Sphaerella Buxi Cooke, in 'Handbook of British Fungi,' is a mixture, but as regards the perithecial stage, based on Currey, *loc. cit.*, it is *Hyponectria Buxi*.

The correct designation of this species is *Hyponectria Buxi* (Desm.) Sacc.

The specimens collected by Vize at Forden, and issued as *Nectria Rousseliana* in Cooke, Fung. Brit. Exsicc. ed. 2, no. 478, and in Plowright, Sphaer. Brit. no. 8, are *Hyponectria Buxi* (Desm.) Sacc. The same is true of the specimens collected at Sandsend, Yorks, May 1913, and recorded as *Nectria Rousseliana* in 'The Naturalist,' January 1914, p. 15.

Hyponectria Buxi occurs on the underside of Box leaves. The perithecia are immersed, each in a separate spot, which is usually depressed and conspicuously rose-coloured. When examined microscopically, the epidermis is found to be coloured brown round the apex of the perithecium, but that is not noticeable macroscopically. The perithecium is depressed globose, 0·36 mm. diameter, and has a yellow wall. The asci are oblongo-clavate, $66 \times 11\,\mu$, eight-spored, spores biseriate. The ascospores are narrow-oval or fusoid, ends rounded, sometimes inequilateral, sometimes with the lower end sub-truncate, $14–18 \times 4–5\,\mu$.

2. ELEUTHEROMYCES SUBULATUS (Tode) Fuckel.

Tode, in 1791, described a fungus as *Sphaeria subulata* from specimens growing on "*Agaricus auratus*, Fl. Dan. t. 480." It was simple, crowded, subulate, granular (rough), fuscous, crowned with a yellow mass of spores which turned blackish. In his explanatory note, he stated that it was almost a line (2 mm.) high, in shape an elongated cone with a convex base, superficial, its surface granular, its colour fuscous, paler at first, becoming darker later. He had seen the apex covered with a white powder, but had not been able to examine the interior of the fungus. The spores were extruded in a pellucid golden globule, but when he examined specimens which had been kept for some time in paper, he found that the globules had broken up into a black powder.

Greville recorded this species, as *Sphaeronema subulatum* (in 'Scottish Cryptogamic Flora,' iv. pl. 189, 1826), on hardened agarics in woods near Edinburgh and near Tarbet on the banks of Loch Lomond. In 1836 ('English Flora,' v. 2, 281), Berkeley recorded it from Cambridge, and in Mag. Zool. & Bot. i. 512 (1837), he stated that it occurred on various Agarics and *Boleti*.

Fuckel (Symb. Mycolog. 1869) transferred *Sphaeria subulata* Tode to a new genus, *Eleutheromyces*, as *El. subulatus* (Tode) Fuckel. He stated that the fungus had asci, $52 \times 2·5\,\mu$, and ovato-cylindric ascospores which were furnished with a cilium at each end, one equal in length to the spore and the other twice as long. Fuckel also stated that the conidial stage of *Eleutheromyces subulatus* was *Isaria brachiata* (Batsch) Schum., which also grows on decaying agarics, and that the conidia of the latter were either ciliate, like the ascospores, or naked. In that view, however, he appears to have been mistaken, as *Isaria brachiata* is a *Tilachlidium*, and its spores are not ciliate.

In 'Michelia,' i. 50 (1878), Saccardo recorded *Eleutheromyces subulatus* on decaying agarics in Italy and Germany, giving the dimensions of the ascus as $50 \times 4\,\mu$, and the ascospores as cylindraceo-oblong, hyaline, $5–6 \times 1·75–2·5\,\mu$, with a cilium about as long as the spore at each end. Winter (in Rabh. Krypt. Flora, ii. 93; 1887) gave the asci as $48–52 \times 2·5–3\,\mu$ and the spores as $4–6 \times 1·5\,\mu$. Presumably he saw the asci, but he copied Fuckel's figures of the ascus and spores.

Thus, during the last century, *Eleutheromyces subulatus* was regarded as an ascomycete, one of the Hypocreaceae. It was recorded for Norfolk by Plowright, and for Yorkshire in 'Fungus Flora Yorks.,' on *Russula nigricans*, Scarborough.

In 1902, however, von Höhnel ('Fragmente zur Mykologie,' no. 32) recorded that he had examined Fuckel's specimen, *Fungi Rhenani*, no. 773, and found that the spores were not contained in asci, but were borne on simple or branched conidiophores. The fungus, therefore, was a pycnidal form, and belonged, not to the Hypocreaceae, but to the Nectrioidaceae.

In 'Sylloge Fungorum,' xvii. (1905), Saccardo noted von Höhnel's conclusions, but stated that, as he himself had found asci in *Eleutheromyces subulatus*, the matter appeared to require further investigation; and in a later note (*op. cit.* xxii. 1142; 1913) he suggested that, since asci had been attributed to *El. subulatus* by Winter, Schroeter, Ellis and Everhart, etc., as well as by himself, it was possible that the fungus occurred in two forms, pycnidial and perithecial respectively. If that is the case, however, it is somewhat remarkable that the pycnospores should be indistinguishable from the ascospores.

Specimens collected at Westwick, Norfolk, in October 1934, on *Sparassis crispa*, were pycnidial only. The pycnidia were scattered or clustered, conoid, rounded at the base, up to 0·6 mm. high, 0·4 mm. diameter, or flask-shaped, or subglobose with a short conical or subcylindrical neck. When fresh they were hyaline, pellucid, but became yellow to brown on drying. The wall is matt, but smooth. When mounted whole, the wall of the pycnidium appears obscurely plectenchymatous, but when broken it is seen to be pseudo-parenchymatous, with polygonal cells about

7 μ broad. In dried specimens, the wall is pale yellow-brown by transmitted light. The ostiolum is fimbriate with parallel obtuse hyphæ, 2 μ diameter. Internally, the pycnidium is incompletely chambered at the base. The basidia are extraordinarily stout, 2–3 μ diameter, at the base, long, closely septate, with numerous lateral branches, attenuated rather abruptly at their apices. The pycnospores are terminal, or lateral at the septa of the main stem ; they are hyaline, oval or narrow-oval, attenuated into a pedicel at the base and a seta at the apex. The body of the pycnospore is 5–9×1·5–2·5 μ, the attached pedicel, 2–4 μ long, and the apical seta, 3–7 μ. Sometimes the two appendages are the same length, 3 μ. The greatest difference observed was a pedicel, 2 μ, and an apical seta, 7 μ. The pycnospores do not show any signs of blackening after five months' preservation.

Many of these pycnidia bore rigid white hairs, scattered or clustered, usually on the upper half, but sometimes all over the pycnidium. These proved to be simple erect conidiophores, up to 50 μ high, 10 μ diameter below, 4 μ diameter at the apex. The base was usually inflated and oblique, and the conidiophore tapered upwards, suddenly or gradually. From the apex emerged a chain of endo-conidia, which were hyaline, continuous, cylindric with truncate ends, 7–15×3–4 μ. This appears to be *Chalara fungorum* Sacc., but the whole fungus in this instance is hyaline. It is parasitic on the *Eleutheromyces*.

3. Hypomyces ater Fries.

Cooke (in 'Grevillea,' xii. 80 ; March 1884) described *Hypomyces ater* Fr., Summa Veg. Scand. 564 (1849), as "Effusa, tenuis, atra ; peritheciis glabris, semi-immersis, ostiolo conico, concolore. Ascis cylindraceis. Sporidiis lanceolatis, utrinque acutis, uno polo mucronatis, continuis, hyalinis, 30–35×5–6 μ. On agarics, Sweden (*E. Fries*). Sometimes the mucronate extremity appears to have a pseudo-septum." Fries, *loc. cit.*, had written "Una cum Hymenomycetibus hoc anno mire luxuriabant Hypocreaceae Hyphomycetes v.c. *H. lateritia, viridis, hyalina*— et novæ *H. atra* (agaricicola ?) et *floccosa* in *Lactario torminoso*."

Saccardo (Sylloge Fung. ix. 944 ; 1901) entered this species as *Peckiella atra* (Fr.) Sacc., with the synonym *Hypomyces ater* Fr., Syst. Myc. iii., and a reference to Cooke, *loc. cit.* There is, however, no *Hypomyces ater* in Fries, Syst. Myc., and Fries stated that it was new in Summa Veg. Scand. Apparently Fries did not publish a description. But he sent a specimen to England, which is now in Herb. Kew., labelled by him "*Hypocrea* (*Hypomyces*) *atra*, n. sp., cf. 'Summa,' p. 564, Upsaliæ." Cooke probably drew up the description from that specimen.

In 'Grevillea,' xiii. 47 (September 1884), Cooke recorded *Hypomyces ater* Fr. from Carlisle, on small undetermined agarics,

and published a description in English which ends "sometimes the rostrum seems to be divided from the body of the spore by an incipient septum."

Fries's specimen and Cooke's specimen from Carlisle, dated May 1884, have been examined, and compared with Plowright's specimen of *Hypomyces viridis* (A. & S.) Karst. in Rehm, Ascomyceten, 586. There does not appear to be any doubt that these are all the same species. Plowright (in 'Grevillea,' xi. 46) stated that the perithecia and the stroma of *Hypomyces viridis* became almost black.

In Rehm 586, the ascospores are continuous, narrow-oval or fusoid, sometimes inequilateral, with ends produced into rather long, tapering, *solid* tips, which are often curved or hook-shaped. They are minutely warted, and measure 30–36×5–6 μ. Sometimes they appear centrally pseudo-septate. In Cooke's specimen from Carlisle, the spores are similar, 27–37×5–6 μ. In Fries's specimen, the perithecia are larger, 0·48 mm. high, 0·42 mm. diameter below, but the same shape as figured by Plowright for *Hypomyces viridis* (*luteo-virens*), broadly flask-shaped, with a broad obtuse apex. The spores are the same shape as in the other two specimens, but were longer, 34–45×5–6 μ, in the perithecium examined, though Cooke found them 30–35×5–6 μ.

The specimen from Carlisle is undoubtedly *Hypomyces viridis*, and though Fries's specimen of *Hypomyces ater* has longer spores, the difference appears insufficient to maintain it as a distinct species.

4. Hypocrea pulvinata Fuckel.

Hypocrea pulvinata was described by Fuckel in 1869 from specimens growing on decaying *Polyporus sulphureus*, and in 1873 Karsten described *Hypocrea citrina* f. *fungicola* on decaying *Polypori*. The latter name is usually written as *Hypocrea fungicola* Karst. Weese has examined part of the type-specimen of *Hypocrea pulvinata*, and finds that these two names refer to the same fungus. Weese's clarification of the references to this species was published in Mitteil. Botan. Inst. Techn. Hochsch. Wien, iv. 28–32 (1927).

Phillips and Plowright recorded this fungus for Britain in 'New and Rare British Fungi,' no. 147, as "*Hypocrea citrina* Fr. forma *Fungorum* Karst." on the hymenium of *Polyporus betulinus*, Darnaway Forest, Sept. 1879. Since then it has been recorded in the 'Transactions of the British Mycological Society' as *Hypocrea fungicola* Karst. from Drumnadrochit, Worcester, and Minehead, all without host, and from Petersfield, Haslemere, Arundel, and King's Lynn on *Polyporus betulinus* ; and as *Hypocrea pulvinata* Fuckel on *Polyporus betulinus* from Inver (Perth), Aviemore, and Ludlow.

As the two descriptions are incomplete in some respects, the following has been drawn up from specimens on *Polyporus betulinus*, collected at North Wootton, Norfolk, in August 1934.

Stroma at first white and tomentose, becoming pale yellow and glabrous, punctate with the depressed ostiola, finally pale brown or pallid ; circular or oval in plan, up to 8 mm. diameter, or larger and irregular by confluence, pulvinate, even, sometimes tuberculate when old, attached over the whole base, descending into the pores of the host, up to 2 mm. thick when fresh, margin definite, rounded ; perithecia crowded in a yellow peripheral layer ; context very pale yellow, almost white, becoming brownish when old, fuscous at the base where it contains decaying tissue of the host, fleshy, becoming corky ; perithecia small, crowded, ovoid, 0·2mm. high, 0·15mm. diameter,wall yellow then brownish ; asci cylindric, eight then sixteen spored, 80–90×3 μ ; part-spores hyaline, smooth, broadly oval or rectangular or sometimes wedge-shaped, 4–5×2·5–3 μ, sometimes globose, 3 μ diameter, extruded in white masses (measurements from extruded spores).

5. Hypocrea lenta.

Sphaeria lenta was described by Tode (' Fungi Mecklenburgenses,' ii. 30, tab. xii. fig. 102 ; 1791) as compound, lens-shaped, gregarious, tough (lenta), blackish ; perithecia globose, in a single layer. It seems doubtful what Tode intended to convey by " lenta " ; it could scarcely have been the colour, as " lenta " is followed by " pulla," *i. e.*, blackish. Tode's further explanation gives the following details. Gregarious and crowded, two, three, or sometimes four connate. Diameter 4–6 mm. ; disc gibbous ; margin thin, sub-repand and undulated when dry ; disc blackish, tending to lurid, smooth, when old rugulose, depressed in the centre. Internally white, tough (lenta), fibrous, firm, cortex inseparable. Perithecia globose and white, but perhaps immature. On a rotting felled beech trunk, and also on its roots slightly covered with earth.

On page 63, Tode added further information which appears to have been generally overlooked. He there stated that the context was very tough, but not fibrous, and with the progress of time it acquired the hardness of a sclerotium. He had ascertained that the perithecia became black when mature. The perithecia were then situated so closely to the cortex of the fungus that they appeared to be united to it. The spores were extruded in a powder, as in other *Hypoxyli*. In giving the colour of the perithecia, Tode meant the colour of the contents as seen in a section of the stroma. It would appear to follow from his description that, if the fungus was a *Hypocrea*, it had olivaceous or green spores. But the description is more suggestive of a *Penzigia*.

Schweinitz included *Sphaeria lenta* in ' Synopsis Fungorum Carolinæ Superioris,' no. 28, and described it as a species very distinct, often variously contorted, at first elegantly green, internally white, frequent on wood and bark.

In Syst. Myc. ii. 349 (1823), Fries included *Sphaeria lenta* Tode, adding the note that investigation was required to determine whether the *Sph. lenta* of Schweinitz was the same ; and in ' Elenchus Fungorum,' ii. (1828), p. 61, after having examined a specimen from Schweinitz, he separated the two, describing Schweinitz's species as *Sph. rigens* Fr. He stated that the latter was similar in form to *Sph. lenta* Tode, but abundantly distinct in the paucity and position (marginal) of its perithecia. The perithecia were more distant and the ostiola less prominent. It was scarcely distinctly margined, and at first green, whereas *Sph. lenta* Tode was at first fuscous. The context was of unusual structure, becoming rigid.

In 1873 Berkeley and Broome enumerated " *Hypocrea lenta* Fr." in the ' Fungi of Ceylon.' This was supposed to be Tode's fungus, and his species is consequently now cited as *Hypocrea lenta* (Tode) B. & Br. But, though the Ceylon fungus is a green-spored species, it is, as previously recorded (Ann. Perad. vii. 95), quite different in shape from *Sphaeria lenta* Tode, and was, in fact, described by Berkeley and Broome in the same paper as *Hypocrea palmicola* B. & Br.

In a list of additions to Norfolk fungi, recorded in Trans. Norfolk & Norwich Nat. Soc. iii. 730, read March 25, 1884, Plowright included *Hypocrea lenta* Tode and *Hypocrea rigens* Fr. without localities ; and in Phillips and Plowright, ' New and Rare British Fungi,' no. 148, these authors recorded *Hypocrea rigens* Fr., on dead wood, Brandon, Nov. 1876, with the note " This is the *Sphaeria lenta* of Schweinitz, not of Tode, and the *Hypocrea rufa* var. *umbrina* of Saccardo, Fung. Ven. Series, iv. 24, and Mycol. Ven. no. 689." The latter information was evidently derived from ' Michelia,' i. 301 (1878), where it was recorded by Saccardo, who gave " sec. Fr." as his authority for the first part of it.

On turning to Plowright's notebooks, it is found that he there recorded " *Hypocrea lenta* Fr. S. M. ii. 349 ; Tode, Meckl. ii. p. 30, Brandon, November 1876," and in 1879 added " *Hypocrea rigens* Fr. El. ii. 61 = *Hypocrea lenta* supra." Evidently, therefore, the record of *Hypocrea lenta* Tode had been found to be erroneous, and it should not have been included in the list of 1884. Consequently, *Hypocrea lenta* Tode should be deleted from the British list, there being no other British records.

In ' Synopsis Fungorum ' (1832), Schweinitz described another *Hypocrea* as *Sphaeria contorta*. He stated that it was near his *Sph. lenta*, but much larger, closely adpressed to the bark, but affixed only in the centre by a papillæform stalk, the margin

being free and lobed, with the lobes contorted, almost like a lichen. The cortex was black, brown on the lower surface, and the context yellowish white, somewhat granular in the centre. The perithecia were crowded, minute, globose, not deeply immersed, whence the surface was somewhat elevated and irregularly rough. The colour was at first greenish black, soon blackening. The whole fungus was up to 6 mm. broad, and often very many were crowded together.

In 'Grevillea,' iv. 14, this species was recorded for North America as *Hypocrea contorta* B. & C. and in 'New and Rare British Fungi,' no. 57, Phillips and Plowright recorded it for England, on a rotten oak stick, Foxley Woods, after comparison with American specimens from J. B. Ellis. They described it as "Subrotund, fixed to the matrix by the central portion, spreading, becoming thin towards the margin where it is free and variously lobed, dark olive green externally, yellowish white within; perithecia minute, globose, confined to the upper surface; asci 75 μ long; sporidia 16, spherical, with a central nucleus, 5 μ."

Finally, Seaver, in 'The Hypocreales of North America,' 51 (1912), included *Hypocrea lenta* (Tode) B. & Br., with the synonyms, *Sphaeria lenta* Tode, *Sphaeria rigens* Fr., and *Sphaeria contorta* Schw. Seaver's description is:—

"Stromata gregarious, 2 mm.–1 cm. in diameter, lens-shaped, margin free, often becoming undulated, dark coloured externally becoming almost black with a shade of olive-green, white within, fleshy becoming hard when dry; surface roughened by the necks of the slightly projecting perithecia; perithecia subglobose, 150–175 μ in diameter; asci cylindrical, becoming 16-spored, 60–75 $\times$ 4–5 μ; spores [hyaline] subglobose with one large oil-drop, about 4 μ diameter."

Seaver's synonymy appears to overlook the differences recorded by Fries and Schweinitz, and the fact that *Sphaeria lenta* Tode had dark spores. Further investigation of the two American species and examination of Schweinitz's specimens seem desirable.

As regards *Hypocrea lenta* (Tode), Winter (in Rabh. Krypt. Flora, ii. 138) remarked that it was still an undetermined species. The description in Saccardo, 'Sylloge Fungorum,' ii. 521, was taken from Fries, Syst. Myc. ii. 349, with the addition of microscopic details from Currey, 'Compound Sphaeriae,' 271, fig. 83. Currey did not state the source of his specimen, but, as he described the spores as colourless, it could not have been correctly named. It must be concluded that *Sphaeria lenta* Tode is still an undetermined species.

(To be continued.)

NOTES ON RUBI.

By William Watson.

(Continued from Journ. Bot. 1933, 229.)

III. *Rubus confertiflorus*, sp. n.

When in 1904 Sudre published his observations on the Sot of British Rubi he stated that No. 77, *Rubus holerythros* Focke, from Surrey, was not the same as the French plant that Genevier had described under the name of *R. nitidus* W. & N. and that Focke had adopted as the type of his *R. holerythros*. To this Rogers and E. F. Linton thought it sufficient to reply that Focke had himself seen the plant issued and had given them the name *R. holerythros* for it (Journ. Bot. 1905, 200). It does not seem to have occurred to them that Focke, having never set foot in France and therefore having never seen a living example of *R. holerythros*, might have been mistaken in his identification.

Focke saw another bramble with Druce at Boar's Hill, Berks, in 1894, which he also named *R. holerythros*. Actually this bramble was *R. insularis* Aresch. and was not the same as the Surrey bramble, although in some ways recalling it, so that Sudre thought that the latter *was R. insularis*. The two English brambles, then determined by Focke as *R. holerythros*, were different from each other: it will be shown that they were also different from *R. holerythros*.

In the 'Flora of Surrey,' 263 (1931), it is stated that the description of *R. holerythros* in Journ Bot. 1895, 47, is by Focke. As a matter of fact, the description is by Rogers (conf. Journ. Bot. 1905, 200). Focke's description is in Abh. naturw. Ver. Bremen, xii. 351 (May 1892), and is as follows:—"*R. holerythros* Focke (*R. nitidus* Genev., non Wh. & N.). Prickles robust. Leaflets densely hairy and often grey-felted beneath, coarsely serrate, the terminal leaflet broadly ovate. Panicles short, flowers large, rose pink, styles violet. Well described by Genevier. I have not yet seen the plant in a living state, but in a dried state it seems to be different from any form of the real *R. nitidus*. Apparently restricted to the West of France: Maine and Loire, Gironde."

The plant Genevier describes evidently cannot be *R. nitidus* of Weihe and Nees, as their plant has white stamens, greenish styles, leaves green beneath, and terminal leaflets oblong or obovate; whilst Genevier's plant has pink stamens, violaceous styles, tomentose leaves, and terminal leaflets rounded ovate. Although Genevier quotes Chaboisseau's *R. nitidus* as a synonym, Chaboisseau's specimens are the real *R. nitidus* W. & N., and so must be disregarded. Genevier also quotes Boreau, and Bouvet confirms that the greater number of the specimens in Hb. Boreau

named *R. nitidus* by Genevier are *R. holerythros* Focke, amongst them being specimens collected by Boreau, Genevier, and Bouvet in Maine and Loire. Bouvet's description (Bull. Soc. Et. Sci. Angers, 1910, 36–42) of the Maine and Loire bramble that Genevier had chiefly in view accordingly fixes and elucidates what Focke meant by *R. holerythros*, namely, Genevier's Maine and Loire *R. nitidus*.

The Surrey plant does not answer to these descriptions of Focke, Genevier, and Bouvet. It therefore cannot be *R. holerythros*, in spite of Focke having determined it as such.

Focke in his original description (above) quotes a Gironde specimen as being also his *R. holerythros*. This specimen, he said later, had been sent to him by Clavaud. A Gironde specimen of *R. holerythros* was issued by Sudre as No. 217 in 'Batotheca Europæa' which he says in 'Rubi Europæ' is the same as *R. burdigalensis* Boulay & Clavaud. Most probably, therefore, it is the plant of Clavaud to which Focke refers, but it certainly differs from the Surrey *R. holerythros*. It is likewise certain that the Boar's Hill bramble (*R. insularis* Aresch.) determined by Focke as *R. holerythros* is neither the same as the Maine and Loire bramble nor the Gironde bramble on which Focke based his species.

In the foregoing circumstances *R. holerythros* Focke cannot be retained as a British plant; and the Surrey bramble so determined is therefore described under a new name.

Rubus confertiflorus, sp. nov. *Turiones* suberecti demum arcuati rarissime auctumno radicantes, acutanguli sulcati subglabri, primo nitentes rubri deinde opaci, aculeis conformibus ad angulos dispositis sæpe bigeminatis validis rectis vel falcatis sat crebris muniti. *Folia* quinata; petiolus ruber canaliculatus, aculeis uncinatis stipulisque rubris lineari-lanceolatis glandulosis instructus; foliola plicata contigua, subæqualiter usque subdupliciter dentato-serrata, mucronibus sæpe curvulis, supra parce strigosa, subtus molliter pubescentia, adulta paulum flavescentia; terminale subrotundum ovato-oblongum ellipticum vel elliptico-obovatum, plus minus abrupte cuspidatum, basi emarginatum vel integrum (foliorum inferiorum cordatum). *Rami florentes* rubri angulati striati, superne pubescenti-pilosi, aculeis mediocribus valde declinatis vix falcatis armati. *Folia* superiora subtus viridia vix cinerascentia subvelutina; foliola centralia obovato-oblonga; foliorum inferiorum petioli elongati. *Panicula* brevis subracemosa vel paulum composita, flore sessili vel subsessili finita; flores congesti. *Ramuli inferiores* petiolum sane sed non totum folium subiectum superantes. *Bracteolæ* rubentes parce glandulosæ.

Flores magni. *Sepala* late ovata acuminata, olivaceo-cinerascentia albo-marginata, sæpe appendiculata, basi aculeolata, post anthesin patula deinde reflexa. *Petala* rhomboideo-elliptica pilosa subcontigua cum staminibus longis stylisque semper roseola. *Antheræ* pilosiusculæ. *Receptaculum* pilosum. *Carpella* juniora glabra vel parce pilosa.

Hab. On sandy, pebbly, and gravelly commons in Surrey and West Kent. Near the Half Moon Inn, Witley Heath, Surrey, 1. 7. 1934 (type), in Herb. W. Watson. Abundant on many commons in S.W. Surrey, also on Barnes Common, N. Surrey; and on Chislehurst Common, Hayes Common, and Keston Common, W. Kent.

In the open the stem is green with red angles below and is shining red at the growing point; the base of the prickles, the petioles, and the stipules are red from the first. On the middle of the stem the prickles are usually a little bent upwards or downwards and sometimes a pricklet or two may be found. The veins on the underside of the leaf are clothed with semi-appressed hairs. The panicles (on a stout rachis) consist usually of less than ten congested flowers, which begin to expand before the end of June and are soon all, or nearly all, open together. The petals and stamens are tinged a deeper rose at the base and the styles are always rose. The flowers are succeeded by dense clusters of fruits which turn a coral-red together. The carpels may be glabrous or may have 1–2 hairs at the apex each. The fruit is oblong with 2–4 of the carpels undeveloped.

The affinities of *R. confertiflorus* are with *R. gratus* in the *Silvatici*.

R. villicaulis Koehl, which grows with this at Witley, is best distinguished by the fairly frequent pricklets and stalked glands present on the upper part of the stem and on panicle branches produced in late summer, but may be told earlier by the remote narrower petals, the white stamens, and the greenish styles. This plant, gathered at Milford Common, Surrey, by R. P. Murray, was issued as part of "*R. holerythros* Focke" in No. 77, Set of British Rubi.

R. rhodanthus W. Wats., also with holerythrine flowers and long stamens, differs in the gradually acuminate leaflets, the panicles with long interlacing cymose branches and long-pedicelled flowers. It is of an altogether more slender habit throughout than *R. confertiflorus*.

R. insularis Aresch. is another holerythrine-flowered species, distinguished by its pyramidal panicle with long-peduncled cymose lower branches, and leaves so markedly discolorous that it was at first (incorrectly) identified in 'Flora Danica' as *R. discolor* W. & N. It is of exceptionally vigorous growth.

Various other plants have been determined by our authorities as *R. holerythros* Focke. They are (1) *R. plicatus* W. & N. from Ambersham, W. Sussex; (2) *R. nitidus* W. & N. from Tilford, Surrey (*E. F. Linton*); (3) *R. badius* Focke, from Heath Common,

W. Sussex (distinguished at once by the conspicuous stalked glands on the flower buds and pedicels) ; and (4) *R. opacus* Focke subsp. *nobilissimus* W. Wats. from Abrook Common, Surrey (known immediately by its stoloniferous stems).

A plant of *R. confertiflorus* W. Wats. × *R. Marshalli* Focke & Rogers grows not far from the Half Moon Inn, Witley, Surrey.

IV. *Rubus scaber* Wh. and *Rubus microdontus* Muell. & Lef.

It was an unfortunate step when the bramble from Boar's Hill, Berks, which had been vaguely determined by Focke as "under *R. scaber* Wh.," was selected to represent *R. scaber* in the Set of British Rubi.

According to contemporary notices by Rogers (Essay, Journ. Bot. 1892, 303, and 1895, 101), *R. scaber* was considered to be very variable and very imperfectly known in England. The real *R. scaber* often went under the name of *R. dentatus* Bloxam, and was suspected by some to be *R. Bellardii* Wh. Even after the 'Handbook' appeared, correctly distinguishing *R. scaber* from *R. Bellardii*, the former was sometimes still identified as *R. Bellardii*. For example, in the following instances where *R. Bellardii* has been reported from the south-eastern counties investigation shows that the plant was *R. scaber* :—

W. Sussex : Popple Hill, Graffham (Journ. Bot. 1917). *R. Bellardii* recorded, *R. scaber* found there.
Sansom's Farm, Rudgwick (Fl. Sussex, 1907). *R. Bellardii* recorded, specimen in Hb. S. London Bot. Inst. is *R. scaber*.

Surrey : Wareham Hill, Brook (Fl. Surrey, 1931). *R. Bellardii* recorded, *R. scaber* found there.

E. Kent : W. side of Sandling Park (Fl. Kent, 1899). *R. Bellardii* var. *dentatus* Bab. recorded, specimen in Hb. Mus. Brit. is *R. scaber*.

The notion that *R. dentatus* Bloxam was to be identified with *R. Bellardii* Wh. originated with Bloxam, who sent specimens of his plant from Twycross, Leic., to Genevier as "*R. Bellardii*." This may have influenced Genevier to identify his own specimens of *R. scaber* obtained from Bégrolles as *R. Bellardii* in his Essai Monogr. 1869, 64. Boulay saw the error of calling these specimens *R. Bellardii*, but identified them in Rouy & Camus, Fl. France, vi., as *R. tereticaulis* P. J. Muell. Bouvet at first accepted this view, but, after Sudre issued some of Genevier's plants in Bat. Eur. (1905, 48) under the new name of *R. tereticaulis* var. *breviglandulosus* Sud., Bouvet agreed for some time with Sudre, but at length ('Florule des *Rubus* de l'Anjou,' 1923, 21) returned to his first opinion and took the plant for *R. tereticaulis* P. J. Muell., type. That Boulay, Bouvet, and Sudre should all take *R. scaber* to be *R. tereticaulis* or a form of *R. tereticaulis* speaks for the propinquity of those two species.

Focke's treatment of *R. tereticaulis* was to place it as a subspecies of *R. scaber*, which, unlike Rogers, he judged—and rightly—to be a very invariable species. Exactly what he meant, therefore, in pronouncing that the Boar's Hill bramble came "under *R. scaber*" is not very clear. If he thought that it was a variation of *R. scaber* not worth distinguishing, this would be at variance with his opinion that *R. scaber* was invariable. It is possible that he meant that it should come under *R. scaber* in the way that *R. tereticaulis* did in his arrangement, although he would not propose, with his strong views of "buissonomania," that a bramble that was not perfectly known nor ascertained to be well distributed should be separated and given a name. What he clearly did not intend was that it should be taken as typical *R. scaber*.

The Boar's Hill bramble proves to be a constant and rather widely distributed plant in the Midlands and south-east of England (v.c. 14, 16, 19, 21, 22, 23, and 24), extending into the north of France. It agrees with the description of *R. microdontus* M. & L. (Versuch, No. 186), and with the specimen of Sudre, Bat. Eur. No. 580 (a *forma umbrosa* collected by Questier in the Forest of Retz), and with a specimen in Hb. Mus. Brit. collected by Questier at Cuvergnon, determined by Sudre as *R. microdontus*. Both Boulay and Sudre make this a variety of *R. tereticaulis* P. J. Muell., but as it goes a fair way from *R. tereticaulis* towards *R. scaber* it is perhaps better that it should stand separate between *R. scaber* and *R. tereticaulis*.

Where *R. microdontus* occurs it is usually in quantity over a large area. It is more often found in old natural woods than in the open. I have seen it at Dartford Heath, Row Hill, and Hosey Hill, W. Kent ; at Burnham Beeches, Bucks ; at Boar's Hill, Berks ; at Shotover Hill, Oxon ; Mr. J. Chapple has shown me specimens from Denham, Bucks ; and Mr. C. Avery specimens from Stanmore Heath, Middx. There is a specimen in Hb. S. London Bot. Inst. collected by T. Hilton near Chailey, E. Sussex ; and one in Hb. Kew collected by G. C. Brown at Ardleigh, N. Essex. Well down on the northern slope of Boar's Hill I have seen plants of *R. caesius* × *R. microdontus* ; and on the southern side, on a brambly slope near the Fox Inn, where *R. vestitus* accompanies *R. microdontus*, there are bushes of the Boar's Hill "*R. adscitus*," which I take to be *R. microdontus* × *R. vestitus*.

R. microdontus M. & L. has stem and flowering branch obtuse-angled, the sides of the stem slightly furrowed and densely clad with rather long patent and intricate hair, in which are dark red sunken glands. Gland-tipped acicles exceeding the hair are rare.

The petiolar prickles and the prickles on the panicle rachis are declining or falcate, a few are hooked. Acicular prickles from a low extended base are the rule, but later-formed prickles may have larger flattened dilated bases and then begin to resemble those on *R. scaber*. The leaves are 3–4–5-nate pedate; the leaflets broad, often more or less rhomboid, shortly pointed, narrowly subcordate in shade, strigose above and thinly pilose and glaucous beneath, and shallowly—in shade, broadly—toothed.

On average panicles, which are short and rather broadly pyramidal, the fourth flower of a branch comes off a lateral pedicel, and the branches are divided to or below the middle. Radical inflorescences are elongate and floriferous, with the branches divided to the base. Stalked glands are slightly unequal, but all short, only exceeding the hair on the pedicels. They extend to the lower part of the leaflets, both on the upper surface and on the mid-rib and nerves beneath. The upper bracts are trifid with the central segment linear-lanceolate, foliaceous. The buds are greenish, thinly pubescent, and pilose, densely furnished with short-stalked glands and a fair number of whitish slightly falcate prickles. The flowers are moderately large, the petals white, crumpled, narrowly obovate, tapered into a slender claw, the apex strongly incurved, the margins irregularly dentate-crenate. The stamens are shorter than the styles, ultimately much shorter. The carpels are glabrous. The sepals are reflexed in flower, patent after flowering. The stem is remarkable for the white pruina, which, as the stem turns purplish in exposure, helps to produce a slaty purple effect.

R. scaber has the young shoot and leaves at first of a conspicuous bronze colour, passing to a pale olive-green. The stem is only slightly glaucous, becoming at length in the open a reddish or deep reddish purple. The hair on the stem is very short, not dense, and is partly adpressed. The leaves are glabrous above. The prickles are stout-based and short on the upper part of the stem, and there are stout pricklets as well. The hair on the panicle is short and is exceeded by the stalked glands, which are therefore conspicuous, although quite short.

(To be continued.)

SHORT NOTES.

FLORA OF GREENLAND.—Under the title "Stray Contributions to the Flora of Greenland," vi.–xii. (Meddelelser om Grønland, Bd. 93, nr. 3), Morten P. Porsild records the results of his work on several genera and species. In the Greenland species of *Lycopodium* sect. *complanata* Victorin he concludes that *L. tristachyum* Pursh is absent from Greenland, and that the great majority of specimens listed as this or as *L. Chamaecyparissus*

are forms of *L. complanatum*, whereas a few are forms of *L. alpinum*. *L. complanatum* has been found only in the southern half of the west coast, and is to be regarded as an American type in Greenland. "The Greenland Utricularias" comprise *U. minor* L., *U. ochroleuca* R. Hartm., and *U. intermedia* Hayne, which are described with the aid of text-figures. A list of the aquatic vascular plants of Greenland is given, none of which can be justly termed arctic. Some thrive well and reproduce normally, others are stunted and sterile. Their existence in Greenland is a difficult problem. Whence and by what means did they arrive? There is also a study of the Greenland Wild Thyme, *Thymus arcticus* Ronnig, and of *Gentiana detonsa* Rottb.; the author finds no justification for distinction of varieties or races. There are also accounts of botanical excursions to the Fiords of Godthaab district and the south-eastern parts of Disko Bay, with list of plants noticed.

ANTITHAMNIONELLA SARNIENSIS Thur.—In this Journal for 1930 (p. 261) Miss Westbrook records the occurrence of this French and Channel Islands species of marine alga at Plymouth (1925) and at Salcombe (1926). I do not know if it has been found elsewhere in the West, but I found it at Lundy in August 1934. Apparently it had moved up the Bristol Channel. It appeared as an epiphyte, fringing with crimson sturdier algæ from below low-water mark, and by the next month it had disappeared. I saw no signs of sporangia.—GEORGE FOX TREGELLES, Barnstaple, May 1935.

REVIEWS.

Primitive Land Plants. By Professor F. O. BOWER, Sc.D., LL.D., F.R.S. 8vo, pp. xi, 658, 450 figs. London: Macmillan and Co. 1935. Price 30*s*.

THIS volume is the outcome of the author's belief "that at the end of a long life of research some comprehensive expression of opinion, however tentative and imperfect, would aid students who will carry on the work." It is perhaps unwise to make predictions after once reading a book, but this may well prove to be one of the most important contributions to botanical thought yet made in this century. It is more than an expression of personal opinion—rather a well illustrated summary of the labours of the last fifty years in a field where morphological investigation has been most successful. This summary is not a mere collection of facts, but a comprehensive survey in which all the important discoveries find a place, and are illuminated by the author's reflections.

The presentation of an outline of the evidence for a view of the evolutionary history of the Pteridophyta, a group in which the historical evidence of fossils has been linked with the intensive study of modern forms, is opportune, for although most British botanists are convinced evolutionists, a distinguished Scandinavian worker in the field of genetics recently wrote : " Darwin's Evolution has proved to be lifeless and probably, what is worse, to have been a fiction." In ' The Origin of a Land Flora ' the author provided a rough sketch, but in the present volume he gives a much more complete and consistent picture of the probable early development of land plants. Some of the outlines of the first sketch have been altered, but many of the details have been filled in. The book will be valuable to all who wish to obtain an insight into the results of recent research on the Bryophyta and Pteridophyta.

The descriptions of the classes, occupying the first 470 pages, are provided with lists of references to the most important papers and with summaries of the chief points. The pages devoted to the Bryophyta provide a particularly useful summary of structure and relationships ; the author has made considerable use of the extensive studies of the late Professor Goebel on this group and reproduces many of his figures. Many readers may be interested to find that Professor Bower now regards the Anthocerotales as the starting-point for a study of the Bryophyta ; they are described as a primitive and imperfectly specialised group, providing a link between the Liverworts and Mosses. Further, under the influence of Goebel's views on reduction series in the Bryophyta, it is recognised as no longer possible to regard the simple sporogonium of *Riccia* as a primitive structure ; it may be the result of progressive reduction with the elimination of the photosynthetic stage. Professor Bower still adheres to the view that the Archegoniate sporophyte is a stage intercalated in the course of evolution between syngamy and meiosis, but this seems to be based mainly on theoretical considerations It is recognised that all life-histories—aquatic, amphibial, or subaërial—need not be interpreted according to one common scheme.

Among the chapters dealing with the Pteridophyta mention may be made of that dealing with the Psilotales, which contains an illustrated summary of the work of Holloway on *Tmesipteris*—especially useful to students, as the original papers have not been easily accessible. A condensed but well-illustrated account of the ferns (160 pages) brings together the main results from the researches which have occupied so much of the author's life. This includes a chapter on the natural grouping of the ferns, and summarises views which have opened a new era in the classification of the group. The chapter on the British ferns was previously printed in the ' Yorkshire Naturalist,' will now be more readily available ; it displays the British fern flora in a new and interesting light.

The second part of the book deals with general questions of morphology raised by the preceding studies. Many of the principles enunciated demand the consideration of those who study the higher plants. The author, naturally, limits himself to the Archegoniatae, but if we believe in evolution we must extend his arguments to the gymnosperms and angiosperms. If this is done, many of the structures of the higher plants will appear in a new light, and some of the problems of their morphology may be resolved. Professor Bower introduces to English readers Zimmermann's concept of the *telome*, which has proved most useful when we compare ancient and modern plants : he suggests, however, considerable modifications of Zimmermann's interpretation of the small leaves seen in *Equisetum* and *Lycopodium*. These are now regarded as enations, lateral outgrowths from surfaces previously unoccupied, and are thus contrasted with megaphylls or cladode leaves. The suggestion that the photosynthetic organs of land plants may have arisen in two distinct ways will have to be extended later to the seed plants, where a complete convergence of the two lines of evolution is found ; and, further, the bracts, bracteoles, and, perhaps, even the calyx of the flowering plants may now be viewed in a new perspective.

To some readers the views advanced may seem largely speculative, but they do provide a reasonable and effective means of correlating many of the facts of plant structure.—H. HAMSHAW THOMAS.

Botany. A Senior Text-book for Schools. By D. THODAY. Fifth Edition. Pp. i–xxi, 1–524, with 230 text-figs. Cambridge University Press, 1935. Price 7*s.* 6*d.*

PROFESSOR THODAY'S well-known elementary text-book of botany, written for the guidance of students preparing for the Cambridge Higher School Certificate and similar examinations, is a book about plants. The fifth edition has been thoroughly revised, but the author has retained the original scheme of his book, and has touched but lightly on those developments in which the plant is subordinated to other considerations. Interpretation is not stressed, a particularly welcome feature in a book for beginners, whose first need is a knowledge of the facts about plants.

The reader is offered a comprehensive elementary survey of the structure, physiology, and ecology of the Angiosperms, a brief account of their classification, and a short general description of a few plants chosen from the remainder of the plant kingdom. The theoretical framework is so well covered by a clothing of carefully selected facts that it is implied rather than exhibited. The tone of the book is sober and cautious, the

author directing the attention of his readers to the plain results of observation and experiment.

Instructions for practical work are freely provided, and are given in such a way that they can be applied successfully only if intelligence is used by the experimenter. The student is thus encouraged to make a personal contribution to the work, and so is led towards the idea of research.

Exception might be taken to some matters of detail. For example, it seems undesirable to suggest (p. 129) that the terms "starch sheath" and "endodermis" are synonymous, and the possible relationships of the bacteria and fungi (p. 482) might be more clearly indicated. At times compression is somewhat too severe; a little more might have been said of the functions of stems in supporting leaves and reproductive structures in positions favourable to efficient functioning (p. 163), and a slight expansion of the statement relating to secondary growth in some Liliaceae (p. 359) would have prevented a feeling that that statement was unnecessarily brief.

Professor Thoday's book can be recommended to beginners who wish to learn something about plants as plants, and, with confidence, to students preparing for examinations, since the best method of passing an examination with credit is to reveal to the examiners an intelligent knowledge of the subject.—B. BARNES.

Chronica Botanica, an Annual Record of Pure and Applied Botany. Edited by FR. VERDOORN, in collaboration with an Advisory Board and numerous Assistant and Corresponding Editors. Vol. I. 8vo, pp. 447, with illustrations. Leiden, 1935. Annual subscription, 15 Guilders.

WE give a hearty welcome to this new annual, a remarkable achievement of editorial effort and co-operation. To quote the foreword contributed by Dr. E. D. Merrill, "it covers a field not hitherto pre-empted, conflicts with no established periodical, supplements those already in existence, and should, by its very name, encourage the spirit of international co-operation."

The plan of the work is indicated in a preface: it is a review of important current research in all branches of Plant Science. In addition, it supplies professional and personal news of the past year (appointments, obituaries, anniversaries, expeditions, etc.), often with illustrations, and notes of future events; an index of the main acquisitions of Herbaria, Botanic Gardens, etc.; and reports and notes on Societies and Congresses, etc. A special section is devoted to the coming International Botanical Congress at Amsterdam, and programmes of other Congresses are also included. There are also general articles, an almanac of events,

past and future, a section of Correspondence, and a list of new Periodicals. It includes all branches of Plant Science—Agronomy, Forestry, Horticulture, Microbiology, Soil Science, Agricultural Chemistry, etc.

It is obvious that a work of this exhaustive nature can only be possible with a wide and effective co-operation. This will be carried out by means of a questionnaire which will be received by all directors of institutions and secretaries of societies at the beginning of December of each year, and replies should reach the Editor-in-Chief, Dr. F. Verdoorn, Leiden, Holland, not later than January 30.

The sections of the volume are indicated by the colouring of the leaf-edges. The first—Congresses, Committees, and Societies—opens with the programme of the Amsterdam International Congress of September, which is followed by a brief "Survey of Nomenclature" (1930–35) (by T. A. Sprague) and "A Short History of the International Botanical Congresses" (by A. B. Rendle) from 1864 to 1930. The notes on Congresses, etc., follow in alphabetical order (pp. 41–75); they include reports of meetings in the previous year and programmes for 1935. The second, and largest, section is a "Review of all branches of Plant Science" during 1934 (pp. 76–333). The arrangement is geographical—countries and places are in alphabetical order, ranging from Afghanistan and Alaska to Zanzibar—and the items are arranged under the various institutions and societies. Much of the information is in English, but reports from individual countries may be in French, Italian, German or Spanish. The amount of information given is remarkable, and it will, presumably, be increased in subsequent issues as the response to the questionnaires becomes still more general. A number of portraits are included, mainly of botanists who died in 1934; also occasionally views of buildings, etc.; we note, for instance, an air view of some of the experimental field-plots at Rothamsted. There is, as might be expected, a wide difference in the amount and character of the information supplied by different institutions.

The third section includes Correspondence,—letters to the editor and queries (pp. 334–42),—a list of "new and changed addresses" of botanists (pp. 345–78), a Children's Corner in the form of a short illustrated history of botany in the Netherlands, advertisements (pp. 384–428), and, finally, indexes respectively of families and genera of plant names referred to in the text, and of persons.

We trust that Dr. Verdoorn will meet with a well-merited encouragement in the co-operation necessary to make the 'Chronica' as comprehensive and useful as possible.—A. B. R.

Flora of the Presidency of Madras. By J. S. GAMBLE. Part X. *Gramineae.* By C. E. C. FISCHER. Sm. 8vo, pp. 1689–1864. Published under the authority of the Secretary of State for India in Council. Adlard & Son: London, 1935. Price 6*s.* 8*d.*

DR. FISCHER is to be congratulated on the completion of the floristic portion of this 'Flora,' in the compilation of which he has proved an able successor to the late J. S. Gamble. The Gramineae are not one of the easiest of families—Sir Joseph Hooker spoke of his enumeration of the family in the 'Flora of British India' as the most difficult part of the work. The late Dr. Stapf's valuable contribution to the 'Flora of Tropical Africa' has been helpful—the genera, wherever possible, are those adopted by him, and the key to the genera is based on his work. Mr. C. E. Hubbard is also thanked for help and advice. The more modern view of the limitation of genera, especially the segregation of the unwieldy genus *Andropogon*, has entailed the introduction of generic names unknown to or not recognised in the 'Flora of British India,' but references in synonymy maintain correlation with that standard work. A number of new combinations have been necessary. 132 genera are included.

We await now the Index and Appendixes, which will complete the book.

Flora of Moray. Edited by JAMES J. BURGESS, M.A. Sm. 8vo, pp. xv, 104. Elgin: 'Courant & Courier' Office, 1935. Price 5*s.*

THE labour and industry of more than one generation of field botanists in the north-east of Scotland have gone to the making of this small volume, and a foreword contributed by the Prime Minister acknowledges a worthy achievement connected with his native county. A sketch of the history of the botanical investigation of the area is provided, and a short chapter is devoted to the rarer or more noteworthy plants that have been recorded. Mr. Peter Leslie gives an account of the indigenous and introduced conifers, and also a list of the fungi of the county. The mosses are enumerated by the Rev. Mr. Birnie. To the Editor, Mr. Burgess, was entrusted the general form of the 'Flora' and the compilation of the records of the flowering plants. His death, last year, before the publication of the work, has removed from the north of Scotland an enthusiastic and accomplished field botanist, but the volume has been issued much as it left his hands, and while dedicated to the Moray Field Club, it is also a fitting memorial to one who did much to make its publication possible.

The nomenclature and numbering of species follows the 11th Edition of the 'London Catalogue' and, by a system of

abbreviations, the occurrence of each species in the nineteen parishes of the county is indicated. One misses a map of the county, which one has become accustomed to expect in works of this kind; the inclusion of even a sketch-map would have been an advantage to readers unfamiliar with the parish boundaries. Notes on the habitats of species and indications of their degree of abundance are useful features. The names of introduced species bear a distinguishing mark, but, as stated in the introduction, it is not always possible to draw the line between casual and indigenous species. Some of the native plants are dying out, partly due to the human factor, but, on the other hand, it is recorded that *Radiola linoides* and *Centunculus minimus* appear somewhat spasmodically in habitats made suitable by man's disturbance of the native vegetation. A few species reported for the county illustrate noteworthy extensions beyond their usual range in this country, such as *Hottonia palustris* in a marsh on the historic Culbin Sands, *Ulex nanus* in Speymouth, and *Corynephorus canescens* in abundance along the shore east of Lossiemouth. The last-mentioned species was observed thirty-five years ago among *Phalaris canariensis* and other aliens where the cleanings of a bird's cage had been thrown down, and this is probably the source of the present large colony of the plant.

There are a few inconsistencies in the book, doubtless due to its being the work of several writers. While the names of authorities for flowering plants are quoted in the usual way, those for mosses are enclosed in brackets, and in the list of fungi they are omitted. But these are minor blemishes, and those interested in our native flora will welcome this addition to the comparatively small number of local floras which deal with the Botany of Scotland. The book is nicely printed, and typographical errors are few. A frontispiece depicts two of the more interesting species found in the county—*Moneses uniflora* encircled by a spray of *Linnaea borealis*.—J. R. MATTHEWS.

English Names of our commonest Wild Flowers. Part II. Arranged and explained by ROBERT FISHER, M.A., late Canon of York. Cr. 8vo, pp. viii, 344. T. Buncle: Arbroath, 1934. Price 6*s.* (paper bound).

PART I. of the late Canon Fisher's valuable and interesting compilation on English Plant Names was reviewed in this Journal in 1933 (p. 267). Part II., which is similar in arrangement to Part I., includes those species which, though common, are not included in all the 112 comital districts. The manuscript was completed by the Canon before his death.

Though botanists may not always be in agreement with the name selected, or in some cases devised, for standardization,

the large number of cross-references will point the enquirer to any popular name that he may wish to track. Under the selected name will be found the variants and also the derivation. To save space the text is very much condensed by use of abbreviations, a list of which is given following the directions for use; but this excessive condensation makes reading difficult, especially when, as occasionally happens, the explanation of the abbreviation has been omitted. Thus there are frequent references to 'Nuttall,' *e. g.*, on p. 1, under Aaron's Rod—"Nuttall iii, 190"—but no explanation of the reference appears in the list. And on the same page, under "Ache," under the derivation "fr. Fr.—*Ache*, Lat. *apium*, Parsley or Celery, Pt. 3"—to what does Pt. 3 refer? Is a further part of the work in contemplation? If a reprint is called for these points might be considered.

We note that the price of the part, though considerably larger than Part I., remains constant. The two parts may be had bound together in cloth for 14*s*. 6*d*.—A. B. R.

List of Common Names of British Plant Diseases. Compiled by the Plant Pathology Committee of the British Mycological Society. 8vo, pp. 95. University Press, Cambridge [1935]. Price 2*s*. 6*d*.

This is a revision of the list compiled by the Plant Pathology Sub-Committee and published in the Society's 'Transactions' in 1929 (vol. xiv.). Some additions have been made, and considerable revision of the scientific names of the relevant pathogens has been necessary to ensure conformity with the International Rules of Botanical Nomenclature. The aim of the Sub-Committee has been to ensure uniformity in the popular nomenclature of these diseases in the British Isles. The host-plants are arranged in groups—Cereals, Pasture and Forage Crops, Pulse, Potato, Fruit, Ornamental Plants, etc.—but it has not been found feasible to include tree-diseases (other than fruit). The plants are arranged alphabetically in each group under their English names; the selected common name of the disease and that of the fungus causing it, in the case of parasitic diseases, follow. Where the pathogen is a virus this is stated. When the disease is also prevalent in foreign countries the common names applied in certain of these are included. In a few cases alternative names have been inserted, but it is hoped that the selected name will be generally adopted.

The Sub-Committee will welcome emendations or additions for a future edition.

BOOK-NOTES, NEWS, ETC.

'The Gardens' Bulletin,' Straits Settlements (vol. viii. pt. 2; Jan. 26, 1935).—Two-thirds of this part are occupied by a fifth contribution on "Some Malayan Orchids," by C. E. Carr, an enumeration of the orchids collected by the Oxford University expedition to Sarawak in 1932. Most were collected on and around Mt. Dulit from sea-level to 1400 metres altitude. There are 132 species, 32 of which were novelties. Apart from new species, 18 are new records for Borneo. The new species are very fully described, and include seven of *Dendrochilum* and *Bulbophyllum*, and three each of *Dendrobium* and *Chelonistele*; there are also new varieties and combinations, and a separate index facilitates reference. E. D. Merrill supplies a few additions and corrections to Ridley's 'Flora of the Malay Peninsula.' E. J. H. Corner describes and figures a *Nectria* (*N. egens*, sp. nov.) found in Pahang, parasitic on a liverwort, *Leptolejeunea corynephora*, that was growing on a ginger-leaf. Supplementary details are also given on *Neotiella crozalsiana*, confirming the author's former account of this species. Under the title "Araceae Malesicae" C. X. Furtado describes five new species (four from Borneo), reduces twelve species, and proposes new names for three which had been published under already preoccupied names. He also gives reasons for regarding *Nenga pumila* (Mart.) Wendl. as having a better claim than *N. Wendlandiana* Scheff. for this palm.

'Orchid Review.'—In the June number of this journal Dr. J. J. Smith concludes his descriptive list of species of *Dendrobium*: section *Ceratobium*, that are in cultivation in the Malay islands. The section is characterised by the relatively large, more or less twisted petals. Notes on habitat and references to original descriptions and to figures are included. The Rev. H. R. M. Rupp, of New South Wales, gives an account of the ground orchids that he has recorded in the South Maitland Coalfields district, which, despite its name, has proved surprisingly rich in species—within a radius of 12 miles sixty-six species were recorded in one year. *Pterostylis* showed an extraordinary development; eighteen species were found, the majority in abundance. F. Lyle Wind, Henry Shaw School of Botany, St. Louis, Mo., concludes his account of the technique of the asymbiotic germination of orchid seeds—"asymbiotic cultures have the advantage of producing a very high percentage of germination, but require careful attention to the details of procedure, particularly those relating to pH."

'Blumea' (a Journal of Plant-Taxonomy and Plant-Geography).—This new journal, three numbers of which have been issued (vol. i. nos. 1–3), comprising 536 pages, replaces the

'Mededeelingen van's Rijks Herbarium, Leiden' (1910–33). In his editorial note the Director of the herbarium, Dr. H. J. Lam, describes the scheme of the journal, which will be issued at irregular intervals and will be devoted primarily to papers written by workers at the Rijks Herbarium or dealing with material belonging to it, or with the flora of the Malay Archipelago or adjacent countries. The title commemorates C. L. Blume, the first Director of the herbarium (1829–62). The three numbers contain seventeen papers, of various length and subject, mainly in English. No. 1 (pp. 1–216) opens with a report on the ecology of a Sphagnum bog, by L. G. M. Bass Becking and E. Nicolai, recording the work of members of the "Leidsch Biologen Club." The remaining papers are of taxonomic interest. B. H. Danser, "The Cornaceae, *sensu stricto*, of the Netherlands Indies," revises the species of *Mastixia*: he recognises only eleven species as indigenous to the area, uniting many previously recognised under a few polymorphic species. He also suggests that *Mastixiodendron* may better be placed in the family Rubiaceae. H. J. Lam discusses the general character and origin of the flora of New Guinea; J. J. Smith contributes an artificial key to the orchid genera of the Netherlands Indies, New Guinea, the Malay Peninsula, and the Philippines; J. Th. Henrard notes on the genus *Digitaria*; and Fr. Verdoorn a revision of the Lejeuneaceae Holostipae of Oceania, Australia, and New Zealand. W. A. Goddijn discusses the species-concept in relation to taxonomy and genetics; and W. J. Ltüjeharms contributes a philosophic essay, "Substanzbegriff und Systematik."

No. 2 (pp. 241–343) contains a revision of the Malayan species of *Alangium* by S. Bloembergen—sixteen species are recognised—and a study of *Nyssa javanica* by J. Wasscher. J. J. Smith describes a new *Bulbophyllum* from Sumatra and revises the genus *Rigiolepis* Hook. f., which he regards as distinct from *Vaccinium*. Two short papers deal respectively with "Some Malaysian Grasses," by J. Th. Henrard, and "the Inflorescence and Flower of *Korthalsella Dacrydii* (*Arceuthobium Dacrydii* Ridley)," by the late J. C. Mekel. B. H. Danser records some grammatical objections to the recently published Rules of Botanical Nomenclature.

No. 3 (pp. 351–536) comprises the first part of a monographic revision of the Compositae of the Malay Archipelago, by J. Th. Koster, and includes the Vernonieae and Eupatorieae.

PROF. E. B. BABCOCK, Division of Genetics, College of Agriculture, University of California, Berkeley, Calif., U.S.A., proposes to study cyto-taxonomically certain genera of the subtribe Crepidineae of Compositae, and desires viable seeds of all possible species of *Lactuca*, *Prenanthes*, *Mulgedium*, *Launea*, and *Sonchus*. Herbarium specimens of plants collected in the wild are also desired.

NOTES ON HYDROCHARITACEAE.—II.

BY J. E. DANDY.

2. THE GENUS *OTTELIA* IN CHINA.

THE genus *Ottelia*, as delimited in the first of these Notes*, is well represented in China, though most of the species are restricted to the south-western provinces. Only one species—the common *O. alismoides*—was included in the list of Hydrocharitaceae in Forbes and Hemsley's enumeration of Chinese plants†, published in 1903, but since that date ten species have been described (under the generic names *Boottia*, *Oligolobos*, and *Xystrolobos*) from the provinces of Szechuan, Kweichow, and Yunnan. One of these ten is based on a Pontederiaceous plant‡; the other nine on critical examination appear to be reducible to six valid species of *Ottelia*. In the present note a further new species is described from Yunnan, and *O. cordata* is recorded from the island of Hainan, so that the total number of species at present known from China is nine.

The only species with a wide distribution in China is *O. alismoides*, representing the subgenus *Otteliastrum*. This variable plant occurs in most parts of south-eastern Asia, as well as in tropical Australia and north-eastern Africa. It is frequently found in rice-fields. *O. cordata*, the type of the subgenus *Boottia*, has a much more restricted range, but extends from Hainan westwards as far as Burma. The other seven Chinese species belong, like *O. cordata*, to subgen. *Boottia*; they are, however, known only from the south-western provinces of China, and together with *O. Balansae* (from Tongking) form a natural group which includes Gagnepain's genera *Oligolobos* and *Xystrolobos* and is here treated as a section with the designation *Oligolobos*.

Section *Oligolobos* presents some interesting and distinctive features which are worthy of mention here. The plants are monoclinous or diclinous, but in either case the fertile (hermaphrodite or female) spathes usually contain two or more flowers instead of the solitary one which is characteristic of *Ottelia cordata* and the other species of subgen. *Boottia*. Moreover, the spathes are as a rule deeply lobed or split so that the ovaries are more or less prominently exserted. The most important character, however, is found in the ovary itself; the gynœcium is tricarpellary with three bifid styles and three placentas (reduced dissepiments), and on the outer wall of the ovary are three longitudinal keels or wings which alternate in position with the placentas. These keels or wings are particularly well shown in

* See Journ. of Bot. lxxii. 132 (1934).

† C. H. Wright apud Forbes and Hemsl. in Journ. Linn. Soc., Bot. xxxvi. 1 (1903).

‡ See p. 217.

fruiting material of *O. polygonifolia* collected by Forrest (n. 8442). From their position they are evidently outgrowths from the midribs of the three united carpels, and are thus analogous with the spathe-wings in the African subgenus *Dipteron* which are developed along the midribs of the connate bracts constituting the spathe. The geographical range of sect. *Oligolobos* comprises Kweichow, Yunnan, and the adjoining regions of Szechuan, Kwangsi, and Tongking.

In the ensuing enumeration of the Chinese species the cited specimens are accompanied by abbreviations referring to the various herbaria in which they have been examined, as follows:—

BM.—British Museum (Natural History).
E. —Royal Botanic Garden, Edinburgh.
K. —Royal Botanic Gardens, Kew.
P. —Muséum d'histoire naturelle, Paris.
V. —Botanische Abteilung, Naturhistorisches Museum, Vienna.
VU.—Botanisches Institut, Universität, Vienna.

The work has been carried out in the British Museum Herbarium. To the authorities of the other institutions named I am indebted for the loan of material.

Key to the Species.

Spathes unwinged; leaves submersed or with the lamina floating; flowers hermaphrodite or dicœcious (Subgen. BOOTTIA).
  Gynœcium 9–15-carpellary; ovary and fruit without keels or wings; flowers unisexual, the fertile (female) spathes 1-flowered; lamina (at least in the upper leaves) floating, clearly differentiated, with a deeply cordate base (Sect. *Euboottia*) ..... 1. *O. cordata.*
  Gynœcium 3-carpellary; ovary and fruit with three longitudinal keels or wings, more or less prominently exserted from the spathe; flowers bisexual or unisexual, the fertile (hermaphrodite or female) spathes 1- or more-flowered; lamina submersed or floating (Sect. *Oligolobos*).
    Leaf-lamina flat (not crispate) at the margin.
      Margin of lamina entire; petals white or white with yellow base; ovary and fruit smooth.
        Apex of lamina rounded to obtuse or subacute.
          Flowers hermaphrodite, the spathes 2–4-flowered; stamens 3; lamina normally submersed ..... 2. *O. sinensis.*
          Flowers dicœcious, the male spathes several- to many-flowered, the female spathes 1–6-flowered; stamens 12.
            Lamina ovate to lanceolate-oblong, cordate or subcordate to sometimes broadly cuneate at the base (*cf.* figs. 1–2), normally submersed; male spathes smooth or sparingly echinulate; female spathes about 3–6-flowered ..... 3. *O. Esquirolii.*
            Lamina lanceolate or linear-lanceolate, cuneate or broadly cuneate at the base (*cf.* fig. 3), apparently floating; male spathes smooth; female spathes about 1–2-flowered. 4. *O. polygonifolia.*
        Apex of lamina gradually acuminate; lamina lanceolate-oblong to lanceolate or linear-lanceolate, the base attenuate to broadly cuneate (*cf.* fig. 4); flowers dicœcious ..... 5. *O. acuminata.*
      Margin of lamina more or less minutely denticulate; petals yellow to orange; ovary and fruit (where known) more or less echinulate; flowers dicœcious.
        Lamina ovate- or elliptic-oblong, rounded to subcordate at the base, rounded to obtuse at the apex (*cf.* fig. 5) ..... 6. *O. yunnanensis.*
        Lamina lanceolate or linear-lanceolate, attenuate at the base, gradually acute to acuminate at the apex (*cf.* fig. 6) .. 7. *O. Cavaleriei.*
    Leaf-lamina conspicuously crispate-denticulate at the margin; flowers dicœcious; petals white .... 8. *O. crispa.*
Spathes with several more or less well-developed (sometimes obsolescent) foliaceous longitudinal wings; leaves normally submersed; flowers hermaphrodite * (Subgen. OTTELIASTRUM) .... 9. *O. alismoides.*

Subgen. A. BOOTTIA (Wall.) Dandy.

Sect. I. **Euboottia** Dandy, sect. nov. Based on *Boottia* Wall. Pl. As. Rarior. i. 51 (1830). The type-species is *Ottelia cordata* (Wall.) Dandy (*Boottia cordata* Wall.).

1. OTTELIA CORDATA (Wall.) Dandy in Journ. of Bot. lxxii. 137 (1934).

Boottia cordata Wall. Pl. As. Rarior. i. 52, t. 65 (1830).

GEOGRAPHICAL RANGE.—From Upper and Lower Burma through Siam to Hainan.

KWANGTUNG. Hainan, Kiung-chow, Mar. 1893, *Chinese Collector* (*Hainan Collections*) 427 (K).

The collector describes the flowers as white.

B. cordata was erroneously recorded from Yunnan by H. Léveillé, Cat. Pl. Yun-Nan, 131 (1916). His material (now

* In *O. alismoides*. Other species of subgen. *Otteliastrum* have dicœcious flowers. *O. lanceolata* (Gagnep.) Dandy, which apart from its dicœcism is very similar to *O. alismoides*, occurs in Tongking and is to be looked for in the adjacent parts of China.

in Herb. Edinburgh) is referable to *Monochoria vaginalis* (Burm. f.) C. Presl, a species of Pontederiaceae ; it was collected by E. E. Maire on the plain of "Kiao-Kia," Yunnan, at an altitude of 400 m.

Sect. II. **Oligolobos** (Gagnep.) Dandy, sect. nov. Based on *Oligolobos* Gagnep. in Bull. Soc. Bot. Franc. liv. 542 (1907), and including *Xystrolobos* Gagnep. *tom. cit.* 544. The type-species is *Ottelia Balansae* (Gagnep.) Dandy (*Oligolobos Balansae* Gagnep.).

2. Ottelia sinensis (Lév. & Van.) H. Lév. [in Fedde, Repert. Nov. Sp. v. 10 (1908), *nomen synonymum*] ex Dandy, in Journ. of Bot. lxxii. 137 (1934).

Boottia sinensis Lév. & Van. apud H. Lév. *loc. cit.* (Jan. 1908).

Oligolobos triflorus Gagnep. in Bull. Soc. Bot. Franc. lv. 34 (Mar. 1908). H. Lév. Fl. Kouy-Tchéou, 197 (1914).

Geographical Range.—Kweichow and north-western Kwangsi.

Kweichow. Pingfa, in stream, 1 Mar. 1902, *J. Cavalerie* 815 (E, holotype ; P, holotype of *Oligolobos triflorus*). Pingchow, in standing clear water, 20 Sept. 1930, *Y. Tsiang* 7194 (VU). Anlung, border of Kwangsi, in waste field, 22 Oct. 1930, *Y. Tsiang* 7453 (VU).

Kwangsi. Bako-shan, west Pose, border of Yunnan, c. 910 m., 13 Sept. 1928, *R. C. Ching* 7387 (VU).

This species has white flowers. The leaves, according to Tsiang (n. 7194), are wholly immersed and are edible.

3. Ottelia Esquirolii (Lév. & Van.) Dandy in Journ. of Bot. lxxii. 137 (1934).

Boottia yunnanensis Gagnep. in Bull. Soc. Bot. Franc. liv. 542 (1907)—non *Ottelia yunnanensis* Dandy (1934). Diels in Not. R. Bot. Gard. Edin. vii. 85, 91, 169 (1912). H. Lév. Cat. Pl. Yun-Nan, 131 (1916).

Boottia Esquirolii Lév. & Van. apud H. Lév. in Fedde, Repert. Nov. Sp. v. 9 (1908). H. Lév. Fl. Kouy-Tchéou, 197 (1914).

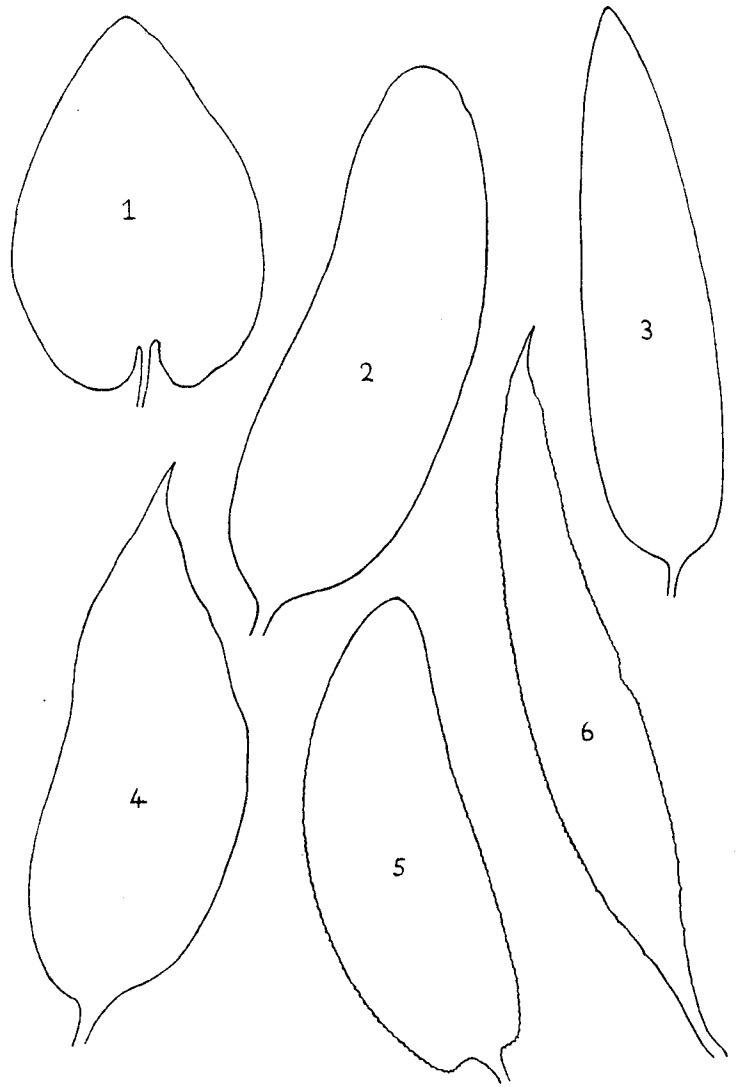
Xystrolobos yunnanensis var. *calospatha* H. Lév. Cat. Pl. Yun-Nan, 131 (1916).

Geographical Range.—Southern Szechuan, Kweichow, and northern Yunnan.

Szechuan. Near Choso, in lake, c. 2600 m., 18 June, 1914, *C. Schneider* 1596 (V).

Kweichow. Without locality, common in the ponds and swampy rice-fields, Aug. 1905, *J. Esquirol* 732 (E, holotype).

Yunnan. Plain of Tungchwan, in ponds, 2500 m., Aug., *E. E. Maire* (E, holotype of *Xystrolobos yunnanensis* var. *calospatha*) and Sept., *E. E. Maire* (V). "Mo-so-yn" (near Lang-kiung-hsien), in ditches, 6 Jan. 1890, *J. M. Delavay* 4647 (P, lectotype of *Boottia yunnanensis*). Lichiang plain, lat. 27° 10′ N.,



Shapes of leaf-lamina in some species of *Ottelia* sect. *Oligolobos*.

1. *O. Esquirolii* (× ½), from the type, *Esquirol* 732 (E). 2. *O. Esquirolii* (× ⅔), narrow extreme, from *Forrest* 2845 (E). 3. *O. polygonifolia* (× ⅔), from *Henry* 9861 (K). 4. *O. acuminata* (× ½), from *Ducloux* 648 (K). 5. *O. yunnanensis* (× ⅔). from *Forrest* 11,720 (E). 6. *O. Cavaleriei* (× ⅔), from *Schoch* 76 (K).

in ponds and quiet streams, c. 2590 m., Aug. 1906, *G. Forrest* 2845 (E). Lichiang valley north of the city (Lichiang-fu), lat. 26° 50′ N., in ponds and margins of swift-flowing streams, c. 2500 m., May 1906, *G. Forrest* 2038 (E ; K). Along the base of the eastern flank of the Tali range, lat. 25° 40′ N., in clear running streams and ditches, c. 2440–2740 m., Sept. 1906, *G. Forrest* 1876 (E). Kunyung-hai (Yunnan-fu lake), at edge of lake, Feb. 1920, *J. Cavalerie* 4738 (K). Without locality, 16 June 1887, *J. M. Delavay* 2688 (P).

According to collectors' notes the flowers of this species are white with the base of the petals yellow. The plant may attain a height of about 1·25 metres, and it appears that as a general rule the leaves are submersed. In one case (*Forrest* 2845) the collector describes the foliage as floating, but this may have been due to unusual conditions such as an appreciable fall in the level of the water. There is considerable variation in the shape of the leaf-lamina, which ranges from ovate with a cordate base (as in the type, *Esquirol* 732 ; see fig. 1) to lanceolate-oblong with a broadly cuneate base (as in *Forrest* 2845 ; see fig. 2).

4. **Ottelia polygonifolia** (Gagnep.) Dandy, comb. nov.

Boottia polygonifolia Gagnep. in Bull. Soc. Bot. Franc. liv. 540 (1907). H. Lév. Cat. Pl. Yun-Nan, 131 (1916).

Geographical Range.—Western and southern Yunnan.

Yunnan. Mingkwong valley, lat. 25° 20′ N., in pools and ditches, c. 1380–2130 m., July 1912, *G. Forrest* 8784 (BM ; E). Tengyueh valley, lat. 25° N., in ponds, ditches, and streams, c. 1710 m., July 1912, *G. Forrest* 8442 (BM ; E). Mengtsz, in lake, c. 1370 m., *A. Henry* 9861 (K) ; *ibid.*, in stagnant water, c. 1370 m., *A. Henry* 9861A (K).

This species is identified from Gagnepain's description of *B. polygonifolia*, based on a plant collected by H. Leduc at Mengtsz. Henry's specimens came from the same locality. Field-notes indicate that the flowers are white with the base of the petals yellow, and that the plant reaches a height of about one metre. There is no information from the collectors concerning the leaves, but from their appearance it seems likely that the lamina floats. The shape of the lamina is lanceolate or linear-lanceolate (see fig. 3).

5. Ottelia acuminata (Gagnep.) Dandy in Journ. of Bot. lxxii. 137 (1934).

Boottia acuminata Gagnep. in Bull. Soc. Bot. Franc. liv. 538 (1907). H. Lév. Fl. Kouy-Tchéou, 196 (1914).

Geographical Range.—Kweichow and northern Yunnan.

Kweichow. Environs of Anping (" Gan-pin "), Tsingchen, abundant in the streams of the plain, 9 Aug. 1897, *L. Martin & É. Bodinier* 1749 (E ; P, holotype).

Yunnan. Near Lichiang-fu, in stream towards " Böscha," c. 2500 m., 25 July, 1914, *H. Handel-Mazzetti* 4328 (V). Yunnan-fu, *Ducloux* 648 (K).

The gradually acuminate leaf-apex readily distinguishes this species from its close allies, *O. Esquirolii* and *O. polygonifolia* ; see fig. 4. Martin and Bodinier describe the flowers as white. The leaves are probably submersed, but the collectors' notes give no information on this point. No female material has been seen.

6. Ottelia yunnanensis (Gagnep.) Dandy in Journ. of Bot. lxxii. 138 (1934).

Xystrolobos yunnanensis Gagnep. in Bull. Soc. Bot. Franc. liv. 544 (1907). H. Lév. Cat. Pl. Yun-Nan, 131 (1916) excl. var.

Boottia echinata W. W. Sm. in Not. R. Bot. Gard. Edin. viii. 333 (1915). H. Lév. *loc. cit.* (1916).

Geographical Range.—Northern Yunnan.

Yunnan. Near Hokin, in pool in rice-fields, c. 2500 m., 25 Sept. 1914, *C. Schneider* 2810 (K). Erh-hai (Tali lake), lat. 25° 40′ N., in shallow bays on western shores of lake, c. 1980 m., Nov. 1910, *G. Forrest* 7376 (BM ; E, holotype of *Boottia echinata* ; K) ; *ibid.*, in margins of lake, c. 1920 m., Nov. 1913, *G. Forrest* 11692 (BM; E; K) and Sept. 1913, *G. Forrest* 11720 (BM; E; K); *ibid.*, in shallower part of lake, c. 2070 m., 27 Oct. 1915, *H. Handel-Mazzetti* 8554 (K) ; *ibid.*, c. 2200 m., 3 Oct. 1914, *C. Schneider* 2742 (K). Kunyung-hai (Yunnan-fu lake), in deep places, Nov. 1903, *Ducloux* 2218 (P, lectotype).

This species has yellow or orange flowers. It grows in deep as well as shallow water, and according to Forrest (n. 11692) reaches a height of about three metres. There is no information as to whether the leaf-lamina is submersed or floating ; for its shape see fig. 5.

7. **Ottelia Cavaleriei** Dandy, sp. nov. *Planta* acaulis. *Folia* longe petiolata ; lamina lanceolata vel lineari-lanceolata, basi attenuata in petiolum gradatim decurrens, apice sensim acuta acuminatave, margine minute denticulata, usque ad c. 30 cm. longa et 4 cm. lata, translucens, nervis primariis c. 7 ; petiolus in parte inferiore sparse echinulatus. *Flores* dioici. *Spathæ masculæ* exalatæ, multifloræ, usque ad c. 5 cm. longæ et 2·5 cm. latæ, saltem ad loborum apices plus minusve echinulatæ, lobis elongatis c. 3–4 cm. longis apice fere subulatis ; pedunculus lævis vel apicem versus sub spatha parce echinulatus ; pedicelli minute plus minusve echinulati. [*Spathæ femineæ* non adhuc notæ.]

Geographical Range.—Northern Yunnan in the region of Yunnan-fu.

Yunnan. Kunyung-hai (Yunnan-fu lake), in interior of lake, Feb. 1920, *J. Cavalerie* 4740 (K, holotype). Yunnan-fu district,

in large lake at foot of Mt. Hsi, c. 1900 m., 4 May, 1916, *O. Schoch* 76 (K).

The affinities of this species are clearly with *O. yunnanensis*, from which, however, it is at once distinguished by the narrow leaf-lamina with attenuate base and gradually acute or acuminate apex (see fig. 6). There is no information concerning the flower-colour, but judged from Cavalerie's dried material the petals are yellow or orange as in *O. yunnanensis*. The leaves have the appearance of being submersed.

8. **Ottelia crispa** (Hand.-Mazz.) Dandy, comb. nov.

Boottia crispa Hand.-Mazz. in Anz. Akad. Wissensch. Wien, Math.-naturwissensch. Kl. lxii. 253 (1925).

Geographical Range.—South-western Szechuan towards the Yunnan border.

Szechuan. Towards Yungning (in Yunnan), in lake, c. 2800 m., 18 June, 1914, *H. Handel-Mazzetti* 3099 (K ; V, holotype).

This species is easily recognized by the crispate-denticulate margin of the leaf-lamina. The flowers are white, and the leaves are certainly submersed though Handel-Mazzetti gives no information on this point.

Subgen. B. Otteliastrum Dandy.

9. Ottelia alismoides (L.) Pers. Synops. Pl. i. 400 (1805). C. H. Wright apud Forbes & Hemsl. in Journ. Linn. Soc., Bot. xxxvi. 3 (1903). Dunn & Tutch. in Bull. Misc. Inform. Kew, Add. Ser. x. 257 (1912). Merr. in Lingnan Sci. Journ. v. 23 (1927). Groff in Lingnan Sci. Journ. x. 438 (1931).

Stratiotes alismoides L. Sp. Pl. i. 535 (1753).

Ottelia japonica Miq. in Ann. Mus. Bot. Lugd.-Batav. ii. 271 (1866). Diels in Engl. Bot. Jahrb. xxix. 221 (1900). H. Lév. Fl. Kouy-Tchéou, 197 (1914).

Geographical Range.—Widely distributed in south-eastern Asia, extending from India eastwards to Japan, southwards to Malaysia and tropical Australia ; also in north-eastern Africa.

Shantung. Chefoo, in fresh-water pond at "Bluffs," 2 Sept. 1920, *N. H. Cowdry* 680 (K).

Kiangsu or Anhwei. "Province of Kianang," Oct. 1793, *G. L. Staunton* (BM).

Szechuan. Hokiang, in rice-fields, *E. Faber* 966 (K). Near Hweili-chow, Mola, above the Anning-ho ("Nganning-ho"), in rice-fields, c. 1300 m., 21 Sept. 1914, *H. Handel-Mazzetti* 5236 (V).

Hupeh. Ichang, *A. Henry* 165 (K).

Chekiang. Chinhai, in ditch, 7 Sept. 1927, *C. Y. Chiao* 14061 (K). Ningpo, 1877, *W. Hancock* 63 (K).

Hunan. "Hsikwangschan," near Sinhwa-hsien ("Hsinhwa"), in rice-fields at "Tindjiatang," c. 500 m., 22 Sept. 1918, *H. Handel-Mazzetti* 12678 (BM). From Tsing-chow towards Liping (in Kweichow), in rice-fields, c. 350–500 m., 30 July, 1917, *H. Handel-Mazzetti* 11003 (BM).

Kiangsi. Kiukiang, in the ponds, Sept. 1873, *G. Shearer* (K).

Kweichow. Environs of Kweiyang, Lipo, etc., common in the rice-fields, 29 Aug. 1899, *J. Cavalerie & É. Bodinier* 2748 (E). Anping ("Gan-pin"), 14 Sept. 1911, *J. Cavalerie* 4345 (K).

Yunnan. Szemao hills, in small pool, c. 1370 m., *A. Henry* 12391 (K). Szemao, in pools, c. 1370 m., *A. Henry* 12391A (K). Szemao forests, in running water, c. 1370 m., *A. Henry* 12391B (K).

Kwangsi. On the way to Suantze from Nanning, common in open pond of shallow water, c. 210 m., 10 Oct. 1928, *R. C. Ching* 7744 (VU).

Kwantung. Yingtak, in pond, 29 July, 1929, *Y. K. Wang* 2845 (K). Near Canton, in pools near "Sönggegong," c. 50 m., 10 Mar. 1913, *R. Mell* 115 (V). Whampoa, July 1860, *H. F. Hance* 6056 (BM). Fukwing, *R. Krone* in *Herb. Hance* 1509 (BM). Hainan, 1889, *A. Henry* 8291 (K) and 8662 (K). Without locality, Aug. 1887, *C. Ford* 241 (K).

Hongkong. Lantao, Aug. 1886, *Native Collector* 61/88 (K).

This widespread species is extraordinarily variable in some respects, such as size, leaf-shape, and degree of development of the spathe-wings. According to collectors' notes the flowers vary in colour from white (Henry) to pink (Ford), bluish (Chiao), or light purplish-blue (Cowdry). The leaves are normally submersed, but in Ching's no. 7744 they are described as floating. Usually the margin of the leaf is entire ; sometimes, however, it is more or less denticulate, as, for example, in Krone's specimen from Fukwing.

Excluded Species.

Boottia Mairei H. Lév. Cat. Pl. Yun-Nan, 131 (1916) is Monochoria vaginalis var. plantaginea (Roxb.) Solms (Pontederiaceae).

NOTES ON BRITISH HYPOCREACEAE.

By T. Petch, B.A., B.Sc.

(Concluded from p. 192.)

6. Melanospora Zobelii (Corda).

The history of this name was related by von Höhnel in 'Fragmente zur Mykologie,' no. 841 (1914). The following account gives von Höhnel's conclusions, with further details and comments.

Dr. Zobel found a fungus in the hymenial tissue of a truffle, *Choiromyces meandriformis* (Tuberaceae), for which Corda instituted a new genus, *Microthecium*, with the species, *M. Zobelii*.

He gave a figure of it in 'Icones Fungorum,' v. pl. viii. fig. 53 (1842). It had totally immersed, membranous perithecia, which lacked an ostiolum, and his figure appears to show, in section, two confluent globose perithecia between the asci of the *Choiromyces*. The spores were almost black, lemon-shaped, $21 \times 12 \mu$, with somewhat produced and truncate tips. The genus *Microthecium* Corda differs from *Melanospora* Corda in the absence of an ostiolum, which in the latter is conical or cylindrical, usually long and fimbriate at the apex.

Tulasne found a fungus on the hymenium of *Hydnocystis arenaria* (Tuberaceae), which he considered identical with Corda's species, and accordingly named it *Sphaeria* (*Hypocrea*) *Zobelii* (Corda) in 'Fungi Hypogaei,' 186, pl. xiii. fig. 1 (1851). Tulasne's fungus had partly immersed perithecia with a conical apex, which became shortly cylindric when open, and was evidently a *Melanospora*. The ascospores resembled those of Corda's species and measured $23 \times 16 \mu$. He maintained that Corda's description of the perithecia as astomate was based on an incomplete examination.

Later, Fuckel found a fungus growing on the disc of *Peziza* (*Sepultaria*) *arenosa*, which he described as *Ceratostoma brevirostre* (Bot. Zeit. xix. 50; 1861), but subsequently he decided that it was the same as Corda's fungus and recorded it as *Melanospora Zobelii* (Symb. Mycolog. 127; 1869). Fuckel's description of *Ceratostoma brevirostre* states that the perithecia are thin-walled, spherical, glabrous, pale brown, with a short cylindrical ostiolum, which is fringed at the apex with white setæ. He said that if one imagined the ostiolum lengthened, it would be *Melanospora lagenaria*. He cited Corda's statement, that an ostiolum was lacking, with a note of astonishment, and said that it appeared that Tulasne had overlooked the fringe of setæ. Fuckel's figure shows a globose perithecium with a short, broad, cylindrical ostiolum, about one-sixth the height of the perithecium. From the ostiolum, there arises a mass which appears to consist of spores and diverging setæ, but the scale of the figure is too small for accurate interpretation.

Von Höhnel (*loc. cit.*) claimed that Fuckel's fungus was quite distinct from *Microthecium Zobelii*, because it had a short, cylindrical, fimbriate ostiolum and almost fusiform spores. He held that *Microthecium* was a valid genus, synonymous with *Nigrosphaeria* Gardner and *Guttularia* Obermeyer, two genera which have been instituted during the current century for alleged astomate perithecial fungi found on the hymenium of Tuberaceae.

In his revisions of fungi, von Höhnel usually took care to record what exsiccati he had examined in arriving at his conclusions. But he did not state that he had examined a Fuckel specimen of *Melanospora brevirostris*, and it would seem probable that he derived his information from Fuckel's description and figure.

Fuckel issued specimens of *Melanospora brevirostis* (as *Ceratostoma*) in 'Fungi Rhenani,' no. 809, and these, with herbarium specimens collected in this country, have been examined. The fungus covers the disc of the *Peziza* with more or less globose perithecia, usually crowded, and appearing black owing to the colour of the included spores. The smaller perithecia are ovoid, rounded above, and have no ostiolum. The larger are globose, with a short conical ostiolum, and open by a circular apical pore, sometimes surrounded by the upturned edge of the perithecial wall. The pore appears to result from the disintegration of the perithecial wall, and is not a definite structure, furnished with periphyses, as in *Nectria*. In some cases, the orifice is surrounded by loose cells, which appear to be the remains of the perithecial wall. In a few instances, short, scattered, hyaline setæ arise at the margin of the orifice, and in some, though rarely, these setæ are numerous enough to form an almost continuous fringe, but they are not united laterally into a tube, as in *Melanospora parasitica*. The wall of the perithecium is brown, rather thick for a *Melanospora*, with a few brown hyphæ adherent externally. The spores are oval, acuminate, often inequilateral, with truncate apices and prominent germ pores, and measure $25–31 \times 13–16 \mu$, rarely $22 \times 10 \mu$, with some, globose, $13–15 \mu$ diameter.

It may be deduced that the perithecia are at first ovoid and astomate. They then become globose with a conical apex, which opens by a circular pore. Finally, setæ develop round the margin of the pore. But the most remarkable feature, and the one which probably accounts for the divergences in the descriptions quoted, is that in all these stages of development the perithecium contains some mature black spores.

A similar occurrence has been noted by Miss Cookson (Ann. Bot. xlii. 255; 1928) in a paper "The Structure and Development of the Perithecium in *Melanospora Zamiae* Corda," a species which has a long cylindrical ostiolum. Miss Cookson wrote "The body of the perithecium, sooner or later, according to the individual concerned, becomes oval in outline by the initiation of the future neck. This is often not developed until some of the asci and spores are mature." It is possible that this early maturation of the ascospores may be a common phenomenon in *Melanospora*. I did not, however, observe it in *Melanospora parasitica* in culture, and naturally-grown specimens of that species have been seen, in which the beak was 3 mm. long, while the spores, though fully formed, were still hyaline.

As far as regards the shape of the perithecium, *Melanospora brevirostris* does not differ from Tulasne's fungus. The latter did not exhibit any setæ round the margin of the ostiolum, but neither do the majority of the perithecia on the Fuckel specimen examined. Further, the unopened perithecia of the latter answer to Corda's description of *Microthecium*. As regards the spores,

however, there is a difference. In Tulasne's figures, the spores are broadly lemon-shaped, and exactly match Corda's, while the dimensions given by the two authors are 23×16 μ and 21×12 μ, respectively. But in *Melanospora brevirostris* they are oval, acuminate, often inequilateral, 25–31×13–16 μ, rarely 22×10 μ, with a few globose, 13–15 μ diameter. In general, the spores of *M. brevirostris* are narrower in proportion to their length than those of *M. Zobelii*, and the latter were not figured as inequilateral by either Corda or Tulasne.

It would appear that Tulasne was correct in considering his fungus identical with Corda's. In that case, as Tulasne's fungus is a *Melanospora*, the genus *Microthecium* lapses. Probably the same will be found to be true of the genera *Nigrosphaeria* and *Guttularia*. Corda's fungus on Tuberaceae should be known as *Melanospora Zobelii* (Corda) Fuckel. But until further specimens on Tuberaceae have been collected, and the range of variation of the spores determined, the *Melanospora* on Discomycetes referred to here should be left as *M. brevirostris* (Fuckel) von Höhnel.

Both *Melanospora Zobelii* and *M. brevirostris* occur in this country. Berkeley (' Outlines of British Fungology,' 402 ; 1860) recorded a fungus found on truffles as *Ceratostoma Zobelii* Berk., with a reference to *Sphaeria Zobelii* Tul. No specimen is now available, but there is little doubt that this was *Melanospora Zobelii* (Corda) Fuckel. Again, in Herb. Kew. there is a specimen, *ex* Herb. Currey, of *Melanospora brevirostris* (Fuckel) von Höhnel, labelled *M. Zobelii*, on *Peziza sepulta*, from the Rev. H. Higgins, November 1858, without locality ; while in Trans. British Mycol. Soc. iv. 314, *M. brevirostris* is recorded, under the name *M. Zobelii*, on *Sepultaria arenicola* (Lév.) Massee from Wallasey, November 25, 1913.

In May 1873 (' Grevillea,' i. 175), Cooke described a fungus found on *Peziza hemisphaerica* at Eastbourne in February of that year as *Ceratostoma Helvellae*. Saccardo (' Michelia,' i. 283 ; 1878) transferred it to *Melanospora*, and Cooke listed it as *Melanospora Helvellae* (Cooke) Sacc. in " British Sphaeriacei," ' Grevillea,' vii. 78 (1879).

Cooke described *Melanospora Helvellae* as having ovate perithecia, with an ostiolum scarcely equal in length to the diameter of the perithecium and ending in a somewhat erect fringe of hairs, and lemon-shaped spores, 22–25×14–16 μ. In the type in Herb. Kew., the perithecia are about 0·36 mm. diameter, with a brown cellular wall like that of *M. brevirostris*. In general, the ostiolum is lacking, but a few perithecia have a cylindrical hyaline ostiolum, sharply distinct from the perithecial wall in structure, 180 μ high, fimbriate at the apex. The spores measure 22–27×13–16 μ, with a few globose, 13–16 μ diameter, and are oval, rarely slightly inequilateral, ends truncate, with the germ-

pores less developed than in *M. brevirostris*, and, probably because of that, not acuminate.

It would appear that *Melanospora Helvellae* shows the fully developed form of *M. brevirostris*, in which the setæ have grown out as hyphæ, laterally adherent into a tube. When living specimens of *M. brevirostris* are available, that should be confirmed by watching their further development. Meanwhile, *M. Helvellae* is best regarded as a synonym of *M. brevirostris*.

The identifications of the host *Pezizae* given above are those recorded by the authors concerned. In the available specimens they appear to be decidedly similar to one another.

7. MELANOSPORA GIGANTEA (Massee & Crossland).

In ' The Naturalist,' November 1901, 341, Crossland recorded a new species, *Sphaeroderma giganteum* Mass. & Crossl., found on decaying grass in company with *Chaetomium murorum* Wint., near Cadeby. In the ' Fungus Flora of Yorkshire,' 215 (1905), this species was listed as *Melanospora gigantea* (Mass. & Crossl.), Cadeby, on decaying grass along with *Chaetomium elatum*. No description of *Melanospora gigantea* appears to have been published, and the name is consequently *nomen nudum*. There is a packet in Herb. Kew., *ex* Herb. Crossland, labelled " *Melanospora gigantea*, on decaying grass along with *Chaetomium elatum*, spores elliptic, coloured, 24–30×18–20 μ." I failed to find any *Melanospora* on the specimen, and the sheet bears a note by Hawley, " The *Melanospora* has vanished, except for a few loose brown spores, 23–28×17–19 μ." Similarly, on another part of the same gathering in the cover of *Chaetomium murorum*, there does not appear to be any *Melanospora*. The *Chaetomium* is *Ch. elatum*.

It would seem possible that the fungus was the same as *Melanospora sphaerodermoides* Grove, found on the culms of *Heracleum* and described as having broadly fusoid spores, 30–34×15–17 μ.

8. GIBSONIA PHAEOSPORA Massee.

Massee (Ann. Bot. xxiii. 336 ; 1909) instituted the genus *Gibsonia*, with the species *Gibsonia phaeospora*, for a fungus which had been found on a decaying mass of *Saprolegniae* by Prof. Harvey Gibson in North Lancashire. *Gibsonia* was characterised as having globose, superficial, membranous, olivaceous perithecia, furnished with a long cylindrical ostiolum, fimbriate at the apex ; asci soon diffluent, eight-spored ; spores continuous, brown, ellipsoid, extruded in a mucilaginous mass.

In entering this genus in the ' Sylloge Fungorum,' xxii. 452 (1913), Saccardo and Trotter queried whether it was sufficiently distinct from *Melanospora*. Unfortunately, there is no specimen in the Kew Herbarium, but the generic description, and the

description and figure of the species, do not indicate any difference from *Melanospora*. There is no doubt that *Gibsonia* is a synonym of *Melanospora*.

The species, *Gibsonia phaeospora*, was described as " Perithecia scattered, 1 mm. high, subglobose, olivaceous, glabrous, with repent hyphae at the base, passing abruptly into a long ostiolum ; context parenchymatous, composed of polygonal cells ; asci cylindric ; spores uniseriate, ellipsoid, brown, continuous, 14–15 × 7–8 μ." In the absence of specimens, it is not possible to decide whether this agrees with any previously described species of *Melanospora*. *M. lagenaria*, which has ellipsoid spores, 11–14 × 6 μ, and grows on fungi, has sparingly hairy perithecia.

9. Nectria helminthicola B. & Br.

Nectria helminthicola was described by Berkeley and Broome in ' Notices of British Fungi,' no. 896 (1859), as " carnea minuta globosa parasitica glabra ; ascis sursum angustioribus ; sporidiis bi-quadrinucleatis. Parasitic on some large species of *Helminthosporium*. Batheaston, January 1859, C. E. B. Scarcely visible to the naked eye, globose, flesh-coloured, smooth ; asci generally attenuated upwards, often curved ; sporidia hyaline, with two to four nuclei and consequently either uniseptate or ultimately triseptate, ·0006–·00056 inch long." Richon (in Bull. Soc. Bot. France, xxviii. 184, pl. v. fig. 1 ; 1881) redescribed and figured *Nectria helminthicola*, noting that the ascospores were uniseptate and brown. Specimens collected by Broome at Batheaston in January 1859 were issued in Rabenhorst, ' Fungi Europaei Exsiccati,' no. 47 (1859), and specimens collected by Vize at Forden, February 1878, were distributed by Plowright in Sphaer. Britt. iii. no. 10.

In 1880 Saccardo (' Michelia,' ii. 73), described a fungus which had been found in company with a *Helminthosporium* by Letendre in France. It was a *Nectria* with brown spores, and for it Saccardo instituted the genus *Letendraea*, with the species, *L. eurotioides*. Subsequently (Syllog. Fung. ii. 538; 1883), he listed *L. eurotioides*, including under that name, *Nectria helminthicola* Richon, *loc. cit.*, and Plowright, Sphaer. Britt. iii. no. 10. But, no doubt relying on Berkeley and Broome's suggestion that the spores were ultimately triseptate, he listed *Nectria helminthicola* B. & Br. as *Calonectria helminthicola* (B. & Br.) Sacc., ' Michelia,' i. 315.

Weese (Centralb. f. Bakt. Abt. 2, xlii. 587, 1914, and Mitt. Bot. Tech. Hochsch. Wien, i. 59, 1924) has examined the specimens in Plowright, Sphaer. Britt. iii. no. 10, and Rabenhorst, ' Fungi Europaei,' no. 47, and found that these are both *Letendraea* and the same species. Consequently, the name will now stand as *Letendraea helminthicola* (B. & Br.) Weese, with *L. eurotioides* Sacc. as a synonym.

10. The Ascospores of *Cordyceps*.

As is well known, the ascospores of *Cordyceps* are long and slender, and divide when mature into a number of short cylindrical part-spores. Apparently, the interval between the formation of part-spores and the expulsion of the contents of the ascus from the perithecium is a brief one, for it is not the rule that one finds mature part-spores in herbarium specimens. The asci, in general, contain undivided ascospores, more rarely septate ascospores, or the perithecia are empty or filled with a secondary mycelium. The same is true of the corresponding genus, *Hypocrella*. Failing the presence of mature part-spores, one has to determine their length from the distance between consecutive septa in the septate ascospore, if such are present. That is not an easy matter, as one has to deal with a twisted bundle of eight linear spores, each about 1 μ diameter ; and the result may be fallacious, because the formation of septa may not have been completed. Parenthetically, it may be noted that the subdivision of the ascospore into part-spores does not always proceed to the same extent. It is fairly common to find a variation of 100 per cent. in the length of the mature part-spores.

As pointed out by Möller, to secure reliable data regarding the length of the part-spores, it is necessary to obtain extruded spores. Unfortunately that can only be done with fresh material in the mature stage. There should, however, be no difficulty in the case of temperate species, as a spore-print can easily be obtained by keeping a fresh mature specimen on a glass slide in a damp chamber overnight. A spore-print of *Cordyceps gracilis* Mont. & Dur. showed a uniform sample of part-spores, 5–9 × 1·5–2 μ. A similar print from *C. militaris* (L.) Link gave part-spores, 3·5–6 × 1–1·5 μ, but there were several undivided non-septate lengths, 10–25 μ long. In this instance, therefore, part of the ascospore had not divided up normally by the time the contents of the ascus were extruded.

Cordyceps capitata (Holms.) Link affords an example of the uncertainty attending the estimation of part-spores from dried specimens. Tulasne gave the dimensions of the part-spores as 30–60 × 3–5 μ ; Cooke (' Handbook '), 7·5 μ long ; Currey, 15–20 μ long ; Saccardo, 25–40 × 6 μ ; and Seaver, 20–40 × 4–5 μ. Lloyd (Mycol. Notes, no. 44, 608 ; 1916) measured them as 12–16 × 3 μ, and added " I think never 25–40 μ, as stated in Saccardo, which record was probably based on segments that were not finally divided."

A spore-print was obtained from a large specimen of *C. capitata*, gathered at West Runton, Norfolk, in October 1934. The head had turned black and the spore-print was poor. The range of the majority of the part-spores was 23–48 × 4–6 μ, most over 30 μ, with a few, 10–18 × 3 μ. The part-spores of the first group were fusoid or narrow oval, with a wall up to 1 μ thick, and

subtruncate ends, solid for a length up to 5 μ. There was no possibility of mistaking these for undivided segments. The smaller were subcylindrical with thinner walls. One partly divided segment, 70 × 5 μ, was seen, strongly constricted in the middle.

Another spore-print was obtained from a smaller specimen, gathered at North Walsham Woods the following day. In this also, the head was black and the spore-print poor. The part-spores varied from 8 × 4 μ to 45 × 5 μ, the full range being 8–45 × 3–5 μ. Consecutive part-spores from one ascospore, which remained in contact when extruded, measured 11 × 3, 8 × 4, 37 × 5, 39 × 5, 40 × 5, 42 × 5, 42 × 5, 40 × 5, 38 × 5 μ, respectively. This was probably not the whole of the original spore.

I have also examined an American specimen of *C. capitata* from the herbarium of Cornell University. The part-spores in the ascus varied from 7 × 3 μ to 46 × 5 μ. In one ascus, the part-spores at the apex were barrel-shaped, 7–9 × 3 μ, while below these they were fusoid, with subtruncate thickened ends, 32–34 × 4–5 μ. Part-spores 9 × 3 μ and 18 × 3 μ lay side by side in the same ascus; and one, 9 × 3 μ, was followed by one, 36 × 3 μ, in the same ascospore. The part-spores of *C. capitata* have strongly thickened ends, and the longer are fusoid or somewhat lozenge-shaped. They cannot be regarded as segments of the ascospore not finally divided. The dimensions obtained in these examinations are 7–48 × 3–6 μ.

The part-spores of *C. ophioglossoides* (Ehrh.) Link are more easily obtained, as very many adhere to the head on extrusion in white masses which give it a mouldy appearance. In specimens from North Wootton, Norfolk, the extruded part-spores were cylindrical with rounded ends, or oblong-oval, 3–5 × 2 μ, or oval, 2·5 × 2 μ, or subglobose, 2–2·5 μ diameter. But there were very many longer, cylindrical, 6–30 × 1·5–2 μ, which were evidently undivided segments. These longer segments did not show septa, or pseudo-septa, as figured by Corda in Sturm's Deutschl. Flora, Abt. iii. Bd. 3, pl. 64.

CREPIS BIENNIS IN NORTH YORKSHIRE AND ISLE OF WIGHT.

By E. B. Babcock (University of California).

In 1932 Dr. E. Drabble reported in this Journal that he had cultivated one plant of *Crepis oporinoides* Boiss. on his place in the Isle of Wight, that the seed from which this plant grew was taken from a herbarium specimen collected the previous year in N. Yorkshire, and that portions of this plant had been preserved and deposited in his own herbarium and that of the British Museum (the latter an error—it is at Kew).

Crepis oporinoides is a little-known species, indigenous in the Sierra Nevada of southern Spain. For years I had desired to cultivate the plant for purposes of cyto-taxonomic study and wrote to Dr. Drabble asking for seed from this plant, only to learn that the plant died without maturing seed. Dr. Drabble asked for my opinion of the herbarium specimen taken from it and filed at Kew. After examining this specimen in 1933, I wrote to Dr. Drabble that I agreed with this determination, although several differences were noted which at the time seemed of minor importance. At that time I had not seen a specimen of the parent plant nor any other specimen from North Yorkshire, and the Kew specimen consists only of leaves and the topmost portion of the inflorescence, together with florets and immature achenes. These leaves have unusually narrow lobes for *C. biennis*, the peduncles are extremely long, and the heads rather small, while the outer involucral bracts are rather narrow and the dorsal pubescence of the inner bracts is much reduced. All these peculiarities strongly suggest *C. oporinoides*, and in addition the immature achenes are more like mature achenes of *oporinoides* than of *biennis*. The florets, however, show more resemblance to the latter species, and I was in error in not attaching more importance to this fact. In 1934 Mrs. Hilda Drabble sent me a photograph which she had taken of the cultivated plant supposed to be *C. oporinoides*. Had I seen this photograph at the time I first examined the Kew specimen I should have realized that the plant could hardly be *oporinoides*. For the cultivated specimen had the tall axis, equally spaced branches, and numerous heads which are characteristic of *C. biennis*, whereas *C. oporinoides* is characteristically a low, spreading, few-headed plant. In 1933, however, I was inclined to think that the differences noted between the herbarium specimen from the cultivated plant and typical *oporinoides* were due to the effects of cultivation.

In order to determine whether Dr. Drabble could possibly have grown *C. oporinoides*, I undertook to find out whether this species occurs in North Yorkshire. Through the courteous assistance of several correspondents, whose help I gratefully acknowledge, it has been possible to answer this question in the negative. I am especially indebted to Mrs. Drabble, who has lent me the specimen of the parent plant from which the seed was taken that produced the supposed *oporinoides* specimen. This parent specimen is typical *C. biennis* L. Recently I have seen three other specimens from the same district in North Yorkshire, through the courtesy of Mr. Chapple of the Botanical Society and Exchange Club of the British Isles, and they are all *C. biennis*. I have also re-examined the supposed *oporinoides* specimen of the Kew herbarium, and I am convinced that it is only a form of the notoriously variable *C. biennis*.

In this connection it should be noted that the parent specimen referred to above had been sent by Mr. R. J. Flintoff to Dr. G. Claridge Druce at Oxford for determination. Unfortunately Dr. Druce determined this specimen as *C. nicaeensis* Balb. Later it was sent to Dr. Drabble, who eventually annotated the specimen as *C. oporinoides*, being misled, I suppose, as was the present writer, by the marked peculiarities of its cultivated offspring. Dr. Drabble deserves the credit of realizing that this cultivated plant and its parent are not *C. nicaeensis*. Dr. Druce's

	nicaeensis.	*biennis.*	*oporinoides.*
Height.....	30–90 cm.	30–120 cm.	10–45 cm.
*Leaves	Dentate to runcinate-pinnatifid.	Dentate to lyrate-pinnatifid.	Pinnatifid with very narrow lobes.
Axis	Elongate, several times branched from above or below middle.	Elongate, many-branched from above or below middle.	Very short, few-branched.
Branches	Semi-erect or strict.	Semi-erect or strict.	Diffuse or procumbent.
Aggregate inflorescence.	Corymbiform.	Corymbiform.	Simply dichotomous.
Heads	Numerous, medium.	Numerous, large.	Few, medium.
Outer involucral bracts.	Short, linear.	Long, lanceolate-linear.	Intermediate.
Inner bracts ..	Ventrally glabrous.	Ventrally pubescent.	Ventrally pubescent.
Florets	Ca. 11 mm. long.	13–18 mm. long.	Ca. 14 mm. long.
Anther-tube ..	Ca. 4 mm. long.	4–5·5 mm. long.	Ca. 4 mm. long.
Anther-appendages.	Ca. 0·8 mm. long, acute.	0·8–1 mm. long, obtuse.	Ca. 0·6 mm. long, obtuse.
Style-branches .	Ca. 1·5 mm. long, dark green.	Ca. 3·5 mm. long, yellow.	1·75–2 mm. long, yellow.
Achenes	2·5–3·8 mm. long, 10-ribbed.	4·5–7 mm. long, 10–13- or 18-ribbed.	7–9·5 mm. long, 20–30-ribbed.
Pappus	4–5 mm. long.	6–7 mm. long.	5–7 mm. long.
Chromosomes ..	$2n=8$.	$2n=40\pm$.	?

error in naming the parent specimen may have been due to his lack of authentic specimens of both *C. biennis* and *C. nicaeensis*. It is difficult to identify *Crepis* species from descriptions alone.

It has been shown by Flintoff (North Western Nat. 30, 1934) that the only *Crepis* species in the region of N. Yorkshire from which the parent specimen came is *C. biennis*. Apparently *C. nicaeensis* does not occur in that region. It should be noted, however, that both these species are occasionally introduced

* Later leaves of rosette and lower stem.

with seeds of grass and other forage plants, and that it would not be surprising to find *nicaeensis* in North Yorkshire. So far as I am aware, *C. oporinoides* has never been found outside its native habitat.

For the assistance of any who may be interested in distinguishing between the three species under discussion, I have prepared the accompanying synoptical treatment of certain morphological features based on my own studies of authentic specimens.

Berkeley, Calif., May 1935.

NOTES ON THE FLORA OF ANGOLA.—I.

By A. W. Exell, M.A., F.L.S.

Ritchiea Youngii, sp. nov. (Capparidaceae). *Frutex* scandens, ramulis glabris. *Folia* plerumque unifoliolata rarius trifoliolata longe petiolata, petiolo 3 cm. longo, petiolulis 2–2·5 mm. longis, lamina ovale apice acuminata apiculata basi rotundata vel cuneata, 7–13×2–6 cm., costis lateralibus utrinque 5–7. *Flores* virides magni longe pedicellati, pedicello ad 4·5 cm. longo glabro, in racemos breves 2–3 cm. longos axillares vel terminales dispositi. *Sepala* 4 lanceolata vel ovato-lanceolata acuminata acuta 2–2·5×0·8–1·1 cm., margine tomentella ceteroque fere glabra. *Petala* lineari-elliptica longe et anguste unguiculata, 3–5×0·3–0·7 cm., glabra. *Stamina* numerosa filamentis ad 4·5 cm. longis, antheris 2·5 mm. longis. *Ovarium* cylindricum, 6×1·5 mm., glabrum, gynophoro 3–3·5 cm. longo, glabro.

Hab. Angola. Lunda: climbing on trees near the River Dundundo, Dundo, fl. Aug., *R. G. N. Young* 476. (Typus in Herb. Mus. Brit.).

From the description this is near to *R. macrocarpa* Gilg from the Cameroons, but the petals and stamens are about twice as long.

Polygala Youngii, sp. nov. *Herba* annua circa 60 cm. alta, caulibus erectis filiformibus sparse pilosulis vel nonnunquam fere glabris. *Folia* sessilia filiformia 7–10 mm. longa patenti-pilosula vel fere glabra. *Flores* lutei in racemos laxos elongatos terminales dispositi. *Sepala* 3 libera ovalia margine ciliolata unum majus dorso basin versus carinatum, 3×1·5 mm., altera minora 2×1·2 mm. *Alæ* oblongo-ovales apice rotundatæ basi oblique cuneatæ, 5–6×3–3·5 mm., nervis conspicuis. *Petala* superiora oblique oblonga, 5–6×2·5 mm., glabra. *Carina* cymbiformis, 3·5 mm. longa, glabra cristata, crista magna apice fimbriata, 5×2·8 mm. *Stamina* 6. *Ovarium* obovoideum, 3×2 mm., margine sparse pilosulum, seminibus cylindricis, 1·5–1·6×0·8–0·9 mm., dense pubescentibus apice arillatis, arillo trilobato, lobis haud appendiculatis.

Hab. ANGOLA. Lunda: Vila Henrique de Carvalho (Saurimo), *R. G. N. Young* 1163. (Typus in Herb. Mus. Brit.).

Flowers yellow; wings brownish-red.

In appearance (when dried) this closely resembles *P. angolensis*, but differs in having six stamens instead of eight, in having a larger crest to the carina, and in the absence of appendages to the aril-lobes.

Caloncoba angolensis Exell & Sleumer, sp. nov. (Flacourtiaceae). *Arbor* parva vel suffrutex 30–90 cm. altus, ramis glabris longitudinaliter striatis, ramulis subglabris vel pubescentibus, sparse lenticellosis. *Folia* oblonga vel obovato-oblonga, brevissime petiolata, petiolo breviter hirsutulo circa 5 mm. longo, apice breviter subcurvato-acuminata interdum apice ultimo brevissime cuspidata, basi late cuneata vel varius subrotundata, chartacea, integra vel leviter undulata, ad costam utrinque ±manifeste sparsissime pilosa, alibi glabra, juventute manifeste glutinosa, 9–12×3·5–5·5 cm., fere semper supra medium latissima, nervis lateralibus utrinque 5–6 (7) arcuato-adscendentibus marginem versus inter sese conjunctis supra haud, subtus sicut costa parum prominulis, venis subtus laxissime et parcissime reticulato-elevatis. *Flores* polygami præcoces in ramulis defoliatis axillares, solitarii vel 2- (rarissime 3-) fasciculati, pedunculo subglabro sub anthesi 2–3 cm. longo, postea, ut videtur, manifeste elongato. *Sepala* 3 ovato-oblonga chartacea extus maculis punctiformibus brunneis resinosis sparsa, 10–12×5–6 mm. *Petala* circa 10, tenera (alba), obovato-elongata basi subunguiculata, nervosa, circa 2 cm. longa et apicem versus 0·6 cm. latissima. *Stamina* indefinita, filamentis subfiliformibus laxissime pilosis vel glabris, circa 2·5 mm. longis, antheris elongatis circa 5 mm. longis longitudinaliter dehiscentibus. *Ovarium* ovoideum glabrum apice in stylum crassum brevem superne incrassatum obscure 5–6-lobatum vel denticulatum abiens. *Fructus*, valde immaturus, sessilis ovoideo-globosus lævis.

Hab. ANGOLA. Lunda: Xa-Sengue, *R. G. N. Young* 757. (Typus in Herb. Mus. Brit.; photogr. in Herb. Berol.); Alto Cuilo, Cacolo Road, *R. G. N. Young* 729 (Herb. Mus. Brit.; Herb. Berol.).

This can be distinguished from all other species of *Caloncoba* by the very short petiole.—A. W. EXELL AND H. SLEUMER.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

FORTIETH ANNUAL CONGRESS.

THE Fortieth Annual Congress of the Union was held at Bournemouth, June 26–29, under the presidency of Professor A. C. Seward, F.R.S., Master of Downing College and Professor of Botany, Cambridge. In his Address, entitled "The Herbarium of the Rocks," Prof. Seward gave a clear and interesting account of some of the problems arising from the study of certain Tertiary floras in the Old and New Worlds. Professor Chaney and other American workers have established the relationship between various Tertiary floras in the Western States, in part with the present-day flora of the respective localities, in part with existing tropical floras and also with the Cretaceous flora of the Arctic regions. "If it is true that genera represented in the older Tertiary floras of both hemispheres came from the Arctic regions where they were members of a Cretaceous flora, we are confronted with a problem of some importance in relation to the question of the value of plants as indices of climate," and it is "probable that the Cretaceous ancestors of Tertiary plants were hardier and more tolerant of comparatively low temperatures than their later descendants." Prof. Seward paid tribute to the thoroughness of Prof. Chaney's work in his study of fossil species.

Taking the Cretaceous flora of Greenland as an illustration, examples such as *Gleichenia*, *Sequoia*, *Ginkgo*, *Platanus*, *Magnolia*, and *Artocarpus* were cited as pointing to the derivation from the far north of genera which are now mainly tropical or subtropical. The Polar regions are almost girdled by an interrupted ring of Tertiary floras, which have many plants in common and differ in many respects from the older Cretaceous flora of Greenland, and indicate climatic conditions more temperate than those suggested by the Cretaceous plants. The Mull flora has many features in common with those of these arctic lands. The Eocene flora of the London Clay, as recently described by Mrs. Reid and Miss Chandler, with its strong Malaysian affinity, presents a very different picture. "In the early stages of the Tertiary era there were two botanical provinces in western Europe and the arctic regions: one represented by the arctic floras and the flora of Mull, the other by the flora of the London Clay, the rich flora of Bournemouth—which has never been adequately studied,—the rather later floras of Bembridge in the Isle of Wight, and others." Advantage should be taken of any chance to add to our collections of fossil plants from the Hampshire coast. "We should like to be able to follow the waves of vegetation over western Europe subsequent to the Cretaceous period; to trace the relationships of the early, middle, and later Tertiary phases of plant-life to present-day floras . . . to know more about the climatic variations under which the floras lived." Great changes in the relative position of land and sea must have reacted upon climate, but there are serious meteorological and astronomical problems to be faced if we estimate temperature of past periods on the assumption that extinct species of plants had the same response to external factors as their modern descendants. One of the most puzzling problems is to explain the occurrence of ancient floras in the arctic regions which are similar to those

of the same geological age in regions much further south. Two hypotheses point the way to an explanation of the various problems raised, some kind of continental drift and the conception of the plant as an organism subject to change in its power of endurance during the course of the ages. Prof. Seward's address was illustrated by a series of excellent photographic lantern-slides.

The Botany section met under the presidency of Professor R. J. Tabor. At the business meeting Mr. A. J. Wilmott, B.A., F.L.S., Deputy Keeper of the Department of Botany, British Museum, was elected President for 1936. Prof. Tabor's address, "The Effect of certain Physical Factors on the Determination of Plant Habitat," dealt appropriately with the effect of soil factors as illustrated by a reference to the immediate neighbourhood, part of which would be visited on the sectional excursions—the vegetation of the chalk ridge which runs westward from Studland, of the sandy heath which extends northward from the chalk, and the shore vegetation of Poole Harbour.

The fact that certain species, though sometimes found elsewhere, occur in regular association and in abundance on the chalk is not explained by a high demand for calcium salts. Many of these can be found on other types of soils and all can be grown in garden soils with a relatively very low proportion of calcium carbonate. On the other hand some species, calcifuges, such as the heaths and others, are intolerant of calcium carbonate, but are abundant on the adjacent wide tracks of sandy heath. The two types of soil differ markedly in their physical and chemical characters—the sandy sorts, open in texture with a low water capacity, are poor in soluble salts and tend to accumulate an acid humus; the chalk, also light and porous, retains water more tenaciously, forms a mild humus, and is neutral or faintly alkaline and richer in soluble salts, notably calcium carbonate. There is no evidence that calcium ions are poisonous, they are absorbed freely by all plants, but they prevent the accumulation in the soil of acids, and promote the decay of humus by bacterial action. Hence in the spring and early summer with abundant moisture and a rising temperature there is available a supply of the essential nitrogen compounds which promote the early growth and development of the vegetation of such soils. In sandy soils, on the other hand, the products of bacterial action cannot be neutralised and tend to accumulate, the soil becomes acid, and the action of the nitrifying bacteria slows down and ceases. In the seedling stage, when competition is most severe, such factors as relative acidity may be most potent. Competition is keenest between nearly related plants. Certain pairs of related species, such as *Galium sylvestre* and *G. saxatile*, are confined respectively to calcareous and non-calcareous soils, but each can live freely on soils of the other type in the absence of the competing species.

It is suggested that the action of the hydrogen ions is to alter the permeability of the protoplasm and so affect the uptake of necessary salts. This may also be true of other ions. Excess of calcium lowers the absorption of other metals, especially potassium, magnesium, and iron, and may explain the absence of potash-loving plants, such as *Castanea*, or the well-known yellowing or chlorosis probably due to deficiency of magnesium or iron, shown by many plants, on calcareous soils.

The deposit of silt around Poole Harbour carries an assemblage of plants, halophytes, characterised by the marked succulence of their organs and the power of enduring exposure to high concentration of salts in the soil water. The ash of halophytes may consist of nearly half its weight of sodium chloride. It is apparently not the case that these plants have a high specific resistance to sodium chloride—solutions of pure salt are as fatal to them as to ordinary plants,—but that other salts in the sea-water, notably calcium carbonate and magnesium sulphate, exert a beneficial effect on the absorption. In continental areas halophytes—often the same species—are found inland in alkali soils where the concentration of other salts such as calcium sulphate, magnesium sulphate, or sodium carbonate is high. One important respect in which these plants differ from ordinary plants is in their extreme power of regulating the osmotic strength of the cell-sap, thus enabling them to absorb water under the most variable conditions of concentration of the soil-water caused by drying of the soil on the one hand to saturation with rain water on the other. Variety in this power of regulation may be one of the factors in the well-known zonation of salt-marsh plants. Halophytes transpire as freely as mesophytes, and their succulence is not related, as in the Cacti, to the storage of water, but appears to be due to the effect of salt on the structure of the protoplasm which causes changes in the growth and development of the tissues. The address was illustrated by lantern-slides.

Prof. M. C. POTTER, M.A., D.Sc., gave an account of the perception and transmission of stimuli in plants, illustrated by slides showing details of cell-structure.

Botanists and zoologists took part in two joint excursions, to Littlesea and Studland Heath, under the guidance of Mr. L. B. Hall, and to Poole Harbour.

The Regional Survey Section heard an address by Dr. Vaughan Cornish on "Science Amenities in Town and Country."

An interesting evening lecture by Lt.-Col. C. D. Drew on the recent excavations at Maiden Castle was followed on the last afternoon by an excursion to Dorchester Museum and Maiden Castle under his guidance. An evening reception by the Mayor of Bournemouth, Alderman J. R. Edgecombe, J.P., in the Pavilion, was a pleasant social gathering. The meeting was favoured with fine summer weather.—A. B. RENDLE.

OBITUARIES.

Robert Paulson, F.L.S.

(1857–1935).

Robert Paulson was born at Hendon, Middlesex, on April 24, 1857. From childhood he took delight in natural history, and the influence of a friend led to his making a special study of flowering plants. When Toynbee Hall was in its full vigour as an educational centre, he carried on a voluntary class on botany there. On adopting teaching as a profession, his alert and sympathetic mind made him an inspiring teacher. Besides having a good knowledge of British flowering plants, in later years he devoted much time to lichens, and obtained such proficiency as to enable him to render assistance at the British Museum in identifying specimens obtained on foreign expeditions, such as those to Mount Everest and Spitzbergen. In studying the living lichen thallus he made observations on the relations of the hyphæ with the associated algal cells or gonidia, and, in collaboration with Dr. Somerville Hastings, was able to demonstrate the division of the algal cells within the tissues.

Paulson was a member of the Quekett Microscopical Club, of the British Mycological Society, and of the Royal Microscopical Society, of which he was vice-president in 1918. In 1913 he was elected a Fellow of the Linnean Society. He was a member of the Essex Field Club for thirty-six years, and served as President from 1920 to 1923.

To the 'Essex Naturalist' he contributed articles on various botanical subjects, such as "Birch-Tree Disease in Epping Forest," "The Birch Groves of Epping Forest," "Fungoid Disease in Hornbeams," "Report on Lichens of Epping Forest," "The Ecology of Lichens," "Ten Years' Progress in British Lichenology," and "Mycorrhiza."

He was a man of the most kindly and genial disposition. On a country ramble he was a delightful and stimulating companion, and was ever ready to help others from the wide stores of his knowledge. He died on March 1, 1935, after having suffered for some time from failing powers.—G. Lister.

Joseph Edward Little, M.A.

(1861–1935).

By the death of J. E. Little, January 18, 1935, very suddenly, after a long period of heart weakness, this country lost a very thorough and always helpful field-botanist who had a sound knowledge of British plants in general. He had done useful work on trees and shrubs, some of the results of which were published, with clear illustrations by his daughter, in 'Country-side'—as, for example, "Some Common Poplars," 1928, 100–102, and "The Norway Maple," 1934, 8–10.

The more important of his articles and notes in this Journal between 1916 and 1931 were on Hertfordshire Poplars, 1916; Hertfordshire Plants, 1917; Notes on Bedfordshire Plants, 1919; On North Herts Willows, 1922; *Alnus incana*, 1923; *Rumex obtusifolius*×*R. pulcher*, 1924; and (in collaboration with Dr. Eric Drabble) British Veronicas of the *agrestis* group, 1931 (with drawings by Miss Little). Mr. Little also worked at many critical genera, including *Prunus*, *Rumex*, *Salix*, *Juncus*, *Luzula*, *Sparganium*, and *Carex*.

He was a Vice-President of the British Empire Naturalists' Association (B. E. N. A.) and a helpful contributor to its journal, 'Country-side.' The Rev. Preby. R. J. Burdon, in an appreciation (with portrait) of his old friend ('Country-Side,' 1935, 204), says: "All his life he had been in the habit of studying wild plants and the notes he made on them are full of interest. . . . While at school he began to write a flora of Tonbridge, which was subsequently reproduced in a supplement to the 'Tonbridgian' (1884)." His devotion to the attempt to solve difficulties was apparent in many of the interesting letters the present writer received from Little almost up to the time of his death. Nothing but the most accurate work would satisfy him. He was a scholar in the true sense, and a good linguist. His devotion to Hitchin and the country round is in some measure visualised in his chapter on "Botany" in Mr. Reginald Hine's elegant volume on 'The Natural History of the Hitchin Region,' 1934.

Little contributed many careful notes to the Reports of the Watson Bot. Exch. Club, as well as to those of the B. E. C. For the former Club he thrice managed the annual distribution. His herbarium of British plants, containing 6000 specimens, was recently given to the Botany School at Cambridge.

In one of his last letters to me, dated 28 June, 1934, he confirmed the occurrence of *Primula elatior* in Bedfordshire.

Little was born at Tonbridge, Feb. 12, 1861, the eldest son of the Rev. J. R. Little, and educated at Tonbridge and Lincoln College, Oxford. After holding assistant masterships at Northallerton and Plymouth College he was appointed headmaster of Hitchin Boys' Grammar School in 1889. Retiring in 1897 he did temporary work at Rugby and Haileybury and private coaching, but devoted much of his time to botany.—H. S. Thompson.

Ida M. Roper, F.L.S.

(1866–1935).

Miss Roper was a native of Bristol, where she was born August 25, 1865, and died June 8, 1935. She had been in ill-health for nearly a year, but at times bravely continued her work, particularly for the Bristol Naturalists' Society, of which she had been Hon. Secretary and Editor for nineteen years, Hon.

Librarian for a long time, and was the only woman to become President (1913–1916). Her first Presidential Address was on "Some Historical Associations of Flowers"; that in 1916 on Mistletoe showed wide observation on the host-trees of that parasite. She was elected F.L.S. in 1909.

Very great help was given by her to the late J. W. White in the compilation of his 'Flora of Bristol,' 1912, "not only for field work, but for assistance in literary research and in revision and correction for the press." A widely appreciated labour of love was the thirteen years' collecting and exhibition of local wild plants, both summer and winter, at the Bristol Museum and Art Gallery. Her own well-arranged herbarium of British flowering plants and ferns was given to the University of Leeds not long before her death. Her contributions to the two British Botanical Exchange Clubs were always acceptable.

Miss Roper's knowledge of British Violets was considerable; and one of over a dozen short notes by her in this Journal was on a form of *Viola Riviniana* that she called forma *multiflora* (1922). But her published botanical notes and a few longer articles were of less real importance than the great help she gave in furthering a love of field botany not only in Bristol, but in connection with Societies in various parts of England. Largely for that reason, and her frequent attendance at British Association Meetings, she was widely known, and her cheerful and energetic personality so much appreciated. Her energy and driving power were remarkable. At the British Association Meeting in Bristol, 1930, Miss Roper acted as Local Secretary for Section K. Her work on Plant Galls is acknowledged by the late Col. Jermyn in his "Notes on the Diptera of Somerset," pt. v. (Appendix), in Somersetshire Arch. & N. H. Soc. Proc. for 1922. She was from 1920 a member of that Society and of its Botanical Section Committee. She also served on the Council of the Bristol and Gloucestershire Archæological Society.

Miss Roper also did some useful work in Archæology. She had long been interested in monumental effigies, and had visited nearly every church in Gloucestershire and Bristol and many in Somerset to collect information. This work culminated in 1930 in the publication of a handsome volume on 'Monumental Effigies in Gloucestershire and Bristol.'

A large and representative company attended the funeral service in Bristol on June 12.—H. S. Thompson.

SHORT NOTES.

Plantago lanceolata L. var. anthoviridis Watson.—This variety, to which Dr. Watson first called attention in this Journal (Dec. 1921, 355), seems to be widespread, but rather sparing in occurrence. The characters—more erect stamens on shorter

filaments with greenish-yellow long-elliptic or somewhat lanceolate anthers—are always well marked.

I find there is also an important and rather puzzling difference in the character of the pollen, which in the variety seems to be largely imperfect. In typical *P. lanceolata* the abundant pollen grains are circular in outline, about 0·03 mm. in diameter, and opaque by reason of the granular contents. Plants of the variety which I have recently examined are of two forms. One of these has the anthers on very short filaments, almost sessile in appearance, and as far as I can see no pollen is ripened or shed. The old shrivelled anthers remain closely pressed to the spike quite down to its base and still retain their pollen grains. These are only about half the width of typical grains of *P. lanceolata* and are nearly transparent, lacking the granular contents. Most are circular, but some are irregular in shape, looking as if the envelope has collapsed. The second form of the plant has the filaments considerably longer and the anthers do open and shed pollen. About 10 per cent. of the grains are in size and appearance just like those of typical *P. lanceolata*; the remainder are like the smaller grains described above.—F. Rilstone.

Bromus lepidus Holmb.—*Bromus lepidus* Holmb. (*B. britannicus* I. A. Williams) seems always, or nearly always, to occur in fields sown with *Lolium italicum*, and is therefore presumably introduced with the seed. Of the following records the first three appear to be new county records: Roadside near a farmyard, Belstone, Devon, September 1934. A few plants only. Westfield Farm, Kingston, Dorset, June 1935. Great abundance. Roadside near Antony, Cornwall, June 1935. Field near Fleam Dyke, Cambridgeshire, June 1935. In all cases *L. italicum* was growing mixed with the *Bromus*. The identifications have been verified by comparison with material determined by Mr. I. A. Williams.—T. G. Tutin.

REVIEWS.

Flore Laurentienne. By Frère Marie-Victorin, D.Sc., Directeur de l'Institut Botanique de l'Université de Montréal. 4to, pp. 917, with 22 maps and 2800 text-figs. by Frère Alexandre, L.C., Professeur de Biologie au Mont-Saint-Louis. L'Institut des Frères des Ecoles Chrétiennes, Montreal, 1935.

Professor Frère Marie-Victorin is dealing with the botany of an area to which he has devoted many years of critical study. The present work is not a complete flora of the province of Quebec, but is destined to afford the Canadian French a general knowledge, as exact as possible, of the spontaneous flora of their country, and to supply a manual for the use of teachers and students. In view of its presumed "elementary nature"

a large concept of the term species has been adopted, and varieties and forms have been omitted except where a variety is evidence of an important biologic or phytogeographic fact. But it is certainly a book which may be studied and consulted with profit by all botanists interested in the origin, development, and present state of the flora of the definite area in question. This area and its relation to surrounding areas is indicated by means of sketch-maps. It does not include the whole basin of the St. Lawrence, but the central portion of the river-valley bounded on the north-west by the watershed between the Gulf of St. Lawrence and Hudson Bay, on the north by Lake Saint-Jean, the Saguenay, and the Matapédia River, on the east, south, and south-west by the frontiers of the province of Quebec. The limitation is artificial and represents, not a natural floristic division, but the most densely populated and accessible part of the province. The early French colonists have left traces of their efforts to distinguish the forest trees and other species in popular names, and some of the old Indian names have become common usage, but as contrasted with old countries popular names are few, and the author has adopted a "nomenclature bourgeoise" or "Benthamian"—the translation into French of the Latin binominal which, in the text, follows the botanical name. The system of classification adopted is that of Wettstein's 'Handbuch,' edition 3 (1924), and the nomenclature follows the generally accepted "Rules."

The taxonomic portion is preceded by two general chapters. The first a brief history and bibliography of the botany of Quebec. The second a general sketch of the flora considered under two heads: I. Equilibre actuel; II. Dynamisme. The first is a *résumé* of the factors—physiographic, geologic, climatic, and human—under which the present-day flora subsists, and of the general characters of the vegetation of the different botanical districts of the province. The second pictures the natural "forces of evolution or elimination," which, acting through geologic periods, have influenced and will continue to influence the character of the flora. The scanty and isolated remnants of the Cordilleran flora are cited as an instance of progressive elimination. In addition, man has played a prominent part in change and elimination, which will cease to function with the gradual destruction of our civilisation and the disappearance of the human species!

The preliminary chapters occupy the first 78 pages of the volume; the remainder is a descriptive flora, preceded by a synopsis of the orders and families and an artificial key, especially for the use of collectors, prepared by M. Jacques Rousseau, based largely on obvious characters of habit and leaf. The text includes the Pteridophytes and Seed-plants, and determination is facilitated by keys to genera and species. The descriptions are

short and reduced to striking and differential characters with notes of habit and dimensions. Time of flowering and habitat are indicated, and where it is known the chromosome number. Notes of economic or cultural interest are often included. The illustrations are a helpful feature. They are small figures of habit, leaf, inflorescence, flower, or fruit that are planned to show the differences between the species of a genus or between genera. For instance, the habit of the native arborescent Gymnosperms is illustrated by silhouettes, the distinctive characters of willows and poplars by leaf-sketches, and of Carices by inflorescence, perigynium, and bract. 1568 species, representing 554 genera, are described and figured.

There follow a glossary, a list of authorities for species with their usual abbreviations, and an exhaustive index.

The author records his thanks to numerous helpers, some of whom have undertaken the revision of individual genera, and especially to Frère Rolland-Germain, the companion of his field-work during thirty years, and to the author of the illustrations, Frère Alexandre. And, finally, to the Institut des Frères des Écoles Chrétiennes, which has assumed financial responsibility for publication. The volume is dedicated to the youth of the country, and especially to the ten thousand members of the Cercles des Jeunes Naturalistes.

It is an admirable work, conceived and produced on a generous and attractive scale, and we tender our thanks to all concerned in its production.—A. B. R.

Botany, Principles, and Problems. By EDMUND W. SINNOTT, Professor of Botany, Barnard College, Columbia University. Edition 3. Cr. 8vo, pp. xx, 525, frontisp., and 310 text-figs. McGraw-Hill Book Co.: New York and London, 1935. Price 21*s*.

APART from general revision and additional illustrations—seventy-six in all, of which sixty have been prepared expressly for the book—there are two important innovations in this edition. One deals with the phylogeny and classification of the vascular plants. The terms Pteridophyta and Spermatophyta have been discarded, and the term Tracheophyta is proposed to include the two, and thus to correspond with Thallophyta and Bryophyta. The Psilophytales are regarded as the original stock from which have developed three lines, the Lycopsida (Lycopods etc.), Sphenopsida (*Equisetum*) and Pteropsida, the last-named including Filicineae, Gymnospermae, and Angiospermae. It is a wide and difficult subject to treat in a few pages, but the account will serve as an introduction to more detailed study.

The second innovation is the introduction of a chapter on Morphogenesis or Experimental Morphology, which appro-

priately precedes that on the plant and its environment. The facts of correlation, regeneration, and polarity are indicated and illustrated, and the factors directing growth—chemical, physical and protoplasmic—and their mode of operation are discussed. The author insists on the very incomplete state of our knowledge of the subject and the wide field which still remains open for investigation.

The book, as a whole, follows the lines generally adopted for a full year's college course. An introductory survey is followed by chapters on the cell, the root, leaf, and stem, and their functions, metabolism, growth, development, and morphogenesis, the plant and its environment, reproduction, heredity and variation, plant evolution and the three great groups. It is well written and amply illustrated, mainly with clear line-drawings.—A. B. R.

Some Jamaica Wild Flowers. Described and pictured by M. WALTER. Sm. 8vo, paper cover, pp. 47. Dept. of Education, Kingston, Jamaica, 1934. Price 2*s*.

THIS little pamphlet has been issued, with the financial assistance of the Carnegie Corporation of New York, under the auspices of the Director of Education, who contributes a Foreword. It is a praiseworthy attempt to introduce the wild flowers of Jamaica to the many who must surely be interested in the flora of their beautiful and botanically rich island. Sixty-three species are figured and very briefly described. The arrangement is alphabetical, under English names, presumably those recognised in Jamaica. The botanical name and family are also given. An index including the botanical names would be helpful, as visitors to Jamaica with some botanical knowledge would not recognise the plants under the English names used. It is hoped that a more complete edition will follow—in which case the author might perhaps contemplate a more scientific arrangement of the material. Misspellings of botanical names should also be corrected.—A. B. R.

The Flowering Plants and Ferns of Cardiganshire. By J. H. SALTER, D.Sc. 8vo, pp. vi, 182. Cardiff: University Press Board, 1935. Price 5*s*.

THIS work, which the author modestly states makes no pretence to be a Flora of the county, includes about 890 native or naturalised species, and in addition (in square brackets) a large number of aliens, casuals, and natives either erroneously recorded or now extinct. Dr. Salter, who has evidently explored the county thoroughly, has very carefully scrutinised the records of plants that he has not himself seen ; and very few indeed of the species admitted are included in error. The work is well brought up

to date, and the species of such critical genera as *Rubus*, *Hieracium*, and *Euphrasia* are dealt with in the light of the latest investigations. Interspersed throughout the book are a number of personal observations, some of which are of considerable interest and illustrate the peculiar features of the county flora. The Poppy of the cornfields in Cardiganshire is not *Papaver Rhoeas* but *P. Lecoquii* ; *Geranium pratense* is " probably nowhere native " ; *Cytisus Laburnum* is much grown in hedges ; and the Daisy is said to occur only in enclosed pasture-fields and not on the open sheep-walks. While *Crepis taraxacifolia* is " not common," *Veronica agrestis* is almost ubiquitous in cultivated ground. *Hypericum undulatum* Schousb. is a new county record. *Euphrasia micrantha* Rchb. appears to have been omitted through inadvertence.

A map of the county would have been useful in locating the numerous records, especially as Cardiganshire has not been divided into botanical districts. And the printing of every specific name with a capital letter for the trivial is not in accordance with the rules of nomenclature. A few misprints may be noticed in the text.

These are minor criticisms which but slightly impair the usefulness of the book, and Dr. Salter is to be congratulated on the production of an accurate piece of work that will stimulate students to explore further the upland sheep-walks and other less accessible parts of the county.—H. W. PUGSLEY.

BOOK-NOTES, NEWS, ETC.

'JOURNAL OF SOUTH AFRICAN BOTANY.'—This addition to botanical periodicals is published under the authority of the Trustees of the National Botanic Gardens of South Africa, Kirstenbosch, Cape Province, with the Director of the Gardens, Prof. R. H. Compton, as Editor. It will provide a medium for the publication of work on the South African Flora whether carried out in South Africa or in other countries ; and also on botanical subjects of special interest and application in South Africa. The Journal will appear in four parts of about equal size per annum, and the complete volume will consist of about 200 pages (quarto) of text, together with plates and line-drawings. The annual subscription is 20*s*. per volume. Single parts 6*s*. 6*d*. each. Subscriptions should be sent to the Secretary, National Botanic Gardens, Kirstenbosch. Part I. (pp. 1–45), dated January 1935, contains a valuable critical revision of the genus *Freesia* Klatt and an account of its history, by the late Dr. N. E. Brown ; and under the title " Plantæ Novæ Africanæ," Series I., descriptions of new species of *Hessia* and *Erica* by Miss Barker, Paymaster-Captain T. M. Salter, and Prof. Compton, with three

plates. Part II. (April) (pp. 47–88) contains a discussion of "Some Problems presented by South African Grasses and Grass Communities," by John Phillips, "A Preliminary Study of the Root Development of certain South African Highveld Grasses," by S. M. Murray and P. Glover, an account of the nomenclature of the genus *Peyrousea* DC. (Compositae) with description of a new species, *P. argentea*, from Cape Province, by R. H. Compton, and "Plantæ Novæ Africanæ," Series II., new species of *Oxalis* and *Erica*, by T. M. Salter. Prof. R. S. Adamson supplies book-reviews in each number.

'GENTES HERBARUM.'—Vol. III. fascicles vi. and vii. of Prof. L. H. Bailey's publication give the results of his study of the American Palmettoes and the Royal Palms. The former is a revision of the species of *Serenoa* (one species) and *Sabal* (22 species). The separation of *Inodes* from *Sabal* is shown to be unjustifiable. The endemic Bermuda palmetto is given a new name, *S. bermudana*, as the name under which it is generally known, *S. Blackburnia* Glazebrook, is considered to represent a different species, the origin of which is doubtful. Fascicle vii., entitled "A Preliminary Survey," gives a brief historical account of the genus *Roystonea* and reasons for preferring the name to that adopted by Kunth, *Oreodoxa*, and also a revision of the six known species. Both fascicles are profusely illustrated with photographic reproductions of habit and drawings of structure.

'LONDON NATURALIST.'—In the 'Journal of the London Natural History Society' for 1934 W. Watson concludes his critical notes on the brambles of Kent and Surrey and describes a new species, *Rubus longifolius*, found near Tunbridge Wells. H. J. Burkill gives a list of species found in the dried bed of the River Mole in September 1934, grown from seeds brought by the stream and stranded when during periods of excessive drought the river retires more or less completely to an underground channel. The publication of Botanical Records of the London Area is continued as a supplementary sheet. The Presidential Address, by John E. S. Dallas, dealt with the characteristics of plant-life in the Alps. The Journal records the activities if the Society during the year and includes articles and notes in various branches of natural history.

'LEVERHULME RESEARCH FELLOWSHIPS.'—Grants in aid of research have been made to Mr. R. D'Oyley Good, Dept. of Botany, University College, Hull, for work on a botanical survey of Dorset; and to Prof. J. W. Heslop Harrison, Armstrong College, Newcastle, for genetical and evolutionary studies wth special reference to closely allied species and local races.

RHODODENDRON SEEDS, WITH SPECIAL REFERENCE TO THEIR CLASSIFICATION.

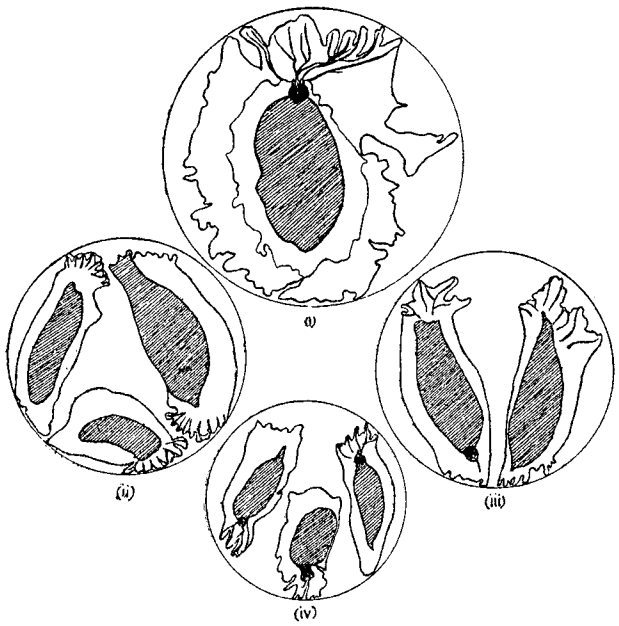
BY F. KINGDON WARD, B.A., F.L.S.

THE work of Mrs. E. M. Reid on late Tertiary floras has proved that their composition, certainly as regards the genera and often as regards the species represented, can be determined from the seeds embedded in clays and lacustrine deposits. Even when these seeds were heavily pyritized, Mrs. Reid successfully recognised either the actual species or its nearest living representative. One may fairly draw the inference therefore that seeds are amongst the most stable parts of the flowering plant; they do not easily change in response to a changed environment, whatever the vegetative parts may do. The classification of plants according to the natural system is based on the comparative morphology of the flower-parts, for the reason that they are regarded as the more stable structures, less likely to be influenced by outside change. But little notice has as a rule been taken of seeds in classification—on the whole, they are found to vary with units proposed on other grounds. In the difficult problem of large genera however, a study of the seeds may give valuable pointers in determining the line of descent, and so in recognising relationships. It will be sufficient to call attention to the obvious seed-differences in such genera as *Iris*, *Primula*, and *Rhododendron*; though I am concerned here only with the last.

Rhododendron is one of the largest genera of flowering plants, embracing possibly over a thousand species. Several classifications have been proposed from time to time, as more species became known; the chief being those of Maximowicz, Hooker, and Bayley Balfour as revised by Wright Smith. While the classifications of Maximowicz and Hooker were based mainly on differences of flower-structure, that of Bayley Balfour and Wright Smith was based mainly on vegetative characters, particularly on leaf-indumentum or its absence. Bayley Balfour was, of course, too good a botanist to discard sound taxonomic principles, and for the most part his groups were natural groups—differences of leaf and of flower went hand in hand. Still there can be little doubt that he, himself a keen horticulturist, was influenced by the enthusiasm of Big Gardening in this country to devise a system of classification which would be simple for the layman to grasp, and applicable at all seasons. This last condition a classification by leaves, of course, fulfilled—the majority of Rhododendrons being evergreen. But whereas the earlier botanists had dealt with at most a few dozen species*, Bayley

* Maximowicz, discussing only the species of Eastern Asia, dealt with 36, not all of which are recognised to-day. Hooker dealt with the Sikkim species, numbering 43. In his 'Flora of British India' 45 species are described.

Balfour was dealing with hundreds, many of which were rapidly coming into cultivation. Botanists and gardeners alike therefore cannot be too grateful to him. Had he not kept pace with the Chinese invasion of Rhododendrons, relating them to the Himalayan species known since Hooker's day, the chaos must quickly have become unmanageable. His work was carried on, with modifications, by Wright Smith. Since this system was propounded, however, the work of discovery has continued. Many new species have been brought to light, and, as inevitably happens, all of them do not fit readily within the framework;



Rhododendron seeds.

Fig. 1.—Forest type. Seed flattened, with all-round wing, sometimes expanded at the ends, less than three times as long as broad. (i.) *R. magnificum* sp. nov. A forest tree, sometimes gregarious. (ii.) *R. arizelum* Balf. f. & Forrest. A gregarious gnarled tree, forest zone. (iii.) *R. Beesianum* Diels. A gregarious small tree, or large shrub, from the forest line, 12,000 feet. (iv.) *R. Thomsonii* Hook. f. A large forest shrub. All ×8.

the only result of forcing them is to create anomalies. The distribution of known species has been extended, and new problems in the evolution of the genus have come to light.

I have no intention of tampering with the principles of the present classification, although I do maintain that it fails to throw much light on the evolution of the genus. It appears

to me to be unnecessarily artificial. But in view of what was said in the opening paragraph, it might be profitable to pay some attention to the seeds of *Rhododendron*. They may be able to tell us something.

Bayley Balfour himself would have been the last to claim finality for his system; but I propose nothing more drastic than an amendment. He, and those who followed him in the preparation of that invaluable book 'The Species of *Rhododendron*,' subdivided the genus into three great groups, according to whether the leaves are glabrous (*Glabratae*), scaly (*Lepidotae*), or hairy (*Lanatae*) beneath; later a fourth group, comprising the Azaleas, was added. This arrangement is not explicitly stated in the work referred to, though it is well understood; but the species (excluding the Javanese and New Guinea Rhododendrons) are divided into 43 sections, which are further subdivided. In what follows I have taken Bayley Balfour's and Wright Smith's sections as they stand.

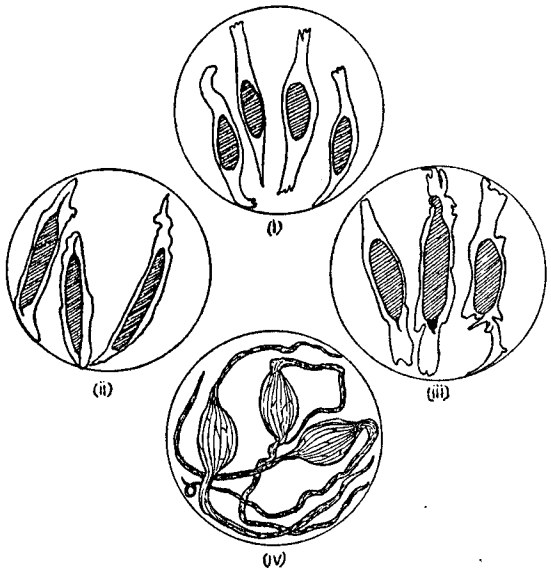
A detailed examination of a large number of Rhododendron seeds has convinced me that they fall into three main groups, which can be defined as follows:—

(i.) Seed flattened, with all-round wing, sometimes very narrow laterally, but then expanded at the ends into broad fins; oval, or narrow-oval, rarely spindle-shaped, less than three times as long as broad; finely striated, coffee-brown or yellow (fig. 1). This type of seed is common to most forest-tree species, whether gregarious or not, and may therefore be called the forest type. Examples in which the length is less than twice the breadth are found in the big-leafed tree species such as *R. arizelum* and *R. sino-grande*, as well as in smaller-leafed species allied to *R. Thomsonii* and in small trees such as *R. Beesianum* and *R. tanastylum*. *R. vesiculiferum* (a species closely allied to *R. barbatum*) and *R. neriiflorum* (which is a shrub) have more spindle-shaped seeds nearly three times as long as broad; but they have well-developed end-fins.

(ii.) Seed prominently spindle-shaped or fusiform, from 4 to 6 times as long as broad, the lateral wings obsolete, the ends drawn out into long tails which are not expanded into fins; usually light in colour; seed-coat finely striated (fig. 2). This type of seed is common to all epiphytic species and to some others. It appears to be a special development of the forest-type, and of course epiphytes are found only in connection with forests. Examples, *R. virgatum*, *R. micromeres*.

(iii.) Seed rounded or angular, without wing or end-tails; seed-coat pitted or striated; often golden yellow (fig. 3). Most alpine Rhododendrons have wingless seeds; we may therefore call this the alpine type. All the typical alpine sections, e.g., *Lapponicum*, *Saluenense*, *Anthopogon* (including *Cephalanthum*), *Glaucum*, *Lepidotum*, and *Campylogynum* have the alpine type of

seed. On the other hand, all alpine species belonging to section *Neriiflorum* have winged seeds—which suggests that these are derived from forest-dwellers. But wingless seeds are not confined to the alpine region ; and this type is perhaps the commonest of all. It is found in sections *Azalea*, *Triflorum*, *Cinnabarinum*, *Scabrifolium*, and *Ovatum*. *R. tephropeplum* also and its nearest allies have wingless seeds.

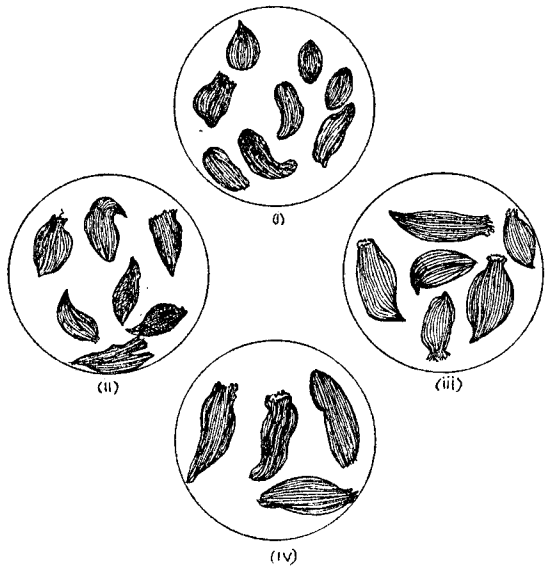


Rhododendron seeds.

Fig. 2.—Epiphytic type. Seed spindle-shaped or fusiform, from 4 to 6 times as long as broad, the ends drawn out into tails, not expanded. (i.) *R. virgatum* Hook. f. Common on rocks and cliffs in the forest belt. Not on trees. (ii.) *R. taronense* Hutch. Epiphytic in hill jungle, rarely on rocks, 6000 feet. (iii.) *R. micromeres* Tagg. Always epiphytic in temperate rain-forest. (iv.) *R. vaccinioides* Hook. f. Always epiphytic in temperate rain-forest. An extreme development of the epiphytic type. All × 8.

Thus the three seed-types do not correspond with the three principal groups (*Glabratae*, *Lepidotae*, and *Lanatae*). The forest-seed occurs both in *Glabratae* and *Lanatae* ; the alpine seed in *Glabratae* and *Lepidotae*. Only the epiphytic seed is confined to one group, *Lepidotae*—for the reason that all epiphytic Rhododendrons belong to the *Lepidotae*. But this is only what we should expect, if we are to attach any importance to the seed-character. For example, the *Lanatae* are mostly forest-trees with the forest type of seed. If we find *Lanatae* in the alpine region, still with

forest-seeds, amongst a majority of species with alpine seeds, it is a reasonable inference that they are recent comers to the alps, and that they were derived from forest-species. Similarly, the *Glabratae* are mostly forest-trees or large shrubs : *e. g.*, sections *Stamineum* and *Thomsonii*. When a species such as *R. selense* ascends to the alpine region, retaining its forest-seed, we may confidently assume that it too is a climber from the forest, and



Rhododendron seeds.

Fig. 3.—Alpine type. Seed rounded or angular, without wing or end tails. (i.) *R. campylogynum* Franch. A gregarious alpine undershrub from 14,000 feet. (ii.) *R. tephropeplum* Balf. f. & Farrer. A gregarious shrub, from the sub-alpine region and forest line, 10,000–11,000 feet. (iii.) *R. racemosum* Franch. A gregarious semi-alpine undershrub. (iv.) *R. hippophaeoides* Balf. f. & W. W. Sm. A gregarious undershrub, alpine moorland. All × 8.

probably a newcomer. The forest type of seed is mainly confined to the forest, and gives us a hint of the derivation of species found beyond the forest-belt, but retaining the characteristic seed. The same argument applies to the alpine type of seed. Alpine seeds are found in the forest-belt (*e. g.*, section *Ovatum*). The alpine type is probably the more primitive, since it sounds more reasonable to develop a wing, in accordance with special requirements, than to lose one already acquired through disuse. Moreover, the sections with wingless seeds are the most widely spread. Granting then that the forest-species with wingless seeds may be supposed to have been derived from alpine species,

we may assume that they got left behind after the retreat of the ice, and adapted themselves to a new mode of life. Moreover, the flower of *R. triflorum* and its immediate allies—those of subsection *Triflorum*—is highly specialised, and must be a recent evolution. In its working parts, it resembles the flower of *R. saluenense*, and the two sections probably had a common origin.

The seed-character may be used to decide relationships otherwise doubtful. Thus several species provisionally associated with *R. triflorum* are found to have winged seeds. Flower- and leaf-character would justify their inclusion either in section *Triflorum* or in section *Maddeni*; the seed-character settles the question in favour of section *Maddeni*. Thus three species (*R. kasoense*, *R. concinnoides*, and *R. flavantherum*) should be removed from section *Triflorum*.

On the other hand, although the yellow-flowered *R. chrysolepis* has the epiphytic type of seed, that is no reason for associating it with the very different *R. Boothii*. The flower of *R. chrysolepis* suggests rather section *Maddeni*, where also we find species with epiphytic seeds. Section *Boothii* itself, as at present constituted, includes species which have no close connection with one another. *R. aureum*, for example, with its tubular corolla and long style, is not closely related to the highly specialised *R. Boothii*, which has an almost rotate corolla and a short hooked style, even though its seeds (of the epiphytic type) are somewhat similar. On the other hand, *R. tephropeplum*, whose flowers resemble those of *R. aureum*, has alpine seeds; nevertheless, it comes nearer to *R. aureum* than it does to *R. Boothii*, and nearer still to *R. glaucum*, with which perhaps it should be associated, since that too has alpine seeds. *R. aureum*, in its seeds, resembles the not dissimilar *R. virgatum*, which has been associated with *R. racemosum*, mainly on the grounds that both have axillary flowers. It seems probable that *R. aureum* and *R. virgatum* are more closely related than *R. virgatum* and *R. racemosum*.

Section *Lepidotum*, too, has had species thrust upon it which seem to find their true affinity elsewhere. *R. lepidotum* itself and several similar species have, it is true, alpine seeds; so also have *R. imperator* and *R. uniflorum*, which have been placed in the same section—assuredly not for that reason. There resemblance ceases. *R. lepidotum* has the rotate corolla and short hooked style typical of section *Boothii*; *R. imperator* has the more usual funnel- or trumpet-shaped corolla and long style seen in *R. tephropeplum*. To associate *R. imperator* with *R. lepidotum* is to do violence to the flower-structure in order to magnify the seed-character. But the seed-character, though important, is nevertheless a single character, and must not be given special privileges.

I have confined my observations to the seed, because it has hitherto been overlooked in discussing relationships in *Rhododendron*. But I have something to say about flower-structure also, though not now; flower-structure has hardly attracted the attention it merits, though it has not been entirely neglected. The leaf alone has received undue attention. Even here, scant notice has been taken of seedling plants, although it is in the very young stage that they may give valuable hints as to their origin and descent. I have notes on these aspects of the problem*; but to discuss them here would indefinitely lengthen this paper. They may well be left—to be added to as occasion arises—until the whole question of revision comes up again. Meanwhile, I have drawn attention to a too long neglected point.

I have to thank Miss C. L. Howland of the Department of Botany, Natural History Museum, for making the drawings.

Rhododendron magnificum, sp. nov. Sect. *Grandis*, *R. protisto* Balf. f. & Forrest et *R. sinograndi* Balf. f. & W. W. Sm. affinis, sed a priore indumento manifestius arachnoideo, a *R. sinogrande* indumento sparso laxoque et corolla infundibulare roseo-purpurea differt.

A tree 40–60 ft. high. *Leaves* oval, broadest at or just above the middle, 20–32 cm. long, 10–14 cm. wide, indumentum thin, rather loose, snow-white, tending to disappear on old leaves; petiole 3·75 cm. long. *Inflorescence* a compact raceme of about thirty flowers. *Calyx* an 8-lobed rim, both it and the short pedicel pubescent. *Corolla* rosy-purple, unmarked, with eight darker pocket-glands at the base, narrow-bell-shaped, 8-lobed, 6 cm. long, 5 cm. wide, rather fleshy. *Stamens* 16, shorter than the corolla, slightly unequal, longest 3·75 cm., shortest 2·7 cm., glabrous; filaments white, anthers chocolate. Style 4 cm. long, crimson; stigma capitate. *Ovary* conic-truncate, fluted at the base, densely white-tomentose, 16–20-celled.

Burma–Tibet frontier, Adung valley; 28° 10′ N., 97° 40′ E. Scattered through the temperate rain-forest, especially lining the river at 6000–8000 feet. Flowers February, March. Kingdon Ward 9200 (type in Herb. Mus. Brit.). Also K. W. 9301.

NEW GIANT LOBELIA FROM RHODESIAN MANICALAND.

By H. B. Gilliland, B.Sc., F.L.S.

The plant described below was found during a botanical tour in Rhodesian Manicaland about three miles north-east of Penhalonga. There was a little group of about fifty plants. Mrs. Strickland, who knows Manicaland well, assured me that she had not met nor heard of the plant elsewhere, nor had the natives.

* *I. c.*, the classification, descent, and distribution of *Rhododendron*.

On returning to Salisbury recently, I find with the aid of Miss E. A. Bruce's excellent paper in 'Kew Bulletin,' no. 2, of 1934, that this new species belongs to the rather primitive group characterised by the reddish flowers, ovoid minute seeds without a winged margin, and lax inflorescence. These of the "Longisepala" series occur at low altitudes (3000–8000 ft.), and are woodland rather than mountain grassland plants. The new species agrees with this, occurring in kloof forest in the *Acacia abyssinica* zone between the mutsatsa (*Brachystegia Bragaei*) and the mountain grassland at an altitude of 4500 ft.

Lobelia (*Tylonium* : *Longisepala*) **Stricklandae,** sp. nov. *Herba* altissima verisimiliter monocarpica, inflorescentia 3–4 m. alta spicato-racemosa, foliisque pilosis, ab iis gregis *Longisepalae* inter alia facile distinguitur.

Caudex sub inflorescentia usque ad 1 m. alt., 4–8 cm. crass., in foliis rosulatis terminatus. *Folia* decidua lanceolata vel ovato-lanceolata, basin versus angustata, vix amplexicaulia, apice acuminata, margine acute dentata, supra plus minusve glabrescentia, subtus in nervis præsertim pilosa, 15–20 cm. long., 5–9 cm. lat. *Inflorescentia* 3–4 m. alt., ramis brevibus multis in axillis bractearum quam foliis breviorum et crassiorum, racemo denso multifloro terminantibus; bracteis anguste lanceolatis, quam pedicellis pilosis (1·5–2 cm. long.) vix longioribus. *Calycis* segmenta anguste-lanceolata (1–1·5 cm. long.), ovario duplo longiora, fructu persistentia. *Corolla* anguste-cylindrica, 2·5 cm. × 0·6 cm., punicea glabra, segmentis 5, apice minute puberulis, duobus lateralibus ad basin, intermediis ad $\frac{1}{3}$ longitudinis divisis. *Filamenta* 1–1·25 cm. long., glabra; antheris 0·7 cm. long., dorso pilosis. *Ovarium* subhemisphæricum 15–20-nervosum, hispidum, stylo 1·75–2 cm. long., stigmate bilobato. *Fructus* 0·6 cm. × 0·9 cm., subhemisphæricus; semina minuta glabra haud marginata.

Hab. RHODESIAN MANICALAND. Penhalonga, Oct. 1934. "Plant of 14–20 ft. A long raceme of pinkish-purple flowers is thrown up from a rosette of leaves crowning a short stout stem; leaves deciduous early after the commencement of flowering. In flower and fruit in October in a kloof on Mrs. Strickland's farm, 'Nodzi.'" *Gilliland* 728 (Typus in Herb. Mus. Brit.).

MELAMPYRUM PRATENSE L.

By C. E. Britton.

LITTLE has been done in recent years in adding to the knowledge of the distribution within the British Isles of the many forms of *Melampyrum pratense* L. It may be said that what is already known was due to the late Dr. G. C. Druce. The species was

one in which he took particular interest, and all his herbarium material illustrating it in Britain was at the disposal of Gustave Beauverd when the latter prepared his elaborate monograph on the genus *Melampyrum*. The valuable collection of the Druce Herbarium is of the utmost importance in the study of British forms, from the extent of the material and from the circumstance that all specimens bear Beauverd's determinations and notes. For the opportunity of studying these plants I am greatly indebted to the Trustees of Dr. Druce. Detailed descriptions of the principal forms have been drawn up from material authenticated by Beauverd, and will appear in the 1934 Report of the Botanical Society and Exchange Club. The present notes chiefly refer to plants in private herbaria, in the herbarium of the British Museum (Natural History) (abbreviated Herb. Mus. Brit.), and in the herbarium of the South London Botanical Institute. The unsatisfactory division into two subspecies, *eu-pratense* Beauv. and *vulgatum* Beauv., is ignored, as well as the cumbersome citation adopted by the monographer.

"MELAMPYRUM PRATENSE L. c. FOLIATUM Neum." This variety appears in the 'British Plant List,' ed. ii. (1928), followed by particulars of the distribution, "Sussex, Tyrone." The varietal name was first introduced to British botanists by Druce in his paper on "The Genus *Melampyrum* L." in the B. E. C. Report for 1917 (Sept. 1918). This paper dealing with the British forms was based on the then recently-issued Monograph of Beauverd. At that period, owing to war conditions, Druce's plants were still in the possession of Beauverd. It does not appear that, when the plants ultimately reached Druce, any attempt was made to rectify errors or remove misconceptions, and "var. *foliatum*" is a case in point where further investigation was desirable, for the Druce Herbarium contains no plants identified by Beauverd as *foliatum*. The Monograph gives the British distribution as *Hibernia*, "Clogher Valley," Tyrone, vii. 1907, c. L. Peck (in Herb. Druce !) and *Anglia*, "Graffham, in Middlehath [Middleheath] Wood, Sussex," leg. Lacaita (the plant of this collector being distinguished as "f. nov. *laxum* nob."). The Clogher Valley plant was distributed through the Botanical Exchange Club in 1907. An example is in Herb. Mus. Brit., and the Druce Herbarium contains those referred to by Beauverd, but the latter specimens are determined "*Melampyrum pratense* ssp. *eu-pratense* var. *typicum* Beck (f. *luteum* Blytt ?) without any indication of belonging to sub-var. *foliatum*. As to the Sussex plant, an excellent set is in Herb. Mus. Brit., all authenticated by Beauverd. A careful study of these has led me to form the opinion that they cannot be associated with the Irish plants named var. *typicum*, nor can they be placed to the sub-

var. *foliatum* of Beauverd. According to the descriptions of the latter, *foliatum* is without any intercalary leaves, and the inflorescence begins at the 2nd or 3rd node. The Graffham form (f. *laxum*) is further characterised by the more elongated internodes (40–100 mm.) and by the inflorescence beginning at the 4th node.

The British Museum material referred to shows some divergences from the description, for it is only the median internode that is conspicuously lengthened (8–10 cm.), the lower nodes being 2–3 cm. apart. The inflorescence may begin at the 5th node, and as to intercalary leaves one pair may be present. In the characters of the inflorescence commencing at the 4th or 5th node, and in the absence of intercalary leaves or the presence of one pair of these organs, affinity with var. *lanceolatum* is indicated, and the plants of Lacaita appear to be no other than the early summer condition of that widely-spread variety, and later-gathered specimens are likely to have presented quite a different aspect. If there was an error in identification (as I believe), it probably arose from attaching too much importance to the secondary coloration of the corolla—"*pallide lutea, post anthesin lilacina.*"

Characters that Beauverd assigned to his *eu-pratense* (corolla ultimately becoming purple) and to ssp. *vulgatum* (corolla becoming blackish or brown), whatever may be the case on the Continent, cannot be relied on as a distinction between the two in Britain, for it may commonly be observed that among colonies of *M. pratense* individuals that grow in the more exposed situations, where the sun reaches, have empurpled corollas.

Fresh plants, of lax growth, with erect or ascending non-flowering branches, and with yellow corollas becoming pale purple were gathered by my friend Mr. A. Beadell at Chelsham, Surrey. Two gatherings of this form were distributed through the Botanical Exchange Club, 1934. No. 4127 A, collected 15. 6. 1934, closely agrees with descriptions of sub-var. *foliatum*, and fairly matches Lacaita's plants in Herb. Mus. Brit. The later gathering, No. 4127 B, 10. 7. 1934, made for the purpose of establishing the identity of the form, with its narrow leaves, widely-spreading branches, with secondary branches, all flowering, and with palmatifid upper bracts, clearly shows that the plant must go to subsp. *vulgatum* and to var. *lanceolatum* Spenn.

Var. TYPICUM Beck. V.c. 92, S. Aberdeen—at about 2000 ft., beside Allt a Chlaiginn, Glen Callater, 5. 7. 31, *R. Mackechnie* (in Herb. Wallace). I have compared this gathering with the Clogher Valley plants of the Druce Herbarium, and find that they agree in all respects.

Var. ALPESTRE Beauv. (as the sub-var. *scotianum* Beauv.). V.c. 89, E. Perth—Ben-y-Vrachie, c. 2600 ft., 2. 7. 1930, *R. Mackechnie* (in Herb. Wallace); v.c. 110, O. Hebrides—Ullaval above 1000 ft., 16. 7. 1897, *W. S. Duncan* (Herb. S. Lond. Bot. Inst.)

Var. ERICETORUM D. Oliver. V.c. 5, S. Somerset—Wheddon Cross, 16. 7. 1929, *E. C. Wallace*; v.c. 14, E. Sussex—Horsted Keynes, 18. 9. 09, *R. S. Standen*; Cross-in-Hand, *Jos. Woods* (3771); v.c. 17, Surrey—several localities in the Leith Hill and Hurt Wood districts; v.c. 18, S. Essex—High Beech, 2. 7. 1876, *A. French* (as var. *montanum*), Herb. Mus. Brit.; v.c. 58 Cheshire—Knutsford Heath, June 1870, *J. L. Warren*; v.c. 86 Stirling—Rowardennan, 25. 6. 27, *R. Mackechnie* (in Herb. Wallace); v.c. 88 Mid-Perth—Cairn Chois and Glen Turret, *R. Mackechnie*; pasture near Ben Lawers Hotel, *E. C. Wallace*; v.c. 92, S. Aberdeen—Braemar, *E. C. Wallace*; v.c. 100, Arran—Lamlash, *R. Mackechnie* (Herb. Wallace).

Var. COMMUTATUM (Tausch) Beck (including sub-var. *concolor* (Schönheit) Beauverd). V.c. 16, W. Kent—Pilgrim's Way, near Trossley Towers, *J. E. Lousley*; v.c. 34, W. Glos.—wood below Dents Pulpit, 16. 6. 1912, *H. J. Riddelsdell* (Herb. Mus. Brit.); v.c. 35, Monmouth—Wind Cliff, ex herb. *E. Forster* (Herb. Mus. Brit.); v.c. 69, Lake Lancashire—Old Hall Wood, *E. Hodgson* (Herb. Mus. Brit.).

Var. VULGATUM (Pers.) Beck sub-var. LAURIFOLIUM Beauv. V.c. 7, N. Wilts—Foxbury Wood, *C. P. Hurst*; v.c. 9, Dorset—Swanage, *H. N. Ridley*; v.c. 10, Isle of Wight—Luccombe Chine, *A. H.* ex Herb. *Townsend*; v.c. 12, N. Hants—Bishopstoke, 1896, *C. Cotton* (Herb. Mus. Brit.); v.c. 15, E. Kent—Wye, *E. S. Marshall* (Herb. Mus. Brit.); Queendown Warren, Maidstone, *Boswell Syme* (Herb. Mus. Brit.); v.c. 16, W. Kent—Darent Wood, *Boswell Syme* (Herb. Mus. Brit.); v.c. 22, Berks—Pangbourne, *W. W. Newbould* (Herb. Mus. Brit.); v.c. 23, Oxon—Goring, *Druce* (Herb. Mus. Brit.); v.c. 37, Worcester—Astley (Herb. Mus. Brit.).

Var. OVATUM Spenn. V.c. 2, E. Cornwall—Trelawny Woods, near Looe, 26. 5. 1900, *A. O. Hume* (as var. *montanum* Johnst. in Herb. South London Bot. Inst.); v.c. 15, E. Kent—Boxley Hills, *W. H. Beeby* (Herb. S. Lond. Bot. Inst.); Wye, *E. S. Marshall* (Herb. S. Lond. Bot. Inst.); Rochester, *Boswell Syme* (Herb. Mus. Brit.); Hartlip, *H. N. Ridley* (Herb. Mus. Brit.); v.c. 16, W. Kent—Cuxton, *H. N. Ridley* (Herb. Mus. Brit.); v.c. 17, Surrey—Ranmore, *W. H. Beeby* (Herb. S. Lond. Bot. Inst.). This, which is the var. *laurifolium* of Salmon's Fl. of Surrey, still occurs where Beeby gathered it nearly 50 years ago! V.c. 22, Berks—Pangbourne (Herb. Mus. Brit.); v.c. 23, Oxon—Goring, *E. S. Marshall* (Herb. Mus. Brit.); v.c. 33, E. Glos—Crickley, *J. W. Haines*, July 1923 (Herb. Mus. Brit.); v.c. 34, W. Glos—Pennal, *H. J. R.*, 16. 6. 1912 (Herb. Mus. Brit.).

Var. LANCEOLATUM Spenn. No doubt the most common form of the species. V.c. 14, E. Sussex—Fishers Gate, *E. C. Wallace*; v.c. 16, W. Kent—Hosey Common !—Toy's Hill, Ide Hill, *A. Beadell*; v.c. 17, Surrey—Walton-on-the-Hill !, Coldharbour Common !, between Chiddingfold and Hascombe, *W. Johnson*; Margery Wood, Tandridge, Limpsfield Chart, Moorhouse Bank, *A. Beadell*.

NOTES ON *RUBI*.

By WILLIAM WATSON.

(Concluded from p. 198.)

V. *RUBUS LEJEUNEI* WH.

Rubus Lejeunei Wh. remains largely an unknown bramble to English botanists. The 'Handbook' gives it for Brecknock only, on Focke's authority. Focke himself gives it for Surrey, and states in his last work (1914) that he has seen it also from the Midlands and from Wales. He also gathered it in Dorset. This suggests that it is a well-distributed bramble in this country.

The root of the difficulty has been that some mistaken details are included in the original description. Weihe and Nees state that the leaves of *R. Lejeunei* are green beneath, the petals large, roundish, rose-red, and the filaments rose-red or purple. Turning to their plate, however, one finds that the leaves are depicted greyish-green beneath, with white veins, and the petals elliptical (14 mm. × 8 mm.), pink at first, but bleaching to white. (The artist has drawn the inflorescence in a state which surely was never seen in nature: the lower parts of the branches bear well-advanced fruits, while the terminal and subterminal flowers are in bud or have just unclosed.)

Focke (1902) gives a true description of the leaves and flowers, and has understood the plant. Most other authors have copied the erroneous parts of the original description, and it is doubtful whether they have had any acquaintance with the living plant.

Focke recorded *R. Lejeunei* from near Godalming (Surrey) in Abh. Nat. Ver. Bremen, xii. 359 (May 1892). In September 1894, on seeing the living plant in Surrey and Berks, he suggested that it *might* prove to be *R. ericetorum* Lef. Focke had at that time just published an account of the German and Swiss Rubi in Koch's 'Synopsis' (1892), in which he had said that *R. Lejeunei* had leaves green beneath and styles greenish, and *R. ericetorum* leaves adpressedly grey-felted beneath, petals oblong or elliptical, pink, and styles sometimes reddish. He had evidently not yet discovered the mistakes in the description of *R. Lejeunei*, and the Surrey and Berks plant agreed better with his own description of

R. ericetorum, so far as the leaves and flowers were concerned. It must have been on the same visit to England that he took seed and specimens of the same plant from Dorset, which he finally named *R. Lejeunei* (see 'Flora Bournemouth,' 1900, where the plant is called *R. Lejeunei*, W. & N.? on page 8, but *R. Lejeunei*, W. & N. var. *ericetorum* Lef. on page 85).

Sudre says (Bull. Soc. Bot. Belg. 1910, 207) that Focke sent him under the name of *R. Lejeunei* a bramble of which he had obtained seed in the south of England—in 'Rubi Europæ,' he says, from Dorset—and which he had cultivated in his garden at Bremen. By 1902 Focke had discovered and corrected the erroneous characters in the original description of *R. Lejeunei*. His communication to Sudre, therefore, must be regarded as his mature decision that the English plant was *R. Lejeunei* and not *R. ericetorum*; and it is in line with his record of the Godalming plant as *R. Lejeunei* in 1892. Apparently no author other than Focke has expressly identified the well-distributed English bramble in question as *R. Lejeunei*.

I have myself met with this plant in the field in West Kent, South-west and North Surrey, West Sussex, and Berks, and have always found it with leaves greyish-white felted and pubescent beneath, panicles long, lax, and broad, and diminished upwards, the rachis felted and loosely pilose, the flowers large with petals elliptical-obovate, pink to pinkish-white with a yellowish claw, the stamens long, white (reddening), and the styles reddish-based. It is also abundant around Killarney.

When Weihe and Nees described *R. Lejeunei* they mentioned that the plant grew in the neighbourhood of Malmedy and Spa, where it had been found by Libert and Lejeune. In another place they give Malmedy as the "patria," without mention of Spa. It seems evident that Weihe and Nees knew the plant only through specimens and notes supplied by Lejeune, who communicated his finds to Weihe for many years. It is impossible that the description of the flowers given by Weihe and Nees can have come from the specimen which the artist painted. It must have been derived from another specimen, or from notes contributed by Lejeune.

A hint of the possible cause of the confusion is obtainable from the synonyms put by the authors at the head of their description. They state that their plant is the same as the *R. Lejeunei* Weihe of Lejeune in 'Revue de la Flore de Spa,' 100. There one reads that this in turn is a synonym of *R. fruticosus* of Fl. Spa, i. 133. This second synonym is quoted by Weihe and Nees exactly as printed in Fl. Spa, p. 133 being put in mistake for p. 233. It seems, therefore, that Weihe and Nees did not look at Fl. Spa, i. 233, which gives Lejeune's description of his *R. fruticosus*, nor to a later page in the Rev. Fl. Spa, on which Lejeune states that the *R. fruticosus* of Fl. Spa

was a variety of *R. discolor* W. & N., and not *R. Lejeunei* Weihe, a glandular bramble, he says, to which he had improperly referred it.

What the variety of *R. discolor* really was, it is impossible to say from Lejeune's brief notice; but there is more than one discolorous bramble in the neighbourhood of Spa and Malmedy, e. g., *R. ulmifolius* Schott and *R. vestitus* W. & N., that may have supplied the description "petala orbiculata, magna, rosea: stamina purpurea (vel rosea)," which Weihe and Nees took over for their *R. Lejeunei*.

VI. *Rubus adscitus* Genev.

Three different brambles have come to be known in this country as *Rubus adscitus* Genev., and are comprised under that one name in the 'Handbook.' The true *R. adscitus* was gathered by J. G. Baker at Colwell Heath, I. of Wight, in 1866 (specimen in Hb. Kew.), and was identified correctly by him. The plant was also collected by Briggs in that locality, as well as in many parts of Devon, Cornwall, and Somerset; and in 1871 he wrote a paper in the *Journal of Botany* identifying the bramble entirely with Genevier's *R. adscitus*. Briggs's specimens are in Hb. Mus. Brit. and are certainly *R. adscitus* Genev.

The first fascicle of the Set of British Rubi contained two sheets under the name *R. adscitus* Genev., in accordance with the announcement accompanying that fascicle that "in some cases in which considerable variation appears to arise from differences in situation, soil or climate we have given two sheets under one cover." One of these sheets was collected by R. P. Murray at Dulverton, Som. There is a specimen in Hb. Mus. Brit. and it is in my opinion, as the label names it, *R. adscitus*. The specimen was determined by two or more of the editors of the Set, as a notice in the first fascicle states, and the name was subsequently confirmed by Sudre (Obs. sur Set of British Rubi, 1904). I have met with *R. adscitus* myself in Somerset, at Hopcott Common, eleven miles from Dulverton, and have seen another Somerset specimen in Hb. Mus. Brit. collected by Briggs on Blackdown.

That Rogers knew *R. adscitus* is further shown by a specimen in Hb. Kew, which he collected at Brentnor, S. Devon, and named *R. adscitus*, and likewise by his statement in Journ. Bot. 1898, 87 (under *R. micans*), that the plant occurred in Jersey and Brittany, and in Normandy was "certainly one of the commonest brambles, and usually identical with Genevier's own specimens of his *adscitus*, and our typical south-west England form."

R. adscitus Genev. occurs in Britain in v.c. 1, 2, 3, 4, 5, 10, and 69. It is reported for the north, north-west, and the west of France, with its northerly limit on the latitude of Rouen.

Rubus prolongatus Boul. & Let.

The second sheet issued in the Set of British Rubi under the name of *R. adscitus* Genev. was collected near Wareham and Corfe, Dorset, in which neighbourhood I have myself seen the plant in question. This bramble is not correctly identified as *R. adscitus*. Rogers regarded it as *R. adscitus*, but not typical, and refers to it in the note following the description of *R. micans* in the 'Handbook,' thus: "sometimes the stem though very hairy is destitute of all acicular and glandular development, while the panicle is nearly or quite eglandular." I have met with this bramble in a good many stations between Caernarvonshire and Kent, and have records of its occurrence in v.c. 1, 4, 9, 14, 16, 17, 35, 36, 41, 45, 46, and 49. On the other side of the Channel it is said to be rather common opposite to Dorset and the Channel Isles. It is well described under the name of *Rubus prolongatus* Boul. & Let. in Corbière's Fl. de Normandie (1893), 203. Boulay has it as *R. hypoleucus* L. & M. subsp. *R. prolongatus* Boul. & Let. Sudre gives a figure of it.

Rubus conspersus, sp. nov.

A third plant was consistently determined by Rogers as *Rubus adscitus* Genev. (*R. micans* when that name temporarily superseded *R. adscitus*), but it was not issued in the Set. It, however, seems to be referred to in the 'Handbook' under *R. micans* in the words: "sometimes . . . the panicle is . . . narrower, more cylindrical and with nearly straight rachis." I have seen in Hb. Mus. Brit. and in Hb. S. London Bot. Inst. specimens of this bramble collected by Rogers in Wolmer Forest, N. Hants, v.c. 12, and on Lodsworth Common, W. Sussex, v.c. 13, named by him in each case as *R. micans*. I have met with it myself in many places in W. Sussex, v.c. 13, and S.W. Surrey, v.c. 17. It seems to be distributed over an area of at least 150 square miles. I have failed to learn of its occurrence abroad or of any name for it As in *R. adscitus* itself, the quantity of stalked glands on the stem varies, sometimes being sufficient for the *Radulae*, when it approaches *R. Genevieri* Bor., especially the form of that bramble which has relatively short and dense, nearly leafless panicles (see Focke in Ascherson and Graebner, Synop. 1902–3, vi. 563). The form of the leaves and petals, however, and its stouter habit stand in the way of its being brought satisfactorily under that species; and I have therefore prepared the following description of it as a new species:—

Rubus conspersus, sp. nov. *Turio* primum pallide viridis deinde rufescens, faciebus leviter impressis, pilis divergentibus glandulisque brevissimis sparsis vel interdum sat densis aculeisque flavescentibus robustis haud crebris præditus. *Folia* quinata

mediocria vel majuscula ; petiolus crassus, supra planus ; foliola undulata, inæqualiter serrato-dentata, subtus albo-virentia, molliter pilosa, terminale obovatum. *Ramus* elongatus pæne rectus robustus obtusangulus pilosus tenuiter glandulosus, aculeis debilibus declinatis armatus. Folia superiora subtus alba, foliola terminalia rotundato-cuneata. *Paniculæ* angustæ congestæ obtusæ ramuli remoti imis ab axillis sero egressi summam paniculam sæpe æquantes vel exsuperantes. *Flores* speciosi incurvi ; petala magna lata undulata elliptica vel in umbrosis aliquanto scutulata, roseola ; sepala cinerascentia glandulis aciculisque minutis adspersa, sub anthesi reflexa postea patula appendicibus erectis ; stamina alba stylos pallidos æquantia vel super eos parum eminentia. *Carpella* juniora pilosissima. *Fructus* majusculi ovoidei sapidi.

Hab. Witley, Surrey, August 1934. Type in Hb. W. Watson.

The young stem is greyish-green, becoming as it grows mottled or wholly light red. The young leaves are olive-green with bronze margins. In woods the panicle develops strongly and is then pyramidal and may be leafy nearly to the apex, the large flowers often having broadly lozenge-shaped petals. The leaves white beneath distinguish it from *R. Schlechtendalii*. It goes best in the *Vestiti*.

The three foregoing brambles differ throughout from one another, and cannot be associated. They may be distinguished as follows :—

(1) Rachis very flexuose. Terminal leaflets oval with compound teeth. Stamens a good deal longer than the styles. Young carpels glabrous ..... (2).
(1) Rachis nearly straight. Terminal leaflets broadly obovate, with unequal, coarse, hardly compound teeth. Stamens equalling or only slightly exceeding the styles. Young carpels very pilose..... *conspersus*.
(2) Terminal leaflets coarsely toothed, sublobate. Stem and panicle a good deal glandular. Prickles weak and small and straight ..... *adscitus*.
(2) Terminal leaflets finely but doubly serrate-dentate, ending in a rather long, slender, sharp point. Stem and panicle hardly at all glandular. Panicle armed with many strong, declining, and curved prickles.... *prolongatus*.

SHORT NOTES ON SOME INTERESTING BRITISH PLANTS.

By J. Edward Lousley.

A number of plants noted by the writer during the last few years appear to be of sufficient importance to justify a brief note rather than a mere record in each case. Some of these have been brought together here in order that British botanists may have the full facts in a convenient form.

Spergularia Bocconei (Soleir.) Steudel × S. salina Presl. A few specimens of *Spergularia Bocconei* (Soleir.) Steudel (*S. atheniensis* Asch. & Schweinf. ; *S. campestris* (Kindb.) Willk. & Lange) were gathered at the usual place at Par Harbour, East Cornwall, on June 14, 1934. Amongst these was one specimen which had been selected as being rather different from the remainder of the otherwise very uniform population. It was larger, with fewer-flowered, less crowded heads, with much longer deflexed fruiting peduncles (about equalling the calyx in length), and longer stouter leaves. The fruits were very similar to those of *Bocconei*, but a trifle larger. In these characters it showed distinct evidence of *salina* parentage, and appears to be the hitherto unrecorded hybrid *Bocconei* × *salina*.

Epilobium adenocaulon Hausskn. Mr. G. M. Ash has identified specimens collected by the writer from "Roadside ditch between Hever and Edenbridge, West Kent. Aug. 4, 1930," as belonging to this interesting species. The plant from "Moist roadside, near Brook, Witley, Surrey, July 13, 1930. (Ref. B. 20)" (Rep. Watson B. E. C. 1930–31, 73), on which the referees disagreed, he determines as "*Ep. adenocaulon* × *montanum*."

Bidens cernuus L. sub-var. rugosa Coss. & Germ. *Bidens cernuus* normally has the stem glabrous, as drawn in E. B. t. 1114, and described in many Floras, or with a few hairs. On the Green at Breamore, S. Hants, on Sept. 9, 1934, an interesting form with the stem clothed in numerous prominent patent yellow bristles was plentiful. Mr. N. D. Simpson suggested that this might be the sub-var. *rugosa* which Cosson & Germain (Fl. des Environs de Paris, 488, 1861) described as "Tiges et rameaux rugueux-scabres parsemés d'aiguillons sétiformes courts." This variety is evidently rare in Britain, as the only other specimens of it in the writer's herbarium are from Heckfield, Berks, Oct. 1, 1928.

Carduus pycnocephalus L. (restr.). On the Hoe, Plymouth, June 10, 1934, attention was attracted by two thistles of very different habit growing amongst planted shrubs near the lower road. One was clearly *C. tenuiflorus* Curt. in a form common on the south coast of England. The other, more slender plant, may be referred to *C. pycnocephalus* L. (restr.). These two species are now regarded as abundantly distinct by continental botanists, and are well illustrated by H. Coste (Fl. France, ii. nos. 2040 & 2041, p. 379 ; 1903) and Hegi (Illustr. Fl. von Mittel-Europa,

vi. 2, figs. 559 & 560, p. 863 ; 1929). They may be contrasted as follows :—

C. tenuiflorus Curt.	*C. pycnocephalus* L.
A very spiny plant with broadly winged stems ; the wings extending right up to the anthodes, often terminating in a small bract-like leaf.	A rather "softer" plant, less spiny, with narrowly winged stems. The anthodes on naked peduncles.
Anthodes small (7–9 mm.), subcylindrical, usually aggregated.	Anthodes larger, ovoid-oblong, solitary, or up to 4 in a head.
External phyllaries white and scarious at the margins.	External phyllaries lacking scarious margins.
Internal phyllaries acuminate, exceeding the florets.	Internal phyllaries more sharply acuminate, and shorter than the florets.
"Atlantic" type of distribution.	"Mediterranean" type of distribution.

The restricted *C. pycnocephalus* was first recorded for Britain by Isaiah W. H. Keys (Fl. Devon & Cornwall, iii, 33; 1868), from under the Hoe at Plymouth. In 1872 specimens of apparently the same plant were distributed through the Exchange Club by F. O. Balkwill (Journ. Bot. 1872, 243, ex Rep. B. E. C. 1872), and commented on by J. Boswell Syme. In 1876 further specimens were distributed by T. R. Archer Briggs with the note that a specimen had been referred to the true *C. pycnocephalus* by M. Déséglise (Rep. B. E. C. 1875, 19). A year later H. C. Watson made further comments (Journ. Bot. 1879, 246, ex Rep. B. E. C. 1877–8, pp. 7 & 8). Briggs again collected specimens on July 1, 1878 (of which there are specimens in Herb. Mus. Brit., and an excellent example in Herb. S. Lond. Bot. Inst. ex Herb. Townsend) ; and he carefully summed up all then known of the plant in Fl. Plymouth, 191–2 (1880). During the last fifty-five years there appears to have been no further printed record of the plant from Plymouth, but there is a sheet in Herb. Mus. Brit. (ex Herb. H. & J. Groves) collected on the Hoe in June 1902 by A. B. Jackson. The fact that this thistle has survived the very considerable changes which have taken place during the conversion of this formerly wild habitat into a public park is of considerable interest.

G. C. Druce considered that *C. pycnocephalus* was not native in Britain, but a rare alien. As an alien it is occasionally recorded from British ports, e. g., Bristol (Rep. B. E. C. 1932, 341) ; and Falmouth (Herb. Kew., specimen collected by Mrs. Jennings, July 21, 1927), and it seems quite possible that, in spite of its long survival, it was originally introduced by shipping at Plymouth. Both *pycnocephalus* and *tenuiflorus* have become naturalized in Germany and Switzerland, and the fact that the former has its headquarters round the Mediterranean and is not known to occur as a native north of Mans (lat. 48° N.), strongly militates against it as a native of Britain.

CHENOPODIUM GLAUCUM L. Near Bidborough, Tonbridge, West Kent, Sept. 30, 1934. Extremely rare as a Kent plant, and only given on old records for stations near London in Hanbury and Marshall's Fl. Kent, 294 (1899). Only about six plants were seen in a field on heavy clay at Bidborough, where the writer was directed to the station by Mr. P. Brenan.

ATRIPLEX PEDUNCULATA L. About 50 small specimens of this rare species were observed at an old station on the East Anglian coast by the writer and A. W. Graveson Oct. 10, 1934. A specimen has been deposited in Herb. Mus. Brit.

RUMEX CONGLOMERATUS Murr. × R. MARITIMUS L. Binsey Common, Oxon, Sept. 10, 1933. Confirmed by Dr. K. H. Rechinger.

RUMEX RUPESTRIS Le Gall. This species was observed in slacks on the dunes near Perranporth, West Cornwall, June 17, 1934, at a station for which directions were kindly supplied by Mr. F. Rilstone. The species is said to grow commonly in "crescent-shaped" formations in such habitats, the "crescents" being said to be due to fruits germinating round the edges of the pools with which the slacks are filled in winter. Mr. Rilstone, I believe, has noticed these crescents at Perranporth, but I failed to trace them in 1934. Probably owing to the lack of rain during the latter part of the previous winter the pools had failed to form, and the absence of the crescents in 1934 is additional evidence that the theory of their formation is probably the correct one.

RUMEX OBTUSIFOLIUS L. × R. PULCHER L. Shalford Common, Surrey, July 22, 1934 ; Alfriston, East Sussex, August 30, 1931—in both cases with parents. This hybrid probably forms freely wherever the parents occur in close proximity.

THAMES-SIDE "RUMEX ELONGATUS Guss." A note on this plant together with the opinions of Dr. K. H. Rechinger and B. H. Danser will be found in Rep. Watson Club 1933/4, 232. It is worthy of note that two plants from this colony have now been grown in garden soil for nearly two years and have remained constant. Thus the opinion of certain continental botanists that this plant is merely a variation of *R. crispus* resulting from the peculiar habitat seems even less probable. Plants very similar to those from the Thames and Wye occurred on the mudbanks of the tidal Medway below Aylesford Bridge, West Kent, Aug. 12, 1934.

CAREX MICROGLOCHIN Wahl. The only known British station for this sedge, where it was discovered by Lady Davy and Mrs. Foggitt in 1923, was visited on August 7, 1933. Here it occurs in a Corrie on the Glen Lyon side of the watershed, but on the

same day it was noticed definitely on the Loch Tay side of the watershed, though at no great distance from the original station. This observation stimulates hope that careful search will reveal it on other Scotch mountains. The references to *Carex microglochin* in British literature are:—B. E. C. 1923, 69 (and "Interim" Report), 1925, 789; Trans. Bot. Soc. Edinb. xxix, 1 (1927); and Proc. Linn. Soc. 1923–24, 2 (1924).

CAREX MONTANA L. On the cliffs between Carbis Bay and Hawk's Point, West Cornwall, v.c. 1, June 13, 1934. This sedge was hitherto recorded only for East Cornwall, and then in somewhat unsatisfactory circumstances. Arthur Bennett, in Journ. Bot. 1906, 280, in a note by F. Hamilton Davey, is said to have found "two specimens" of *C. montana* in his herbarium on a sheet of *Luzula pilosa* collected by W. Curnow at "Hustyn Wood, near Bodmin, E. Cornwall. May 1878." From correspondence in the writer's possession between E. F. Linton (who had an exceptionally good field-knowledge of the plant) and Bennett, it appears that Linton challenged the record, and Bennett reaffirmed his satisfaction with it on July 25, 1907. Later search by Davey proved unsuccessful. The sedge is recorded by Briggs as occurring in numerous spots on Roborough Down, South Devon, which is not very far from the Cornish border, but here it may have suffered from grazing, to which, owing to its soft leaves (a rare condition among the Carices) it is vulnerable. The occurrence of *C. montana* in Cornwall is important, as it is rare in the whole of Western France, being absent from Brittany and Normandy. As it is so far unrecorded from Ireland and Spain, Carbis Bay represents the extreme western limit of *Carex montana* in Europe.

DRYOPTERIS CRISTATA (L.) A. Gray×D. SPINULOSA Kuntze. (×*D. uliginosa* Kuntze; *Lastrea uliginosa* Newman; ×*Aspidium Boottii* Tuckerman.) Three plants of this very rare hybrid were detected among great numbers of the putative parents a few miles from Hickling, East Norfolk, Oct. 8, 1934. The difference between the barren and fertile fronds is considerable, but each clearly shows the characters of both parents.

NITELLA MUCRONATA Miquel. On Aug. 30, 1931, an unusual *Nitella* was found in considerable quantity in the River Cuckmere, Alfriston, East Sussex. Specimens remained unnamed until Dec. 1934, when Mr. G. O. Allen determined them as *N. mucronata*, which is recorded from few British stations, at none of which it appears to have been noticed very recently. Although previously unknown for East Sussex, v.c. 14, it is on record for West Sussex, v.c. 13, having been found at West Grinstead by Borrer in 1820 (locality erroneously given by Babington in Ann. & Mag. Nat. Hist. ser. 2, v. 84 (1850), as East Grinstead, but corrected on page 239 of same volume).

ALYSSUM CAMPESTRE L.

By W. B. Turrill, D.Sc., F.L.S.

ALYSSUM CAMPESTRE L. is described in various modern taxonomic books as a species with a wide distribution in the Mediterranean Region and one which occurs as an alien in many countries, including the British Isles.

The name *Alyssum campestre* was apparently published for the first time in Linn. Syst. ed. 10, 1130 (1759). The full quotation is "*campestr.* B. A. staminibus terminalibus setis interpositis. *Clypeola campestris, Sp. pl.* 3." In Species Plant. 652 (1753) under *Clypeola* 3 no specific epithet is given. The description there reads "Clypeola annua, siliculis bilocularibus dispermis, calycibus persistentibus. *Sauv. monsp.* 71." There is also a reference to Bauhin's "Pinax" 107 and the "Habitat" is given as "*in* Gallia.".

In 'Species Plantarum,' ed. 2, 909 (1763), the name *A. campestre* is applied to a different plant, with the diagnosis "Alyssum caule herbaceo, staminibus stipatis pari setarum, calycibus deciduis," and the description "*Simillimum A. calycino petalis caule foliis, sed magis decumbens foliis lanceolato-ovatis.* Filamenta absque dentibus, sed 2 solitaria habent utrinque setam filamento non adnatam, at receptaculo insertam. Siliculæ ovatæ, vix compressæ, magis tomentosæ." Amongst the references is "Cylpeola annua, siliculis bilocularibus dispermis, calycibus caducis. *Sauv. monsp.* 71." This reference has not been traced in Linnæus's own copy of Sauv. monsp. It is possible that a deliberate alteration by Linnæus of the word "deciduis" into the word "caducis" is the explanation of this reference.

It is obvious that *A. campestre* Systema, ed. 10 (with its back-reference), and *A. campestre* Sp. Pl., ed. 2, are different plants, and that on the rules of priority and homonyms the name cannot stand for the latter. Most modern authors (*e.g.*, Rouy and Foucaud, Hayek) have, however, cited from Sp. Pl., ed. 2, and the name is generally applied to the plant diagnosed, or supposedly diagnosed, there. Yet even *A. campestre* Sp. Pl., ed. 2, appears to be a mixture, because, as is pointed out by Gay in a note in Herb. Kew., the character of "filamenta absque dentibus, sed 2 solitaria habent utrinque setam filamento non adnatam, at receptaculo insertam" applies to *A. calycinum* (*A. alyssoides*) and *A. minimum*, as these species are accepted by modern authors, and not to *A. campestre* as usually accepted in recent taxonomic works. It follows that "*A. campestre* L." is a hopeless muddle and that the name should not be used.

In the Linnean Herbarium there are three sheets stated to represent *A. campestre*. Two are pinned together. One of these

bears the name "*campestre*" in Smith's handwriting, and is the plant which has been usually accepted in recent Floras as *A. campestre* Sp. Pl., ed. 2. The second sheet (pinned behind that just mentioned) is too young to determine without dissection. The third (free) sheet is *A. alyssoides* L. as now generally (and I think correctly) accepted and is written up in Linnæus's handwriting as "*Alyssum campestre* L." Thus an examination of the Linnean Herbarium material confirms the ambiguity of application of the name "*A. campestre*."

The question has then to be answered: What name should be applied to *A. campestre* L. Sp. Pl., ed. 2, as interpreted by most authors (*e. g.*, Rouy & Fouc. Fl. France, ii. 184; 1895)? The earliest available name I have traced is *Alyssum parviflorum* (*paruiflorum*) Fischer ex M. Bieb. Flor. Taur. Cauc. iii. 434 (1819). Bieberstein, it may be noted, used (*op. cit.* ii. 105; 1808), the name *A. campestre* L. in the sense of *A. alyssoides* L. as now accepted. The original description of *A. parviflorum* is not a very full one, but is accurately applicable to the species under discussion.

A. micranthum Fisch. & Mey. (in *Linnæa*, x. Litt.-Ber. 83; 1836, reprinted from Ind. sem. hort. bot. Imp. Petrop. 1833 or 1834) is probably an insignificant variation of *A. parviflorum*, and *A. micropetalum* Fisch. (in DC. Syst. ii. 313; 1821) is a later synonym.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

Ranunculus Raeae Exell, sp. nov. *Herba* perennis erecta radicibus tuberosis elongatis crassiusculis, ad 7×·3 cm. *Caules* ad 38 cm. longi laxe pilosi. *Folia* basalia longipetiolata, petiolo ad 13 cm. longo, sparse piloso, lamina ambitu obovata vel suborbiculari plus minusve profunde tripartita vel nonnunquam subquinquepartita, lobis oblongis acutis apicem versus pauciden-tatis, basi cuneata vel nonnunquam fere retusa, 2–5×2·5–5 cm., juventute appresse pilosa demum glabrescenti, folia caulina petiolata, petiolo ad 2 cm. longo piloso, lamina lobis anguste oblongis vel lineari-oblongis. *Flores* flavi in cymas terminales dispositi. *Sepala* 5 elliptica concava, 4×2 mm., extus pilosa mox decidua. *Petala* 5 oblongo-elliptica, 8–10×3–3·5 mm., glabra longitudinaliter striata. *Stamina* numerosa, filamentis 2–2·5 mm. longis glabris, antheris 1·5 mm. longis glabris. *Carpella* oblique obovata applanata apice breviter rostrata, rostro vix curvato, 2×1·8 mm., minute foveolata glabra.

Hab. TANGANYIKA TERRITORY. Milo, Livingstone Mts., at 7500 ft. alt., open exposed country, partly clay soil, growing in great profusion, *M. A. Rae* A 6 (Typus in Herb Mus. Brit.). NYASALAND. Fwambo, *Carson* 55 (Herb. Kew.).

Apparently a very distinct species differing from all the other tropical African species in the shape of the leaves.—A. W. E.

Dombeya quinqueseta (Del.) Exell, comb. nov. *Xero-petalum quinquesetum* Del., Cent. Pl. Afr. Voy. Méroé, 84 (1826); *Dombeya Delilei* Planch. in Fl. Serres Jard. Europ. vi. 225 (1851), nomen illegit.; *Dombeya reticulata* Mast. in Oliver, Fl. Trop. Afr. i. 228 (1868).—A. W. E.

Terminalia Ferdinandiana Exell, nom. nov. *T. edulis* F. Muell., Fragm. Phytogr. Austral. ii. 151 (1861), non *T. edulis* Blanco (1845).—A. W. E.

Acacia Eggelingii Baker fil., sp. nov. *Arbor* 20- vel interdum 50-pedalis ad *A. Senegal* Willd. accedens, ramulis cortice atro-purpureo vel plumbeo tectis. *Spinæ* paucæ parvæ incon-spicuæ curvatæ. *Folia* bipinnata, pinnis 4–7-jugis; foliolis 10–13-jugis linearibus 4–5 mm. longis, 1–1·5 mm. latis, glabris, rhachei pubescente. *Flores* spicati sessiles, spicis sæpe 2–4 pedun-culatis cylindraceis axillaribus circiter 3–4 cm. longis. *Calyx* brevis campanulatus 0·8–1 mm. longus ruber, dentibus brevis-simis. *Petala* circiter 3 mm. longa. *Stamina* alba 4–5 mm. longa. *Legumen* rectum applanatum glabrum plurispermum lineari-oblongum chartaceum 6–11 cm. longum, 15–25 mm. latum. *Semina* orbiculata circiter 8 mm. diam. nitida, funiculo longo suffulta.

Hab. UGANDA. West Nile District, Zeio, March 1935, *W. J. Eggeling* E 1905 (type), Logiri, E 1871.

"Attains 50 ft., usually about 20 ft. Crown irregular sometimes flat-topped but not so as a rule. Bark characteristically scaling off in vertical strips recurving first from the ends, remaining attached at the middle, giving a ragged look. Sapwood white, heartwood hard, dark brown, resembling that of *Albizzia coriaria*. Reported by the natives to be a good timber, hard and durable. Spines small, paired, recurved, blackish. Pods thin, several seeded, dehiscing on the tree and persisting, resembling large pods of *A. senegalensis* and of similar colour. Flowers more or less precocious, borne in great profusion. The only Acacia flowering freely at time of collection (March). Flowers with red buds, calyx and rhachis; stamens white."

This species is allied to *A. Senegal* Willd. It is noticeable on account of the 2–4 spikes of flowers from the axils, with short red calyces with very short teeth. It differs from *A. Kinionge* De Wild. by the shorter spikes, shorter calyx, and longer petals; from *A. Dudgeoni* Craib by the fewer pinnæ and fewer pairs of leaflets; and from *A. Samoryana* Chev. by the shorter calyx, longer pods with more numerous seeds, etc.—E. G. B.

REVIEWS.

Gymnosperms, Structure and Evolution. By CHARLES JOSEPH CHAMBERLAIN, Ph.D., Sc.D. Cr. 8vo, pp. xii, 484, 397 figs. University of Chicago Press, 1935. Price 21*s*.

BOTANISTS will welcome this pronouncement by a past-master on the group to the study of which he has devoted many years in the field, the laboratory and the greenhouse. It covers forty years of research by the author and replaces the earlier publication, 'Morphology of Gymnosperms,' by the late J. M. Coulter and himself. Whether or no they will always agree with his views on phylogeny botanists will find their presentation of interest, and the clearly written and profusely illustrated text a helpful review of present knowledge of the Gymnosperms.

Two great groups are recognized, Cycadophytes with three orders, Cycadofilicales, Bennettitales and Cycadales, and Coniferophytes with four orders, Cordaitales, Ginkgoales, Coniferales, and Gnetales; in each case distribution in time and space, life-history and phylogeny are described or discussed. The term "Cycadofilicales" is preferred to "Pteridosperms" or "Seed Ferns," as the plants are true gymnosperms and not separated by any character of such importance as separates the Gymnosperms from the Angiosperms. The leaf, which is identical with the fern-leaf even to margins and venation, is strong evidence of a derivation from the ferns, but "the most decisive evidence of a fern ancestry is the seed itself." The retention of the megaspore within the sporangium so that it is never shed, is the criterion adopted of a seed. "The homosporous ferns, in the natural course of evolution, gave rise to the heterosporous ferns, which, in turn gave rise to the Cycadofilicales." An ingenious speculative reconstruction of the course of evolution is given. But there is a serious gap in the history. As the author remarks, "why no embryos are found is still a mystery." They are a characteristic feature of the two other orders and of seed-plants generally "and structures as delicate as these embryos may have been are well preserved."

The Bennettitales and Cycadales developed from the Cycadofilicales, then at their greatest development, in the Upper Carboniferous. What caused the Bennettitales to become extinct, while the Cycadales survived, is another problem. The author suggests that the larger seeds of the latter with their thick stony covering may have made them more resistant than the small seeds of the Bennettitales. In his account of the Bennettitales the author gives full credit to Wieland, whose researches on the rich Mesozoic material in America have added so much to our knowledge of the group, but one misses reference (apart from inclusion in the bibliography) to the work of Carruthers, who, as Scott remarks *, "laid the foundation of

* 'Studies in Fossil Botany,' ed. 1, 448.

our knowledge of the group" in 1868. The displacement of his name *Bennettites* by the earlier name *Cycadeoidea* of Buckland (whose name, by the way, does not appear in the bibliography) is regrettable, but unavoidable—it is probably too late in the day to suggest its inclusion in the list of '*nomina conservanda*.'

The Bennettitales left no progeny. The author, we think rightly, regards the superficial resemblance of the bisporangiate fructification to the Magnolia type of flower as inadequate for establishing relationship.

The Cycadales are still with us and we owe to Prof. Chamberlain, who has studied the scattered remnants of the group in their native homes in widely separated parts of the world, a greatly increased knowledge of their form and life-history. Have they left any progeny? The nine living genera are certainly not responsible; "they are the last of their race, restricted in numbers and geographical distribution and struggling for their very existence."

As to the origin of the Coniferophytes. "The two phyla existed side by side in the Palæozoic, and the Cordaitales have been recognized much further back than the Cycadofilicales; but it is more than doubtful whether the Cordaitales were the ancestors of the Cycadofilicales. Both must have come from heterosporous Pteridophytes." "Some Pteridophyte with compound leaves and a stem with large pith, scanty wood, and large cortex, may have given rise to the Cycadophytes; while another, with similar stem structure, but with simple leaves, may have been the ancestor of the Coniferophytes." "On the whole it seems best to derive the Ginkgoales from the Cordaitales" and "the Coniferales have so many cordaitean characters that they must have come from the Cordaitales, or the two groups must have developed independently from a common ancestor." The origin of the Gnetales, a heterogeneous order, is highly problematical; "like Minerva, they seem to have sprung, fully armed, from the head of Jove."

The illustrations occupy a large proportion of the space, and add greatly to the value of the book for the student. A special feature is supplied by the habit figures, many of which are reproductions of photographs taken by the author during his travels. An extensive bibliography includes 719 entries.—A. B. R.

Diseases of the Banana and of the Manila Hemp Plant. By C. W. WARDLOW. 8vo, pp. xii, 615, 293 figs. (2 coloured). London: Macmillan and Co., 1935. Price 30*s*.

THE Banana (*Musa Sapientum*) is such an important crop—Great Britain imports annually about 15,000 bunches—that a full account of its diseases in cultivation and in transport is most welcome. The author is pathologist for Banana research

at the Imperial College of Tropical Agriculture, Trinidad, and has had considerable experience of the practical problems. Fortunately this has not led him into the stupid practice of trying to write down to the grower.

The body of the book is divided into four sections—Soil-borne, vascular and stem diseases, Plantation diseases of fruit and leaf-diseases, Virus diseases and Storage diseases. In each of these the diseases of Manila Hemp (*Musa textilis*) are considered as well as those of the Banana. As is appropriate a good deal of space is taken up with an account of the Banana wilt or Panama disease, which threatens the extinction of the plant in Jamaica and elsewhere. There is, perhaps, a little too much repetition in the account of the causative fungus, *Fusarium cubense*, as also in other parts of the book, but it is not a serious blemish in a general account of this kind.

The author has spread his net wide and has summarized an enormous amount of information. Long extracts are given from reports of various kinds and of legislations regarding the diseases. There is a good deal of miscellaneous and interesting matter. Probably most mycologists in this country will first turn to the account of transport and storage and the diseases which occur during this period. The statement of the problems encountered is clear and gives much first-hand information.

The book is profusely illustrated. There are four appendixes, one of which gives a list of bacteria and fungi associated with the banana. A "Literature on Banana Diseases" lists 559 titles.

The work as a whole would be well described as a "useful compilation" if it were not that this is usually regarded at the most as faint praise. To cover such a wide field necessitates compilation. My only criticisms are that there appears to be some redundancy, and that sometimes abstracts might have been used profitably in place of full extracts: as a systematist I find unusually few blemishes.

The author is to be congratulated on having produced a book which will be the standard work for many years; the publishers have done their part equally well.—J. R.

Mucorineae. By H. ZYCHA. Kryptogamenflora der Mark Brandenburg, VI. *a*, Pilze II. 8vo, pp. viii, 264, text-figs. 144. Leipzig: Gebrüder Borntraeger, 1935. Price R.M. 22.

THE 'Kryptogamenflora,' published under the auspices of the Botanischer Verein der Provinz Brandenburg, has a deservedly high reputation amongst cryptogamists and they will welcome its continuance: the last part appeared in 1915. The present part deals with more than the Mucorineae of Mark Brandenburg "und angrenzender Gebiete"—indeed, it is a general monograph. Culture work is necessary for proper descriptions and the author made some hundreds of isolations. He also acquired many

cultures from different laboratories and his collection amounts to about three hundred. He decided to describe all that passed through his hands and then rounded off his monograph by incorporating those he had not seen: thus he included such tropical genera as *Glaziella* and *Sclerocystis*.

The first forty pages give a very useful general account of this most interesting group—collection and examination, systematy, taxonomy, physiology, and sexuality are all treated under separate headings. A great deal of reading is summarized, but the author is rather meagre in his references to systematic work in this country.

The arrangement of genera and species follows the standard works. The descriptions are concise and often have appended to them useful notes on physiology, sexuality, and other points. Very few of the illustrations are original. The older synonymy is taken from Alfred Fischer's monograph, but the newer synonymy will prove of great value. There is an extensive list of references which occupies twenty-seven pages.

It is difficult to judge how much of the work is original. Presumably those descriptions not definitely stated to be copied have been confirmed by the author, but the few I have compared with the originals show for the most part only a difference in arrangement. However this may be, it is useful to have such a well-documented general account of these fungi, which are so important as inhabitants of the soil and as a cause of general rots.—J. R.

Protoplasma - Monographien. Vol. 8. *Temperature and Living Matter*. By Professor J. BĚLEHRÁDEK. 8vo, pp. x, 277, 70 figs. Berlin: Borntraeger, 1935. Price R.M. 21.

PROFESSOR BĚLEHRÁDEK'S book is in part a development of the earlier monographs of Kanitz and Prizbram, though in scope it is considerably wider than either of these. Besides dealing with the effect of temperature on the rates of various processes it includes accounts of such topics as the action of frost on plants and animals, injury and stimulative effects of high temperatures, chill-coma (or cold rigor), and certain morphological effects of temperature. The chapter on freezing is a useful summary of the older, as well as the more recent, work on a subject interesting both from the physiological and the practical points of view. The chapter on heat injury opens with a discussion of "optimum temperatures," which reflects the confusion still surrounding this subject even thirty years after the publication of 'Optima and Limiting Factors.'

The most important part of the book is, however, that which deals with the rates of reactions in the organism. As a source of information this will prove very useful, though the theoretical treatment leaves something to be desired. It must be recognized

that temperature coefficients are not strictly characteristic of different types of reaction, but the author does not give sufficient weight to the use which has actually been made of coefficients in the analysis of various processes. There is also, perhaps, too much stress laid on the author's own theory of the importance of protoplasmic viscosity. De Haan's work on permeability is unfortunately not dealt with.

These chapters—and, indeed, the whole book—are a mine of information, brought together and classified in convenient fashion, for which all biologists may be grateful to Professor Bêlehrádek. The Bibliography includes some 1200 entries; in these we must deplore the absence of titles. Hitherto most botanists have refused to follow the chemist in omitting a most useful part of a citation.—M. SKENE.

Wild Flowers of the Great Dominions of the British Empire. By THE LADY ROCKLEY, C.B.E. F'cap. 8vo, pp. xii, 380. 32 coloured plates. Macmillans: London, 1935. Price 16*s*.

DURING one's forty-odd years in the Department of Botany a frequent enquiry, from folks proposing to visit one or other of the overseas Dominions, was for a book on the wild plants of the country, less cumbersome and erudite than a strictly botanical "Flora." Visitors to Canada, Australasia, or South Africa, with a knowledge of plants gained from their gardens, will find in Lady Rockley's charming volume an introduction to the wonderful variety of vegetation that they will meet, written and illustrated largely from their own view-point. But the author is also a botanist and has studied her subject not merely in the field in the course of wide travel in the overseas Dominions but has not neglected the literature. To one who has passed more or less rapidly through the various botanical areas described, the book is a delightful reminder of all too brief acquaintance with the widely differing types of vegetation depicted.

Canada with Newfoundland, Australia, Tasmania and New Zealand, and South Africa are the main subjects, "with a cursory glance at Rhodesia and Kenya." A general view of the flora of each Dominion is given with some suggestion of its origin. This is followed by more detailed accounts of specific phases or areas. Under Canada and Newfoundland are chapters dealing respectively with the Conifers, the early Spring flowers and woodland carpets, Summer flowers, shrubs, edible berries, Newfoundland, the prairies, and British Columbia. Under Australia, chapters on gum-trees, flowering trees and shrubs, plains of grass and saltbush, are followed by impressions of the vegetation of the several States and of Tasmania. The author seems most at home in Australia.

The coloured plates, many drawn by Lady Rockley herself, add to the beauty and value of the book. The numbered keys facing those plates which illustrate groups, such as Canadian Spring Flowers or West Australian Orchids, are helpful additions. Other plates illustrate the home and habits of some striking feature of the flora, such as the author's sketch "Among the Firs of British Columbia"—a beautiful picture.

Lady Rockley follows the custom of some of the early Victorian botanists who "enriched" their text with quotations from the poets—good, bad, and indifferent.

The author has, naturally, described in greatest detail the aspects of the vegetation which came under her own notice, and additions and perhaps modifications would, equally naturally, suggest themselves to those with special knowledge of one or other of the floras. But she has done good service in sketching, for those interested, the plant-life of some of the overseas Dominions. Moreover, she writes easily and her text is free from the misspellings of plant-names which not infrequently mar semi-popular works.

It may, perhaps, be mentioned that Lady Rockley was the Hon. Alicia Amherst, author of a history of gardening in England, and later the Hon. Mrs. Evelyn Cecil of 'London Parks and Gardens.' A. B. R.

A Flower Book for the Pocket. By MACGREGOR SKENE, Melville Wills Professor of Botany in the University of Bristol. With Illustrations by CHARLOTTE GEORGIANA TROWER and RUTH WESTON. Sm. 8vo, pp. 380, figs. 529, 501 coloured. Oxford University Press: London, 1935. Price 7*s*. 6*d*.

THE ordinary British 'Flora' is not an attractive book. To bring the necessarily large amount of subject-matter into the compass of a portable handbook demands condensation and small print. But there is really no royal road to the determination of our plant-species, and a fair knowledge of botany is demanded of the serious student. However, there are demands for a short cut, and such an one Prof. Skene has provided: 844 species are described, of which 501 are illustrated in colour and 28 (the grasses) in black and white, and the text is so arranged that the description faces the illustration.

The family and genus are determined by means of keys. Those of the family are based on habit and flower-character in eight groups:—Plants without green colour, Woody Plants with opposite or whorled or alternate leaves, and five groups of Herbs distinguished by generally obvious floral characters. Naturally some of the families fall into several groups. Key-characters to the genera are different in different families—colour of flower, form or dehiscence of fruit, division of leaf, etc. When the genus is found determination of the species depends on a simple but

adequate botanical description aided in most cases by a figure. The botanical and an English name are quoted. An Introduction gives directions for using the book, and also a short explanation of " botanical terms and characters "—we note the omission of the *ovule*, referred to as " seed " in the explanatory section, but used in the description of the first family (Coniferae). The author acknowledges the help of Mr. Stuart Thompson in reading the proofs and compiling the Index.

Prof. Skene has essayed a difficult task, but has done his work well, and the book should meet the demand for a quick and easy determination of a great number of our flowering plants. We would suggest the reconsideration of a few omissions, such as Mistletoe, Holly, and Ivy, the families of which appear, in square brackets, in the key. As these are monotypic in the British flora the insertion of the name after the family would have put the enquirer on the track.

The figures indicate the character of leaf, inflorescence, and flower, and sometimes of habit, and are perhaps as good as could be expected at the price. They are mainly the work of the late Miss Trower and have been placed at the disposal of the Oxford Press by the executors of the late Dr. G. C. Druce.

The book weighs nearly a pound, and is rather large for the pocket. The use of thinner paper would probably have added to the cost of production.—A. B. R.

Die Entwicklung der Kamellien-, Azaleen- und Erikenkulturen Deutschlands unter besonder Berucksichtigung des sachsischen Unbaugebiets. By Dr. GERHARD SCHIMMLER. 8vo, pp. ix, 212, 25 text-figs. Konrad Triltsch: Wurzburg, 1935. Paper covers.

CAMELLIAS, Azaleas, and Ericas have long been important nursery cultures in several continental countries, but the past few years have seen a marked development in the numbers of Azaleas and Ericas handled in Germany, and they are now about double the number reached in 1911. Camellias showed a decrease in the early years of this century, but there has been a slight increase in these also during the past ten years.

This book, which emanates from the Institut für gärtn. Pflanzenbau of the University of Berlin, deals exhaustively with the propagation and cultivation for market of the three groups of plants, gives an historical sketch of this branch of the nursery industry, and illustrates the methods of providing necessary shelter, water, and temperature as practised in and near Dresden.

A bibliography of 167 works consulted concludes the book, which has no index, but a fairly full table of contents.—F. J. CHITTENDEN.

BOOK-NOTES, NEWS, ETC.

PROF. F. A. F. C. WENT.—We hear with deep regret of the death of Dr. F. A. F. C. Went, perhaps the best known of the Dutch botanists and with a world-wide reputation as a plant-physiologist. Prof. Went was to have presided at the Sixth International Botanical Congress now in session at Amsterdam, in the organization for which as President of the Executive Committee he had taken an active part. From 1896 to 1934 Prof. Went had been Director of the Botanical Laboratory at Utrecht, and on his retirement was appointed Extra-ordinary Professor at Leiden. His was a familiar figure at Botanical Congresses. He was one of the seven overseas members who received the Honorary degree of Doctor of Science from the University at the close of the International Botanical Congress at Cambridge in 1930. In 1933 he was the guest of Section K at the Leicester meeting of the British Association, and read a paper on " Recent Progress in the Study of Growth-substance (Auxin) in Plants." He was elected Foreign Member of the Linnean Society in 1931, and in 1933 a Foreign Member of our Royal Society.

SOCIÉTÉ ROYALE DE BOTANIQUE DE BELGIQUE.—The 'Bulletin' (ser. 2, xvii. fasc. 2) contains papers of taxonomic and ecological interest on the Belgian flora. R. Mosseray continues his " Matériaux pour une Flore de Belgique," with critical notes on *Helianthemum* and *Capsella*, and E. de Wildeman contributes notes on the biology and distribution of a number of species. Of ecological interest are " Etudes phytosociologiques " of the Termonde district by Mlle B. Claessens, of the " terrains calcaires " by M. Nihoul, and of the marshes of Sutendael by J. Goffart, A. Maréchal, and F. Sternon. J. Persy gives a *résumé* of his investigations on the nucleolus in somatic karyokinesis in *Calystegia sepium* and G. Verplancke describes his study of " Bigarrure," a new virus disease of the potato.

'GARDENS' BULLETIN, STRAITS SETTLEMENTS,' vol. viii. pt. 3 (June 1935).—The greater part of this number is given to an account by C. E. Carr of collections of orchids from Mt. Kinabulu, British North Borneo, made by himself in 1933, and by Chaplain J. Clemens, 1931–33; of the latter by arrangement with the Keeper of Botany, British Museum. This, the first instalment, includes the Apostasiaceae and the Orchidaceae up to the genus *Arundina*. 137 species representing 40 genera are enumerated; 39 species are new, and a further 41 are new to the flora of British North Borneo. The new genus, *Neoclemensia*, is a leafless saprophyte closely resembling *Gastrodia*. The wealth of the orchid flora on Kinabulu is shown by the fact that in six months Mr. Carr collected about 700 species in flower. To conform to custom the type-specimen should be indicated where a new species is represented

by more than one number. Under title "Palmae Malesicae, III.," C. X. Furtado contributes notes on some Malaysian *Calami*: eight new species are described from Borneo and Celebes. J. J. Smith describes a new *Rhododendron* from Gunong Tahan, Pahang.

'HONGKONG NATURALIST.'—Vol. v. no. 4 (December 1934) and vol. vi. no. 1 (May 1935) are devoted mainly to Zoology and Archæology. To the former Franklin P. Metcalf contributes notes on "Travellers and Explorers in Fukien before 1700," a side-line in his preparation of a 'Flora of Fukien' on which he has been engaged for some years. In the latter the Editor, G. A. C. Herklots, continues his detailed and admirably illustrated descriptions of the Orchids of Hongkong, comprising *Eria flava* Lindl., *E. coronaria* Rchb. f. and *Dendrobium acinaciforme* Roxb. A. H. Crook discusses the Chinese habit of eating melon-seeds, which have been determined as those of *Cucurbita maxima*, white, and *Citrullus vulgaris*, red.

BRITISH MYCOLOGICAL SOCIETY.—The 'Transactions' (xix. pt. iv., June 1935) contains the following papers:—"Studies of British Pyrenomycetes.—1. The Life-Histories of Three Species of *Cephalotheca* Fuck.," by Chas. G. C. Chesters: the conidial and ascophorous stages are studied in detail, a revised diagnosis of the genus is given, with keys to the three accepted species. "The Fungi of Wicken Fen, Cambs," by E. J. H. Corner: a list of the species collected during 1924–8, four being new records for Britain. "Notes on the Occurrence of *Pyrenophora Avenae* Ito, in Scotland," by R. W. G. Dennis. "On Variation in *Thamnidium elegans* Link, induced by the Action of High Temperatures," by B. Barnes. "A List of Fungi etc. maintained in the National Collection of Type-cultures, 1935," by R. St. John-Brooks and Mabel Rhodes: the list comprises some 1200 species of fungi and bacteria as compared with 777 listed in 1930. "A new Species of *Glomerella* on *Camellia Theae*," by A. G. Tunstall, Mycologist to the Indian Tea-Association. "The Presence and Absence of an Endophytic Fungus in *Lolium temulentum* and *L. perenne*," by Kathleen Sampson: both species can exist either with or without an endophytic fungus; the fungus invades leaves, stems, and tiller-buds, and in a perennial plant is distributed by vegetative propagation: it invades the ovule and is mechanically inherited from the female plant only.

'SINENSIA' (Contributions from the National Research Institute of Biology, Academia Sinica).—Recently issued numbers contain several papers on fungi: three by S. C. Teng, namely, "Notes on Discomycetes from China" (v. 431–65) with keys to the families, genera, and species, and descriptions of the last; and similar papers on Tremellales (466–79) and Thelephoraceae and Hydnaceae (vi. 9–43) from China. S. H. Ou contributes "Notes on Dothideales from China" (vi. 1–8).

NOTES ON THE FLORA OF JAMAICA.

BY A. B. RENDLE.

THE GENUS *LOBELIA*.

THE genus *Lobelia* is represented in Jamaica by the small annual herb, *L. Cliffortiana* L., a widely-spread species in the West Indies and Tropical America, and nine perennial herbaceous or shrubby species of the section *Tylomium*, seven of which are endemic. *L. Cliffortiana* is based on 'Hortus Cliffortianus,' 426, t. 26, and there is a good specimen in Clifford's herbarium at the British Museum. Owing partly to failure to consult original specimens there has been some confusion as to the identity of some of the perennial species, which the following notes may clear up.

L. ACUMINATA Swartz, Prodr. 117 (1788); Fl. Ind. Occ. 1950 (1806). Swartz's original description (Prodr. 117)—"L. caule erecto suffruticoso, foliis lanceolatis attenuatis serrulatis; racemo terminali multifloro. Lobelia 2. Browne Jam. 322. Rapunculus folio oblongo Sloan. h. 1. t. 95. Jamaica"—would apply to several species. The fuller description in Fl. Ind. Occ.—leaves broadly lanceolate, raceme shorter than the leaves, calyx-limbs half the length of the corolla—excludes the Sloane plant, though Swartz, still quoting the reference, says the figure is "bona." Sloane's figure, confirmed by the specimen in his herbarium (Herb. Sloan. iii. fol. 24) represents *L. salicina* Lam. (Encycl. Meth. iii. 583; 1789, and Herb. Lam. in Herb. Paris!). There is no specimen extant of Browne's Lobelia 2, but it may represent the same species; the brief description and the locality "lower shady hills" would fit it. Browne cites the reference to Sloane, but also a reference to Linn. Sp. Pl. which is *L. cardinalis*, a species not found in Jamaica.

Through the kindness of Prof. Samuelsson I have been able to examine Swartz's type in the Stockholm Herbarium. It is at once distinguished by the large glabrous flowers and the long calyx-lobes, 2 cm. in length, whereas *L. salicina* Lam. has narrower leaves and a long puberulous raceme with velvety flowers and short calyx-lobes, 0·5 cm. long. The earliest specimen of *L. acuminata* extant is one collected by Masson, in 1781 (Swartz was in Jamaica 1784–6), in Herb. Mus. Brit., which is a good match with Swartz's specimen. It was almost certainly seen by Swartz when working in Herb. Banks; and is, I think, written up by him.

Urban (Symb. Antill. viii. 702), in the synonymy under *L. salicina*, has indicated some confusion between this species and *L. acuminata* as interpreted by some later authors. The confusion of *L. acuminata* Sw. with *L. salicina* Lam. (which was

published a year or more later) initiated by Swartz's citations of synonymy was carried on by Willdenow (Sp. Pl. i. 943 ; 1797), who gives no description, but merely cites Swartz's original description, that of *L. salicina* Lam., and the references to Browne and Sloane. It was repeated by Roemer and Schultz (Syst. v. 46; 1819). "L. acuminata Sw." of Sprengel (Syst. i. 711; 1826) is solely *L. salicina* Lam. as is also Tussac's description and figure (Fl. Ant. iii. 116, t. 36 ; 1824). Alphonse de Candolle (Prodr. vii. 396 ; 1839) who named the species *Tupa acuminata*, quoting *Lobelia acuminata* Sw., cited in synonymy *L. salicina* Lam. and the references to Browne and Sloane. His description is a puzzling medley ; " racemo foliis breviore " and " calycis lobis corolla dimidio brevioribus " suggest *L. acuminata* Sw., but " racemo velutino " and " corolla velutina " suggest *L. salicina*, as does also the locality " Haiti " ; whereas " antheris omnibus apice barbatis " would exclude all the Jamaican species; in these only the two lower anthers are bearded. De Candolle's next species, *Tupa ensifolia* is undoubtedly *L. salicina* Lam.

Another species has been confused, and with more reason, with *L. acuminata* Sw. It is the *T. acuminata* Griseb. Fl. Br. W. Ind. 386, non A. DC. as indicated by a specimen from Purdie, named by Grisebach in Herb. Kew. This and similar specimens in various herbaria have been assigned to *L. acuminata* Sw., but may at once be distinguished by the much shorter calyx-lobes and the shorter corolla which is described as " greenish yellow," whereas that of *acuminata* is " white, sometimes tinged with rose." It is, moreover, so far as recorded localities indicate, confined to the eastern end of the island, whereas true *acuminata* is a western species. It is an undescribed species which I have named *L. innominata*. Grisebach's inclusion of " Haiti " in the distribution of his species may refer to *L. salicina*. The earliest collected specimen is from Dr. Dancer (who was in Jamaica from 1773–1811) in the Banksian Herbarium, where it has been mounted subsequently on the same sheet as Masson's specimen of *L. acuminata* Sw.

Lobelia innominata, sp. nov. Planta " herbacea, 5-pedalis " glabra, foliis late oblanceolatis acuminatis acutis, ad basin angustatis et in petiolum brevem anguste decurrentibus, margine pæne usque ad basin minute serrulatis ; racemo foliis breviore, florente unilaterale ; bracteis lineari-lanceolatis pedicello brevioribus ; calycis tubo turbinato, lobis anguste triangularibus vel e basi triangulare angustatis, minute denticulatis, 5–9 cm. long. ; corolla glabra, falcata, 2-2·5 cm. long. ; staminum filamentis pilosis, antheris sparse pilosis vel glabris, duobus inferioribus apice barbatis ; capsula late turbinata, parte superiore libera tholiformi.

Tupa acuminata Griseb. Fl. Brit. W. Ind. 386 (1861), non A. DC.

Hab. Dancer! (without locality) (Herb. Mus. Brit.); John Crow Mts. *Harris & Britton*, Fl. Jam. 10,703 ! (Herb. Jam.) ; Woods of Portland, *Purdie* ! (Type, Herb. Kew.) ; St. Mary, *McNab* ! (Herb. Edin.).

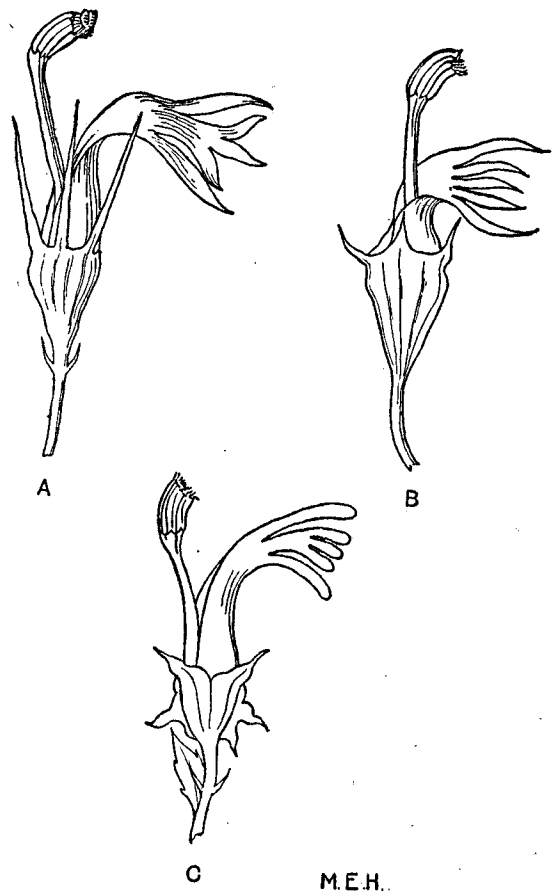


Fig. 1.—Flower of : A, *Lobelia acuminata* Sw. ; B, *L. innominata* Rendle ; C, *L. Ryanii* Rendle. All natural size.

The plant is described by Harris and Britton as " herbaceous, 5 feet high," there are no notes as to habit with the other specimens. *Stem* 5–7 mm. thick below the inflorescence. *Leaves* 2·5–3·8 dm. long by 4–6 cm. broad ; petiole about 1 cm. long.

Raceme 15–20 cm. long including the peduncle (4 cm.); bracts minutely serrulate, 1 cm. long or less, adnate to the base of the pedicel (2–2·5 cm. long); bracteoles, springing from below the calyx-tube, scarcely 3 mm. long. Calyx-tube 1 cm. long. Androecium equal to the corolla. Capsule 1 cm. long; the upper 2 mm. forming a low dome within the free part of the calyx-tube, which is 4–5 mm. long.

The differences between the flowers of the two species are indicated in the figure (1, A & B).

L. ASSURGENS L. Amœn. Acad. v. 408 (1760) (Pugill. Jam. Pl.). This very characteristic species was founded on a Jamaican plant, and there is a specimen in the Linnean Herbarium from Patrick Browne written up by Linnæus, "*assurgens.*" This agrees with the other specimens from Jamaica. A. de Candolle (Prodr. vii. 394) distinguished the Porto Rico specimens as var. *portoricensis* and Urban (Symb. Ant. i. 453; 1899) accepts de Candolle's variety, but distinguishes the Jamaican plant as var. *jamaicensis*; the characters he assigns to it are those of the original species to which, however, he makes no reference. Later (in Arkiv Bot. K. Svensk. Vetensk. xxiii. no. 5, p. 104; 1930) Urban raises his variety to specific rank; but the characters merely repeat those of the Linnean type, to which again Urban makes no reference. The synonymy is therefore as follows :—

L. assurgens L. Amœn. Acad. v. 408 (1760).

Var. α *jamaicensis* Urban, Symb. Ant. i. 453 (1899).

L. jamaicensis Urban in Arkiv Bot. K. Svensk. Vetensk. xxiii. no. 5, p. 104 (1930).

L. FAWCETTII Urb. Symb. Ant. i. 452 (1900). Urban correctly points out that *Tupa conglobata* Griseb. (Fl. Brit. W. Ind. 387) is not the original *T. conglobata* A. DC. (Prodr. vii. 395) (*Lobelia conglobata* Lam.), which is a different species, from Martinique. Urban says Grisebach's species also includes a "forma grandiflora" of *L. acuminata*; I have not seen Wullschlagel's plant quoted by Grisebach, but the other specimens cited by him, March, Alexander, and Purdie, and written up in Herb. Kew., are all *L. Fawcettii*; Grisebach's description does not suggest *L. acuminata*, which is definitely excluded by the description of the sepal-lobes as serrulate.

The following is a key to the Jamaican species :—

Raceme more or less elongated.	
Bracts not leaf-like.	
Flowers glabrous.	
Calyx-lobes entire or with a few small teeth.	
Calyx-lobes 1·5–2 cm. long	*L. acuminata.*
Calyx-lobes less than 1 cm. long	*L. innominata.*
Calyx-lobes conspicuously serrate.	
Leaves narrowly elliptic-oblong, crenulate-serrate	*L. Fawcettii.*
Leaves elliptical, denticulate	*L. grandifolia.*
Flowers pubescent.	
Leaves lanceolate to oval-lanceolate.	
Raceme radial	*L. salicina.*
Raceme markedly unilateral	*L. assurgens.*
Leaves linear-lanceolate, caudate	*L. caudata.*
Bracts leaf-like	*L. Martagon.*
Raceme few-flowered, congested within a terminal leaf-rosette	*L. Harrisii.*

The geographical distribution in the island, so far as can be determined from records of localities, is of some interest :—

Western species :

L. acuminata.—Westmoreland, St. James, St. Elizabeth, Cockpit Country.

L. Harrisii.—Cockpit Country (limestone, 2000–2300 ft.).

Western and Central species :

L. Fawcettii.—Hanover, St. Ann, Manchester, Clarendon.

Central species :

L. salicina.—St. Ann, St. Catherine. (Also in Hispaniola and Cuba.)

Eastern species :

L. innominata.—St. Mary, Portland, John Crow Mts.

L. caudata.—Blue Mts.

L. assurgens.—Blue Mts., Port Royal Mts. (Also in Cuba.)

L. grandifolia.—John Crow Mts.

L. Martagon.—Mt. Diabolo; Blue Mts. ('Peak Summit,' 7400 ft. and 'alpine,' 5600 ft.).

Appended are descriptions of two species, hitherto undescribed, from Montserrat and San Domingo :—

Lobelia Ryanii, sp. nov., ex affinitate *L. cirsiifoliae* Lam. differt autem foliis sparsius dentatis et calycis lobis brevius triangularibus. (Fig. 1, C; 2, A.) Ut apparet herba, glabra, foliis anguste lanceolatis, ad apicem subobtusum minute apiculatum et ad petiolum brevissimum angustatis, margine distanter serrato dentibus spinuloso-apiculatis; racemo multifloro glabro folia valde excedente; bracteis lanceolatis basi pedicello adnatis margine serrulato denticulis spinosis; bracteolis subulatis; calycis tubo hemisphærico, lobis anguste triangularibus apice acutis c. 3·5 mm. long.; corolla glabra medio falcata vix 2 cm. long. supra medium fissa; androecio corolla paullo breviore glabrescente; antheris omnibus apice barbatis glabris.

Hab. Montserrat (1778) *Ryan* ! (Herb. Mus. Brit.).

The specimen consists of the upper part of a stem (4 mm. thick) bearing closely arranged leaves, 16 in a length of 10 cm., papery when dry and with a rather narrow midrib projecting

Fig. 2.—A, leaf of *L. Ryanii* Rendle; B, leaf of *L. Turckheimii* Rendle; C, flower of *L. Turckheimii*. A, B, ×⅔; C, nat. size.

beneath, 16·5–20 cm. long including the very short petiole, 2–2·5 cm. broad. *Raceme* radial, 20 cm. long on a peduncle 8 cm. long, axis glabrous; bracts, in the middle of the raceme, 8 mm. long; bracteoles above the middle of the pedicel 2–2·5 mm. long; pedicel slender, puberulous, 12–13 mm. long.

Calyx-tube barely 4 mm. long. Larger lobes of corolla 7 mm. long. *Anthers* 6 mm. long.

This species, collected by Dr. John Ryan, in 1778, is also near *L. infesta** (*Tupa infesta* Griseb.), from St. Kitts and Grenada, but the leaves are broader and less closely toothed, and the teeth are broader and less sharply pointed.

Lobelia Turckheimii, sp. nov., ex affinitate *L. salicinae* Lam. differt autem foliis angustissimis et floribus minoribus (fig. 2, B, C). Herba (?) caule glabro densiter foliato, foliis patentibus lineari-lanceolatis ad apicem acutum et ad basin in petiolum decurrentem angustatis, margine minute spinuloso-denticulato; petiolo breve in caule decurrente; racemo multifloro folia excedente pubescente, bracteis paucis, infimis foliaceis, iis supra basin racemi linearibus superne angustatis, pedicello tenue longioribus, supremis sterilibus; floribus velutinis; calycis tubo late turbinato, lobis triangularibus acutis 2·5 mm. long.; corolla 1·4 cm. long., supra medium subfalcata; androecio corollam æquante, infra medium puberulo; antheris glabris, 2 inferioribus apice barbatis.

Hab. San Domingo, Paradis prope Barahona, 150 m. alt. ad margines sylvæ in fl. xii. 1909. *H. von Turckheim* 2705 ! (Herb. Mus. Brit.). Described from a leafy flowering shoot about 2 ft. long. *Stem* about 1·7 cm. thick at the base, closely leaved—about 8 leaves in 5 cm. *Leaves* gradually tapering to apex and base, 2 cm. long by 1–1·5 cm. broad, marginal teeth shallow. *Pedicels* 2 cm. long. *Calyx*-tube about 5 mm. long. *Anthers* 6 mm. long.

This number of von Turckheim's was assigned by Urban (Symb. Antill. viii. 702) to *L. salicina* Lam., but the specimen in Herb. Mus. Brit. can be at once distinguished by the rather crowded, patent, very narrow leaves and the smaller flowers.

The following new variety was included by the late Spencer Moore in his English manuscript of the Rubiaceae for the 'Flora of Jamaica':—

Erithalis Harrisii Urb. var. nov. **angusta** S. Moore ined. foliis quam in specie angustioribus, anguste oblanceolatis vel obovato-oblongis, 2–6×0·6–1·8 cm., apice rotundo, ad basin gradatim angustatis.

Hab. A low shrub on honeycombed rocks along the sea-beach at Luana Point, Harris. Fl. Jam. 9821 !

* **Lobelia infesta,** comb. nov. *Tupa infesta* Griseb. Fl. Brit. W. Indies, 387. The combination under *Lobelia* does not seem to have been made hitherto.

THE BRACTEOLE IN *SCILLA NUTANS* Sm., AND EXTRA ORGANS IN THE FLOWER.

By I. H. Burkill, M.A., F.L.S.

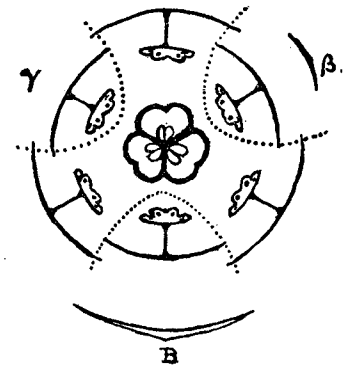
One of the specific characters of the Bluebell, *Scilla nutans*, is that the peduncle and the pedicels are sharply defined organs; and another is that, in common with other Monocotyledons, it should have a single bracteole, but at a divergence of $\frac{1}{3}$ from the bract instead of the more usual $\frac{1}{2}$. A desire to see if this bracteole varied much led me recently to examine several thousand plants; and in a population growing upon the sea-cliffs near Paignton, Devon, I found the material which I needed. I must state that this population occurs in rough herbage, unshaded because the land-owners, for reasons of their own, remove the bushes of *Prunus communis* and *Crataegus Oxyacantha* natural to the cliffs.

The search led to the detection of flowers with no bracteoles and flowers with two bracteoles in very small numbers. An enquiry into the direction of the phyllotaxis of the flower was made: and an unexpected interest was discovered in a relationship between supernumerary bracts on the pedicels and disturbances within the flowers themselves.

The Normal Bracteole.—From an unsystematic search the impression was gained that the normal solitary bracteole is as often on one side of the bract as on the other: to test this impression 150 racemes were gathered at random and the position of the bracteole noted in each of their 1743 flowers. There were no cases of two bracteoles on these 150 plants: 866 flowers had the bracteole to the right: 870 had the bracteole to the left, and seven had no bracteole. Thus was the impression confirmed. It may be added that to the right means to the observer's right hand when viewing the raceme from the side.

On the same 150 racemes the lowest flower had the bracteole to the right as often as to the left. The second flower similarly had the bracteole as often to the right as to the left: but these two flowers differed as often as they agreed in the direction of the spiral of growth (73 to 77). The last flower in 67 racemes had its bracteole to the right and in 83 racemes to the left. These figures suggest that the direction of the spiral of growth is entirely a matter of chance, though this is improbable: but between the first and the last flower, tendencies are set up whereby runs of right-handed and runs of left-handed flowers are met with. On the 150 racemes, with their 1743 flowers (1593 opportunities for change), the change was made 499 times: 73 times between the first and the second flower, that is in every other raceme, and 426 times beyond the second flower, that is after every third flower.

The divergence in the raceme is $\frac{2}{5}$. It was asked if there was any evidence of a lateral symmetry such as would cause the ninth flower to possess the spiral of the first, the tenth that of the second, and so on: but when the figures were extracted this was not found to happen. As divergences of $\frac{1}{3}$ are evident in the bulb and on the pedicel, the figures were tested for that and were tested also for the intermediate divergence of $\frac{2}{5}$, but with negative results, so that of lateral symmetry due to divergence there was no evidence whatever. In fact, I failed to find any cause why one flower should be right-handed and another left-handed.



Floral diagram. The dotted lines indicate the sectors in which extra organs most frequently appear.

Two Bracteoles.—Two bracteoles were present at the base of the pedicels of the lowest five flowers of a raceme of 31 One was to the right and the other to the left of the pedicel; they were equal in size. The flowers above them were normal.

No Bracteoles.—The absence of bracteoles was sporadic. On one plant the third and the sixth flowers were without: on another the seventh and the thirteenth; on other plants absence occurred singly in positions which indicated no rules.

Bracts on the Pedicels.—In order to make as clear as possible the following account of supernumerary organs on the pedicels and the accompanying changes in the flowers themselves, a floral diagram is given. In it B is the bract; β is the bracteole at a divergence of $\frac{1}{3}$ from the bract and γ is the position at $\frac{1}{3}$ further along the spiral of growth, where the next organ is due to appear and where, in fact, when two bracteoles were found

at the base of the pedicel, there was an organ. The sectors (sextants) in the flower above B, β and γ, are delimited in the diagram by dots and will be referred to as the sectors of B, β and γ. In the normal flower the spiral of growth is broken at the bracteole, for there is no organ below the flower in sector γ; and, as authors have pointed out, the sepal first to appear in the hemicyclic flower is directly opposite to the bracteole, *i. e.*, at $\frac{1}{2}$. In the development of the flower the other two sepals follow in series, and then appear between them the three petals, one in each of the three sectors named.

In the search on the Paignton cliffs fifteen abnormal plants were found and examined: some attracted attention in the first place because a foliar organ was found on the upper half of the pedicel which appeared as if it might be a modification of the second bracteole for which I was seeking; and in so much as these organs did not in general produce anything in their axils, many would call them bracteoles. But on second consideration it has seemed better to call them bracts. The more abnormal the plant, the more completely did they assume the characters of bracts, and even in three cases on the most extreme plant were flanked by a bracteole and had a flower in their axil. This development had converted the raceme of the plant into a panicle, and at the same time its lower normally placed bracts were foliaceous, the lowest even to the extent of being 25 cm. long. In this plant it was abundantly evident that vegetative tendencies had invaded the reproductive part, transforming the lowest bracts into leaves, yet not suppressing their bracteoles, and provoking the formation of leaves, yet not increasing them beyond the dimensions of bracts, on axes which should have been bractless pedicels.

These organs, which I have decided to call bracts, occurred on the pedicels of 18 flowers. If no more abnormalities had been present, they would have been merely of passing interest; but the abnormalities in these flowers did not end with them, since every flower on the pedicel of which they appeared showed in addition a remarkable tendency to add to the petals and stamens.

The first point to note is that these abnormal flowers were invariably at the base of racemes carrying normal flowers above, and that the make-up of the lowest and most altered could in all cases be interpreted by a comparison with those immediately above; for these formed a series of transitions to the normal. This circumstance made the deductions more secure.

Two reasons can be put forward for the most abnormal flowers being at the base of the inflorescence: the one—a reason which has already been hinted at—is that the invasion of vegetative tendencies into the flowering region would come from below and act most strongly about the lowest flowers:

the other, which is based on a wide series of observations on different species of plants, is that on the whole tendencies to multiply parts are fostered by high nourishment, and that the first-formed flowers, which in *Scilla* are also the lowest, get the best opportunity of drawing on the available food-supply.

The second point is that the supernumerary organs and distortions of them appeared in the flower at definite places: and it will be established that the chief place is sector γ, which, let it be remembered, is the sector of the additional bracteole and of the abnormal bract when one alone is produced.

Abnormalities are always difficult to classify and it is not proposed to describe the organs in detail, which would be tedious. But the flowers can be grouped by the number of bracts on the pedicel, and in the first place those will be taken—eleven in number—each of which had on the pedicel, at 1–2 mm. from the top, one of the foliar organs here called bracts. As part of the claim that this abnormal development is due to a vegetative tendency, it must be added that the normally placed bracts on the peduncle which subtended these flowers were in half the cases more or less foliaceous. These eleven flowers were all abnormal in petals and stamens in sector γ. In the normal flower, as it develops, two mammillæ appear on the thalamus in this sector; the one becomes a petal, the other becomes a stamen, and while they are growing a radial ridge of tissue rises from the thalamus under them, lifting both, so that they end by being adnate. In these abnormal flowers a tendency was evident to initiate more than two mammillæ, and for the destiny of the mammillæ to be somewhat confused as the adnation became irregular. The number of organs found in sector γ in these eleven flowers, and their nature, are given in the following table:—

No. of flowers	as petals.	as organs intermediate between petals and stamens.	as stamens.
4	None.	One.	One.
1	One.	None.	Two.
1	One.	One.	One.
2	Two.	None.	Two.
1	Two.	One.	One.
1	Two,	One.	Two.
1	Three.	One.	Two.

In a further ten flowers, which make another group, the sector γ was found disturbed, but there was no bract just below the flower on the pedicel. Yet the association of these flowers in racemes with flowers in which the bract was present clearly demonstrated that the disturbance arose from the same invasion of a tendency towards vegetative growth, though operative in

a lesser measure. These further ten flowers were thus constructed in sector γ:—

No. of flowers	as petals.	as organs intermediate between petals and stamens.	as stamens.
1	One.	One.	None.
3	None.	One.	One.
2	One.	None.	Two.
2	One.	One.	One.
1	Two.	None.	Two.
1	Three.	None.	One.

It seems to be a fact to emphasise that, out of the 21 flowers in these two tables, 20 were perfectly normal in all the sectors except sector γ, and that the remaining flower added to its abnormalities in sector γ no more than a partial sterility and bluishness of the anther in sector B (*i. e.*, the sector with a further divergence of $\frac{1}{3}$).

In seven more flowers the invasion of vegetative tendencies was more manifest than in those already discussed. In these seven the pedicel grew from the axil of a bract and had a normally placed bracteole, then it carried at and above mid-length one or two sterile bracts, and these were followed by another bract with a bracteole close against the terminating flower. The irregularities in the flower ending such a several-bracted axis were similar to those described, but were present in the sector of the second bracteole, the number of interposed bracts determining its spatial relationship to the basal organs. However, it is clear that in these seven flowers the phenomena were essentially those of the 21 which were considered first, namely, that in the sector where the exaggerated vegetative activity impinged on the flower additional growth was provoked.

Botanists tend to abandon the Hofmeister-Schwendener theory that contacts round the growing point determine where new mammillæ shall appear; and Goebel ('Organographie,' 1913, 205) has remarked that it is as easy to believe that the mammillæ appear where the supply of food favours them. The multiplication of parts detected in *Scilla* cannot in any way be explained on the Hofmeister-Schwendener theory, but Goebel's comment is not repugnant.

An Extra Whorl of Perianth.—Though at first sight the finding of a third whorl in the perianth appears to belong to a different set of phenomena, this, in the cases to be discussed next, is not so. The extra whorl of the perianth (not always with all three members) was found standing outside the petals, *i. e.*, in sectors B, β and γ; and the members were similar to the petals with which

they were in contact, except that no stamen was adnate to them. Thirteen flowers with this extra whorl came under study, drawn from four different plants. Associated with these extra organs were other abnormalities in the way of splitting of petals, stamens, and imperfect unions of staminal tissue with petals: and, what is important, these abnormalities were confined to the sectors B, β and γ.

This being so, it is justifiable to explain the extra whorl of the perianth as equally due to an invasion of a vegetative tendency into the region of reproduction, aiding this explanation by an assumption that it was the proximity, amounting to contact, which had made the mammillæ to be absorbed into the furniture of the flower itself. On this explanation these doubled flowers were not doubled by any form of petalomania, but by additions on the outside.

Other Abnormalities.—There were a few other abnormalities. In three flowers the parts were increased numerically in sector β, and in one flower in sectors β and γ, further abnormalities being absent. In eight flowers the ovary was 4-locular, seven of them being abnormal also in sector γ and one of them also in sector β.

In three flowers one of the sepals was relatively small; and these were the only abnormalities detected in the sectors of the sepals, except once a sterile stamen.

The zonation of the flower in Angiosperms is an interesting fact, and the way in which it seems to hold firm in these abnormalities is interesting. It may be said that if a mammilla arises in an abnormal position beyond the thalamus it becomes a bract; if in contact with the flower a petal; if within the flower a member of whatever whorl is appropriate, and if astride the boundary of petals and stamens partakes of the nature of both. This is how the diversity of these added organs can be explained: and the formation of a second basal bracteole may well be included.

Attention is called to Peyritsch's work on *Lamium maculatum* and *L. Galeobdolon* (Denkschr. k.-k. Akad. Wien, xxxviii. 1878). He transferred plants of these two species from heavy shade to a sunny place, and the shock of changed conditions induced abnormalities in the flowers of some of the plants and arrested the flowering of others. It has been mentioned above tha the population of *Scilla* at Paignton, which was hunted through, had been deprived of the shade natural to its habitat, and Peyritsch's observations suggest how the tendency of the vegetative activity to overrun its boundaries could have been induced. It is hoped to return to the subject in another year and expected that abnormalities, always hard to find when wanted, will be the more readily forthcoming if search be made for them where the conditions of growth are abnormal.

SUMMARY.

The normal flower of *Scilla nutans* has one bracteole, and there is no evidence why it should be at one time on the right of the bract and at another on the left. Under unusual conditions vegetative features may be introduced into the region of the flowers, resulting in the formation of additional foliar organs on the spiral of growth and a disturbance in that part of the flower where the spiral impinges.

CRITICISM OF DR. THOMAS'S RECENT HYPOTHESIS ON THE NATURE OF THE ANGIOSPERMOUS CARPEL.

By A. C. JOSHI,
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SOME rather startling ideas as to the way in which the angiospermous carpel has arisen have recently been put forward by Dr. Hamshaw Thomas (10, 11). In order to connect the Jurassic Caytoniales with the Angiosperms, Dr. Thomas derives the carpel of the modern group by reduction from a compound megasporophyll of the *Gristhorpia* type to a single pair of ovaries, and their fusion by shortening of the pedicels and the reduction of vegetative tissue, thus forming a single ovary with two rows of ovules tending to approach the ventral suture owing to the failure of the ovary wall to expand along the lines of contact. It is also suggested that the axis of the reduced sporophyll may have become involved in this fusion to some extent, so that the angiospermous carpel is not a simple structure, but a compound organ.

Dr. Thomas seeks support for this hypothesis from the character of the venation in the carpels of certain Ranunculaceae, Rosaceae and Leguminosae. The dorsal (midrib) bundle in these is either a simple cord or gives off only feeble branches, while the ventral (placental) bundles branch copiously. He concludes "that there is in the venation a clear suggestion of the derivation of the apparently simple follicle from a compound structure, and that the three main veins may well represent the midribs of the three segments of a palmate sporophyll, the dorsal bundle representing a central sterile segment, while the placental bundles represent the midribs of the lateral fertile segments which bore ovules along their centres and also possessed laminæ with lateral veins." In coming to this conclusion Dr. Thomas has overlooked several facts. Besides the carpels, in the perianth leaves of many plants, it is seen that the midrib bundle remains comparatively unbranched, while the lateral bundles are conspicuously divided. Similarly the leaves of many plants have a venation

of the same type. The arrangement of main veins in the leaves of several species of *Zizyphus* (Rhamnaceae) is very similar to the venation of the hypothetical ancestor of the *Caltha* follicle, illustrated by Dr. Thomas (10, 659, fig. 6). Nobody will assume from this venation of the *Zizyphus* leaves and, in the absence of any other evidence, that these organs are of compound construction in which three structures are associated. The plan of the veins in the carpels illustrated shows only that these have been derived from organs in which the lateral veins were more strongly developed than the median one. This is natural, for the former supply the ovules and later the developing seeds, while the latter has no important duty to perform. The work of Prof. Bower (2) on 'Size and Form in Plants' shows that the vascular system is very much modified according to the demands made on it.

Taking up the current hypothesis of carpel origin, we find that not only the details of origin, number, and course of bundles forming the vascular supply of the carpels are exactly like those of the leaves, but further, as Prof. Eames (5) has shown, the upfolding and the fusion are also histologically evident. Transverse sections of the ovaries in *Spiraea*, *Physocarpus*, *Trollius*, *Trochodendron*, *Banksia*, *Sedum*, etc., show the upfolding and the inversion of the ventral bundles. In most of these forms, further, the fusion of the margins is still so incomplete that the outer epidermal layers continue uninterruptedly through the region of fusion. The same thing has been observed in the Nyctaginaceae (6), and in one genus of this family the ovary remains open on the ventral side in the basal part even in the ripe fruit. Dr. Thomas might say that this line of fusion represents the region of union of two cupular structures (two ovaries of the *Gristhorpia* type), but in this case in each modern angiospermous carpel we should see not one, but two or three lines of fusion, according to the two or three components making up the structure. We should especially see this line not on the ventral side of a carpel, but rather on the dorsal side, for according to the hypothesis of Dr. Thomas, fusion has so far advanced on the ventral side as to suppress the development of one-half of the laminæ of the fertile segments of the originally 3-parted compound sporophyll, while on the dorsal side the other halves of these laminæ have remained intact and have not suffered much reduction during the inrolling and fusion of the three original segments. No such evidence has been found in any group of modern angiosperms.

Considerable value has been attached (10, 665) to the general occurrence of the anatropous ovule in the modern angiosperms as supporting his hypothesis. Dr. Thomas writes: "There seems to be at present no adequate explanation of why the majority of flowering plants should possess anatropous ovules, while the

orthotropous ovules are rare . . . On the view put forward above, the micropyle would have originally pointed downwards along a line more or less parallel to the placenta or stalk of the ovary, owing to the overarching of the cupule. This position might be attained by the downward growth of the ovule as a whole, or by the curvature of a long micropylar tube, or by the ovule assuming the anatropous position. Since the whole 'ovary' had the shape of an anatropous ovule the chances that the enclosed ovules would develop a corresponding shape are considerable." This explanation seems strange, for in the Caytoniales themselves the ovules are not anatropous. Further, the form of the ovary can be assumed to affect the form of the ovule, if there were only one ovule inside it. It is not intelligible how the form of the ovary can affect the form of one of the ovules in a multiovulate structure. Yet this is the condition in the Caytoniales and the primitive angiospermous carpel figured by Dr. Thomas. All that the form of the ovary can control in this condition is the shape of the entire mass of the ovules, and not the shape of any individual ovule. On the hypothesis in question there should be a fair correlation in a carpel between the position of style and stigma, and consequently the direction of entrance of the pollen-tube on the one hand and the direction of the micropyle of the enclosed ovules on the other. The direction of the incoming pollen-tube should show some control over the direction of the micropyle. There is, however, no such relation. Among closely related genera with the style in the same position the direction of the ovules is very often different. For example, in *Anemone* the ovules are descending with the micropyle pointing upwards, while in the closely related *Ranunculus* the ovules are ascending with the micropyle pointing downwards. Not only this, even among closely related species, in the same species, in the same gynæcium, and in the same carpel, as in *Melilotus* (Cooper, 4), etc., the direction of the ovules is variable. In Annonaceae, according to Baillon (1, 252), in several forms in the same carpel, " we find ovules nearly horizontal at the centre of the placenta, while they are more or less oblique, ascending or descending, as they approach the top or the bottom of the cell " ; and he remarks : " The direction of the ovules has no more importance here than in any other group."

The exact cause of the origin and development of the anatropous ovule is rather difficult to suggest with certainty, for the problem does not seem to have received much attention so far. It may also be pointed out that all authors are not unanimous in regarding it as derivative and the orthotropous ovule as primitive; but even if this is accepted there is some evidence pointing towards its origin in a manner quite different from that suggested by Dr. Thomas. This also seems to explain the above described variations in the direction of the ovules

in the carpel, or in the carpels of closely related species or genera. Reeves (7), studying the development of the ovules and the embryo-sac in *Medicago*, has noted that the young ovule is orthotropous until it has come in contact with the dorsal wall of the ovary. Its straight growth is now checked, and under the mechanical pressure exerted by the ovary wall it begins to bend and curves usually towards the base. In *Cassia Fistula*, according to Thompson (12), commonly towards the base and the apex of the ovary the margins of the carpel remain separated. The ovules in these regions are exposed, have plenty of space to grow, and are generally orthotropous in form. In *Neptunia oleracea*, another member of the Leguminosae, according to Singh and Shivapuri (9), the ovules are half anatropous in form, but sometimes the uppermost ovule in a carpel, where there is enough space for development, remains orthotropous, and does not curve in the normal manner. It may, therefore, be suggested that the anatropous ovule originated under the effect of mechanical influences exerted during development by the growing carpel and limitation of space caused by the multiovulate condition. It is seen that the plants in which orthotropous ovules are found at present possess mostly carpels or gynæcia which are either one-ovuled or only a few-ovuled. The anatropous ovule is so common now because in most types of placentation it is the most suitable form of the ovule for porogamous method of fertilization—limiting to the minimum the distance through which the pollen-tube has to leap over an empty space.

Dr. Thomas's remark (11) that the current view, which regards follicle and the pluriovulate condition as primitive, is based on unsubstantial grounds is hardly true. It may rather be said that it is based on sound grounds of comparative morphology and anatomy, as may be observed from the work of Chute (3). Similarly his conclusion that the primitive stigma " originated on the ventral side of the carpel, perhaps nearer to the base of the ovary than to the apex," is open to objection. The series of forms presented by him from the Magnoliaceae and Rosaceae, beginning with carpels with lateral styles or stigmas and ending with forms having terminal styles or stigmas, can be seen also in many other families of diverse affinity, but there are reasons to believe that the former types are derived rather than primitive. In the Magnoliaceae, Dr. Thomas considers the genus *Drimys* as primitive and *Magnolia* derivative, but taxonomists have reached an opposite conclusion. In the Rosaceae, on the other hand, it may be mentioned that the lateral styles, besides being found in the Kerrioideae, to which Dr. Thomas refers, are also found in the strawberry series, and are a general feature of the Chrysobalanoideae, a group which from other characters, such as

the structure of the androecium, is to be regarded as one of the most highly evolved in the family, and forming a transition to the Leguminoseae. The lateral styles in this family, and also in many others, are found only in uniovulate carpels, which, according to the anatomical evidence afforded by modern forms in this family (3), and even the figures of Dr. Thomas (11, 188, fig. 13), cannot be regarded as primitive. In some Menispermaceae, like *Hyperbaena domingensis* (Rendle, 8, 154), the style and the stigma are terminal on the ovary in the flower stage, but during the development of the fruit they are carried to the ventral side of the ovary, often right down to the base, due to pronounced dorsal growth. A similar change may be supposed to have occurred in carpels with lateral styles or stigmas at an earlier period in the development of the flower, *i. e.*, before fertilization. The change appears to be a secondary one, and not a primitive character of carpel organization. It is actually seen in the development of carpels of *Alchemilla*, *Boerhaavia*, etc., cited by Dr. Thomas, the style first developing in a terminal position, and later on becoming lateral.

The hypothesis of Dr. Thomas is based mostly on palæobotanical work. The abundance of the Urticales in the Upper Cretaceous flora of South Carolina described by Berry in no way supports his argument, for the morphology of the gynæcium in the genera *Ficus*, *Artocarpus*, *Dorstenia*, etc., is very different from that of the single carpel of the Magnoliaceae or Rosaceae. The gynæcium in the family Moraceae is a bicarpellary syncarpous structure, and the lateral position of the style is due to the abortion of one of the carpels.

In conclusion, there seems to be at present no strong evidence in favour of Dr. Thomas's view that the primitive angiospermous carpel was a compound structure composed of two carpels fused together with a part of the original axis bearing these cupules. The origin of the angiosperm carpel according to the old view, from the upfolding of a single open leaf-like megasporophyll bearing ovules along the margins, still seems to be the more acceptable theory. Some modification of this old conception may eventually be necessary, but the basic idea seems to be substantially sound. Just as carpel polymorphism, introduced and so strongly advocated by Miss E. R. Saunders, has proved unacceptable, so one ventures to think will the idea of the compound nature of the carpel brought forward with so much ingenuity by Dr. Thomas prove likewise. The carpel is further on its trial at the hands of Professor McLean Thompson (12, 13). He is inclined to abolish it altogether, and to regard the gynæcium as an acarpous structure. Before criticizing this surprising theory, however, it may be as well to await details of his further studies promised in this direction.

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Reply by Dr. H. Hamshaw Thomas.

After considering Professor Joshi's criticisms of some points in my recent papers I feel that perhaps he has misapprehended their object and argument. Far from desiring to connect the Caytoniales with the modern Angiosperms, I specifically stated in the text and in my diagram (10, 662 and 666)* that the flowering plants were not considered as descended from the Caytoniales. I do think, however, that since there are so many features in the structure, evolutionary history, and distribution of the Pteridosperms which distinguish them as possible ancestors of the flowering plants, we ought to make a very careful re-examination of every aspect of the morphology of seed-bearing structures in megaphyllous plants with reference to this group. In this connection it is important to consider the Caytoniales because their earlier representatives seem to have been gymnospermic and their later forms angiospermic. So by discussing one set of possibilities in a manner which must be theoretical because the flowering plants most probably antedate the Caytoniales, one hoped to get a new insight into the problem and suggest new modes of interpreting the comparative structure of modern forms.

* For works cited see the above list.

It is impossible to overlook the fact that the classical view has to postulate an ancestral sporophyll which differs from any structure known to exist or to have existed, and also to postulate a process which can hardly be credited when judged from its probable effect on the reproductive efficiency of the supposed plants. I am not the only author who, after a careful survey of the evidence, has decided against this view.

My observations on the venation of certain carpels were mainly directed to the criticism of current views, but the question which requires solution is, should venation of the *Caltha* type be taken as evidence for the derivation of the follicle from a simple or from a compound ancestral structure ? I have been unable to find a species of *Zizyphus*, among the many examined, which has the structure mentioned by Professor Joshi, but I have no hesitation in saying that the venation of most species suggests their derivation from compound leaves. The evidence from fossil and recent plants for the greater antiquity of compound leaves is overwhelming. While recognizing the probability of variation in the sizes and physiological importance of the different veins supplying the carpel wall, I do not think that we have as yet any evidence which warrants a belief that the stronger development of the lateral veins can have brought about a complete change in the venation pattern.

My critic considers this hypothesis invalidated by the absence of visible lines of fusion on the dorsal sides of carpels, but it is certain that the fusion or concrescence of ancestral parts in leaves or floral structures is often unaccompanied by visible lines of fusion.

The problem of the anatropous ovule is undoubtedly a difficult one. Its form with the micropyle close to the pollen tube transmitting-tissue is most probably conducive to efficient fertilization, but the problem is how did this type of structure come into being in evolution. I fear that Prof. Joshi's suggestion needs much more evidence, for the ovules produced on abnormal stamens and open carpels are often anatropous. Moreover, if considered in relation to the supposed inrolling of the fertile leaf, the idea of mechanical pressure on the apex of an orthotropous ovule makes it still more difficult to conceive of the continuance of reproduction by porogamous fertilization. It seems essential to find a scheme of development in which the micropyle always faces the point of approach of the pollen tube. Clearly the subject needs fuller investigation. The same remark may be applied to many other aspects of the subject. In comparison with other branches of Science, many of our current morphological conclusions are based on the most flimsy evidence. My critic thinks that this is not true with reference to the primitive nature of the follicle and the pluriovulate condition ; he mentions the excellent work of Miss Chute (3) ; but this work really

proves little more than the improbability of the one-ovuled carpel or achene being a primitive type, with which I entirely agree. The facts displayed are quite consistent with my position, which is that the ancestral angiospermous plants had two or a few ovules; but the author, starting with assumptions to which I would not agree, reaches a conclusion which is not necessarily valid because it agrees with established views. And, even if the follicle is admitted to be primitive in the Ranunculaceae, are we justified in believing that the carpels of all other alliances are derived from follicles with many ovules ? What are we to say about *Drimys* and *Magnolia* in this connection ?

Professor Joshi seems to imply that in dealing with the Rosaceae I considered only the Kerrioideae, but actually I referred to the whole family as studied by Juel, mentioning the genera in which lateral styles were found, and figuring *Comarum* and *Alchemilla* among others. No reference was made to the Chrysobalanoideae, because when Juel studied *Parinarium* he found* that its carpels and floral structure indicated that this group should probably be excluded from the Rosaceae. I fear that this interesting work has been overlooked by some recent authors.

The examples from the Menispermaceae which my critic cites have been constantly in my mind since I mentioned them in my original description of the Caytoniales (1925). They played an important part in the formulation of my concept, but were not included in my recent papers because I had no knowledge of their early developmental stages.

The statement that my hypothesis is based mostly on palæobotanical work needs some qualification. It is true that the discovery of forms like the Caytoniales and Corystospermaceae, and the failure to find any fossil plants remotely similar to the hypothetical angiosperm ancestors of the older theories, caused doubt as to the validity of the classical concepts, but the formulation of new views has been due to a study of the form and structure of modern plants. So that while my views originated from the study of fossils, the evidence for the hypothesis is provided by modern plants ; structures do exist to-day which can be correlated by the new theory as well or better than by the old. Obviously much remains to be done, but the important thing is to provide some incentive which will lead to a careful examination of the precise facts. Professor Joshi speaks of the structure of the gynæcium in the family Moraceae as indicating that the carpels of *Ficus*, *Artocarpus*, and *Dorstenia* are morphologically very different from those of the Rosaceae. I was, of course, aware that such a view might be expressed, but it carries no weight with me until it can be shown that the styles of these plants are not lateral or basal. I feel that botanists have been too ready to

* Juel, H. O., Arkiv för Botanik, Bd. 14, no. 7, 1915.

suggest what ought to be the structure and development of organs, and not sufficiently careful to note what is the actual structure when it conflicts with current theories.

I have never expected that my views would be acceptable to many botanists, because the acceptability of a hypothesis depends so largely on the current scientific background, but the validity and utility of a theory is unaffected by this consideration.

NEW LEGUMINOSAE FROM AFRICA AND TIBET.

By Edmund Baker, F.L.S.

Crotalaria (*Oliganthae*) **Youngii,** sp. nov. *Perennis* humilis ad *C. sericifoliam* Harms et *C. variegatam* Welw. accedens. *Caules* flexuosi graciles plures ex eadem radice orti; ramis adultioribus glabris, junioribus pubescentibus. *Stipulæ* minutæ. *Folia* trifoliolata; foliolis cuneato-obovatis subcoriaceis 10–12 mm. latis, petiolo brevissimo circ. 1 mm. longo. *Flores* 4–5 mm. longi parvi pauci. *Calyx* in toto 4 mm. longus, dentibus acuminatis. *Vexillum* suborbiculare cum ungue 5 mm. longum, 6 mm. latum. *Carina* dorso rotundata 5 mm. longa. *Legumen* oviforme circ. 10 mm. longum sæpissime 2-3-spermum, seminibus ±5·5 mm. longis, ±3 mm. latis.

Hab. Angola. Vila Luso, July 30, 1932, *R. G. N. Young* 335 (type), 301. " Dry forest land. Standard brick red outside, wings yellow, keel tinged red."

Allied to *C. sericifolia* Harms and *C. variegata* Welw., but differs from both by the much smaller flowers and pods.

Lotus Eylesii, sp. nov., ad *Lotus Oehleri* Harms accedens differt primo intuitu caulibus herbaceis et capitulis 8–10- non 3–4-floris. *Caules* probabiliter procumbentes pilosi. *Folia* 3–5-foliolata sessilia vel subsessilia; foliolis oblongo-obovatis vel elliptico-oblanceolatis 7–10 mm. longis, 3 mm. latis, pilosis. *Flores* in capitula dispositi; capitulis densis 8–10-floris. *Pedunculi* pilosi 5–9 cm. longi. *Calyx* in toto 4–6 mm. longus; dentibus acuminatis 2–3 mm. longis. *Vexillum* 10–11 mm. longum, panduriforme apice emarginatum. *Alæ* 10–11 mm. longæ, circ. 5 mm. latæ. *Carina* navicularifformis 7–8 mm. longa, basi unguiculata. *Ovarium* glabrum multiovulatum. [*Legumen* ignotum.]

Hab. Southern Rhodesia. Stapleford, E. Border, alt. 5500 ft., *F. Eyles* 6379. In the dried state the flowers are creamy white.

Dr. Chiovenda recently described *Lotus corniculatus* L. var. *eremanthus*, founding it on *Mearns* No. 811 from Lake Naivasha, but this number of Mearns had already been described as *Lotus Mearnsii* by Dr. De Wildeman.

Aeschynomene Youngii, sp. nov. *Suffruticosa* erecta ramosa 40 cm. alta vel ultra. *Caules* scabrido-hirti. *Stipulæ* non appendiculatæ 6–10 mm. longæ lineari-acuminatæ. *Folia* breviter petiolata, rhachei ±20 mm. longa; foliolis 12–16-jugis, 4–7 mm. longis, 0·5–1 mm. latis, linearibus, interdum leviter curvatis. *Flores* paniculati. *Calyx* 5–6 mm. longus, bilabiatus, apicem versus sparse pubescens. *Vexillum* cum ungue 8 mm. longum, lanceolato-oblongum apice emarginatum. *Alæ* angustæ cum ungue 10 mm. longæ. *Carina* circ. 5 mm. longa. *Legumen* stipitatum 1–2-articulatum, articulis 6–7 mm. longis, 4–5 mm. latis.

Hab. Belgian Congo. Lufupa, edge of dry forest land, *R. G. N. Young* 123.

Allied in some respects to *A. tenuirama* Welw.

Vigna (*Liebrechtsia*) **sudanica,** sp. nov. ad *V. esculentam* De Wild. accedens. *Caules* plures e rhizomate crasso orti 10–15 cm. longi, subrigidi pilosi. *Stipulæ* non evolutæ. *Folia* non evoluta. *Flores* 2–5 ad apicem caulium dispositi. *Calyx* 5–6 mm. longus pilosus, dentibus ±2 mm. longis tubo brevioribus. *Vexillum* suborbiculari-obovatum cum ungue 18–19 mm. longum, ±21 mm. latum, apice emarginatum, ungue ±3 mm. longo, basi auriculatum. *Alæ* cum ungue 19–21 mm. longæ, 8–9 mm. latæ. *Carina* dorso rotundata ±19 mm. longa apice sursum curvata. *Pedicelli* 2–3 mm. longi. *Ovarium* lineare velutinum.

Hab. Anglo-Egyptian Sudan. Bahr-el-Ghazal Prov., South of Maridi–Yambio Road between Ibba and Yambio, *J. E. Dandy* 636. " Herb with stout rootstock, leafless when in flower. Standard light purple greenish outside and with white mark at the base inside; wings light purple, especially towards the upper margin; keel white."

A close ally of *Vigna esculenta* De Wild. in the Section *Liebrechtsia*, from which it differs by the rather shorter calyx and different pubescence. It is easily distinguished from *Vigna Kotschyi* Schweinf. from Fazogli by the character of the inflorescence and the much narrower standard etc.

Rhynchosia rhodesica, sp. nov., ad *R. karaguensem* Harms, *R. Goetzei* Harms et *R. imbricatam* Baker accedens, primo intuitu differt caulibus et foliis brevissime pubescentibus, racemis foliis multo brevioribus, foliolis terminalibus ovatis acutis basi late cuneatis. *Suffrutex* erectus. *Caules* rigidi brevissime pubescentes. *Stipulæ* ovatæ. *Folia* trifoliolata, foliolis terminalibus subtus brevissime pubescentibus 20–30 mm. longis, 20–27 mm. latis, foliolis lateralibus inæquilateralibus ovatis acutis 20–25 mm. longis, 18–20 mm. latis, petiolis gracilibus 10–20 mm. longis. *Flores* axillares in racemos breves dispositi, racemis foliis brevioribus. *Calyx* in toto 6–8 mm. longus, dentibus inæquilongis, dente infimo ceteros excedente. *Vexillum* obovatum vel orbi-

culari-obovatum 12–15 mm. longum, 10–12 mm. latum, flavum lineis notatum. *Alæ* flavæ cum ungue 11 mm. longæ. *Ovarium* lineare. *Legumen* ignotum.

Hab. RHODESIA. Mufulira, *F. Eyles* 8152. "Small bush in open forest. Standard yellow with lake lines. Alæ yellow. Keel herbaceous with two red patches within at tips. Anthers free."

The distinguishing features are the very short indumentum, the short inflorescence shorter than the leaves, the ovate acute terminal leaflets with broad cuneate base, the yellow standard with lake lines and the carina with two red patches within at the tips.

Eriosema Youngii, sp. nov. Herba gracilis ad *E. gracillimum* Bak. fil. accedens differt forma folium &c. *Caules* gracillimi 5–10 cm. alti e tubere orti. *Stipulæ* parvæ lanceolatæ. *Folia* simplicia superiora lineari-lanceolata fere glabra 4–6·5 cm. longa, 4–5 mm. lata, foliis inferioribus brevioribus ; petiolis brevissimis. *Flores* parviusculi pedunculati axillares, pedunculis gracillimis 2–2·5 cm. longis sæpissime 3-floris. *Calyx* in toto 4 mm. longus, dentibus acutis ±2 mm. longis. *Vexillum* cuneato-obovatum ±6 mm. longum. *Alæ* cum ungue 5·5 mm. longæ. *Carina* 5·5 mm. longa. *Legumen* ignotum.

Hab. ANGOLA. Malange, border of vlei, *R. G. N. Young* 851.

Hedysarum citrinum, sp. nov. *Herba* perennis ? erecta. *Stipulæ* scariosæ acutæ 14–18 mm. longæ. *Foliola* 7–8-juga ; foliolis ovatis vel ovalibus superne glabris subtus pubescentibus, apice emarginatis, 14–17 mm. longis, 9–12 mm. latis ; petiolulis brevibus ±1 mm. longis. *Flores* pallide flavi in racemos 10–15 cm. longos dispositi, pedicellis gracilibus 4–6 mm. longis. *Calyx* 5–6 mm. longus dentibus acutis 2·5–4 mm. longis. *Vexillum* oblanceolatum 14–15 mm. longum, ±5 mm. latum. *Alæ* angustæ. *Carina* cum unguibus 15–17 mm. longa. *Leguminis articuli* 3–4 mm. longi, 5 mm. lati, glabri vel subglabri, subrotundati.

Hab. S.E. TIBET. Dongkar, open stony hillside, August 16, 1934, alt. 13,500 ft., *F. Ludlow* and *G. Sherriff* 832. "Pale lemon-yellow."

The distinguishing features are the oval emarginate leaflets in 7–8 pairs, the racemes of pale lemon-coloured flowers, and the pod with 3–4 flat glabrous articulations. Several species of *Hedysarum* have been recorded from Tibet—*H. obscurum* L., *H. Falconeri* Baker, *H. Limprichtii* Ulbr., *H. pseudo-astragalus* Ulbr.,—but by the characters enumerated *H. citrinum* can be easily distinguished.

I am much indebted to Dr. Handel-Mazzetti for kindly examining this plant and giving me his opinion.

The specimens described above are all preserved in the British Museum Herbarium.

SIXTH INTERNATIONAL BOTANICAL CONGRESS, AMSTERDAM.

A CONGRESS which is supported by delegates from more than fifty countries, the majority extra-European, may fairly claim to be international—860 members had registered. A busy week was spent at Amsterdam, from September 1 to 7, and the votes of thanks at the final plenary meeting to those responsible for the organization, especially to the energetic senior secretary, Dr. M. J. Sirks, were generally felt to have been well earned.

It was a hard fate that removed Prof. Went, the directing spirit of the Executive Committee, a few weeks before the meeting, but his place was ably taken by Prof. J. C. Schoute, of Gröningen, who in his address of welcome to the delegates and members referred feelingly to the loss sustained by botany and the Congress.

The headquarters of the Congress was at the Kolonial Institut, pleasantly situated facing a tree-lined canal, a short walk along which brought one to the Amstel, the broadest of the many water-ways that intersect the town. The ten sections were accommodated for their meetings at the Institut and at the botanical and other laboratories in the neighbourhood. An excellent tram-service provided connection and also means of transport from the hotels at which the members stayed. A programme, which was a marvel of condensation, in three languages, English, French, and German (the educated Dutch seem at home in any one) gave information as to meetings, excursions, social events, exhibitions, etc. Volume II. of the 'Proceedings,' containing abstracts of sectional papers, edited by Dr. Sirks, was ready for the use of the members. Volume I., to be published after the Congress, will contain the Report of the Congress's activities. Two other handbooks had been prepared for the use and edification of the members: 'Botany in the Netherlands,' a sketch of the history and present position of botanical science in the Netherlands and their overseas territories, edited by Dr. Sirks from accounts supplied by those in authority at the various laboratories, institutions, or societies, and a descriptive account of the Netherlands as an environment for plant-life, admirably illustrated by maps, sections, and tables, compiled by Prof. W. C. de Leeuw, and presented to the members by the Netherlands Botanical Society.

Each section had its bureau ready appointed, with president, vice-presidents, recorder, and secretaries. The work of each was the consideration of a number of themes, suggested by the executive committee and supported by papers submitted on invitation. In many cases the theme was of interest to more than one section, and combined meetings were arranged. Nomenclature formed a subsection of Taxonomy, and was ably presided over by Dr. E. D. Merrill. The preparation of a "Synopsis of

Proposals" and a collated series of preliminary opinions, by Dr. T. A. Sprague, simplified the work. A few textual emendations were made to the recent edition of the "Rules" and some points involving differences of opinion were discussed. An important feature was the appointment of various committees which should act in the interval between this and the next Congress. Dr. Sprague was appointed secretary of the executive committee, and Miss M. L. Green acted as English recorder. We may expect the appearance of the results of the deliberations at no long interval.

Several days were devoted to excursions, full particulars of which were given in a special programme. These included visits to the botanical laboratories and gardens at Utrecht, Leyden, and Baarn. The professors and directors of the different institutions had been at great pains to make the visits instructive and interesting. One recalls, for instance, Prof. Koningsberger's laboratories at Utrecht, where members were initiated into the details of investigations on growth-substance, the National Herbarium at Leyden under Prof. H. J. Lam, and of special interest the adjoining Hortus Botanicus founded in 1587. It contains several very old trees, a Laburnum, planted 1601, a Liriodendron, 1657, and a replica of the garden as arranged under Clusius's supervision in 1594 and based on the original plan and inventory. At Baarn Dr. Joha. Westerdyk did the honours of the Phytopathological Laboratory and the Central Bureau for Fungus Cultures: an interesting exhibit was a collection of species or varieties of elm which have proved immune to the Dutch elm-disease. Other members visited a flower-growing centre and the bulb-research laboratories at Lisse under Prof. E. van Slogteren; and a geobotanical excursion to the Veluwe, a preglacial sand and gravel tract of country, was of special interest to the ecologists and field-botanists.

On the long drives through towns and villages, often old and quaint, and large tracts of polderland, one became familiar with the characteristics of that large portion of the country which, lying below sea-level, is kept free from water by dykes and draining—wide green expanses intersected by canals and ditches, and affording grazing to herds of black and white cattle (with a brown one to each herd, for luck (?)). A final excursion, labelled sight-seeing (not botanical), was a long day's drive along the old Zuyder See, now the Ysel Meer, and on to the great dam which now keeps back the North Sea—an object-lesson in land reclamation. Much still remains to be done before the ancient See is reduced to a mere outlet for the rivers from the interior, the passage of which to the sea is controlled by huge sluices, but different stages in the development of polderland were seen, including an area, now supporting two villages and various crops, that five years ago was submerged. The field-

botanists regretted that the drive back within the coastal sand-dunes did not allow time for their inspection.

Evening receptions by the Netherlands Botanical Society and the Government—the latter at the Rijksmuseum, allowing a visit to the famous picture galleries,—and sectional and official dinners, gave ample opportunity for social intercourse.

An interesting exhibit of Linneana—books, manuscripts, sketches, etc.—arranged in one of the rooms of the Zoological Society, the spacious gardens of which near the Kolonial Institut, were open to members of Congress, commemorated the bicentenary of the publication of Linnæus's 'Systema Naturæ' (Leyden, 1735). Linnæus lived in Holland from 1735–38; he was a student at Leyden, and some of his earliest works were published in Leyden or Amsterdam.

It may seem ungenerous to find fault when so much had been done for the comfort and enjoyment of the members, but the statement "Evening dress is not necessary and its use at official functions is optional" caused embarassment to some members who had interpreted it literally; when one's hosts are in "tails" one may feel a longing for at least a dinner jacket. And would it not be appropriate to maintain, when possible, liaison with the preceding Congress by allowing some part in the opening ceremony to the past president? Perhaps our Swedish colleagues, whose invitation for the next meeting in 1940 was accepted, would consider these minutiæ?—A. B. Rendle.

IMPERIAL BOTANICAL CONFERENCE.

The Third Imperial Botanical Conference was held in the Linnean Society's Rooms, Burlington House, by kind permission of the President and Council, from August 27–30. It opened with an Evening Reception to members and their wives. A number of interesting exhibits were staged in the Library. These included a series of Linneana from the Society's collections, illustrating the development of Linnæus as a botanist, arranged by Mr. Savage, and a selected set of specimens from the Kew Herbarium, showing species and strains of *Eleusine Coracana*, *Oryza sativa*, and *Pennisetum*, lawn and pasture grasses, and species and strains of *Agrostis*, arranged by Mr. Hubbard. Dr. Pole Evans showed a beautiful series of coloured transparences depicting South African vegetation.

The business opened with an address of welcome by the President, Sir Arthur Hill, which was followed by a number of papers on Pasture Research in different parts of the Empire: Prof. R. G. Stapledon spoke on the importance of strain in grassland plants; Mr. M. G. Jones on the influence of the biotic factor, emphasising the importance of adjusted grazing; and

Mr. G. E. Blackman on that of nitrogen supply and other factors on the growth of pasture plants; and Dr. Pole Evans and Prof. G. W. Scarth on pasture research in South Africa and Eastern Canada respectively. An afternoon session was given to papers on the succession of forest types, Dr. Burtt Davy, Mr. P. Topham, and Mr. W. D. Macgregor dealing with their evolution, distribution, and succession in tropical Africa; and Mr. P. W. Richards with a comparison of rain-forest types in British Guiana, Sarawak, and Nigeria. Two sessions were devoted to problems of fruit storage and transport as affecting various parts of the Empire, and in the final session the President discussed a scheme for the creation of liaison officers, and Sir Geoffrey Evans the organization of botanical research in the tropics.

An afternoon tea and reception was arranged by the Department of Botany, Natural History Museum, and the Conference closed with a visit to the Royal Botanic Gardens, Kew, where the members were entertained to lunch by H.M. Government.

The Executive Committee, with Prof. W. Brown as Secretary, are to be congratulated on the success of the Conference, which was well attended by home and overseas members.—A. B. RENDLE.

OBITUARY.

BENJAMIN LINCOLN ROBINSON

(1864–1935).

I REMEMBER no more welcome or charming visitor to the British Museum Herbarium than B. L. Robinson, whose long service to floristic botany at Harvard was closed by death on July 27. Robinson was born at Bloomington, Illinois, on November 8, 1864, and, after graduating at Harvard in 1887, studied plant-anatomy under de Bary at Strassburg. His thesis for the Ph.D. at the Kaiser-Wilhelm's University was on the stem-anatomy of *Phytocrene macrophylla* Bl. (Bot. Zeit. xlvii.; 1889). On his way back to America I had the opportunity of showing our Herbarium to a quiet and unassuming young man. Since then Robinson has paid several visits to London, and he has been one whom it was a pleasure to welcome and help.

One remembers also his tactful co-operation at certain Botanical Congresses, especially at Vienna, in 1905, where he represented the more stable school of nomenclature as opposed to the somewhat revolutionary Neo-American School. But that is ancient history. There are also pleasant memories of a day at Boston, after the Ithaca Congress of 1926, when Robinson did the honours of the Gray Herbarium, the last word in safety—furniture and fittings all of steel as on a battleship—and organized equipment.

On his return from Strassburg Robinson had been appointed Assistant to Sereno Watson, and when Watson died in 1892 Robinson became Curator of the Gray Herbarium. Gray had died in 1888, and the continuation of the work which had made his herbarium world-famous and the centre of American floristic botany devolved on two young men, Robinson and his assistant M. L. Fernald. 'The Synoptical Flora of North America' left unfinished by Gray and Watson, was completed under Robinson's editorship, with the help of Coulter, Trelease, and Bailey, in 1895–7; and the much-needed revision of Gray's 'Manual' (edition 7), in which Fernald co-operated, appeared in 1908.

The most pressing need was adequate housing and endowment for the herbarium, and from 1909–15 the Gray Herbarium, which had acquired recognised status as a unit of the University, was, thanks to a number of generous donors, gradually established in a large modern building with a much increased income. An innovation had been the association of teaching with its functions. Through the generosity of Mrs. Gray the Asa Gray Professorship in Systematic Botany was founded in 1899, with Robinson as its first incumbent.

His tenure of the curatorship has been marked by a continuous stream of publications, by himself and his assistants, on the botany of North America, Mexico, and Tropical South America. These, which appeared mainly in the 'Transactions of the American Academy,' have been made more accessible to botanists by their collection into well-indexed volumes as 'Contributions from the Gray Herbarium.' A more ambitious publication was the 'Memoirs of the Gray Herbarium,' initiated by Robinson's 'Revision of the Genus *Brickellia*' in 1907.

Robinson's interest in local botany found expression in his work for the New England Botanic Club, founded at Boston in 1895. He edited its Journal 'Rhodora' for thirty years, from its inception in 1899. The herbarium of the Club, numbering more than 150,000 sheets, is housed in the Gray Herbarium and forms a valuable local and regional collection.

His election to the Foreign Membership of the Linnean Society in 1922 was a mark of the appreciation of his work by British botanists.—A. B. RENDLE.

SHORT NOTE.

HAINESIA RUBI Sacc.—While on holiday this summer in Pembrokeshire, I found (Aug. 4) on leaves of a form of *Rubus fruticosus* a remarkable Coelomycete which does not seem to have been noticed in this country before. It attacked the uredo-sori and teleuto-sori, on the underside of those leaves, of *Phragmidium*

Rubi Wint., which is abundant always in autumn on the Welsh coast. The infested sori were seen to be surmounted by a kind of whitish collar. On microscopical examination this resolved itself into a dense fringe of sporophores, each of which bore on its apex a single oblong or oval colourless spore measuring 6–10 × 2·5–3·5 μ, immersed in mucus. The spores were eseptate, and agreed exactly with Saccardo's rare species above mentioned, which is described in the 'Sylloge,' iii. 699.

These pustules reminded one of the pycnidia of *Darluca Filum* which infests so many of the sori of Uredinales on leaves, with two differences—the spore-mass of *Darluca* is surrounded by a distinct peridium and its spores are uniseptate. Just as *Darluca* may be regarded as a sport of *Ascochyta*, which has taken to living on Uredinales, so *Hainesia* might be regarded as a similar sport of *Gloeosporium*.

On my return I wrote in September to Mr. Rilstone in Cornwall (which so closely resembles Pembrokeshire), asking him to look for the fungus. He found it in plenty, and sent me specimens almost by return of post. It would seem that the fungus is more abundant this year than it has ever been here before.—W. B. Grove.

REVIEWS.

Weeds. By Walter Conrad Muenscher, Assistant Professor of Botany, New York State College of Agriculture. Cr. 8vo, pp. xxii, 577 (7 blank), 123 full-page figs. Macmillan Co.: New York, 1935. Price 25*s*.

The primary aim of the author has been to make more available the information on the identification and control of the commonest weeds of the northern United States and Canada. The distinction between weeds and other plants is necessarily somewhat arbitrary, and, in addition to the common weeds, there have been included some of local distribution and also recent introductions that are yet limited to restricted areas, but have shown aggressiveness and promise of becoming more widely scattered.

Part I., about one-fifth of the whole, is a general account of weeds and their control. In four chapters the author discusses, respectively, the dissemination and importance of weeds (the losses caused by and certain benefits derived from plants classed as weeds); weeds of special habitats—unfortunately the printing has failed on seven pages in this and the next chapter, so we are left uninformed as to several habitats, including cranberry-bogs and rice-fields; the control of weeds; and chemical weed control. Of the 500 weeds described in the volume, 45 per cent. are perennial, 7 per cent. biennial, and 34 per cent. annual; with very few exceptions all produce seed. As regards their origin 39·2 per cent. are native to North America, 35·4 per cent. to

Europe only, and 16 per cent. are also of Old World origin. Interesting cases are cited of escapes of ornamental plants. *Ranunculus acris*, grown in 1919 as a rare exotic in a rock garden, in ten years' time was overrunning the pastures in the neighbourhood.

Part II. opens with a key to the groups and species of weeds based on vegetative, floral, and seed characters, which has the appearance of careful compilation. The greater part is occupied with a descriptive account of the weeds, arranged in alphabetical order under their botanical names in their respective families—the page on which each species is described is indicated in the key. The botanical name is followed by commonly used English names; the habitat and distribution of the plant as a weed in the United States and Canada are indicated, a concise general description follows, and methods of control are suggested. The good illustrations, mainly the work of Mrs. Helen Hill Craig, show the habit and characters of flower and fruit of a large proportion of the weeds described, and will be most helpful in identification.

The book naturally has a special appeal to an American public, but contains much of general interest on the subject of weeds. Some of the common names show variation or deviation from our English names. *Agropyrum repens* is "quack-grass," apparently a variant of "quick"; rabbit-foot clover, for *Trifolium arvense*, replaces "hare's-foot." Absence of *Senecio Jacobaea* as a common weed is indicated by citation of both Groundsel and Ragwort under *S. vulgaris*; *S. Jacobaea* is included as an introduction in Gray's 'Manual.' "Cursed crowfoot" for *Ranunculus sceleratus* is suggestive.—A. B. R.

Problems in Soil Microbiology. By D. W. Cutler and L. M. Crump. Cr. 8vo, pp. 99, with map and figs. Longmans, Green & Co.: London, 1935. Price 9*s*.

The volume under review forms one of the Rothamsted monographs on Agricultural Science; its subject-matter is based on a series of public lectures given at the University of Wales. In the early chapters soil is considered from a biological viewpoint as an environment for bacterial and protozoon development. The physical conditions of this habitat mentioned include temperature changes of the soil, moisture relationship of the soil-particles both on the surface of the crumb and within, and the process of soil-aëration partially caused by daily fluctuations in temperature and subsequent air displacement. The density of the soil-population affords sufficient proof of the suitability of the environment, whilst its accurate estimation affords numerous problems for investigation. An adequate statistical equipment—both mental and mechanical!—is a vital necessity for such research.

The authors have isolated from effluent filters a number of soil-bacteria capable of accomplishing phases of the nitrification processes; so that it is no longer thought that certain reactions are dependent upon the activity of one peculiar organism only, Winogradsky's *Nitrosomonas*; they may be carried out by quite a large number of soil-bacteria. The versatility of the soil-organisms in their physiological activity may well be illustrated by the behaviour under varying circumstances of certain ammonifying forms which may oxidise ammonia to nitrate, and under given conditions may consume their own product. Further evidence of adaptibility is shown by the number of carbon compounds, including sugars and organic salts, that are broken down by one and the same species. With the protozoa the investigations, which are briefly outlined, include a statistical analysis of the influence of soil temperature and moisture on the numbers present in the soil, analyses of daily and seasonal fluctuations and rhythms, and of the density of the population in its effect upon the growth-rate of its constitutent members.

The later sections of the book deal with the interaction of the organisms. The influence of partial soil-sterilisation should hold the attention of the practical grower; for temporarily increased fertility may accrue from the increased bacterial numbers which result from the removal of predatory amœboid protozoa. Such observations have led to the investigation of the efficiency of the bacterial machine in relationship to the density of the population. Apparently the protozoa hold the bacterial efficiency near the maximum by checking the number of bacteria. The thorough elucidation of such problems must be a lengthy procedure. It is left to the reader to imagine further work along physico-chemical lines.

The book shows the difficulties of the investigators in interpreting data collected daily from mixed populations under varying conditions. It also conveys something of the fascination felt in unravelling the entangled skein of the inter-relationship of simple forms of life with one another. Interesting analogies are also drawn with higher forms of life in a less restricted sphere. The book leaves no doubt as to the importance of the lowly organisms in influencing fertility in the field.

Throughout, the text reads easily, and generally can be understood with little technical knowledge. The argument is supported by sufficient data, whilst full details of experimental investigations are held in reserve. If one must find fault with the book, it is too highly priced.—M. A. H. Tincker.

British Association Meeting.—A report of the Norwich Meeting is deferred to the November number.

PRELIMINARY NOTE ON ALGAE FROM THE SOILS OF RICE-FIELDS IN CEYLON *.

By E. C. T. Holsinger, B.Sc., F.R.M.S.

An investigation of the algal flora of the soil of certain rice-fields in Ceylon was begun in October 1934, and the present communication records the species so far observed with notes on certain Chlamydomonadaceae. The soil of a rice-field is inundated with water once or twice a year for a period of from eight to twelve weeks, and in this respect differs altogether from the soils that have hitherto been investigated (literature in Moore and Carter (4)). Van Oye (6) reviews the very scanty literature available regarding the algæ of rice-lands, and concludes by pointing out that, in the interests of agriculture, the activities of the microflora and microfauna of such tracts should be thoroughly investigated.

Collections were made from rice-fields at Peradeniya, Gampaha, and Kirillawela, the two last localities being situated at about sea-level, while the Peradeniya rice-field is at 500 metres. Eleven samples of soil were taken in July and August and three further ones in November 1934; the samples were gathered both from the surface and at various depths (0–5 cm., 15–20 cm.), and were allowed to dry at air temperature. They remained in this condition until cultures were started in October 1934 and January 1935 in London. The mineral salts solution used and the method adopted were very similar to those of Bristol (1). The culture vessels were placed in a greenhouse at a temperature of 60°–75° C. The life-history of certain species that appeared in mixed cultures was followed in hanging drop cultures and unialgal sub-cultures, adopting the technique described by Bristol (2) and Waksman (7).

General Remarks on the Algae observed.

All four classes of Algae that have been recorded from the soil have appeared in my cultures. The Chlorophyceae are represented by fifteen, the Xanthophyceae (Heterokontae) by three, and the Myxophyceae by four genera. Diatoms were also present, but have not yet been studied.

The following species of Chlorophyceae occur in the cultures from all three localities:—*Chlamydomonas gloeogama*, *C. Reinhardi*, *Carteria Klebsii*, *Chlorococcum humicolum*, and *Chlorochytrium paradoxum*. *Protosiphon botryoides* (Kütz.) Klebs appeared in a culture of surface-soil from Peradeniya. The occurrence of species of the genera *Carteria*, *Oocystis*, *Chodatella*, and *Spirogyra* in the soil is reported for the first time †. *Choda-*

* From the Department of Botany, Queen Mary College, University of London.

† *Carteria* and *Chodatella* have not hitherto been recorded from Ceylon.

tella, *Oocystis*, and *Closterium* are plankton-forms, the last two being recorded from Ceylon rice-fields by W. and G. S. West (8). Sterile filaments of *Spirogyra* were present in cultures both from the surface and from a depth of 15–20 cm., the average width of the filaments being 21 μ.

The Xanthophyceae appeared only after four and a half months in a culture of soil (1–5 cm.) from Peradeniya. They included *Ophiocytium cochleare*, young plants of a species of *Botrydium*, too immature for determination, and a filamentous form that requires further study. The long threads are composed of barrel-shaped cells, 11·2–12·6 μ long and 3–3·5 μ broad, and with uniform thin walls showing no trace of H-structure; the cells contain 8–10 discoid chromatophores. *Ophiocytium* has not previously been reported from the soil.

The Myxophyceae are mainly represented by species of *Phormidium* (*P. autumnale*, *P. molle*, *P. foveolarum*, and *P. angustissimum*). *P. molle* was obtained from all depths from Peradeniya and from 0–1 cm. and 1–5 cm. depths from Gampaha. *P. foveolarum* was present in the surface-centimetre at Peradeniya and Gampaha, and at the latter locality also in samples from 1–5 cm. *P. autumnale* and *P. angustissimum* were found only at Peradeniya, and not below 5 cm.

Notes on certain Members of Chlamydomonadaceae.

Species of this family were frequent and included *Chlamydomonas gloeogama* Korschik., *C. Reinhardi* Dang., *C. atactogama* Korschik. var. *ceylanica*, var. nov., *C. clathrata* Pascher, and *Carteria Klebsii* (Dang.) Francé, the first two and the last appearing in all cultures. *C. atactogama* var. *ceylanica* appeared in the surface-soil at Peradeniya and down to 20 cm. at Kirillawela, and *C. clathrata* in a single culture of soil collected at a depth of 15–20 cm. at Kirillawela.

(a) *Chlamydomonas atactogama* Korschik. var. nov. **ceylanica** (fig. 1); cellulis late ovalibus, 12–30 μ longis, $\frac{2}{3}$ lat. quam long.; membrana tenui distincta, cytioplasmatem arcte ambiente, cum papilla anteriore parva sed distincta; flagellis e media parte papillæ ortis, quam corpore cellulæ ca. $1\frac{1}{2}$-plo longioribus; chromatophora crateriformi, totam cellulam præter aream parvam rotundatam anteriorem occupante, pyrenoide solitario mediano; stigmate pallido, ca. tertia parte longitudinis a fine anteriore posito. Propagatio asexualis per divisionem in partibus 4; sexualis gametis nudis elongatis finem anteriorem versus acuminatis, per divisionem in 4 vel 8 partibus ortis, majoribus 8 μ, minoribus 6 μ longis; copulatio anisogama.

In asexual reproduction the four daughter-cells are arranged in pairs whose long axes intersect at an angle of about 30°. The positions of the daughter-cells are explicable on the assumption

that the plane of the first division is longitudinal and that the two protoplasts subsequently rotate through about 15° in opposite directions. The second division takes place in a plane at right-angles to the first, so that the planes of division of the respective protoplasts will intersect at an angle of about 30°.

Gametes are formed, to the number of 4 or 8, in stationary cells, 14–20 μ in diameter, whose membrane at first becomes distended and thinner, and later disorganizes. The naked gametes are of two sizes, and all those formed from the same parent-cell are of the same size. The gametes differ in shape from the vegetative individuals, being elongated and tapering somewhat towards the anterior end, while bluntly rounded at the posterior

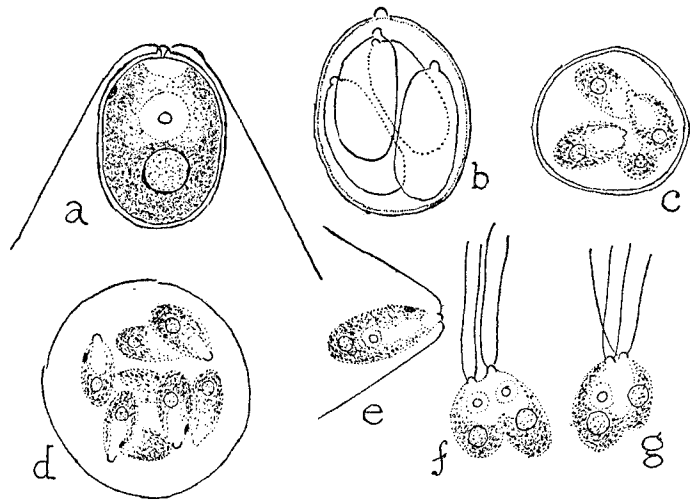

Fig. 1.—*Chlamydomonas atactogama* Korschik. var. *ceylanica*, var. nov. *a*, motile individual; *b*, asexual reproduction; *c*, *d*, gamete-formation; *e*, gamete; *f*, *g*, fusion of same. (All × 1640.)

end. The papilla is like that of the vegetative individual, and the flagella emerge from it in the same manner.

Anisogamous fusion is the rule. The gametes come into contact by their anterior ends, rotating on their axes as they continue to swim. Subsequently they come to lie side by side, and in this position fusion occurs, the process beginning at the anterior end. The zygote soon comes to rest, enlarges considerably, and secretes a thin membrane. At this stage the protoplast is highly vacuolated, and the chloroplast has a transparent green colour.

The variety above described resembles *C. atactogama* in most respects, but differs from the diagnosis in Pascher (5) in the origin

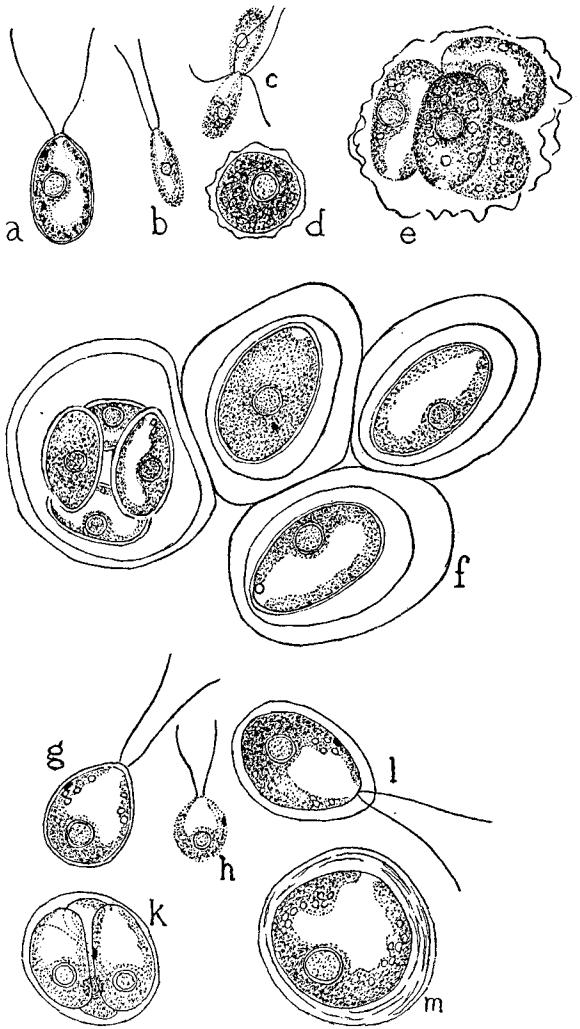

Fig. 2.—*a–f*, *Chlamydomonas gloeogama* Korschik.: *a*, motile individual; *b*, gamete; *c*, fusing gametes; *d*, zygote; *e*, germinating zygote; *f*, palmella stage. *g–m*, *C. Reinhardi* Dang.: *g*, motile individual with thin wall; *h*, gamete; *k*, asexual reproduction; *l*, motile individual with thick mucilaginous wall; *m*, sedentary cell showing increase in size. (*a–d*, *g–m*, ×1240; *e*, *f*, ×1570.)

of the flagella from the middle of the papilla, in the location of the stigma nearer the anterior end, in the naked unequal gametes, and the lateral usually anisogamous fusion. The differences do not appear to be of sufficient significance to warrant the establishment of a separate species. In the mode of origin of the flagella and the lateral fusion, the variety resembles *C. Debaryana*, a closely related species.

(b) *Chlamydomonas gloeogama* Korschik., forma (fig. 2 *a–f*).—The majority of the cells of this form were present in the palmelloid stage, which formed a soft gelatinous stratum on the sides of the culture vessels or on the surface of the solution. When a small portion of the stratum is transferred to a slide, in about thirty minutes the cells develop flagella, acquire a distinct stigma, and swim out of the gelatinous matrix. Already in the palmelloid stage the cells have two distinct contractile vacuoles.

Asexual reproduction by successive division into four occurs in the palmelloid stage. The daughter-cells, when four in number, are grouped in pairs whose long axes intersect at an angle of 60°–90°. This arrangement can be explained as resulting from a rotation of the two protoplasts formed in the first division in opposite directions through an angle of 30°–45°, after which the second division follows at right-angles to the first. Occasionally when division has taken place only into two the anterior ends of the daughter-protoplasts are found pointing in opposite directions, implying a rotation through an angle of 180°.

The gametes, which are all of the same size and are formed to the number of eight, are naked and more elongate than the vegetative cells. During fusion, which is end to end, the gametes become shorter and thicker. The zygote develops a thick membrane ornamented with warts, and is 15–20 μ in diameter.

The form above described resembles *C. gloeogama* in most respects, but differs from the diagnosis in Pascher (5) in the mode of division during asexual reproduction, the naked gametes, and the verrucose zygospore-membrane.

(c) *Chlamydomonas Reinhardi* Dangeard (figs. 2 *g–m*; 3 *a*, *b*).—This form resembles *C. Reinhardi* (3, 5) in the shape of the individual, and *C. intermedia* Chodat (5) in the frequent occurrence of palmella stages (fig. 3 *b*). It differs from both in the stigma being situated near the middle of the cell (fig. 2 *g*, *l*). The cell-wall is either thin and fits closely against the protoplast (fig. 2 *g*) or it is thick and mucilaginous and may be stratified (fig. 2 *l*, *m*).

A noteworthy point is that sedentary cells grow to dimensions as great as 40 μ before they divide into 16–32 zoospores (fig. 3 *a*).

(d) *Chlamydomonas clathrata* Pascher (fig. 3 *c–e*).—The Ceylon form is very similar to that described by Pascher (5), the only points of difference being the rounded shape of the

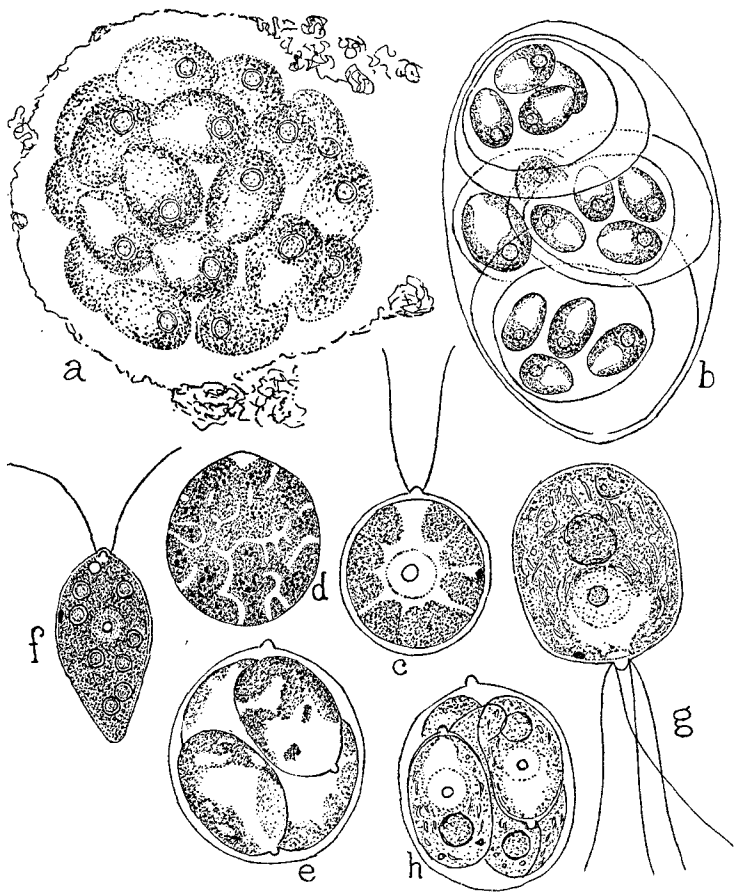

Fig. 3.—*a*, *b*, *Chlamydomonas Reinhardi* Dang.: *a*, asexual reproduction within an enlarged cell; *b*, palmella stage. *c–e*, *C. clathrata* Pascher: *c*, motile individual; *d*, cell stained to show starch; *e*, asexual reproduction. *f*, *Chlamydomonas* sp. *g*, *h*, *Carteria Klebsii* (Dang.) Francé: *g*, motile individual; *h*, asexual reproduction. (*b*, ×900; all others, ×1230.)

individual (fig. 3 *c*) and the median position of the stigma. The chloroplast, while cup-shaped as a whole (fig. 3 *c*), has a markedly reticulate character (fig. 3 *d*). Asexual reproduction occurs after the individual has lost its flagella (fig. 3 *e*).

(e) *Chlamydomonas* (?) species (fig. 3 *f*).—This appeared after eleven days in a single culture of surface-soil from Gampaha, and gave rise to a vigorous unialgal culture. After about a fortnight it disappeared completely.

The cells are ovoid with a broad anterior end, which is produced into a small papilla from the base of which the equal flagella arise. The posterior end is usually bluntly pointed. The width of the cell is approximately three-fifths of the length, which varies between 16 and 24 μ. The flagella are usually from $\frac{2}{3}$ to $\frac{3}{4}$ the length of the cell, although sometimes equal to it, while the stigma is situated about one-third of the length from the anterior end. The membrane is closely adherent to the protoplast. The pyrenoids are irregularly scattered, and their number may be as great as 13, only young daughter-cells having a single pyrenoid. The nucleus lies somewhat towards the anterior end.

The mode of reproduction was unfortunately not studied while the material was available. The vegetative individuals do not closely resemble any described species of *Chlamydomonas*, while the chloroplast recalls that of some forms of *Chlorogonium*. A decision as to the exact status of this alga is therefore deferred until further material can be obtained.

(*f*) *Carteria Klebsii* (Dang.) Francé, em. Troitzkaja (fig. 3 *g*, *h*).—The Ceylon alga only differs from that described in Pascher (5) in the more rounded shape of the individuals.

In conclusion, I wish to thank Professor F. E. Fritsch, F.R.S., for his guidance, and Dr. N. Carter and Miss F. Rich for various suggestions. I am indebted to Dr. A. Joachim (Peradeniya), Mr. G. V. Wickramasekera (Gampaha), and Mr. T. B. Dissanayake (Kirillawela) for help in obtaining soil-samples.

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THE GENUS *HEMIZYGIA* BRIQUET

By Maurice Ashby, Ph.D., D.I.C.

In course of a study of the genus *Orthosiphon* it has been necessary to investigate the status of the genus *Hemizygia* and its relationship with *Orthosiphon*; from this investigation it appeared that a revision of *Hemizygia* would be useful.

Hemizygia is a member of the Labiatae; it was proposed by Bentham (in DC. Prodr. xii. 41; 1848) as a section of the genus *Ocimum*, of the sub-tribe Moschosminae of the Ocimoideae. The section was to include the species *O. teucriifolium* Hochst., in which the filaments of the anterior stamens are fused at the base, in contrast to the free filaments of other species of *Ocimum*. In Engler and Prantl's 'Pflanzenfamilien' (iv. 3 a, 368; 1897) Briquet raised the section to generic rank, laying stress on the fused filaments of the anterior stamens as a differential character, and he later described some further species *. In the 'Flora Capensis' (v. i, 237; 1910) N. E. Brown rejected the fusion of the filaments as a generic criterion for *Hemizygia* on the ground that the amount of union varies, even in the same plant, there being sometimes no union at all. He therefore merged *Hemizygia* in the genus *Orthosiphon*.

The following observations are based on a detailed study of the species of the two genera. The variation of union in the filaments of *Hemizygia* noted by N. E. Brown occurs, but not often to any marked degree, and only very rarely are the filaments free to their base. Other differences in the androecium of the two genera have been noted. The anterior pair of stamens in *Hemizygia* are contiguous at their insertion at the mouth of the corolla-tube, while in *Orthosiphon* the anterior stamens are well separated at their insertion, which is at some little depth in the corolla-tube, or rarely in the corolla-throat. Except in one species (*H. Gerrardi*) *Hemizygia* has the posterior stamens inserted towards the base of the corolla-tube at a considerably greater depth than the anterior pair, while in *Orthosiphon* (except rarely) the two pairs are inserted at more nearly the same level. It may also be noted that generally the stamens of *Hemizygia* are exserted beyond the anterior lip of the corolla, while those of *Orthosiphon* do not exceed the anterior lip.

There are other features beside the androecial characters by which *Hemizygia* may be distinguished from *Orthosiphon*, and some of these are noted here. The corolla-tube of *Hemizygia* is usually dilated at the throat and truncate at the mouth; the posterior lip is small, the anterior lip larger and more or less deflexed at maturity. In contrast, *Orthosiphon* rarely has the

* See Annu. Conserv. Jard. Bot. Genève, ii. 249 (1898), and Bull. Herb. Boiss. sér. 2, iii. 992 *et seq.* (1903).

corolla-tube widened at the throat; the mouth is not truncate, but the two lips meet laterally, and are both large, the anterior lip being more or less straight. Finally, several species of *Hemizygia* have the terminal bracts of the inflorescence enlarged and conspicuously coloured, but such differentiation is not found in *Orthosiphon*.

I consider that the original character of the fused stamens is still valuable as a generic criterion, and that the exceptions are so few that they have no significance beyond indicating that *Orthosiphon* and *Hemizygia* are closely allied genera with intermediate species. If the fusion is due to pressure of the anterior corolla-lip on the filaments during development in the bud, as Robyns and Lebrun * have shown occurs in the genus *Coleus*, it is not surprising to find variation in the amount of fusion, because it will be affected by small differences in the shape of the corolla. The fundamental character underlying the fusion is that the anterior stamens are contiguous at their insertion; this character is constant, but does not always make itself manifest in the more obvious feature of the fusion of the filaments. The general facies of the plants and the other characters mentioned above support this separation made on the characters of the androecium.

Hemizygia is distinguished from *Ocimum* (in which genus it was originally included) by the same character as that which separates it from *Orthosiphon*, i. e., that of the anterior stamens being contiguous at their insertion and usually fused for part of their length. In *Ocimum* the posterior stamens are inserted at the base of the corolla-tube, as in *Hemizygia*, but they are generally kneed or appendiculate at the base. The corolla-tube of *Ocimum* is shorter than that of *Hemizygia*, and is not truncate at the mouth.

To sum up: the characters of *Hemizygia* are intermediate between those of *Orthosiphon* and *Ocimum*, and there seems little doubt that *Hemizygia* should be maintained as a separate genus.

The separation of *Hemizygia* from *Orthosiphon* on the characters mentioned above is in accordance with the facts of geographical distribution. *Hemizygia* is South African in its distribution, with a large number of species restricted to the Transvaal region: there are one or two exceptional species which have a wide distribution in tropical Africa, chiefly on the western side. *Orthosiphon* by contrast has a much wider distribution; it occurs in tropical and subtropical Asia as well as in Africa. In the African continent it is largely confined to the tropics, there being few species which grow in South Africa.

The genus *Bouetia* † is included in *Hemizygia*, as the type is not distinguishable from *H. bracteosa* (Benth.) Briq.

* Ann. Soc. Sc. Brux. sér. B, xlix. 2, 88 (1929).

† A. Chevalier, in Mém. Soc. Bot. France, ii. no. 8 *d*, 200 (1917).

As a result of these observations, *Hemizygia* is returned to generic rank and its previous species restored. Of these two are not retained, but three new species are described. Also seventeen species of *Orthosiphon* are transferred to *Hemizygia*, and ten species of *Orthosiphon* are merged into species of *Hemizygia*.

This work has been done at the British Museum (Natural History), under the direction of Mr. J. Ramsbottom and Dr. G. Taylor, to whom I have pleasure in expressing my thanks for their interest and criticism. My thanks are also due to the staff of the Museum for the facilities afforded me. For loans of material I am indebted to the Directors of the Royal Botanic Gardens, Kew, the Botanical Garden and Museum, Berlin-Dahlem, the Natural History Museum, Paris, the Conservatoire and Botanic Gardens, Geneva, and the Transvaal Museum, Pretoria, and to the Mycologist-in-Charge, Natal Herbarium, Durban.

In the enumeration of specimens the following abbreviations are used to indicate the herbaria where they are deposited :—

BM=British Museum (Natural History).
K =Royal Botanic Gardens, Kew.
B =Botanical Garden and Botanical Museum, Berlin.
P =Natural History Museum, Paris.
G =Conservatoire and Botanic Gardens, Geneva.
TM=Transvaal Museum, Pretoria.
HN=Natal Herbarium, Durban (Natal Government Herbarium).

In quoting type-specimens a plan is followed :—Where a herbarium is mentioned before the word "type," *e. g.*, "Gossweiler 000 (BM, type)," the specimen at that herbarium is the holotype of the species, but herbaria quoted after the word "type," *e. g.*, "Welwitsch 0000 (type; BM, K)," have specimens of the type-gathering which have been distributed.

HEMIZYGIA Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3 A, 368 (1897).

Bouetia A. Cheval. in Mém. Soc. Bot. France, ii. no. 8 *d*, 200 (1917).

Branching herbs or sometimes small shrubs, usually erect, sometimes stellately tomentose. *Leaves* opposite and decussate, or rarely ternately arranged, sessile or sometimes petiolate. *Inflorescence* of verticillasters (usually 2- to 6-flowered) in terminal or axillary racemes ; bracts deciduous and small, or sometimes the terminal few pairs persistent, enlarged, coloured, and then usually sterile. *Calyx* semi-erect when flowering, more or less declinate and accrescent in fruit, tubular ; tube naked within, campanulate to ovoid, unequally 5-toothed at the mouth ;

posterior tooth broadly ovate, with the margin slightly decurrent ; lateral and anterior teeth narrowly triangular to subulate, the anterior pair the longer. *Corolla* exserted beyond the teeth of the calyx, tubular-campanulate, dilated above and compressed laterally at the throat, truncate at the mouth, 2-lipped ; posterior lip small, 3-lobed, the median lobe more or less emarginate ; anterior lip entire, deeply concave or navicular, usually deflexed at maturity. *Stamens* 4, exserted (except in *H. pretoriae* where the posterior pair is included) ; posterior pair inserted usually near the base of the corolla-tube (rarely in the throat), the filaments free and sometimes pilose ; anterior pair inserted in the mouth of the corolla-tube, the filaments contiguous at their insertion and with few exceptions connate for part of their length ; anthers reniform, 1-celled. *Disk* usually enlarged anteriorly. *Ovary* 4-lobed, glabrous. *Style* exserted, capitate and emarginate at the apex or shortly 2-lobed, the lobes obtuse or rarely acute. *Nutlets* oblong or suborbicular.

Species 28, mostly confined to South Africa, a few in Tropical Africa. Type-species : *H. teucriifolia* (Hochst.) Briq.

Key to the Species.

Posterior margin of lateral calyx-teeth denticulate. Posterior stamens geniculate at the base ; anthers oblong ..... 26. *tuberosa.*
Posterior margin of lateral calyx-teeth entire. Posterior stamens straight or nearly so ; anthers reniform.
a. Leaves flabellate in shape ..... 1. *flabellifolia.*
aa. Leaves oblanceolate to orbicular, lanceolate or linear.
b. Plants with a tomentum of stellate hairs, especially on the lower surface of the leaves.
c. Leaf-margin not revolute. Stem leafy but not densely so, with or without dwarf branches. Leaves of the dwarf branches (if present) like the main leaves in shape, relatively wide.
d. Leaves crenate at the margin, more or less rugose above and with the nerves prominent beneath ; distinctly petiolate :
e. Terminal bracts of the inflorescence imbricate, brown or purplish, with a woolly margin. Lamina of the leaf more than 2·5 cm. long ..... 2. *Obermeyerae.*
ee. Terminal bracts of the inflorescence spreading, purple, and nearly glabrous. Lamina of the leaf less than 2 cm. long ..... 3. *rugosifolia.*
dd. Leaves entire at the margin, smooth above and with the nerves not very prominent beneath ; sessile or narrowing at the base into a short petiole.

e. Corolla-tube more than four times as long as the calyx. Terminal bracts of the inflorescence not enlarged, but thick and like small leaves ..... 4. *Gerrardi.*

ee. Corolla-tube less than four times as long as the calyx. Terminal bracts of the inflorescence enlarged, membranous, and unlike leaves ..... 5. *Elliottii.*

cc. Leaf-margin revolute. Stems usually densely leafy, due to the many dwarf branches the leaves of which sometimes differ from the main leaves in shape, being much narrower, linear.

d. Corolla-tube not widened at the mouth, often slightly narrowed. Stamens exserted scarcely beyond the anterior lip of the corolla.

e. Lower internodes of the main stems less than 2 cm. long; leaves not more than 0·5 cm. broad ..... 6. *subvelutina.*

ee. Lower internodes of the main stems more than 2 cm. long; leaves usually 0·5 cm. or more broad, especially the lower ..... 7. *teucriifolia.*

dd. Corolla-tube widened at the mouth. Stamens exserted far beyond the anterior lip of the corolla.

e. Terminal bracts of the inflorescence distinct from the lower ones—persistent, enlarged, brightly coloured, membranous, and usually sterile ..... 8. *stenophylla.*

ee. Terminal bracts of the inflorescence like the lower ones—deciduous and small. 9. *Rehmannii.*

bb. Plants without stellate hairs on the lower surface of the leaves.

c. Leaves narrow, revolute at the margin, thickly tomentose beneath with long white hairs, more or less glaucous above ..... 10. *albiflora.*

cc. Leaves broad or narrow, not revolute at the margin, glabrous to tomentose beneath, but never with long white hairs, not glaucous above.

d. Lateral and anterior calyx-teeth narrowly triangular in fruit, weak, and without a subulate tip ..... 11. *latidens.*

dd. Lateral and anterior calyx-teeth filiform or subulate in fruit, more or less rigid.

e. Terminal bracts of the inflorescence distinct from the lower ones—persistent, enlarged, membranous, and often sterile.

f. Differentiated bracts * generally more than one pair, more than 2 mm. broad, and usually more than 5 mm. long. Stem and young leaves glabrous, pubescent, or sometimes villous.

* *I. e.*, those terminal bracts which are persistent, enlarged, coloured, membranous, and often sterile.

g. Leaves glabrous, some more than 6 cm. long. Posterior tooth of the calyx scarcely decurrent at the margin. Verticillasters all 2-flowered.. 12. *foliosa.*

gg. Leaves usually pubescent, rarely glabrous, but then much more than 6 cm. long. Posterior tooth of the calyx distinctly decurrent at the margin. Verticillasters sometimes 2-flowered, but usually 4- or 6-flowered.

h. Terminal bracts lanceolate, usually more than twice as long as broad; pairs more or less distant. Stem erect, usually simple, up to about 30 cm. high, with ascending leaves.

i. Verticillasters all 2-flowered. Young inflorescence villous and generally also the stem and leaves ..... 13. *humilis.*

ii. Vertillasters 4- or 6-flowered. Parts not villous.

j. Corolla-tube more than 12 mm. long ..... 16. *transvaalensis*, p.p.

jj. Corolla-tube less than 12 mm. long.

k. Differentiated bracts obtuse at the apex; less than 3 times as long as broad. Calyx usually green, with many dark, sessile glands ..... 14. *persimilis.*

kk. Differentiated bracts acute at the apex; always more than 3 times and usually more than 4 times as long as broad. Calyx purple, especially on the posterior lip, with a few yellow (not dark) sessile glands ..... 15. *Thorncroftii.*

hh. Terminal bracts usually very broadly ovate or obovate, tapering at the base, less than twice as long as broad; pairs often crowded in an apical cluster. Stem creeping or erect, more or less branched, often more than 30 cm. high, with ascending or spreading leaves.

i. Petiole of mature leaves more than 0·5 cm. long. Leaves covered beneath with a fine greyish-white pubescence, rather obscurely gland-dotted ..... 23. *petiolata.*

ii. Petiole of mature leaves absent or less than 0·5 cm. long (rarely more than 0·5 cm. long). Leaves glabrous, or if pubescent then either clearly gland-dotted beneath or sessile.

j. Leaves glabrous, eglandular. Slender, erect herbs with more or less spreading leaves ..... 17. *Laurentii.*

jj. Leaves pubescent or rarely with only a few hairs scattered on the nerves of the lower surface, gland-dotted. Stout, erect, or semiprostrate herbs, usually with ascending leaves.	
k. Leaves usually less than 3 times as long as broad, and usually sparsely pubescent beneath ..	18. *Welwitschii.*
kk. Leaves more than 3 times as long as broad (usually more than 4 times as long as broad), and usually thickly pubescent to subtomentose beneath.....	19. *bracteosa.*
ff. Differentiated bracts generally only one pair, less than 5 by 2 mm. Stem and young leaves villous.....	20. *petrensis,* p.p.
ee. Terminal bracts of the inflorescence like the lower ones—deciduous, small, and inconspicuous.	
f. Posterior stamens included in the corolla-tube	25. *pretoriae.*
ff. Posterior stamens exserted from the corolla-tube.	
g. Leaves sessile or nearly so.	
h. Stem (and often the leaves also) more or less villous.	
i. Leaves more than 0·4 cm. broad, narrowly lanceolate	20. *petrensis,* p.p.
ii. Leaves less than 0·4 cm. broad, linear	21. *linearis.*
hh. Stem (and leaves) more or less pubescent, but not villous.....	32. *canescens,* p.p.
gg. Leaves petiolate; petiole 0·4 cm. long or more.	
h. Lower surface of the leaves covered with a fine greyish-white pubescence of adpressed hairs	22. *canescens,* p.p.
hh. Lower surface of the leaves sparsely pubescent with spreading hairs....	24. *Mossiana.*

(To be continued.)

THE BRITISH ASSOCIATION AT NORWICH.

By G. Taylor, D.Sc.

After an interval of sixty-seven years the hospitality of the city of Norwich was again extended to the British Association. About 2100 members attended the meetings of the various sections held from September 4 to 11. Professor W. W. Watts, F.R.S., was the President. The subject of his address was "Form, Drift, and Rhythm of the Continents," and his remarks will appeal to students of plant distribution who are anxious for any evidence that may explain the present discontinuous and puzzling distribution of many plant groups. In this connection the President's

remarks on Wegener's work "The Origin of Continents and Oceans" are of interest. "The hypothesis is supported by the close resemblances in the rocks and fossils of many ages in Western Europe and Britain to those of Eastern North America; by community of the structures by which these rocks are affected, and by the strong likeness exhibited by the living animals and plants on the two sides, so that they can only be referred to a single biological and distributional unit, the Palæarctic Region.

"The hypothesis, however, did not stop at this; and in the South Atlantic and certain other areas Wegener and his followers have also given good reasons for believing that continental masses, once continuous, have drifted apart. Broad areas in Southern Africa are built of rocks known as the Karroo Formation, of which the lower part, of late Carboniferous age, is characterized especially by species of the strange fern-like fossil plants *Glossopteris* and *Gangamopteris*. Associated with them are peculiar groups of fossil shells and fossil amphibia and reptiles. Similar rocks, with similar associations and contents, in Peninsular India, have been named the Gondwana Formation. Comparable formations also occupy large regions in Australia, Tasmania, and New Zealand, in Madagascar, in the Falkland Islands and Brazil, and in Antarctica.

"The correspondence between these areas is so close that Suess supposed they must at that date have been connected by lands now sunk beneath the sea, and he named the continent thus formed Gondwanaland after the Indian occurrences. The break-up of this land can be followed from a study of the rocks, and it was a slow process, its steps occupying much of Mesozoic time. Dr. A. L. du Toit's comparison of South African rocks with those of Brazil and elsewhere in South America favours even a closer union than this between the units now scattered.

"One of the most remarkable features shown by these rocks in all the areas mentioned, but to varying extents, is the presence of conglomerates made of far-travelled boulders, scratched like those borne by the modern ice-sheets of Greenland and the Antarctic, associated with other deposits of a glacial nature, and often resting upon typical glaciated surfaces. There is no possible escape from the conclusion that these areas, now situated in or near the tropics, suffered an intense glaciation.

"This was not a case of mere alpine glaciers, for the land was of low relief and not far removed from sea-level, but of extensive ice-sheets on a far larger scale than the glaciation of the northern parts of the New and Old Worlds in the Pleistocene Ice Age. I have never seen any geological evidence more impressive or convincing than that displayed at Nooitgedacht, near Kimberley. Du Toit's work on these glacial deposits brings out two remarkable facts: first, that the movement of the ice was southerly, pole-ward and away from the Equator,

the opposite to what would be expected, and to the direction of the Pleistocene ice-movement; secondly, that the ice in Natal invaded the land from what is now sea to the north-east."

The President observed that the facts of life distribution were far too complex to be explained by any single period of connexion followed by a definite breaking apart, even if that took place by stages. In concluding his main thesis Professor Watts remarked:—"When all is said and done, movements on a colossal scale are established facts, and the question of the future is how far we shall accept the scheme of drift due to Wegener, or one or other of the modifications of it. It is for us to watch and test all the data under our own observation, feeling sure that we shall have to adapt to our own case Galileo's words, *e pur si muove*."

The President of Section K (Botany), Mr. F. T. Brooks, F.R.S., had attended the International Congress at Amsterdam and left that function in order to fulfil his obligations at Norwich. To accommodate botanists returning from Amsterdam, Mr. Brooks gave his address on "Some Aspects of Plant Pathology" on Monday morning.

He discussed certain aspects of recent investigations on diseases in plants. With the discovery of the Mendelian inheritance of disease resistance, a potent weapon was placed in the hands of geneticists and pathologists for the control of plant diseases. Although sometimes very successful, the breeding of disease-resistant varieties cannot be looked upon as a panacea for the elimination of disease; great difficulties are sometimes experienced in building up these types, especially on account of the several diseases to which most crop plants are liable and the close linkage which often exists between a valuable quality and susceptibility to a particular disease; furthermore, progress along these lines with arborescent plants is necessarily slow. On the other hand, certain diseases can be effectively controlled either by paying due attention to environmental conditions which favour the host at the expense of the parasite, by the eradication of the sources of infection in accordance with the principles of plant sanitation, or by fungicidal treatment.

The influence of environment on the establishment of disease in plants is of outstanding importance. Environmental conditions which are most beneficial to the host frequently prevent attack by weak parasites. With fungi such as rusts and downy mildews, however, optimum conditions for the host are often equally favourable to the parasite.

Much progress has recently been made in the study of the epidemiology of certain parasitic diseases—that is, the distribution in space and time of the causative micro-organisms which develop epidemically under favourable conditions. For example, in North America, Australia, and India, an almost complete

explanation is now available of the manner in which epidemics of black rust of cereals (*Puccinia graminis*) arise.

There are many physiologic or biologic forms within single species of parasitic fungi, especially in the rusts, a state of affairs which may greatly complicate the task of producing disease-resistant varieties. How these forms with different parasitic proclivities have arisen is an intriguing problem. It is known that sexual interactions between diverse forms may be the means of adding to their number, but it is suggested that gene mutation has also been a potent factor in their development. Although, in general, these physiologic forms are stable entities, their capacity for evolutionary change must not be forgotten.

Another active branch of plant pathology is that concerning the influence of one micro-organism on another in the establishment of disease. A host attacked by one fungus may thereby be rendered more susceptible to another, and a plant permeated by a complex of two viruses may exhibit symptoms unlike those induced by either virus acting separately. On the other hand, the effect of micro-organisms on one another may be one of antagonism. Of particular interest and of great importance is the antagonism shown by certain saprophytes to pathogenic fungi which invade the underground parts of their hosts: indeed, it is not too much to say that a new chapter in soil microbiology has been opened with the recognition of this factor of biology antagonism. The pathogenicity of fungi which cause foot-rot of cereals, may be completely suppressed by the antagonistic influence of soil saprophytes, either through the secretion of some toxic substance or perhaps by the stress of competition. When more is known about the antagonism of other micro-organisms to pathogenic fungi in the soil, it may be possible to devise methods of biological control—such, for example, as altering soil conditions so as to favour the antagonistic action of other members of the micro-flora.

The meetings of Section K were suitably inaugurated by Professor E. J. Salisbury, F.R.S., with an account of the East Anglian flora. It will be of interest to students of the British flora to have Professor Salisbury's remarks in some detail:—

The richness of the East Anglian flora, which can be indicated by the occurrence of some 1100 species of vascular plants in Norfolk alone, is correlated with the peculiar diversity of local climatic conditions accentuated by soil characteristics. The Continental component is most fully represented with 75 per cent. of the total species of this category present in Britain. All the steppe species of the British Flora are found in East Anglia and over 90 per cent. of those more definitely characteristic of Central European conditions. The Breckland area is the chief home of the steppe species, amongst which "winter annuals" that germinate in the autumn, such as *Veronica verna*

and *Silene conica* are a conspicuous feature. But the Continental element also includes marsh species, such as *Sonchus palustris* and *Liparis Loeselii*, which emphasise the importance of the climatic climax as distinct from soil conditions. Whereas in sunny years the reproductive capacity of Continental species in this country may be high, in wet years it may be extremely low, suggesting the importance of temperature and sunshine as limiting factors.

It seems paradoxical to find that the other geographical component best represented in East Anglia is the Oceanic one with 59 per cent. of the British representatives of this category. If we map the individual occurrences of steppe species, we find that they are concentrated in the belt of low annual rainfall on the eastern side of the area, especially where this is coincident with the well-drained sandy soils of low water capacity of Breckland. On the other hand, Oceanic species, such as *Corydalis claviculata*, are found in the eastern part of East Anglia, where the higher rainfall of from 24 to 29 inches per annum, the heavier soils, and the large areas of standing water combine to produce relatively humid conditions.

It is noteworthy, too, that in East Anglia several northern species, such as *Mertensia maritima* and *Goodyera repens*, find their southern limit, whilst southern species such as *Frankenia lævis* and *Statice reticulata* are at their northern limit. The greater northward extension of the more Continental species on the east side of Britain than on the west, or of the Oceanic types on the west than on the East, is manifest in a diagonal trend in one direction or the other that is a striking testimony to the importance of the climatic factor.

The evidence of the cultural activities of man in East Anglia from early Bronze age times, and even before, suggests one possible means of introduction, and doubtless has facilitated the colonization by Continental species, many of which are more especially associated with the earlier phases of plant succession.

Comparative study shows that the migration factor is unlikely to have played any significant part in determining the richness of the flora of this region. The flora of East Anglia is a striking witness to the importance of ecological conditions in determining the distribution of species. Under favourable environmental conditions the historical factors would appear to influence abundance far more than frequency.

Miss E. R. Saunders discussed "Some Floristic Problems and their Solution." Although there is undoubtedly in the higher plants a fundamental rhythm in development which brings about the disposition of the members of a cyclic flower in alternating whorls, there are, nevertheless, very many species in which this rule of alternation breaks down. Explanation

hitherto offered of such breakdowns are unconvincing, being, for the most part, in the form of suppositions which *if* they were true would account for the facts, but which are unsupported by any trustworthy evidence. Investigation of the internal structure of the flower brings out the fact that except in one particular set of conditions this fundamental rhythm is always exhibited in the processes which lead to the formation of the main vein of the floral members. Thus a vital clue to radial disposition, which is missed when the whole member is taken as the unit, is revealed by a study of the spatial relations of certain tissue units. In this problem of rhythmic development as in other problems, biological as well as physical, an advance towards its solution has resulted from examining the relations of a smaller unit than that considered hitherto.

The seeds and seedlings of *Utricularia vulgaris* L. were described by Dr. F. W. Jane. Capsules were collected in Norfolk in August 1932. Germination of the seeds did not start until May 1933: those from one capsule germinated over a period of eleven to twelve months. On germination, some six primary leaves emerge, to be followed rapidly by about as many more; while it is not possible always to separate these two apparent whorls, they are usually distinct. Associated with the primary leaves there is usually a primary bladder, a shoot, and a small "adventitious shoot." The "adventitious shoot" does not develop farther. The primary leaves are nearly always subulate and unbranched. The cauline leaves of the seedling generally consist of two lateral leafy segments, more or less branched, and a median bladder. The vascular strand to the leaf divides, shortly after leaving that of the axis, into three, one branch going to the bladder, the other two to the leafy segments of the leaf. There is, as a rule, a single leaf at each node, but sometimes there are two. The cauline leaves are subject to considerable variations, but these are nearly always due to reduction of parts of the trifurcate leaf of the seedling, which is above described, or to the replacement of the median bladder by a leafy segment.

Most of the seedlings perennated as minute turions, which formed in November. Some seedlings were grown satisfactorily on moist soil and formed winter buds in autumn, but the opening of such turions in the following spring was erratic, this being due, it is suggested, to the unusual environment.

One session was mainly devoted to papers dealing with the conditions of formation of British peats and the vegetation of peat soils in the British Isles. Dr. H. Godwin, in his paper on "The Topogeneous Peats of the British Coasts and of the Fenland Basin," stated that examination of the micro- and macro-fossils of these peats suggests that they are all of the *Neidermoor* or

Zwischenmoor type. Pollen analyses of the submerged peat beds of the British coasts and of moor-log from the North Sea show that this peat formation is not referable to any single period. Peats of all the periods from pre-Boreal to sub-Atlantic appear to be present. The peat beds and even some of the so-called forest beds overlie salt-marsh deposits, and there is evidence of vegetational succession from salt-marsh through brackish-water *phragmitetum* to fen-woodland on peat. These peat beds appear to be closely connected in origin with the marine transgression.

The conditions of formation of fenland peats are in many respects similar, being closely determined by relative movement of land and sea. Periods of marine transgression led to marine conditions, and stability of retrogression led to vegetational succession towards fen-carr and fen-woodland, often slightly acidic in character. There is no trace of *Hochmoor*.

Two of the overseas guests, Prof. Dr. Lennart von Post and Prof. H. Osvald, contributed papers on the subject. Prof. Osvald gave an account of moss types and their distribution in different climatic regions. He recognized five groups :— (*a*) Raised mosses with trees ; (*b*) naked (treeless) raised mosses ; (*c*) flat mosses ; (*d*) concave mosses ; (*e*) cover or blanket mosses.

Type (*a*) seems to be absent in this country and type (*b*) is represented only by its western facies at low altitudes (valley moors, estuarine moors). On the other hand, types (*d*) and (*e*), which are poorly represented on the Continent, are very frequent in those parts of the British Isles which have the most humid climate. Regeneration is characteristic of the progressive stage of the raised mosses, but of no importance in the blanket type. A retrogressive stage is to be found in many raised mosses on gentle slopes, where it is due to water erosion, and is very common and due to combined water and wind erosion in most of the blanket mosses. Bog burst may be interpreted as a retrogressive process in areas where other types of retrogressive processes do not play any part.

An interesting feature in the vegetation of the British mosses, especially the blankets, is the rather high frequency of many plants which do not grow on the typical raised mosses on the Continent, except in some cases along the drainage systems, *i. e.*, *Polygala vulgaris*, *Potentilla erecta*, *Narthecium ossifragum*, *Schoenus nigricans*, *Molinia coerulea*, *Sphagnum subsecundum*.

The peat of the British raised mosses seems to be built up mainly by *Sphagnum magellanicum* and *S. rubellum*, which are also the most important peat formers in the west of Sweden, and in Ireland by *S. magellanicum*, *S. imbricatum*, and *S. plumulosum*. The pure undecomposed *S. fuscum* peat does not seem to occur in the British Isles. In the blanket mosses the peat is more or less decomposed, often fibrous, and formed by *Eriophorum vaginatum*, *Scirpus caespitosus*, *Schoenus nigricans*, *Narthecium*, and *Molinia*, and to a rather small extent of *Sphagnum* spp.

Mr. E. Wyllie Fenton emphasised " The need for a permanent organisation for undertaking periodic botanical surveys of Great Britain." He suggested that the type of survey should be similar to that of Smith and Rankin and Smith and Moss in England, and the brothers Smith in Scotland. Such surveys have both academic as well as great practical value, indicating the suitability or otherwise of certain areas for particular types of husbandry or afforestation. They would also reveal how human activities were affecting vegetation. Periodic re-surveys are necessary to keep pace with changing conditions, and to indicate whether certain activities are harmful or otherwise : such re-surveys in the past would have been of great value to-day. The ideal is a Scientific Survey including all sciences. With such a survey the maps would be both complete and valuable. The Geological Survey took time to establish, but its value to-day is unquestioned. So it would prove if a Botanical Survey were established. The question of aërial photographs should not be forgotten ; co-operation in certain quarters might overcome the difficulty. To begin with, it would probably be best for botanists to be attached to the Geological Survey, and to develop gradually from this small staff. The ideal of a Scientific Survey should not be unduly delayed or forgotten.

(To be continued.)

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

ANATOMY OF SCIRPUS.—A. Monoyer ("Contribution à l'Anatomie du Genre *Scirpus*," Arch. Inst. Bot. Univ. Liége, xi. 1934, extracted from Mém. Soc. Roy. Sci. Liége, sér. 3, xviii.) gives a detailed account of the anatomy of the stem of various species fully illustrated by twenty-two plates. In the stem of certain species there are special blind bundles, not connected with the leaves or inflorescence, which seem to be degenerated leaf-traces. This retrogression is linked with reduction of the bracts and inflorescences. In numerous aphyllous species there has been a compensatory development of the stem, resulting sometimes in cladodes which may be very slender, as in *S. caespitosus*, or consist of a single hypertrophied cladode, as in *S. lacustris*, or be triangular, as in *S. pungens*, or in section like a Maltese cross, as in *S. mucronatus*. *S. sylvaticus* is taken to represent the primitive type and it is noteworthy that seedlings of *S. lacustris*

are quite leafy and much more like *S. sylvaticus* in miniature than like adult *S. lacustris*. Evolution in the genus is dominated by two tendencies: firstly, towards aphylly; secondly, towards degradation of the vascular system. The latter is common to all aquatic plants. Four main ecological groups can be recognized in the genus: (1) Sect. *Phylloscirpus*, terrestrial species of comparatively dry ground showing the most normal characteristics; (2) Sect. *Schoenoplectus*, species growing with the base in the water and having a system of aërating canals in the greatly thickened stem; (3) Sect. *Baeotryon*, species of mountains, cold and acid soils, and regions of great insolation, with slender, acicular stems and leaves reduced or absent; (4) floating species showing degradation of the vascular system.

C. Raunkier ('Botaniske Studier,' 3 Hefte, Copenhagen, 1935) describes his statistical investigations of the plant formations at Allindelille Fredskor, a small wooded area with a peculiar and rich flora determined by the fact that the chalk reaches the surface of the ground over certain areas allowing the growth of many calciphilous plants—*Ophrys muscifera* is recorded only from this locality in Denmark. Unfortunately, planting of conifers in certain areas has destroyed the original herbaceous flora. A list of species, their life-form, and the biological spectrum of the flora is given. The plant-communities are described in detail under the headings respectively of the vegetation of the hard soil and that of the bogs. The various formations (associations) are analysed and their life-form spectra are determined. The paper, which is in English, will repay perusal by botanists interested in plant-ecology. Two shorter communications deal respectively with the vegetation of some strand-floras (in Danish) and, briefly, with that of the sand dunes north of Sousse in Tunis.

Draba Flora of Greenland.—In no. viii. of her series of contributions (Svensk Bot. Tidskr. xxix, 2, 1935) Elisabeth Ekman deals with *Draba incana* L. and the related species *D. Thomasii* Koch. The number also contains several pages of addenda and emendanda to her previous contributions.

Ranunculus Ficaria var. bulbifera.—E. M. Marsden-Jones (Journ. Linn. Soc., Bot. i. 39–55, 1935) has studied the life-history and pollination of *Ranunculus Ficaria*. The species occurs in two forms—one producing bulbils in the leaf-axils, the other not. The forms remain constant, so far as ten years' observations on individual plants show. The bulbiferous form is described as a new variety, which differs from the species in having usually narrow not overlapping petals, fewer stamens, pollen

with a larger proportion of non-viable grains, fewer carpels, and very few viable seeds per head, the reproduction being almost completely vegetative. The plants are tetraploid while the non-bulbil-producing plants are diploid. The species and variety may grow together, but var. *bulbifera* prefers shady places and damp hedge-banks. A list is given of forty-eight species of insects noted as visiting *R. Ficaria* from March to May.

Flowering of Lemna minor.—H. E. Green, O. A. Mörch, and W. G. Travis ('North Western Naturalist,' June 1935, 101) describe the flowering of *Lemna minor* in Cheshire in August 1934, which may be of interest seeing that many field-botanists heve never met with any of the duckweeds in flower. Flowering fronds were plentiful in a shallow ditch in a pasture where the water was fully exposed to the sun. Though material was kept under observation, only a few half-developed fruits were noted. Vegetative and sexual modes of reproduction do not seem materially to interfere with each other, as a flower might be produced in one pocket and a bud in the opposite pocket of a frond. In no case were flowers produced at both edges of a frond. The flowers were mainly protogynous, but in some cases the stamens developed normally, while the ovary remained within the spathe relatively undeveloped; whether it developed later was not observed. Normally two stamens were present, but occasionally only one. The style and stigma protrude beyond the frond, the stamens do not emerge until the upper part of the style and stigma have withered. Both stamens and stigma are raised above the water-level, but it is suggested that pollination by crawling insects or wind is not the usual method, but, as suggested by previous observers, direct transference of the pollen occurs due to the free-floating flowering fronds coming to lie alongside each other with the flowers in contact. Figures are given of the various stages.

SHORT NOTES.

Epilobium adenocaulon Haussknecht.—Stimulated by the recent article on the occurrence of the above species in Britain by G. M. Ash and N. Y. Sandwyth (Journ. Bot., July), and having been in Mr. Ash's company when he found *E. adenocaulon* near Henley this year (new county record for Oxon), I was interested to see whether it could be found among the thousands of specimens of Willow-herbs in Herb. Druce.

The following three specimens of *E. adenocaulon* were detected and have been seen by Mr. Ash, who agrees with my

determination. They were each sent through one of the two Exchange Clubs, and I append the remarks of the critics :—

1. Shore of Cropstone Reservoir, Leicestershire, Aug. 1894, leg. Rev. T. A. Preston, comm. F. T. Mott as *E. obscurum*× *roseum*. " Correct, I believe."—E. S. Marshall. See Rep. B. E. C. for 1894, 449.

2. Timber Yard, Malvern Link, Worcester, July 31, 1905, S. H. Bickham and R. F. Towndrow as *E. obscurum*×*roseum*. " Correct. There was, however, some admixture of *E. parviflorum*×*roseum* in this gathering."—? E. S. Marshall (no signature). See Rep. Watson B. E. C. for 1905–6, 53.

3. Woodchester, v.c. 34, July 14, 1920, H. J. Riddelsdell as *E. obscurum* Schreb. with the remark by Mr. Riddelsdell that he does not find that the book description of the leaves of *E. obscurum* as sessile always holds good. They are often distinctly short-stalked. " Yes."—Adamson. See Rep. B. E. C. for 1920, 228.

To these three, Mr. Ash has added another—a very young plant in bud only—from Colman's Moor, Berks, June 1928, G. C. Druce, as *E. obscurum*. The late C. E. Salmon thought it to be nearest *obscurum*.

All these are new county records for *E. adenocaulon*, and the Cropstone Reservoir, Leicester, record antedates by twenty-seven years the hitherto earliest-known British record (Heaths north of Woking, J. Fraser, June 26, 1921). It is also earlier than any European record cited by Sandwyth and Ash.

The evidence of these further records from widely different parts of Britain makes the problem of its arrival in this country from North America still more difficult. The suggestion put forward by Ash and Sandwyth that the species may have been introduced by the Canadians in camp at Witley during the Great War might quite well explain the occurrence of the species so plentifully in that neighbourhood, but it still leaves unsolved the question of the appearance of *E. adenocaulon* in Leicestershire as far back as 1894.

One will await with interest the further finding of this species, which, no doubt, will be found in many more counties now that attention has been drawn to it.—JOHN CHAPPLE, Oxford.

CREPIS MOLLIS Ascherson IN IRELAND (p. 168).—In July last, after correspondence with Mr. Reynolds, Dr. Praeger visited the station in County Down and thoroughly examined it with the surrounding area, but without success. Mr. Reynolds now suggests that a mixture of his specimens may have occurred, and that his plants may not have been collected in Ireland. In these circumstances it seems desirable to ignore the record pending the production of further evidence.—H. W. PUGSLEY.

REVIEWS.

The Biology of Flowers. By W. O. JAMES and A. R. CLAPHAM, Department of Botany, Oxford. Roy. 8vo, pp. viii, 116, 70 figs. Clarendon Press : Oxford, 1935. Price 8*s.* 6*d.*

THIS strikingly attractive volume deals with the mechanism of seed-reproduction of flowering plants, as illustrated by detailed description and drawings of about thirty examples of common flowers selected to illustrate pollination by various types of insects or wind. The presentation vividly recalls the admirable—but, unfortunately, not easily available—work in this direction of Dr. A. H. Church, though, the authors admit, he has had no direct influence on the production of the volume.

The first forty pages are devoted to a general account of the morphology of the inflorescence, flower, including development, and fruit, including dispersal, with chapters on pollination and fertilization. The greater part of the book deals with the practical examination of flowers, in which the authors insist on the value of the floral diagram and a drawing of the flower as seen in a longitudinal section. Many of the latter occupy a full page and all are remarkably clear outline drawings, the accompanying description serving as explanation.

As, however, one stage only is represented in the section of the flower, ample scope is left for the student to fill in details and stages in the pollination process, as explained in the text, from examination of the actual flower. The student who uses the drawing in place of a practical examination will find that much of interest and value is missed.

Most of the drawings are original and made direct from the plants. Some beautiful figures illustrating floral development are borrowed from Church's ' Types of Floral Mechanism ' and contrast with the preceding somewhat sketchy figures of the development of the ovule of *Lilium candidum*, which are not completely self-explanatory—fig. *a* is rather a puzzle.

The selection of specimens is good and the accompanying text clear and well arranged. Teachers will find in the book a useful guide to the practical study of a phase in flower-biology which requires no more apparatus than a sharp knife and a hand-lens, with pencil and paper.—A. B. R.

The Living Garden or the How and Why of Garden Life. By E. J. SALISBURY, D.Sc., F.R.S. 8vo, pp. xi, 338, 17 pls., and line-drawings in text. G. Bell & Sons : London, 1935. Price 10*s.* 6*d.*

AN eminent botanist reveals himself as a keen and evidently successful gardener. Success has been promoted by an alliance of science and practice, and his book is an effort to effect a liaison between botany and gardening. Every botanist who loves

his plants should be a gardener, and the gardener who seeks the why and wherefore of his operations will find vastly increased interest in his work. It is perhaps a counsel of perfection " to envisage a future," as would the author, " in which the great majority of horticultural enthusiasts are a band of voluntary helpers in our pursuit of the knowledge of plants," but an appreciation of the principles underlying the growth and functions of the living plant will tend in the desired direction.

In a series of clearly written chapters Prof. Salisbury leads his readers through the story of the life of the plant, from the soil, where it gains a holdfast and from which it absorbs food-substances, onwards to flower, fruit, and seed. The effects of environment, sunlight and shade, cold and warmth, frost and fog, seasonal and diurnal changes are introduced and explained—we learn the reason, for instance, of the success of the homely *Aspidistra*, and appreciate more fully the advantages of pure air and cultivation, or the often puzzling idiosyncrasies of our garden plants.

The intelligent reader will often be left asking—which is as it should be. Why does *Tragopogon* close at noon or the Scarlet Pimpernel before tea ? We may explain the mechanism, but what is the reason ? Why should closely allied species be the one a chalk-lover, the other a chalk-hater ? Horticulture bristles with problems and its devotees will thank Prof. Salisbury for throwing light on so many of them.

A charming feature is supplied by Mrs. Caroe's black-and-white drawings, reminiscent of the old herbals, from which a few have been reproduced. The plates, from the author's photographs, are a tribute to his skill ; his folder showing the striking variety in root-systems is a good piece of work. An interesting, helpful, and attractive book from cover to cover.—A. B. R.

The Translocation of Solutes in Plants. By OTIS F. CURTIS. 8vo, pp. xiii, 273. McGraw-Hill Publishing Co., Ltd. : London, 1935. Price 18*s*.

THE subject of the transport of dissolved substances in the plant, and particularly of dissolved organic substances, has received remarkably little attention until the last few years. Since the distances to be traversed between the assimilating organs and the roots are great—several hundred feet in the case of the highest trees—and the quantities large, the problem would seem to be an obvious one and the neglect all the more surprising. The want of interest in the problem seems to have been mainly due to the facile acceptance by botanists of the view that salts and some organic substances moved up the xylem and the assimilatory products moved down in the phloem, and also to the failure to realise fully the quantitative

relationships, *i. e.* the great rate at which organic materials move to the dependent underground organs. Between the years 1920 and 1922 botanists were rudely shaken out of the easy acceptance of views—generally ill supported by evidence, and inadequate in their quantitative aspects—by the publication in America of papers by Curtis, the author of the work under review, by Birch-Hirschfeld in Germany, and by Dixon here.

Of these shocks to plant-physiological complacence that of Dixon was the most severe, for he boldly claimed that the xylem was the normal channel not only for the upward movement of substances carried in the transpiration stream but also for the downward transport of the assimilatory products of the leaves. As a result of these publications the translocation of organic substances in the plant became one of the major physiological problems, and since that time a number of theories have been put forward and numerous studies have appeared, the most elaborate of these being that of Mason and Maskell on transport in the cotton plant. Between 1922 and 1934 these two authors have published no less than ten papers on translocation. The time was therefore ripe for a critical review of the present position of the subject and this Dr. Curtis has provided.

The author, as already stated, is an active worker in this field, having carried out numerous experiments on the effect of " ringing." He concludes that upward as well as downward movement occurs in the phloem, that the backward flow through the xylem claimed by Dixon, and suggested less strongly by Birch-Hirschfeld, cannot be accepted. The well-known hypothesis of Münch, that of a unidirectional flow through the phloem resulting from a pressure gradient, is fully considered, its strength and weaknesses weighed in the balance, and its rejection considered necessary. The question as to whether protoplasmic streaming in the sieve-tubes can explain the enormous rate—far beyond the possibility of simple diffusion—at which materials are carried in the phloem is fully examined. The conclusion is reached that living protoplasm is necessary for the rapid movement observed, and that " the protoplasmic streaming hypothesis seems at present most adapted to meet the requirements of transport and to demand the structure and conditions that obtain in phloem tissues."

It cannot be said that the method of translocation in the plant is fully understood, for the protoplasmic mechanism which it seems necessary to postulate is still obscure. Plant physiologists and botanists generally are, however, very grateful to Dr. Curtis for this critical survey of a field of research in active development at the present day. The author's hope that the book will stimulate further investigation will certainly be fulfilled.—V. H. B.

Praktikum der Zell- und Gewebephysiologie der Pflanzen. By Dr. SIEGFRIED STRUGGER. 8vo, pp. xi, 181, 103 text-figs. Berlin: Borntraeger, 1935. Price R.M. 8.50.

Dr. STRUGGER describes ninety-four experiments, the great majority of which deal with cellular physiology; the physiology of tissues is represented by a few experiments on differential staining and regeneration. Although primarily a 'Praktikum,' the book gives an outline of the work carried out in recent years, chiefly in Germany, on problems of permeability attacked by microscopical methods. The effect of this work in deepening our knowledge is indicated by the necessity of introducing such new terms as "plasmoptysis," "karyoptysis," "cap-plasmolysis," and "cytorrhisis." The word "intrability" is used for penetration into the cytoplasm, and "permeability" is restricted to penetration into the vacuole.

In separate chapters Dr. Strugger deals with:—General methods; plasmolysis; intrability; permeability; vacuole contraction; plasmoptysis; accumulation of dyes in the membrane; the nucleus; viscosity; movement; regeneration. The experiments are described very clearly and the theoretical explanations are, for the most part, sound. Only the treatment of antagonism seems inadequate. While many experiments are new, nearly all are of so simple a nature that they may be used for class work.

Special mention may be made of the introduction of new and useful plant material, such as the cells of the fruit flesh of *Symphoricarpus* and the petals of *Anchusa*. In general the treatment of material is so carefully described that experimental difficulties should be reduced to a minimum. The book is a useful addition to the available works on practical plant physiology.—M. SKENE.

Moss Flora of North America North of Mexico. By A. J. GROUT, Ph.D. Vol. ii. part 2, pp. 67–138, pls. xxvi.–lvii. Published by the Author: Newfane, Vt., U.S.A., 1935. Price not stated.

THIS further part contains Funariaceae, Orthotrichaceae, Erpodiaceae (by W. C. Steere), and Splachnaceae (by Miss Geneva Sayre). The author has had the advantage of previous studies of *Ephemerum*, *Physcomitrium*, and *Orthotrichum* by the late Mrs. Britton, though he has by no means slavishly followed her treatment. The treatment of the difficult genus *Orthotrichum* is somewhat conservative, and will be found useful by European bryologists. The question is raised whether the European *O. Winteri* Schimp. is not identical with the earlier-published *O. consimile* Mitt.; but it is left to European botanists to decide.

On p. 70, in the synonymy of *Nanomitrium*, the line "*Ephemerum grandifolium* C. Muell. etc." seems to be out of place.

The American *Voitia hyperborea* Grev. & Arn. is treated, following other authors, as a synonym of *V. nivalis* Hornsch. Original specimens, however, from Melville Island, coll. Sir E. Parry, are markedly different from any European and Asiatic forms seen by the reviewer. Besides showing a much smaller plant, the capsule is short and wide, broadly conical rather than elliptic, and the calyptra covers only a small part of the capsule, while the leaves also show differences. There seem good reasons for keeping the American plant distinct.

Ulota crispa var. *intermedia* (Schimp.) is given as *n. comb.* It has, however, been used in British works, and dates from Dixon and Jameson, Handb. of Brit. Mosses, 241 (1896).

As with previous issues, this is profusely and beautifully illustrated with full-page plates—the plates, indeed, occupy more than half the bulk of the part.—H. N. D.

Lebensgeschichte der Blütenpflanzen Mitteleuropas. Edited by Dr. W. WANGERIN and Dr. C. SCHROETER. Lief. 49, Bd. ii. Abt. 1, *Moraceae* (Schluss), by HANS WALTER, 8vo, pp. 861–909, figs. 52–74; *Urticaceae*, by ERICH KOLUMBE, pp. 910–951, figs. 1–36. E. Ulmer: Stuttgart, 1935. Price R.M. 6.

THE completion of the Moraceae concludes the account of the hop, *Humulus Lupulus*, and is followed by that of another valuable economic plant, hemp, *Cannabis sativa*; the Urticaceae include the three Linnean species of *Urtica*, and a somewhat doubtful species *U. Kioviensis*, regarded by Hegi as distinct, but as a variety of *dioica* by other authorities; also two species of *Parietaria* (*officinalis* and *judaica*). The respective authors have contributed a full account of the morphology, anatomy, life-history, and economic uses of the various species; details of structure of leaf and the characteristic hairs are especially well illustrated. In the account of *Urtica dioica* matter of ecological interest is also included—some account of its associations and leaf-variation under various grades of illumination. The authors have given a useful general and well-illustrated account of the two families as represented in Central Europe.

Wild Flowers of Newfoundland.—Part III. By A. M. AYRE. Size 4¼ by 6 ins., pp. iv, 231, 572 figs. in text. Published privately by A. M. Ayre, St. John's, Newfoundland. Agents, L. Reeve & Co.: Ashford, Kent, 1935. Price 4*s.*

THIS little book evidently represents a labour of love. Reproduction in colour is notoriously expensive, and we are

told in the preface that the paint was washed off about 1000 life-sized water-colour drawings, which were then outlined in ink, photographed, and reduced to uniform size. A selection of 250 was made for the present volume, which includes " mainly Orchis, Willow, Buttercup, Mustard, Rose "—that is, these and associated families. Four other parts will appear. The figures are on the model of Bentham's ' Illustrated British Flora,' with which they compare unfavourably; some have been adapted or supplemented, by permission, from Bentham or from Britton and Brown's ' Illustrated Flora.' Brief descriptions are given of the species figured, and names of allied species, with or sometimes without annotation, are added. The author acknowledges her indebtedness to Prof. Fernald for naming the plants. The book will help towards putting names to plants collected, provided the family is known; there are practically no descriptions of the families, but these may perhaps appear in Part I., which is entitled ' Introduction.'

BOOK-NOTES, NEWS, ETC.

' JOURNAL OF THE LINNEAN SOCIETY OF LONDON.'—Vol. 1. pp. 1–265 (Sept. 1935) contains some important floristic papers. A revision of the South African species of *Juncus* by R. S. Adamson raises the number of species to 40, 27 of which are endemic, and four others occur only in immediately adjacent countries. A contribution to the Moss Flora of Borneo, by H. N. Dixon, based mainly on recent collections by R. E. Holttum and P. W. Richards, records some 300 species, of which 75, including two new genera, are new to science, and 85 others are new records for the Island. Nellie Carter gives an account of a collection of alpine Desmids made in British Columbia by Dr. W. R. Taylor and his colleagues. A sketch of the geography and botany of Tibet by F. Kingdon Ward confirms the view that the flora is a recent one and Himalayan in affinity. The author considers that it has been derived since the Pleistocene, and that the whole of Tibet, with the Himalaya west of Sikkim and the Karakorum to the north-west, forms one floral region—Sino-Himalaya. Central Asia forms a distinct floral region lying thousands of feet lower than the central plateau and with a very different climate. A study in floral anatomy by Jean Dickson deals especially with the gynæcium of *Glaucium flavum* and other members of the Papaveroideae.

' TRANSACTIONS OF THE BRITISH MYCOLOGICAL SOCIETY.'—Vol. xx. pt. 1 (Aug. 1935) contains Dr. B. Barnes's Presidential Address on " Induced Variation "—a review of the results of experimental work with temperature variations, chemical stimuli, and X-rays, by himself and other workers, on Yeasts, *Aspergillus niger*, and other fungi. Permanent varieties had been produced in many cases. Recent work on insects, the tobacco plant, and *Antirrhinum* was also reviewed. A useful compilation by A. A. Pearson is a correlation of three lists by Quélet, René Maire, and Carleton Rea of Cooke's ' Illustrations of British Fungi,' with the author's nomenclature, which was often wrong or doubtful. Reports of the Stroud and Norwich forays in 1934 are also given.

' JOURNAL OF THE WASHINGTON ACADEMY OF SCIENCES.'—Vol. 25, no. 6, contains a revision of the genus *Cremospora* Benth. (Gesneraceae) of Colombia by C. V. Morton. The author maintains its distinction from *Besleria*, with which it has since Bentham's time been united. Examination of material at Kew, the U.S. National Herbarium, and elsewhere has extended the list of known species from two to ten. A number of new species from the Death Valley, California, are described by the same author and F. V. Coville in this and the following number (7), and in the latter S. F. Blake describes in considerable detail new species of Asteraceae from the United States, Mexico, and South America. The monotypic genus *Spirochaeta* Turcz. (united with *Elephantopus* by most authors) is renamed *Chaetospira* Blake, owing to the earlier use of the name for a genus of Bacteria.

' GENTES HERBARUM.'—In vol. iii. fasc. viii. (July 1935), Prof. L. H. Bailey continues his careful elucidation of various Palms. Art. 8, The King Palms of Australia, proposes this English name for the beautiful pinnate-leaved Queensland genus *Archontophoenix*, frequently planted in tropical and warm-temperate climates, in habit not unlike the Royal Palm. It was originally confused with the *Seaforthia elegans* R. Br., an error still perpetuated in horticultural usage. Examination of extensive material and the literature leads the author to agree with Dr. Burret of Berlin-Dahlem that the known material may be grouped under two species, *A. Cunninghamiana* Wendl. & Drude and *A. Alexandrae* W. & Dr., with a variety *Beatricae* of the latter. Art. 9, " Certain Ptychospermate Palms of Horticulturists," " being the cases of *Seaforthia* and some of its relatives that are planted or listed in America and are confused in identity or name." *Seaforthia* of Brown is antedated by *Ptychosperma* of Labillardière, and Art. 9 is a discussion of species of various genera which have been confused in cultivation, with indication of their correct names.

' ORCHID REVIEW.'—In the September number is an editorial reference to an increase in price of this journal, as from January 1936, from one shilling to eighteenpence monthly, in order that the quality of production may be maintained rather than that the quality or quantity of the matter and illustrations should

be reduced. Though essentially a magazine for orchid-lovers, the articles have often a botanical interest. A photograph in the present number of an orchid laboratory in New Jersey indicates the advanced technique employed in seedling culture. In the October number Miss E. V. Miller mentions that more than sixty species of the charming little botanical genus *Pleurothallis*, native of the West Indies and Tropical America, are grown at the Glasnevin Gardens, Dublin, and a number have flowered this season.

'Essex Naturalist.'—The last number (xxv. pt. 1, April–Sept. 1935) contains a note by Miss G. Lister of three new records of Mycetozoa for the county, collected by Mr. J. Ross, bringing the county list up to 101. Also a good photograph of the late Robert Paulson, an obituary notice of whom, by Miss Lister, appeared in the August number of this Journal (p. 232).

National Botanic Gardens, South Africa.—Prof. R. H. Compton's report for 1934 contains a list of new species, supplied by or grown in the gardens, that have been published by Mrs. L. Bolus and other workers during the year. He also refers to work done in the restoration of the Silver-Tree woodland, which had been threatened with obliteration by the invasion of agressive exotic trees; a generous public response to an appeal for funds has made this possible.

'Bulletin du Jardin Botanique de l'État, Bruxelles.'—Vol. xiii. fasc. 3 (June 1935) contains a revision by G. A. Boulenger of the 'Roses of Asia,' of the groups *Pimpinelli-Suavifoliae*, *Orientales*, and *Alpinae-Vestitae* of the Section *Eglanteriae*. The groups embody a revision of the views of Crépin and Burnat on an admittedly difficult set of species. As in his work on the 'Roses of Europe' the author has found in the disc of the urceole and the orifice for the passage of the styles very important characters, neglected by these workers, which have facilitated specific definition. The first group contains eighteen species, three described as new from Central Asia, the second is restricted to a single species, and the third contains six. So experienced a systematist as Dr. Boulenger should appreciate the value of a running number for species in a revision and also the importance of indicating the type where a new species is described from several collections.

New York Botanic Garden.—Dr. Marshall A. Howe, Assistant Director of the Garden since 1923, has been appointed Director in succession to Dr. E. D. Merrill. Dr. Merrill becomes head of the Botanical Department, Harvard University. Dr. Howe is an authority on the Marine Algae of North America,

THE BRITISH ASSOCIATION AT NORWICH.

By G. Taylor, D.Sc.

(Concluded from p. 325.)

A series of mycological papers occupied the greater part of two sessions. Mr. T. R. Pearce dealt with the Dutch elm disease, and pointed out that it was most serious in the south-east of England, decreasing in severity towards the north and west, and was unknown in north England and Scotland. The devastated areas were described in detail and the history of the disease outlined. The causal fungus is now known as *Ceratostomella Ulmi*, and is probably disseminated by the elm bark beetle, in the tunnels of which it fructifies. Dr. W. J. Dowson described the water-mark disease of the cricket-bat willow and the history of its investigation. Thousands of willows in Essex were infected and the loss ran into hundreds of thousands of pounds. The speaker stated that he had isolated *Bacterium Salicis* and confirmed Day's original work that this organism was responsible for the pathenogenic condition. Dr. K. M. Smith discussed "Some Aspects of the Plant Virus Problem." During the last decade our knowledge of viruses has increased greatly. Among the interesting facts discovered may be mentioned new knowledge concerning the relationship of plant-viruses with insects, the alteration in flower colours due to virus infection, the existence of closely similar virus strains, the immunity conferred upon a plant by one strain against other strains or related viruses, and the possibility of using this immunity as a means of virus differentiation. Improved methods of ultrafiltration have rendered it possible to measure the actual particle-size of viruses. Many problems, however, still await solution, the origin and method of spread of certain viruses are unknown, and the actual nature of these disease agents is still a matter for speculation. Dr. Smith discussed the mode of infection by insects—aphids and thrips—and showed photographs of the actual penetration by the mouth-parts of the insect and the exudation of infected saliva into a cavity, thereby forming a source of virus which spread therefrom. He explained the movement of viruses and described a new virus present in roots.

In his paper on "The Resistance of the Apple Fruit to Fungal Infection," Dr. A. S. Horne stated that the internal resistance of apple fruit to infection was mainly conditioned by its high acidity. Data were given on the relation of manurial treatment of apple trees to chemical-resistance of fruit to fungal infection. Though statistics collected in other years were apparently contradictory, laboratory experiments suggested a fundamental problem needing further investigation. The President congratulated the speaker on his original method of measuring the

rate of mycelial invasion of living tissue. Mr. P. W. Brian gave an account of the germination of mould spores and discussed the effect of wetting on the viability and latent period of germination. He showed that temperature and chemicals in solution, especially phosphates, have a great influence on germination. Dr. C. E. Foister described the white tip disease of leeks and stated that it was fairly common in the Lothians and had been found near Bristol. The main source of infection was contaminated soil and the causal fungus was found to be a new species, *Phytophthora Porri*. Onions and *Allium fistulosum* are immune, and, since control of the disease by spraying is impracticable, these plants are being used in crossing experiments to see if their immunity can be transferred to the commercial leek. Mr. A. R. Wilson described his investigation of the chocolate spot disease of beans. The most frequent cause is a strain of *Botrytis*, which gains entry under certain weather conditions. Occurrence of frost and poor drainage encourage the disease, as do soil deficiency in lime and potash. He provided meteorological data correlating the epidemics of chocolate spot with certain weather, especially high rainfall, over a considerable number of years.

The discussion on "The Utilisation of Light Land, with special reference to Breckland," which was held in conjunction with K* (Forestry) and Section M (Agriculture), was introduced by Dr. S. Watt, who gave an account of the peculiar conditions operating in Breckland. The vegetational features of the area are determined by a dry soil in a dry climate. There is a high summer temperature with a low summer rainfall, and other important features are the high number of hours of sunshine and the shortness of the frost-free period. There is also a wide variety of soil types, which vary much in their chemical properties. The flora under such conditions is essentially drought-resistant or drought-escaping. Dr. Watt mentioned the chief vegetational types, and outlined their relationships. Mr. W. L. Taylor followed and gave an account of the activities of the Forestry Commission in the area. He dealt with the peculiar condition of Breckland, and described how local conditions determined the species of tree planted. Dr. L. Dudley Stamp spoke from the farming standpoint. In his paper he summarised some of the main results of the survey of existing land use in Breckland carried out in 1933–34 by the Land Utilisation Survey of Britain. A general discussion followed, and the main facts arising may be summarised as follows :—

(1) The desirability of preserving a part of Breckland in its present state, under the National Trust, was expressed by several speakers. It was hoped that the Forestry Commissioners in their future acquisition of land in Breckland would keep this in mind.

(2) The Forestry Commissioners were attacked on two main points of policy :—(*a*) It was affirmed that the Forestry Commissioners were planting land which could be more profitably used under agriculture. It was pointed out, however, by members of the Commission that the land which had been, or would be, acquired for afforestation purposes was already derelict land or was in the process of becoming derelict. They had taken no land for planting purposes which was being used already for any other purpose. Agriculturists had failed to utilise the land in this area, and the Forestry Commissioners were, therefore, justified in reclaiming, through afforestation, such land in this area that they could obtain.

(*b*) The Forestry Commissioners through wholesale planting of Conifers were not, it was stated, by so doing helping to restore the fertility of the soil of Breckland. Only by planting broad-leaved trees could soil-fertility be improved. It was pointed out, in reply, that broad-leaved trees had been planted in past years, but without success. The climatic factors operating on the area were against them. The main danger was frost, and until some shelter was established it was hopeless and wasteful to plant such species. Where pine was now established, it had been found that less hardy species could be introduced successfully. It was, however, clearly indicated that broad-leaved species would be planted when the opportunity occurred of doing so with some hope of success.

Dr. F. K. Sparrow gave an illustrated account of his investigations of the aquatic fungus flora in the vicinity of Cambridge. He described representatives, including several new species, from each of the lower classes of Phycomycetes, and of special interest were his remarks on the parasitism of many of these very primitive forms on other parasitic and saprophytic fungi.

A semi-popular lecture on "Tree Planting since the Roman Occupation and its Results" was given by Mr. A. C. Forbes on Monday afternoon. The following is a summary :—

During the Roman occupation of Britain, planting must have been extensively carried out for fruit growing, shelter, shade, and ornament, and probably for marking boundaries, and several well-known trees owe their traditional introduction into the country to that period—the Spanish chestnut, walnut, and English elm are the best examples. Beech may possibly be one of these. Neither the Saxon nor Norman period has left any definite record of tree-planting, but it is highly probable that the monastic institutions, which were so prominent throughout the country down to the Dissolution, carried on and expanded the work initiated by the Romans. Yew walks and avenues are the chief survivors of this period.

During the Sixteenth Century the early stages of landscape planting can be traced to avenues, clumps, and groups of trees, which proved the more imposing features of the style of gardening

adopted and which had much in common with that of two thousand years previously. It was not, however, until enclosures increased in number and size that tree-planting on a large scale was evident. Throughout the Middle Ages the bulk of the country was open grazing land, forest, and waste, and the small enclosures were devoted entirely to food-crops or coppice. During the Seventeenth and Eighteenth Centuries the laying out of country residences developed enormously, and the English landscape of to-day owes its existence more to these two centuries than to any other period. Ideas in planting were at first largely borrowed from France, and long avenues radiating from the residences of the landowners and geometrical clumps were the chief features. Later on, what was termed the natural style of planting came into fashion, and new woodland was created with species introduced from various parts of Europe. In the course of little more than two hundred years, therefore, bare hills and treeless plains were converted into the typical British landscape, which is almost unique throughout the world.

The question of widespread interest to-day is—" Can this landscape be preserved ? " The breaking up of large estates into building plots, the neglect of small woodlands, and the general destruction of hedge-row timber along road-sides is rapidly altering the face of the country. State planting is doing something to afforest the poorer soils, but cannot preserve the tree-growth on the richer agricultural ground, while the use of conifers in most planting operations is changing the character of many districts in which hardwoods have prevailed for generations.

Ribbon development in housing, glaring hoardings, petrol stations, etc., are defacing the country-side to a deplorable extent, and the absence of hedge-row trees will aggravate this evil. The formation of local committees to watch developments in every district might enable precautionary measures to be taken, but the matter rests with the individual landowner, and with him financial considerations are paramount in the long run.

At the concluding session Mr. T. G. Tutin described his work on *Zostera marina*. An account was given of the morphology, floral anatomy, and geographical distribution of the species, and attention was drawn to the sudden decrease in populations about 1930. A number of different organisms were suggested as responsible for decrease, and, while two at least seem to be serious parasites, it appears almost certain that the chief factor affecting the spread of the species is the failure to produce seedlings over most of the plant's range. Germination is apparently dependent on a fairly high autumnal temperature with good illumination, and these conditions are rarely present on the Atlantic coasts of Europe. It was suggested that in a slightly adverse season widespread destruction may be produced by

continued vegetative propagation affording an opportunity for the spread of a normally mild parasite.

Dr. W. E. Isaac dealt with the distribution and zonation of marine algæ on the coasts of South Africa. He described the conditions present—the west coast was subject to the influence of the antarctic Benguella current, while the east and south coasts (to Cape Agulhas) were affected by the tropical Mozambique current. The different temperature conditions produced have a marked effect on the distribution of species; large Laminariaceae such as *Ecklonia buccinalis*, *Laminaria pallida*, and *Macrocystis pirifera* form an extensive sub-littoral zone in the colder waters, while in the warmer waters *Gelidium pristioides* dominates a mid-tidal zone. Species of Caulerpaceae are prominent in regions directly under the influence of the Mozambique current, but are absent from the colder waters. Throughout the region investigated, from Lambert's Bay on the west coast to East London on the east coast, *Porphyra capensis* was found to be the dominant species in the highest littoral zone. This zone was stated to be poorly developed in the warmer waters, but dense and extensive with large-sized individuals in the cold waters.

Most of the exhibits staged on Tuesday afternoon illustrated papers which had already been given in the sectional meetings. Mr. F. Ballard and Mr. C. E. Hubbard showed a large series of specimens illustrating cleistogamy in various families of flowering plants. Such species are always modified in some way, usually by reduction of or actual loss of petals and a reduction in size of the stamens. In most cases the pollen-grains are not liberated from the anthers, but germinate *in situ*, their pollen-tubes growing out towards the stigmas and making contact therewith. Plants rarely produce cleistogamous flowers only, although in *Warpuria clandestina* (Acanthaceae), a species only known in cultivation, such a condition obtains. Cleistogamous and chasmogamous flowers may be developed simultaneously on a plant, as in *Cardamine chenopodiifolia* (Cruciferae). Frequently cleistogamous flowers are subterranean, or the fruits become so by the bending of the peduncles. Other species exhibiting cleistogamy were shown from the following families: Violaceae, Balsaminaceae, Droseraceae, Leguminosae, Labiatae, Commelinaceae, Juncaceae, and Gramineae, in which it was stated that cleistogamy was particularly widespread, occurring in fifty genera representative of fourteen tribes.

On Thursday afternoon members had the opportunity of seeing something of the vegetation of the Broads on an excursion to Rockland and Wheatfen Broads. Among the interesting plants observed were *Lathyrus palustris* L., *Cicuta virosa* L., *Sonchus palustris* L., and *Acorus Calamus* L.

The sectional excursions during the week-end were favoured with excellent weather. Saturday was spent in Breckland and

members had thus an opportunity of seeing this characteristic tract of country, which was to form the subject of a discussion on Monday afternoon. On Sunday an extensive tour was made of the Broads, and, while there was little time for any intensive study of the vegetation, a most interesting day was spent.

MALAYAN SPECIES OF *JUNCUS*.

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

The rushes in the Malayan region are very few in number and are confined to the higher mountains of Java and Sumatra. So far as is known at present, they are absent from Borneo and the Malay Peninsula.

Juncus effusus L. has been collected on Gunong Prahu in Java by Horsfield and occurs too in the Philippines, but is probably an introduction. Specimens collected in West Falklands by Mrs. Vallentin (1909–1911) are ticketed :—" This plant has only been found in one place close to Ray Cove Settlement, where machinery has been unpacked. This leads me to believe the seed was introduced in the packing."

Juncus sundaicus, sp. nov. Species *J. glauco* Ehrh. affinis, tepalis multo longioribus, lanceolatis longe acuminatis, atro-castaneis, staminibus sæpissime 3, capsula obconoidea, apice lato subtruncato, distincte breviore, atro-castanea, differt.

Rhizoma lignosum, caulibus arcte appressis basi crassiusculis gracilibus teretibus 45 cm. longis 2 mm. crassis, medulla tenui laxa sæpe septata, vaginis ad bases ovatis acutis castaneis politis 3 mm. longis. *Cataphylla* lanceolata obtusa cuspidata, cuspidibus filiformibus 3 mm. longis. *Bractea* cylindrica acuminata 5–35 cm. longa. *Panicula* laxa patens 2–7 cm. longa, ramulis gracilibus pallide viridulis ; bracteolæ ovatæ acuminatæ castaneæ. *Pedicelli* graciles 2 mm. longi. *Sepala* anguste lanceolata longe acuminata atro-castanea 4 mm. longa ·05 mm. lata. *Petala* subæquilonga latiora castanea, costa lata. *Stamina* 3 interiora, rarius 6, dimidio petali vix superantia, antheris linearibus. *Ovarium* obovoideum basi angustato obtuse triquetrum ; stylus brevis, stigmatibus 3 brevibus rubris. *Capsula* obcuneata basi angustato, apice latiore truncato 3 mm. longa ; semina ovoidea vel elliptica rufo-brunnea.

Hab. Sumatra: Korinchi Peak, 7300 ft. alt. (*Robinson & Kloss*) (type). Java: Preanger, Pangentjongam (*Koorders* 26,550 B), Ngdisari, 2300 metres (*Koorders* 3745), Papandayan (*Van Steenis*), cult. in Mt. Gedeh (*Clemens* 30,421).

This plant is clearly allied to *J. glaucus* Ehrh. and especially to some Indian forms from Madras and Sikkim, but in all these the sepals and petals are pale and shorter than the capsule, which is ellipsoid or oval. In *J. sundaicus* the sepals and petals

are deep chestnut-brown, longer than the fruit which is obcuneate, broad and flat at the top, the valves forming distinct shoulders. The stamens are usually three in number, and opposite the petals, but in one specimen I found six stamens. In *J. glaucus* Ehrh. the seeds are very mucilaginous and adhere together ; I see no signs of mucilage in the dried Sumatra plants.

The plant, which does not seem to have been seen by Buchenau, has been referred by botanists to *J. effusus* L., *J. glaucus* Ehrh., and a hybrid between the two.

J. prismatocarpus R. Br. var. Leschenaultii (Gay) Buchenau grows in wet marshy spots. Sumatra : Berastagi and by the hot sulphur stream flowing from Sibayak Volcano (*Ridley*) and at Alahan Panjang at 5000 ft. alt. (*Matthew*). Java: Papandayan (*Van Steenis* 90) ; Daradjat, in Garut (*Burck*).

The species occurs in Australia, Japan, Kamschatka, Himalayas, Madras, Ceylon, Burmah, and Hanoi.

The plant varies in height from 15 to 40 cm., and is remarkably tough and difficult to pull out of the sandy mud in which it grows. The Java and Sumatra form is the var. *Leschenaultii* with terete, not flattened stems, and is the same as is found in all the other localities but Australia.

THE GENUS *HEMIZYGIA* Briquet.

By Maurice Ashby, Ph.D., D.I.C.

(Concluded from p. 318.)

1. H. flabellifolia S. Moore in Journ. Linn. Soc., Bot. xl. 173 (1911).

Gazaland: Chimanimani Mts., 7000 ft., Sept., *Swynnerton* 1414 (BM, type ; K).

Distinguished by the flabellate leaves and close silvery tomentum. In general appearance and in the large caducous bracts of the inflorescence it suggests the genus *Syncolostemon*, but the broad posterior lip of the calyx with its decurrent margin is characteristic of *Hemizygia*.

2. **H. Obermeyerae,** sp. nov. *Frutex* c. 0·9–1·2 m. altus ; rami primum obtuse quadranguli et stellato-pubescentes, demum teretes glabrescentes et cortice griseo obtecti ; internodi c. 0·7–3·5 cm. longi. *Folia* patentia petiolata ; petiolus 0·3–0·8 cm. long., stellato-pubescens; lamina ovata ad oblonga, basi rotunda ad subacuta, apice obtusa vel raro acuta, margine crenata, 2–5 cm. long. et 1·5–3 cm. lat., supra plus minusve rugosa et parce stellato-pubescens, subtus stellato-tomentosa et nervatione subprominente. *Racemi* simplices vel basin versus ramosi, c. 6–7 cm. long. ; rhachis stellato-tomentosus ; verticillastri 6-flori, per anthesin inter se c. 1–1·5 cm. ; bracteæ imbricatæ mox caducæ, superiores ovato-acutæ, 10 mm. long. et 3–6 mm.

lat., purpurascentes ; pedicelli 3–4 mm. longi, stellato-tomentosi. *Calyx* extus glanduloso-punctatus pilis simplicibus stellatisque obtecti, intus glaber, in fructu ignotus ; tubus subcampanulatus, 6–8 mm. longus, dente postico margine leviter decurrente, 1–2 mm. longo et 2–3 mm. lato, dentibus lateralibus anticisque filiformibus, vix 2 mm. longis. *Corolla* utrinque glabra ; tubus plus minusve campanulatus, truncatus, apicem versus ampliatus, fauce lateraliter compressus, c. 13 mm. longus et ore 4–6×2–3 mm. ; labium posticum minutum, anticum 4–7 mm. longum. *Stamina* ex corollæ tubo c. 18 mm. exserta ; postica infra medium tubi corollæ inserta, c. 22 mm. longa, filamentis basin versus parce pilosis ; antica corollæ fauce inserta, c. 17 mm. longa, filamentis fere ad apicem connatis. *Stylus* c. 25 mm. longus, apice breviter bilobatus.

TRANSVAAL. ZOUTPANSBERG : Entabeni, Dec., *Obermeyer* 876 (TM), and Nov., *Obermeyer in Herb. Transvaal Mus.* 31,556 (TM, type). "A very common bush in cleared woodland patches, shrubby, spreading, 3–4 ft. high."

Has no near allies and is distinct among those members of the genus having stellate pubescence by reason of its large petiolate leaves. It resembles the genus *Syncolostemon* in general appearance and in the nature of its floral bracts, but is included in *Hemizygia* because of its calyx, which has a broad posterior tooth with a decurrent margin.

3. **H. rugosifolia,** sp. nov. *Frutex vel suffrutex* ramosus ; rami primum quadranguli et stellato-pubescentes, demum teretes glabrescentes et cortice griseo obtecti ; internodi 0·1–1·5 cm. longi. *Folia* patentia petiolata ; petiolus c. 0·3 cm. longus, stellato-pubescens ; lamina elliptico-oblonga, basi et apice obtusa, margine minute crenata, usque ad 1·7 cm. longa et 0·3 cm. lata, supra rugosa, pilis stellatis minutis obtecta, subtus stellato-tomentosa, nervatione evidente. *Racemi* simplices vel basin versus ramosi, c. 9–13 cm. longi ; rhachis hispidulus et nodis villiferus ; verticillastri 2-flori, per anthesin 1–1·5 cm. inter se ; bracteæ inferiores caducæ, superiores (3–4 pares) persistentes patentes, ovato-acutæ, c. 10 mm. longæ et 4–6 mm. latæ, purpurascentes ; pedicelli 3–4 mm. longi, minute hispiduli. *Calyx* extus pilis simplicibus glandulosisque obtectus, intus glaber vel minute puberulus, in fructu accrescens membranaceus et purpurascens ; tubus cylindricus vel campanulatus, 7 mm. longus, dente postica margine leviter decurrente, c. 2 mm. longa et lata, dentibus anticis lateralibusque filiformibus, anticis vix 3 mm. longis (in fructu 3 mm.), lateralibus aliquanto brevioribus. *Corolla* utrinque glabra vel extus labiis puberulis ; tubus sparse glanduloso-punctatus, rectus, oblique truncatus, apicem versus sensim ampliatus, fauce lateraliter compressus, c. 18 mm. longus et ore c. 5×2–3 mm. ; labium posticum parvum, anticum

c. 7 mm. longum. *Stamina* ex corollæ tubo c. 9–20 mm. exserta ; postica circa medium tubi corollæ inserta, c. 15 mm. longa, filamentis glabris ; antica fauce corollæ inserta, c. 20 mm. longa, filamentis fere ad apicem connatis. *Stylus* c. 22 mm. longus, apice minute bilobatus.

TRANSVAAL. PIETERSBURG : The Downs, *Junod* 4342. (TM, type).

Described from a single specimen very distinct from other members of the genus. It is characterised by the leaves which are rugose above and stellately tomentose beneath. The leaves of *H. Obermeyerae* are also sometimes rugose above, but are larger than those of *H. rugosifolia* which differs from the former also in the spreading and persistent terminal bracts of its inflorescence.

4. **H. Gerrardi** (N. E. Brown), comb. nov.

Orthosiphon Gerrardi N. E. Brown in Dyer, Fl. Cap. v. 1, 249 (1910).

NATAL. ZULULAND : nr. Ingoma, rocky ground, *Gerrard* 1239 (K, type ; BM).

Only the type-material has been seen ; this is poor, but the plant is clearly distinct from other members of the genus by reason of its long narrow corolla-tube and its posterior stamens, which are inserted near the anterior pair at the mouth of the corolla-tube.

5. **H. Elliottii** (Baker), comb. nov.

Orthosiphon Elliottii Baker in Dyer, Fl. Trop. Afr. v. 376 (1900).

O. messinensis Good in Journ. Bot. lxiii. 173 (1925).

Geographical Range.—From Eastern Bechuanaland and the south of Southern Rhodesia to Transvaal and Natal.

SOUTHERN RHODESIA. Bulawayo, Dec., *Rand* 167 (BM), Mar., *Rogers* 13,524 (BM), veld, wet season, Dec., *Gardner* 96 (K) ; Megusa Valley, nr. Bulawayo, *Cheesman* 213 (K). Matabeleland, without locality, Feb., *Elliott* s.n. (K, type).

BECHUANALAND. Francistown, Jan., *Rand* 84 (BM) ; Bakwena Territory, about 3500 ft., *Holub* s.n. (K) ; Bakhatla Reserve, Mochudi, Jan., *Rogers* 6554 (BM, TM).

TRANSVAAL. ZOUTPANSBERG : Messina, 2000 ft., *Rogers* 29,904 (BM), same locality, Nov., *Moss & Rogers* 153 (BM, type of *O. messinensis*). PIETERSBURG : Bochum (nr. Blaauwberg), Jan., *Bremekamp & Schweickerdt* 46 (TM) ; between Leipzig and Bochum, Jan., *Bremekamp & Schweickerdt* 150 (TM). WATERBERG : drainage basin of Pongola Riv., 3200–5200 ft., Dec., *Burtt Davy* 18,287 (BM).

NATAL. BERGVILLE DISTR. : Tugela Valley, Mount aux Sources, 5500 ft., sandy river-bed, Feb., *Bayer & McClean* 217 (K) ; nr. gorge, National Park, in bush, Aug., *Hutchinson, Forbes & Verdoorn* 52 (HN).

District not known. Fields nr. Rapetse, 4000 ft., Mar., *Schlechter* 4676 (BM, K, TM).

The specimen "*Lang in Herb. Transvaal Mus.* 32,245 (TM)" from Baiandbai in the Transvaal (Zoutpansberg Distr.) differs from the normal *H. Elliottii* in having most of the verticillasters 4- or 6-flowered and also in that the lower floral bracts are leaf-like and apparently more or less persistent. In general appearance and nervation of leaves the plant differs slightly from normal *H. Elliottii*. Possibly this is of a closely allied but distinct species, but as the only material seen is this one specimen in which the flowers are not yet opened this cannot now be decided.

6. **H. subvelutina** (Gürke), comb. nov.

Orthosiphon subvelutinus Gürke in Engl. Bot. Jahrb. xxvi. 80 (1883).

O. heterophyllus Gürke *tom. cit.* 82 (1883).

TRANSVAAL. LYDENBURG: nr. Lydenburg, nr. Paarde Plaats, Mar., *Wilms* 1152 (type; BM, K); nr. Lydenburg, Dec.–Jan., *Atherstone* s.n. (K); farm Zwagershoek, nr. Lydenburg, Jan., *Obermeyer* 327 (TM); nr. Spitzkop, Feb., *Wilms* 1148 (BM, type of *O. heterophyllus*) and 1155 (K); Pilgrim's Rest, Dec., *Rogers* 1432 (TM); Mac Mac Falls, Jan., *Burtt Davy* 2563 (K); Sabie, Nov., *Rogers in Herb. Transvaal Mus.* 14,869 (TM); hill at the back of Palmers (nr. Spitzkop), 4500 ft., Jan., *Burtt Davy* 1643 (K). BARBERTON: Kaapsche Hoop, *Rogers* 21,098 (BM).

7. H. TEUCRIIFOLIA (Hochst.) Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3 A, 369 (1897).

Ocimum teucriifolium Hochst. in Flora, xxviii. 66 (1845).

Orthosiphon Woodii Gürke in Engl. Bot. Jahrb. xxvi. 83 (1899).

H. Galpiniana Briq. in Bull. Herb. Boiss. sér. 2, iii. 993 (1903).

O. teucriifolius (Hochst.) N. E. Brown in Dyer, Fl. Cap. v. 1, 254 (1910); var. *Galpinianus* (Briq.) N. E. Brown *loc. cit.* "*galpiniana*" (1910).

Geographical Range.—From Southern Rhodesia through Eastern Transvaal to Natal and Cape Province.

GAZALAND: Mt. Pene, 6500–7000 ft., Sept., *Swynnerton* 1974 (BM), and Oct., *Swynnerton* 6075 (BM).

TRANSVAAL. Barberton, 3–4000 ft., *Thorncroft in Herb. Rogers* 19,162 *b* (BM, K), same locality, 3–4000 ft., *Rogers* 19,164 *b* (BM); eastern slopes of Saddleback Mt., 4500 ft., Dec., *Galpin* 1217 (type of *H. Galpiniana*; K, HN); Kaapsche Hoop, Sept., *Wager in Herb. Transvaal Mus.* 15,561 (TM). Without locality, *Sanderson* s.n. (K).

NATAL. WEENEN: Culvers, *Rogers* 28,193 (BM). EASTCOURT: at foot of Table Mt., Sept., *Krauss* 448 (type; BM, K). ESHOWE: Entumeni, on grassy hill, 1500 ft. (?), Apr., *Wood* 3964, *in Natal Gov. Herb.* 4775 (type of *Orthosiphon Woodii*; BM, K, HN; the specimens at BM and K are labelled "*in Natal Herb.* 783"). Pietermaritzburg, nr. Curry's Post, 3000–4000 ft., Dec., *Wood* 3567 (K). Illovo, grassy hill, Apr., *Wood* 1877 (K, HN). Richmond, 2000–3000 ft., Oct., *Wood* 10,068 (BM, HN). UMZIMKULU: Zwaartkop, 4000–5000 ft., *Wylie* 10,106 (HN). ALEXANDRA: Campbelltown, 3300 ft., Dec., *Rudatis* 1790 (BM). ALFRED: Harding, 3000 ft., Dec., *Oliver* 66 (HN). Without locality, *Sutherland* s.n. (K).

CAPE PROVINCE. STEINBURG: Zuursberg, Oct., *Tyson* 1561 (K). Tembuland, without locality, about 2500 ft., Nov., *Baur* 558 (K). Between Alice and Queenstown, Dec.–Jan., *Young in Herb. Moss* 15,284 (BM).

Region not known: N. Kandhla, 4000–5000 ft., Apr., *Wylie in Herb. Wood* 8967 (HN); Inswatzi, Sept., *Wylie in Natal Gov. Herb.* 10,886 (HN).

8. **H. stenophylla** (Gürke), comb. nov.

Orthosiphon stenophyllus Gürke in Engl. Bot. Jahrb. xxvi. 84 (1883).

Geographical Range.—South-western Natal and Eastern Cape Province.

NATAL. BERGVILLE: National Park, Devil's Hook, steep mountain ravine, 6000 ft., Dec., *Galpin* 10,168 (K). Drakensberg, Cathkin Peak, Mar., *Galpin* 11,846 (K.). IMPENDHLE: Deepdale, 4000–5000 ft., in clumps in grass, Feb., *Evans* 101 (HN); nr. Boston, 4000 ft., Mar., *Wood in Natal Gov. Herb.* 966 (BM); nr. Boston, 3000–4000 ft., Mar., *Wood* 4624 (K). IXOPO: Mawaqua (Marwaqa) Mt., 6000–7000 ft., Mar., *Wylie in Herb. Wood* 8126 (BM).

CAPE PROVINCE. UMZIMKULU: nr. Emyembe forest, on slopes of mountain, 5000 ft., Mar., *Tyson* 2137, *in Macowan and Bolus Herb. Austr.-Afr.* 1293 (type; BM, K). GRIQUALAND EAST: Zuursberg, 4500 ft., Feb., *Tyson* 1270 (K); nr. Fort Donald, fields at 5000 ft., Feb., *Tyson* 1666 (K). PONDOLAND: Faku's Territory, *Sutherland* s.n. (K).

9. **H. Rehmannii** (Gürke), comb. nov.

Orthosiphon Rehmannii Gürke in Bull. Herb. Boiss. vi. 557 (1898).

TRANSVAAL. Houtboschberg, *Rehmann* 6171 (BM) and 6172 (type, BM), same locality, among rocks, 6500 ft., Feb., *Schlechter* 4442 (BM, K, TM), same locality, Nov., *Pott in Herb. Transvaal Mus.* 13,393 (TM), same locality, Jan., *Wager* s.n. (TM). Kaapsche Hoop, Sept., *Wager in Herb. Transvaal Mus.* 15,598 (TM).

A variable species, especially in the length of the internodes and in the nature of the tomentum in which either minute stellate hairs (e. g., *Rehmann* 6172) or long, weak, simple hairs (e. g., *Rehmann* 6171) may predominate.

10. **H. albiflora** (N. E. Brown), comb. nov.

Orthosiphon albiflorus N. E. Brown in Dyer, Fl. Cap. v. 1, 251 (1910).

O. decipiens N. E. Brown *tom. cit.* 252 (1910).

TRANSVAAL. LYDENBURG: nr. Spitzkop, Feb., *Wilms* 1150 (BM); Sabie, Nov., *Rogers* 18,687 (BM); Mac Mac, *Mudd* s.n. (labelled: "Labiatae, ligneous herb, 2–3 ft., white") (K, type); same locality, *Mudd* s. n. (labelled: "Herb, trailing, rose"—possibly referring to some other plant) (K, type of *O. decipiens*); Belfast, Riet Vlei, Jun., *Smuts* 5 (K). Kaapsche Hoop, July, *in Herb. Rogers* 19,511 (BM), same locality, *in Herb. Rogers* 21,081 (BM), same locality, July, *Rogers* s.n. (BM). Nr. Barberton, 6000 ft., Jan., *Thorncroft* 569 (HN).

Resembles closely *H. Rehmannii* in habit and in size and form of leaves, but differs in its tomentum of simple hairs. As N. E. Brown observes (Fl. Cap. v. i. 253), *Orthosiphon decipiens* differs from *O. albiflorus* only in its more conspicuously bracteate inflorescence and larger flowers. These differences are noticeable, but not striking, and in the absence of any others it seems unwise to maintain the species, as it is based on a single plant which may have had an abnormal habitat.

11. **H. latidens** (N. E. Brown), comb. nov.

Orthosiphon latidens N. E. Brown in Dyer, Fl. Cap. v. 1, 242 (1910).

NATAL. UMVOTI: without locality, *Gerrard* 1233 (K, type; BM, HN); Greytown district, Apr., *Wylie in Natal Gov. Herb.* 20,524 (HN).

Allied to the genus *Syncolostemon*, but has the spreading bracts of *Hemizygia* and the broad posterior calyx-tooth, which is, however, scarcely decurrent at the margin.

12. H. FOLIOSA S. Moore in Journ. Bot. xliii. 172 (1905).

Orthosiphon foliosus (S. Moore) N. E. Brown in Dyer, Fl. Cap. v. 1, 243 (1910).

Geographical Range.—Transvaal and Swaziland.

TRANSVAAL. PIETERSBURG: Izaneen, *Rogers* 12,647 (BM).

SWAZILAND. Mbabane (em-Babaan), Jan., *Burtt Davy* 2833 (BM, type; K); nr. Mbabane, about 4600 ft., fields of high veld, Dec., *Bolus* 12,250 (K).

Characterised by the large leaves on the main stem; these are sometimes ternately arranged.

13. **H. humilis** (N. E. Brown), comb. nov.

Orthosiphon humilis N. E. Brown in Dyer, Fl. Cap. v. 1, 259 (1910).

TRANSVAAL. BARBERTON: Komatipoort, Nov., *Rogers* 12,284 (TM). CAROLINA: Waterval Boven, Nov., *Rogers* 18,290 (K); Waterval Onder, Jan., *Rogers in Herb. Transvaal Mus.* 4375 (K, type; TM); Arnhemburg, Sept., *Roberts in Herb. Transvaal Mus.* 15,853 (TM).

14. **H. persimilis** (N. E. Brown), comb. nov.

Orthosiphon persimilis N. E. Brown in Dyer, Fl. Cap. v. 1, 246 (1910).

O. Rogersii N. E. Brown *tom. cit.* 247 (1910).

TRANSVAAL. Barberton, Aug., *Thorncroft in Herb. Transvaal Mus.* 3132 (K, type; TM), same locality, Dec., *Pott in Herb. Transvaal Mus.* 5672 (TM); Nelspruit, Nov., *Rogers in Herb. Transvaal Mus.* 4740 (K, type of *Orthosiphon Rogersii*; TM).

May be distinguished when in fruit by the greatly enlarged calyx with very long anterior teeth.

15. **H. Thorncroftii** (N. E. Brown), comb. nov.

Orthosiphon Thorncroftii N. E. Brown in Dyer, Fl. Cap. v. 1, 246 (1910).

Geographical Range.—Eastern Transvaal and Swaziland.

TRANSVAAL. Graskop, Nov., *Pole Evans* H. 16,193 (K); Pilgrim's Rest, Nov., *Rogers* 18,251 (K). Barberton, Aug., *Thorncroft in Herb. Transvaal Mus.* 3123* (K, type), same locality, *Thorncroft in Herb. Transvaal Mus.* 3125* (TM), same locality, 3000–4000 ft., *Thorncroft in Herb. Rogers* 19,164*a* (BM, K).

SWAZILAND. Without locality, Aug., *Stewart in Herb. Transvaal Mus.* 12,737 (TM).

Without locality: *in Herb. Rogers* 19,162 *a* (BM).

16. **H. transvaalensis** (Schlechter), comb. nov.

Orthosiphon transvaalensis Schlechter in Journ. Bot. xxxv. 281, "*transvaalense*" (1897).

Ocimum Wilmsii Gürke in Engl. Bot. Jahrb. xxvi. 79 (1898).

Orthosiphon Muddii N. E. Brown in Dyer, Fl. Cap. v. 1, 245 (1910).

TRANSVAAL. Drakensberg Plateau, *Mudd* s.n. (K, type of *Orthosiphon Muddii*). LYDENBURG: nr. Lydenburg, Jan., *Wilms* 1107 (type of *Ocimum Wilmsii*; BM, K); farm Zwagershoek, nr. Lydenburg, Jan., *Obermeyer* 328 (TM); Sabie, Jul., *Cunliff in Herb. Moss* 2807 and 4779 (BM); between Pilgrim's Rest and Sabie, 3900 ft., Oct., *Rogers* 23,232 (BM, TM); Pilgrim's Rest, Dec., *Rogers* 14,373 (TM), same locality, Nov., *Rogers* 18,251 (BM); Marieps Kop, Nov., *Fitzsimons & van Dam in*

* There is some confusion about these numbers in different herbaria.

In the Kew herbarium:

Thorncroft in Herb. Transvaal Mus. 3123 (quoted in Fl. Cap. v. 1, 246 as "*Thorncroft* 3123") is the type of *H. Thorncroftii*.

Thorncroft in Herb. Transvaal Mus. 3125 (quoted in Fl. Cap. v. 1, 245 as "*Thorncroft* 3125") is *H. transvaalensis*.

In the herbarium of the Transvaal Museum at Pretoria:

Thorncroft in Herb. Transvaal Mus. 3123 is *H. transvaalensis* and *Thorncroft in Herb. Transvaal Mus.* 3125 is *H. Thorncroftii*.

Herb. Transvaal Mus. 26,256 (TM); Graskop, Jul., *Rogers* 23,054 (BM); Palmers, nr. Spitzkop, Feb., *Burtt Davy in Transvaal Dept. Agric. Colonial Herb.* 1570 (K); Rietfontein, about 4800 ft., Dec., *Burtt Davy* 7256 (K); rocks, nr. Crocodile Riv., 5200 ft., Dec., *Schlechter* 3916 (BM, K, TM). BARBERTON: Barberton, Dec., *Rogers* 25,528 (BM), same locality, Aug., *Thorncroft in Herb. Transvaal Mus.* 3123* (TM), same locality, hills, *Thorncroft in Herb. Transvaal Mus.* 3125* (K), same locality, Oct., *Williams in Herb. Transvaal Mus.* 7655 (TM), same locality, Oct., *Knottenbelt in Herb. Transvaal Mus.* 23,475 (TM), same locality, on rocky slopes, about 3200 ft., Sept., *Bolus in Herb. Bolus* 7604 (K); nr. Barberton, 2900 ft., *Thorncroft* 175 (HN); Nelspruit, Jul., *in Herb. Moss* 13,705 (BM), same locality, Nov., *Rogers in Herb. Transvaal Mus.* 4741 (TM); nr. Concession Creek, 2900 ft., Sept., *Thorncroft in Herb. Wood.* 4249 (K); Devil's Kantoor, Oct., *Thode in Natal Gov. Herb.* 21,981 (HN); Pretorius Kop, Oct., *Lang in Herb. Transvaal Mus.* 31,557 (TM); White Riv., Sept., *Rogers* 23,282 (BM).

The plants vary considerably in their general appearance according to the state of development of the axillary branches. When these are small, only the relatively few leaves of the main stem are conspicuous; later, when the axillary branches are somewhat elongated, they bear numerous small leaves which almost obscure the larger ones of the main stem, and give the whole plant a very leafy appearance. *Orthosiphon Muddii* N. E. Brown was based on a young plant of this species.

17. **H. Laurentii** (De Wild.), comb. nov.

Orthosiphon Laurentii De Wild. in Bol. Soc. Ibérica, xix. 128 (1920).

BELGIAN CONGO. BALOLO: Eala, Jun., *Laurent* 772 (type; K). "Cultivated Labiate with a strong smell of Sage."

18. **H. Welwitschii** (Rolfe), comb. nov.

Orthosiphon Welwitschii Rolfe in Bolet. Soc. Brot. xi. 88 (1893).

O. adornatus Briq. in Engl. Bot. Jahrb. xix. 176 (1894). Var. *angolensis* Briq. *loc. cit.* Var. *oblongifolius* Briq. *tom. cit.* 177. Var. *chlorochrous* Briq. *loc. cit.* Var. *rotundifolius* Briq. *loc. cit.*

O. Marquesii Briq. in Annu. Conserv. Jard. Bot. Genève, ii. 242 (1898).

H. ornata S. Moore in Journ. Linn. Soc., Bot. xl. 172 (1911).

O. pseudornatus Good in Journ. Bot. lxix., Suppl. 2, 151 (1931).

O. ornatus (S. Moore) Good *tom. cit.* 152 (1931).

* See footnote under *H. Thorncroftii* on p. 349.

Geographical Range.—From Nigeria and French Equatorial Africa through Belgian Congo and Angola to Southern Rhodesia.

NIGERIA. Duru Forest, between Sokoto and Kano, Mar., also between Zaria and Zusqueru, Apr., *Dalziel* 285 (K). BAUCHI PROV.: Bauchi, in clumps in grassland, Jan., *Lely* P. 112 (K); Naraguta, *Lely* 47 (K); Bauchi Plateau, Vom, 3000–4500 ft., *Dent Young* 212 (K). Nr. Puka, Feb., (native name, "Damashin kwooria") *Dalziel* 389 (K); Wamba, in fringing forest, 1200 ft., a weed, Mar., *Thornewill* 58 (K); without locality, Mar., *Hill* 19 (K). SOUTH CAMEROONS: Bamenda, Jua, 3500 ft., weed in grassland, Apr., *Maitland* 1599 (K).

FRENCH EQUATORIAL AFRICA. Eastern Shari (Pays de Snoussi), around Kaga, nr. Talkezi, Dec., *Chevalier* 8287 (BM).

BELGIAN CONGO. BAS CONGO: Lutete, Aug., *Buchner* 570 (B, type of *O. adornatus* var. *oblongifolius*). LULUA DISTR.: Dilolo, Riv. Kamatui, Jul., *Young* 167 (BM).

ANGOLA. Malange, Aug., *Marques* 7 (G, type of *O. Marquesii*; K), same locality, Jul.–Aug., *Mechow* 166 (B, type of *O. adornatus* var. *rotundifolius*), same locality, in bushy thickets, Jul., *Gossweiler* 1030 (BM, type of *O. pseudornatus*; K), same locality, in vlei, Sept., *Young* 804 (BM); between Sanza and Malange, Oct., *Pogge* 349 (B, type of *O. adornatus* var. *chlorochrous*). CUANZA NORTE: Pungo Andongo, woods nr. Cazella, Oct., *Welwitsch* 5555 (K, type; BM); Quisenga, Soba Katunga, in wet situations, Aug., *Gossweiler* 1027 (BM, K). CUANZA SUL: Libollo, nr. Calulu, moist land, Dec.–Jan. (native name, "Lukange"), *Dawe* 316 (K). BENGUELA: Barbaera (Barbaeira), nr. Cuiva and Catumbelo Rivers, 4500 ft., Dec., *Gossweiler* 9720 (BM); Mt. Elende, 4420 ft., *Wellman* 1274 (B). HUILLA: Lopollo, heights nr. Ferrão da Sola, in rocky pastures and low thickets, Jan., *Welwitsch* 5519 (type of *O. adornatus* var. *angolensis*; BM, K); Mumpulla, in poor pastures, Oct., *Welwitsch* 5520 (BM, K); on Riv. Chitanda, between Goudkopje and Kakele, 3900 ft., Oct., *Baum* 186 (BM, K). BIÉ: Cubango, Ganguellas, Vila da Ponte (Fte. P. Amelia), in herb-grown open woods, Dec., *Gossweiler* 2490 (BM); Capembe, reed-beds along Riv. Kuansha, Oct., *Gossweiler* 2190 (BM); Riv. Longa, between Lazingua and Quiriri, 3900 ft., Jan., *Baum* 681 (BM, K).

GAZALAND: Mt. Pene ("Singwekive"), 6500–7000 ft., Oct., *Swynnerton* 6078 (BM, type of *H. ornata*; K), same locality, Sept., *Swynnerton* 1999 (BM).

There is considerable variation within this species in the size, shape, and pubescence of the leaves, but from the abundant material studied it is apparent that the variations are so intergraded that it is not possible to recognise any well-defined groups of forms. Furthermore, the variation cannot be correlated with features of the geographical distribution.

19. H. BRACTEOSA (Benth.) Briq. in Annu. Conserv. Jard. Bot. Genève, ii. 248 (1898).

Ocimum bracteosum Benth. in Lab. Gen. Sp. 14 (1832).

Orthosiphon Schinzianus Briq. in Engl. Bot. Jahrb. xix. 173 (1894).

H. Junodi Briq. in Annu. Conserv. Jard. Bot. Genève, ii. 249 (1898). Var. *Quintasii* Briq. *loc. cit.*

H. serrata Briq. in Bull. Herb. Boiss. sér. 2, iii. 996 (1903).

Orthosiphon rhodesianus S. Moore in Journ. Bot. xliii. 50 (1905).

H. nigritania S. Moore *op. cit.* xlvii. 291 (1909).

Bouetia ocimoides A. Cheval. in Mém. Soc. Bot. France, ii. no. 8 *d*, p. 200 (1912).

Geographical Range.—Widespread in Tropical and South Africa; extending from Senegal, Nigeria, and Tanganyika Territory through the Cameroons, Angola, and Nyasaland Protectorate to Bechuanaland Protectorate, Transvaal, and Portuguese East Africa.

SENEGAL. Labsar, in fields, Aug. *Leprieur & Perrotet* s.n. (G, type), same locality, *Perrotet* 669 (G, BM); without locality, *Heudelot* 396 (K, G).

NIGERIA. NUPE PROV.: without locality, common, *Barter* 946 (K). Yola, 650–800 ft., *Passarge* 21 (B), same locality, in the bush, May, *Dalziel* 108 (K). WEST PROV.: dry zone, *Kitson* s.n. (BM, type of *H. nigritania*).

CAMEROONS. Balda, 1200 ft., rocky slope with thick tree-savannah, Sept., *Ledermann* 4039 (B); Tschamba, 1040 ft., rocky hill with rather thick tree-savannah, Sept., *Ledermann* 5231 (B); Tschamba, Garua, and Durba, about 1000 ft., *Range* 43 (B). Mas Djiki, 1300 ft., thick tree-savannah, May, *Ledermann* 4000 (B).

ANGOLA. BIÉ: Riv. Quiriri, above Sakkemecho, 3900 ft., Feb., *Baum* 721 (BM); Valley of Riv. Tingo, Kuito, Mar., *Gossweiler* 3781 *a* (BM). CUBANGO: between Kubango and Kuito Rivers, nr. Ungombehitze, 3900 ft., Dec., *Baum* 721 (BM).

TANGANYIKA TERRITORY. UJIJI: Uvinza, Jul., *Grant* s.n. (BM). Nr. the junction of the Kilombero (Ulanga) and Luwegu to the Rufiji, 800 ft., sandy, Jun., *Schlieben* 2444 (BM). Kirangi, Lulibaliba, Mar., *Phillips* s.n. (K).

NYASALAND. Nyika Plateau, 8000 ft., Feb.-Mar., *McClounie* 155 (K). Shire Highlands, wet places, *Buchanan* 74 (K). Zomba, 1901, *Sharpe* 136 (198) (K). Mt. Malosa, 4000–6000 ft., Nov.–Dec., *Whyte* s.n. (K).

NORTHERN RHODESIA. Broken Hill, under trees, Dec., *Kassner* 2027 (BM, K, B); Melangushi Riv., *Kassner* 2077 *bis* (BM). Barotseland, Sesheke, *Gairdner* 13, 448 (K). Victoria Falls, 3000 ft., dry sandy veld, Mar., *Eyles* 1278 (BM, K), same locality, *Close* s.n. (BM), same locality, Feb., *Saunders Davies* s.n. (BM), same locality, sand-belt, Jan., *Allen* 253 (K); Livingstone, 3000 ft., sand, Apr., *Rogers* 7010 (K); Kalomo, May, *Rogers* 8223 (K). Zambesi Riv., without locality, *Holub* s.n. (K) and *Wilde in Herb. Transvaal Mus.* 9046 (TM).

SOUTHERN RHODESIA. WANKIE: Deka siding, May, *Eyles* 132 (BM, type of *Orthosiphon rhodesianus*). Mazoe, at foot of granite hills, 4400 ft., Dec., *Eyles* 489 (BM), same locality, Mar., *in Herb. Eyles* 7303 (K). Salisbury, Dec., *Rand* 166 (BM), same locality, May, *Rogers* 13,096 (BM); nr. Salisbury, *Croster* s.n. (K). MARANDELLAS: Sabie, Dec., *Myres* 59 (K). Umtali, *Judd* s.n. (BM), same locality, 3900 ft., grass steppes, Sept., *Engler* 3179 *a* (B); Umtali, Odzani River Valley, 3000–5000 ft., *Seague* 21 (K). MELSETTER: Chikore Hills, 3500 ft., Mar., *Swynnerton* 268 (BM); Melsetter, Oct., *Walters in Herb. Dept. Agric. Salisbury* 2706 (K). Victoria, 1909, *Monro* 973 (BM). GAZALAND: Umoumoumou Riv., 4000 ft., Apr., *Swynnerton* 1956 (BM), same locality, Feb., *Myres* 59 (K). Between Salisbury and Bulawayo, *Cecil* 79 (K). Without locality: Sept., *Hislop* Z. 88, 71 (K).

PORTUGUESE EAST AFRICA. TETE: nr. Lupata, Jan., *Kirk* s.n. (K). MOZAMBIQUE: Mangulane, in sand, *Sousa* 533 (K). COMPANHIA MOÇAMBIQUE: Buzi town, 0–400 ft., Dec., *Swynnerton* 1957 (BM). LOURENÇO MARQUES: Lourenço Marques, scrub, Oct., *in Herb. Moss* 11,899 (BM); Delagoa Bay, Jul., *Monteiro* 20 (K), same locality, sandy hill, Aug., *Bolus* 9741 (K); Rikatla, Oct., *Junod* 258 (TM); along the Limpopo Riv., Jul., "*Gazaland Expedition*" *in Herb. Transvaal Mus.* 15,787 (TM); Maputaland, Jun., "*Maputaland Expedition*" *in Herb. Transvaal Mus.* 14,237 (TM). Jakompua, Mar., *Tiesler* 96 (B); Bassambane, Mar., *Tiesler* 95 (B).

SOUTH-WEST AFRICA. AMBOLAND: Olukonda, Mar., *Rautanen* 233 (BM, K), same locality, *Rautanen* 850 (K); Oshiheke, Jan., *Schinz* 45 (type of *Orthosiphon Schinzianus*; K). DAMARALAND: without locality, 1879, *Een* s.n. (BM).

BECHUANALAND. Kopjes N'Gami, May, *van Son in Herb. Transvaal Mus.* 28,921 (TM); Ngamiland, Kwebe, Jan., *Lugard* 140 (K); Ngamiland, without locality, 3400 ft., Jan., *Lugard* 126 (K).

TRANSVAAL. LYDENBURG: Acornhoek, May, *Roberts in Herb. Transvaal Mus.* 26204 (TM).

Region not known: Bamwe Forest, Feb., *Martin* 599/33 (K).

20. **H. petrensis** (Hiern), comb. nov.

Orthosiphon petrensis Hiern, in Cat. Afr. Pl. Welw. i. 859 (1898).

O. Holubii N. E. Brown in Dyer, Fl. Cap. v. 1, 258 (1910).

O. Engleri Perkins in Engl. Bot. Jahrb. liv. 344 (1917).

Geographical Range.—From Angola to South-West Africa, Bechuanaland, and Transvaal.

ANGOLA. HUILLA: nr. Lopollo, rocky thickets, Jan., *Welwitsch* 5494 (BM, type).

SOUTH-WEST AFRICA. DAMARALAND: Okahandya, bush-steppe, Apr., *Engler* 6475 (B, type of *O. Engleri*), same locality, about 4000 ft., damper places in the bush, *Dinter* 499 (BM, K); without locality, 1879, *Een* s.n. (BM).

BECHUANALAND: Molopo Riv., *Holub* s.n. (K, type of *O. Holubii*).

TRANSVAAL. ZOUTPANSBERG: Messina, Feb., *Rogers* 22,494 (BM, TM), same locality, Mar., *Rogers* 20,811 (TM), same locality, Nov., *Moss & Rogers* 192 (BM); Baiandbai, Nov., *Lang in Herb. Transvaal Mus.* 32,214, 32,228 (TM); nr. Pafuri Riv., Makulele's Location (17 miles from the Portuguese border), Jul., *Obermeyer* 656 (TM). PIETERSBURG: Harmony Block, farm Calais, Jul., *Breyer in Herb. Transvaal Mus.* 25,216 (TM).

Closely resembles *H. bracteosa*, but differs in the small terminal bracts of the inflorescence, the shorter anterior teeth of the fruiting-calyx, and the smaller size of the plant generally.

21. H. LINEARIS (Benth.) Briq. in Bull. Herb. Boiss. sér. 2, iii. 997 (1903).

Orthosiphon linearis Benth. in Hook. Ic. Pl. t. 1274 (1878).

SOUTHERN RHODESIA. MATOPO: Rhodes's Grave, shallow soil over granite rocks, Apr., *Kolbe* 4366 (K); without locality, 4700 ft., Mar., *Eyles* 998 (BM), and May, *Mundy* 20 (K). Bulawayo, May, *Rand* 386 (BM). Matabeleland: without locality, Apr., *Oates* s.n. (K, type).

22. **H. canescens** (Gürke), comb. nov.

Orthosiphon canescens Gürke in Bull. Herb. Boiss. vi. 557 (1898).

O. affinis N. E. Brown in Dyer, Fl. Cap. v. 1, 257 (1910).

Geographical Range.—Transvaal and Eastern Cape Province.

TRANSVAAL. Messina, Waterpoort, Oct., *Rogers* 24,029 (BM). WATERBURG: Geelhoutkop, Jan., *Breyer in Herb. Transvaal Mus.* 17,781 (TM). Rustenburg, Dec., *Collins* 30 (TM). Zeerust, Mar., *Jenkins in Herb. Transvaal Mus.* 11,692 (TM). PRETORIA: Wonderboompoort, *Rehmann* 4507 (type; K); Pretoria Kopjes, Jan., *Leendertz in Herb. Transvaal Mus.* 8555 (TM); Megalisberg, damp spot among rocks, Apr., *Verdoorn* s.n. (K). BARBERTON: Nelspruit, Feb., *Breyer in Herb. Transvaal Mus.* 17,909 (TM), same locality, Apr., *Rogers* 23,975 (K); Kaapsche Hoop, Mar., *Rogers* 20,823 (TM), same locality, *Rogers* 20,830 (BM); White Riv., Dec., *Rogers* 25,019 (BM). Houtboschberg, 5500 ft., among rocks, 30th Mar. 1894, *Schlechter* 4737 (K, type of *O. affinis*; TM; a specimen in BM, collected at the same locality and altitude and on the same day, is labelled "*Schlechter* 4797").

HEIDELBERG: Heidelberg, Dec., *Leendertz* 1027 (K, TM); Kloof, Oct., *in Herb. Moss* 16,941 (BM).

CAPE PROVINCE. QUMBU: nr. Botsabelo, rocky places, 5400 ft., Dec., *Schlechter* 4070 (BM, K, TM).

There is considerable variation within the species in the size, form, and pubescence of the leaves, but the variations intergrade.

23. **H. petiolata**, sp. nov. *Herba* usque ad 1 m. alta (vel longior ?), plus minusve ramosa; caulis primum obtuse quadrangulus sulcatusque, molliter pubescens glandulis pedicellatis interspersus, basi deinde teres, lignosus et cortice griseo-fulvo obtectus; internodi c. 2–4 cm. longi. *Folia* patentia petiolata; petiolus 0·4–1·2 cm. longus, molliter pubescens et plus minusve glandulosus; lamina ovata ad ovato-lanceolata, basi cuneata ad subrotundata, apice acuta vel obtusa, margine serrata, usque ad 5·5 cm. longa et 2·2 cm. lata, supra pilis mollibus albidisque et glandulis pedicellatis obtecta, subtus similis sed plus minusve canescens, nervatione saepe subprominente. *Racemi* simplices vel basin versus ramosi, c. 13–30 cm. longi; rhachis molliter pubescens plus minusve glandulosus; verticillastri 6-flori, per anthesin 0·7–2·8 cm. inter se; bracteæ inferiores caducæ, sessiles, ovato-lanceolatæ, ad 4 mm. longæ et 2·5 mm. latæ, superiores persistentes patentes, latissime obovatæ, basi in petiolum brevem attenuatæ, apice rotundatæ vel obtusæ, ad 9 mm. longæ (petiolo incluso) et 9 mm. latæ, membranaceæ purpurascentes, pare summo sæpe sterili; pedicelli 2·5–3·5 mm. longi, pubescentes et plus minusve glandulosi. *Calyx* purpurascens, extus plus minusve pubescens et sparse glanduloso-pilosus, intus minute puberulus, in fructu accrescens; tubus cylindricus vel tubulo-campanulatus, c. 4 mm. longus; dente postico margine leviter decurrente, 2–2·5 mm. longo et 2–3 mm. lato; dentibus anticis lateralibus subulatis, anticis 1·5–2 mm. longis (in fructu 2·5–3 mm.), lateralibus aliquanto brevioribus. *Corolla* extus pubescens, intus minute puberula; tubus cylindricus rectus vel leviter sursum curvatus, truncatus, fauce abrupte ampliatus et lateraliter compressus, 9–12 mm. longus, ore 3–4·5 × c. 2 mm.; labium posticum parvum, anticum 3–5 mm. longum. *Stamina* ex corollæ tubo c. 8–10 mm. exserta; postica corollæ tubi basin versus inserta, c. 17 mm. longa, filamentis basin versus puberulis; antica fauce corollæ inserta, c. 7–10 mm. longa, filamentis longe connatis. *Stylus* c. 15–24 mm. longus, apice incrassatus, integer vel emarginatus.

TRANSVAAL. ZOUTPANSBERG: Tshakoma (Tsakoma), Nov., *Obermeyer in Herb. Transvaal Mus.* 31,571 (TM, type); Louis Trichardt, Jan., *Breyer in Herb. Transvaal Mus.* 22,727 (TM). PIETERSBURG: The Downs, *Junod* 4358 (TM). Sibasa, *Junod in Herb. Transvaal Mus.* 25,470 (TM).

Allied to *H. canescens*, from which it is distinguished by its differentiated terminal bracts and generally also by its longer leaf-petioles, broader leaves, and longer internodes on the stem.

24. **H. Mossiana** (Good), comb. nov.

Orthosiphon Mossianus Good in Journ. Bot. lxiii. 174 (1925).

TRANSVAAL. Messina, Nov., *Moss & Rogers* 193 (BM, type). PIETERSBURG: The Downs, Jun., *Rogers* 20,216 (BM), Potgietersrust, Pyramid Estate, base of granite mountains, 4700 ft., Mar., *Galpin* 9067 (K).

The species is based on little material and may be merely a wide variant of *H. canescens*, from which it differs only in the pubescence on the leaves.

25. **H. pretoriæ** (Gürke), comb. nov.

Orthosiphon pretoriæ Gürke in Engl. Bot. Jahrb. xxvi. 81, "*Pretoriae*" (1898).

O. natalensis Gürke *tom. cit.* 82 (1898).

Geographical Range.—Transvaal and Natal.

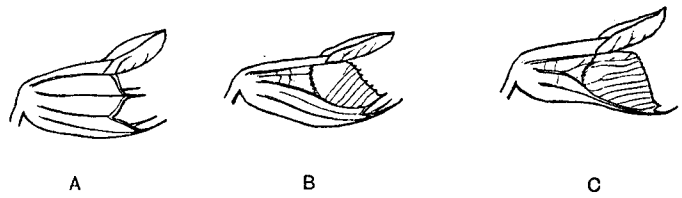
TRANSVAAL. ZOUTPANSBERG: Rietfontein, Oct., *Schutte in Herb. Transvaal Mus.* 13,930 (TM), same locality, Nov., *Conrath* 1060 (K). PRETORIA: nr. Pretoria, Dec., *Wilms* 1151 (type; BM); Rhenosterkop, Oct., *Bremekamp in Herb. Transvaal Mus.* 29,973 (TM); Bronkhorstspruit, Dec., *Janse* 59 (K, TM). LYDENBURG: Machadodorp, Feb., *Jenkins in Herb. Transvaal Mus.* 12,705 (TM), same locality, Feb., *Young in Herb. Transvaal Mus.* 27,241 (TM). JOHANNESBURG: Johannesburg, Dec., *Leendertz* 1721 (K, TM), same locality, Jan. 1915, *Holden* s.n. (TM), same locality, Jan., *Young* s.n. (TM), same locality, open veld generally, Oct., *Rand* 877 (BM), same locality, Milner Park, grass veld, Nov., *in Moss* 6739 (BM), same locality, Jeppe's Town Ridge, c. 6000 ft., Oct., *Gillfillan* 6063 (K); Houghton Ridge, Apr., *Moss* 2803 (BM); without locality, Dec., *Ommanney* 13 (BM). MIDDELBURG: Middelburg, Nov., *Jenkins in Herb. Transvaal Mus.* 10,700 (TM), same locality, Mar., *Hewitt in Herb. Transvaal Mus.* 10,431 (TM); Witbank, Dec., *Rand* 79 (BM). ERMELO: Spitzkop, Dec., *Pott* 5015 (BM, TM). Great Olifants Riv., Nov., *van Niekirk in Herb. Transvaal Mus.* 8252 (TM). Without locality, *McLeu in Herb. Bolus* 5776 (K).

NATAL. UTRECHT: Kafir Drift, *Thode* A 244 (HN). Nr. Newcastle, plains, c. 4300 ft., Nov., *Schlechter* 3420 (BM, K). DUNDEE: Glencoe, Biggarsberg, 4000–5000 ft., Feb., *Wood* 4756 (K). Drakensberg, Coldstream, *Rehmann* 6198 (type of *O. natalensis*; K). ZULULAND: without locality, *Gerrard* 1219 (BM, K), *Baker in Herb. Evans* 569 (HN).

26. H. TUBEROSA Hiern in Cat. Welw. Afr. Pl. i. 852 (1898).

ANGOLA. Pungo Andongo, nr. Condo, in rather dry hilly bushy places, Mar., *Welwitsch* 5565 (BM, type).

This species should be excluded from *Hemizygia*, because of its abnormal calyx, which is intermediate in structure between that of *Hemizygia* and that of *Becium*. In *Becium* (fig. C), instead of bearing acute lateral teeth as in *Hemizygia* (fig. A), the calyx is obliquely truncate at the sides of the mouth with a ciliate or finely denticulate margin. This truncate appearance is due to the enlargement of the posterior margin of the lateral teeth at the expense of the anterior margin, with the result that the lateral teeth become more or less fused with the anterior pair. In *H. tuberosa* (fig. B) the calyx is intermediate between this state and the structure in *Hemizygia*; the anterior margin of the lateral teeth is slightly developed, but the posterior margin



Diagrams of structure of calyx of (A) *Hemizygia*, (B) *H. tuberosa* and allies, (C) *Becium*.

is always either ciliate or finely denticulate, distinguishing it from *Hemizygia*, in which the margins of the lateral calyx-teeth are always entire. The androecium resembles that of *Hemizygia* in that the anterior stamens are connate near the base, but differs (and resembles *Ocimum*) in the posterior stamens, which are geniculate at the base.

Other plants with this structure have been described under different genera, e. g., *Orthosiphon angolensis* G. Taylor and *Ocimum Cameroni* (Baker) R. E. Fries, and there are others undescribed. To determine the generic position of this group further study of the relationships between *Hemizygia* and *Becium* is necessary.

Excluded species and those of which no material has been seen:—

H. Cooperi Briq. in Bull. Herb. Boiss., sér. 2, iii. 992 (1903) is **Syncolostemon macranthus** (Gürke), comb. nov. *Orthosiphon macranthus* Gürke in Engl. Bot. Jahrb. xxvi. 84 (1883).

H. Dinteri Briq. *tom. cit.* 995. No material seen.

H. Hoepfneri Briq. *tom. cit.* 994. No material seen.

RESOLUTIONS CARRIED BY THE SIXTH INTERNATIONAL BOTANICAL CONGRESS (AMSTERDAM).

We have received from the Secretary of the Executive Committee, Dr. M. J. Sirks, a draft of the resolutions carried, unanimously, at the final plenary meeting of the Congress on September 7 :—

General.

1. That the Botanical Section of the International Union of Biological Sciences should act as an administrative connecting link between successive International Botanical Congresses, which maintain their full independence from an international point of view to such an extent that any country which has not joined the Union will have the same rights as those which have joined.

It is proposed that this Botanical Section be authorized to carry through any resolutions carried by the International Botanical Congresses.

2. By reason of the growing financial difficulties and the prohibitive price, for certain museums and laboratories, of transmission by post, rail, and boat, it becomes impossible to guarantee the indispensable exchange of collections of dried plants. It is therefore necessary to obtain for this exchange the free transport now accorded to the exchange of scientific publications.

The Congress asks the Office of the International Union of Biological Sciences to take the necessary steps with various governments in order to obtain this postal privilege.

Sectional.

3. That the Seventh International Botanical Congress shall arrange a Section for Agronomy on the same lines as that of the Sixth Congress.

Cytology and Genetics. 4. That the Botanical Section of the International Union of Biological Sciences on behalf of the Sixth International Botanical Congress should apply to the International Committee for Genetical Congresses for the appointment of an International Committee to study the different meanings of various cytological and genetical terms used in the literature, to propose exact definitions of these terms, and to suggest if and what further steps are necessary to improve the terminology of genetics and cytology.

5. The Sections of Genetics and Cytology take the occasion of their presence in Holland to record the deep sense of debt which the sciences of Genetics and Cytology owe to Hugo de Vries. It is a satisfaction that he lived to see the imposing structure which has been erected on the foundations, in the laying of which his painstaking investigations and prophetic vision had so large a share.

Geobotany. 6. The Sixth International Botanical Congress appeals to all botanists and cartographists to employ for the same plant communities the same colouring, and for sociologically related plant communities, especially in survey maps, similar tints, in accordance with the proposals which the Fifth International Botanical Congress put forward at Cambridge.

7. The Sixth International Botanical Congress draws the special attention of Public Bodies, Scientific Institutes, and Societies for the International Protection of Nature to the danger of inconsiderate destruction of primitive vegetation to which, in the future, vast territories, especially in tropical and subtropical countries, will be exposed through brushwood and prairie fires.

It points out the often radical changes brought about by this practice in the biologic complex. On the one hand, a very great number of species are threatened with extinction—many of them being of the greatest interest from the scientific, æsthetic, and economic points of view. On the other hand, countries formerly covered with a woody vegetation are becoming, or are in process of becoming, desert in consequence of the changes which the destruction of this vegetation produces upon the local climate, the hydrologic conditions, and the physico-chemical characters of the soil.

The Congress emphasizes the necessity :

(1) Of constituting in these countries permanent reserves for safeguarding the equilibrium of the natural conditions and the lives of the plants and animals (National Parks).

(2) Beside the territories thus constituted as permanent Reserves, to lessen in some measure the consequence of the deforestation and exploitation by maintaining an adequate proportion of forest areas.

(3) To prevent the substitution of natural formations of woody autochthones by those of exotic species (in accordance with the conclusions of the International Conference for the Protection of the Fauna and Flora of Africa, London, 1933).

8. The Sixth International Botanical Congress is conscious of the great dangers arising from the destruction of tropical and subtropical vegetations, and also of the changes caused in such regions by the action of man.

The Congress recommends the study of these problems by the botanists of these countries and that they should inform their governments.

Information should be collected and published with a view to the most efficient protection of the indigenous vegetation.

The Congress appoints a Committee for studying this subject and for submitting a report to the Seventh Congress. The following members of this Committee are nominated : I. B.

Pole Evans, President; H. Humbert, E. D. Merrill, and J. Nabelek, Vice-Presidents; R. Bouillenne, H. Brockmann Jerosch, A. Chevalier, L. Emberger, A. W. Hill, J. Jeswiet, P. Ledoux, R. Maire, G. Negri, L. R. Parodi, and M. F. Gallego Quero, and as Secretary J. Trochain.

9. That the programme of the Seventh International Botanical Congress shall include the study and the delineation of the characters of the various types of steppes, their origin, their development, and especially the discriminative criteria for climatic associations and secondary associations which have been confused under the names "steppe," "prairie," "savannah," and the definitions of the corresponding phytogeographic regions.

10. That a committee shall be appointed to elaborate proposals for a classification of climates from a phytogeographical point of view and to submit them to the Seventh International Botanical Congress.

11. The Geobotanical Section recommends:

(1) To use the term *Sociation* for vegetation units characterized mainly by dominance in the different layers, in the sense of Scandinavian plant-sociologists.

(2) To use the term *Association* for vegetation units characterized mainly by characteristic and differential species in the sense of Zürich-Montpellier plant sociologists, or at least for units of the same order of sociological value; *Subassociation* and *Facies* can, where necessary, be used for their subordinate units.

(3) To unite sociations and associations into alliances in the sense of Zürich-Montpellier plant sociologists, and the alliances into higher units.

12. *Mycology and Pathology.* The Sixth International Botanical Congress wishes to express its appreciation of the admirable work accomplished by the Centraalbureau voor Schimmelcultures at Baarn since its foundation in 1906, and views with grave concern the present financial difficulties of what is essentially an international institution.

Pathology. 13. The Committee on Description and Nomenclature of Plant Viruses appointed by the Fifth International Botanical Congress 1930 reports that it has made progress in developing a scheme for the nomenclature of plant viruses, and asks that the Committee be empowered to continue its work.

14. It is recommended that the term "physiologic race" be substituted for "physiologic form" as the former seems more appropriate. It is recommended further that the word "race" be used in general to designate biotypes or groups of biotypes that differ from each other in physiologic characters.

15. The Sixth International Botanical Congress is of the opinion:

that an effective and unceasing campaign against destructive plant diseases and insect pests can be successfully prosecuted only by international action and mutual co-operation;

that close and frequent international discussion of the problems of plant quarantines should take place to bring about improvement of the health conditions of plants and plant-products offered for export;

that such action will greatly facilitate international trade in the commodities concerned; and

recommends that this resolution be brought to the attention of the League of Nations, emphatically endorsing the League's proposal to give this matter urgent and careful consideration with a view to facilitating and expediting the purpose and aims of this resolution.

Systematics. 16. The Sixth International Botanical Congress agrees to the following propositions by the International Standing Committee for Urgent Taxonomic Needs:

(1) Compilation of a new Phytography. The book should not treat the whole content of de Candolle's 'Phytographie'; it should prepare a compilation of the collections represented in the larger herbaria of the world. Institutes are asked to draw up a list of their collections.

(2) Photographs of type-specimens. The scheme to photograph the types of all plants is important, and should be encouraged, but involves very great expense. As the means of most Institutes are restricted at the present time, this point should be postponed to the next Congress.

(3) International Dictionary of Botanical Terminology. The dictionary should be restricted to Phanerogams. The Cryptogams are to be worked out by specialists in the individual groups. The Latin word should be translated and explained in English, French, and German. For use in countries of other languages the botanists of such countries should supply translations. All terms would be given in alphabetical sequence. At the end, the most important terms for single categories (*e.g.*, leaf, root, Orchids) might be placed together.

(4) It is highly desirable that the Linnean type-specimens at the Linnean Society and at the British Museum should be photographed.

17. *Subsection Nomenclature: Votes of Thanks.*

To the Editorial Committee of the 'International Rules of Botanical Nomenclature,' ed. iii. (1935), namely, Professor Harms (General Editor), Dr. Rendle, and Professor Hochreutiner, for the successful manner in which they carried out their difficult task.

To the Executive Committee of the Fifth International Botanical Congress, Cambridge, 1930, for defraying the cost of publication of the 'Synopsis of Proposals' and 'Preliminary Opinions' concerning nomenclature.

Resolution.

That the Sixth International Botanical Congress accepts the decisions of the Section of Taxonomy and Nomenclature concerning the modification of the International Rules of Botanical Nomenclature, ed. iii. (1935), and sanctions the appointment of the Standing Committees by this Section.

SHORT NOTES.

CYPERUS LONGUS L. IN SURREY.—The only record of *Cyperus longus* L. in Surrey is one at Witley, which is mentioned in Salmon's 'Flora of Surrey,' and there stated to have been planted. On Holmwood common, however, I found, on the edge of a pond, three large clumps of this plant in full flower in August of this year. The flowering culms were over six feet tall. The pond is surrounded by a dense thicket of brambles, twelve or more feet high and five or six feet through, and quite impenetrable, and, as the water is quite up to this hedge, the plants are very inaccessible. They can be seen from one side of the pond which is open. I had noticed these clumps some years ago, but being unable to get to them, and they not being in flower, presumed they were those of some *Carex* such as *C. vulpina* L. With much difficulty I succeeded this year in obtaining two flowering culms.

It is open to question whether they may not have been planted many years ago by some former resident of one of the cottages in the vicinity, but I have no evidence of this. I have sought in vain for it elsewhere in the neighbourhood, but the constant fires on the common and the cultivation of the surrounding area might well have exterminated it. Though in England it is mainly confined to the south, it has been recorded as native north of this spot.—H. N. RIDLEY.

PLANT-MAPS FOR THE NETHERLANDS.—The Institute for the investigation of the Netherlands is issuing ('Blumea,' ii. no. 1) a reduced reproduction of sketch-maps showing the distribution of individual species prepared from the 'Plantenkaartzes voor Nederland' initiated by Goethart and Jongmans and continued since 1930 by the Institute. The originals are kept in the Rijksherbarium at Leyden, where the albums are open to inspection, and show at a glance the distribution of all phanerogams and vascular cryptogams found in the Netherlands up to the end of 1934. The sketch-maps (scale 1:3,000,000) are divided into squares, representing approximately an hour's walk each way (exactly 4180×5000 metres), in which the presence of the plant is indicated. Part I. now issued depicts the distribution of twenty species of the "Atlantic" type—*Artemisia maritima*, *Aster Tripolium*, *Cakile maritima*, *Carex arenaria*, *Corydalis claviculata*, *Corynephorus canescens*, *Erica Tetralix*, *Eryngium maritimum*, *Genista anglica* and *pilosa*, *Hydrocotyle vulgaris*, *Limonium vulgare*, *Lobelia Dortmanna*, *Myrica Gale*, *Narthecium ossifragum*, *Plantago maritima*, *Sarothamnus scoparius*, *Spartina maritima* ssp. *stricta*, *Statice Armeria* var. *maritima*, *Teucrium Scorodonia*, and *Ulex europaeus*.

REVIEWS.

Forest Trees and Timbers of the British Empire. Edited by L. CHALK and J. BURTT DAVY, Imperial Forestry Institute, Oxford.—III. *Fifteen South African High Forest Timber Trees.* By L. CHALK, M. M. CHATTAWAY, J. BURTT DAVY, F. S. LAUGHTON, and M. H. SCOTT. 8vo, pp. 103, 17 pls., 13 text-figs. Clarendon Press: Oxford, 1935. Not priced.

THE third issue of this series follows the same general lines as the two previous. It has been prepared in co-operation with officers of the Forestry Department of South Africa, who were responsible for the selection of the species, the supply of the necessary material, and notes on the trees and their timbers. The species have been redescribed from specimens in the Imperial Forestry Institute herbarium, supplemented by additional material specially supplied from South Africa. As in the previous issues, the generic and specific characters are described in some detail and illustrated by line-drawings. In addition to the taxonomic descriptions, the information on each species is highly comprehensive, covering the habit and distribution of the tree, notes on ecology and silviculture, properties and uses of the timber, and a detailed anatomical description of the wood. The following species are dealt with:—*Gonioma kamassi*, *Curtisia faginea*, *Cunonia capensis*, *Platylophus trifoliatus*, *Apodytes dimidiata*, *Ocotea bullata*, *Ekebergia capensis*, *Ptaeroxylon obliquum*, *Rapanea melanophloeos*, *Ochna arborea*, *Olea laurifolia*, *Podocarpus Henkelii*, *Podocarpus falcatus*, and *Faurea Macnaughtonii*.

Certain changes in the treatment of the wood descriptions are evidence of recent advances in this specialised study. The inclusion of detailed microscopic measurements of cell-dimensions in the text tended to make the descriptions somewhat cumbersome, and accordingly most of the figures have been removed from the text and relegated to an appendix. The new method of presenting these data in the form of tables and diagrams

is to be commended, especially as it enables the reader to see at a glance the extent of variation in each measurable feature. The photomicrographs of wood sections as usual are of a uniformly high standard of excellence—in fact, the illustrations as a whole are a notable feature of this series.—B. J. RENDLE.

Check-lists of the Forest Trees and Shrubs of the British Empire. Edited by J. BURTT DAVY, M.A., Ph.D., Imperial Forestry Institute, Oxford.—No. 1. *Uganda Protectorate.* By J. BURTT DAVY and FLORENCE BOLTON, with the collaboration of the Conservator and Assistant Conservators of Forests, Uganda. Cr. 8vo, pp. 132. Imperial Forestry Institute: Oxford, 1935. Not priced.

A CHECK-LIST, a preliminary stage in the preparation of a local flora, indicates the gaps in our knowledge, is of use to workers in the field, and for purposes of recording and also for refreshing the memory as to names—all of which is pointed out in the introduction, which briefly reviews previous work on the Uganda flora. The list also indicates the considerable number of species awaiting identification, some of which may be new to science. The Uganda Forest Department contributes a classification of the forests and notes on the more important timber trees. Finally, there is a list of the chief sources of information.

The check-list enumerates the families, genera, and species. The arrangement in each case is alphabetical; it comprises 107 families, 452 genera, and 1146 named species and varieties, not including exotics which appear in an Appendix. Under each species are cited the collector's name, the number or reference to a publication, and short field-notes have been added, mainly by the Assistant Foresters, Mr. W. J. Eggeling and Mr. C. M. Harris. Where a plant has been wrongly named a cross-reference to the correct name is given. Leguminosae are by far the best represented—they are grouped under the three well-known subdivisions. Rubiaceae and Euphorbiaceae are also especially numerous. Why are the Palms so poorly represented in tropical Africa? Uganda supplies only single species of *Borassus*, *Elaeis*, *Hyphaene* (doubtful), *Phoenix*, and *Raphia*, all of considerable economic value, and two unidentified rattan-palms.

Much work has evidently been put into the preparation of the list, which should meet the needs indicated in the Introduction. We note that the editor ignores the Recommendation of the International Rules governing the use of a capital initial to specific epithets. The universal small initial certainly saves trouble, but the names look unfamiliar and as if lacking in respect to the persons presumably honoured thereby.—A. B. R.

Plant Life: a Textbook of Botany. By D. B. SWINGLE. 8vo, pp. xiv and 441, with frontisp. and 290 text-figs. Chapman and Hall: London, 1935. Price 15*s*.

THE author's preface and the publisher's exhortation to the students who use this textbook are, presumably, intended to promote the sale of Professor Swingle's book of elementary botany. They form the cleverest part of the production, but they are dear at fifteen shillings.

The book does nothing that is not done much better by well-known elementary books in common use; it possesses neither in matter nor in manner the virtues ascribed to it. The information is wide in range, but is not always so accurate as could be wished. It is odd to find the genus *Protococcus* in a book printed in 1935, and it is nearly as odd to find a section justifying the use of botanical names. Modern youth finds little difficulty in mastering the special vocabularies of wireless and motor cars; it would have no trouble with botanical terminology if the absurd idea that botany is nothing but a matter of long names was allowed to stay in obscurity.

At first glance, the figures make a good impression, but, like the text, they disappoint on examination. Few justify the description of "illustrations of exceptional merit" that appears in the preface; some, like the portrait of Darwin (fig. 271), could have been better chosen. Some should not have been printed; it would be difficult to find anywhere a more misleading figure than that of a germinating zygospore of *Mucor* (fig. 182).

Professor Swingle's book was possibly written in the first place to meet the needs of his own students in Montana. No opinion can be given of its suitability to their needs, but, on general grounds, there seems no reason to recommend the book to the favourable notice of students and teachers of botany on this side of the Atlantic.

It is a pleasure to note that the book is attractively bound and well printed on good paper; it is a pity that the contents are not as good as the outside.—B. BARNES.

Botany as an Experimental Science in Laboratory and Garden. By LILIAN J. CLARKE, D.Sc., F.L.S. Cr. 8vo, pp. xvi, 138, frontisp., 8 pls., and 26 text-figs. University Press: Oxford, 1935. Price 6*s*.

WE must regret that Lilian Clarke did not live to see in print the book describing the educational work in Botany at the James Allen's Girls' School, Dulwich, which gained for her distinction among botanists and educationalists. She died in February 1934, and a sympathetic account of her work was written for this Journal by a former pupil, Dr. E. M. Delf. Prof. A. G. Tansley writes an appreciative Foreword to the book,

pointing out the difficulties of the uphill fight for money and opportunity carried on for years. It is good to know that in later years the work was recognised and helped by the School Governors and the Board of Education.

The book is a record of the work at the school in two parts—experiments in the laboratory and the botany gardens. The girls were taught by means of observations and experiments made by themselves in laboratory and garden, and checked or supplemented by the work of previous generations of pupils. No text-books were used up to Matriculation standard. The laboratory work records the experimental study of germination, photo-synthesis, nutrition, transpiration, respiration, growth, and the soil. The history of the botany gardens, begun in 1896, is a record of much voluntary work in a London day school by girls and teacher for fifteen years before financial recognition was granted. In a series of chapters are described the construction and development of the various ecological habitats—a lane, ponds, heath, bog, sand-dunes, salt-marshes, pebble-beach, cornfields, chalk-beds, wall, and woods, with notes on the work done by the girls. It is interesting to note the difficulties underlying the construction of some of the habitats, such as the transport of salt-marsh soil from Burnham-on-Crouch or twelve tons of coarse beach material from Brighton for the pebble-beach. And it is gratifying to note that the interest aroused has been an incentive to botanical investigation on the same lines by " old girls " now holding important botanical posts.

The plates, reproduced from photographs, illustrate some of the habitats and associations.

The book is an interesting account of an educational experiment, and teachers of practical botany in schools will find many helpful suggestions.—A. B. R.

Colloids in Agriculture. By C. E. MARSHALL, M.Sc., Ph.D. Sm. 8vo, pp. viii, 184, 14 text-figs. London: Edward Arnold & Co., 1935. Price 5*s*.

THIS book should appeal to all botanical students who want a clear account of the principles of colloid chemistry in its application to plants, although, as the author states in the preface, the book was primarily written for agricultural advisers and students. The first part is devoted to the general properties of colloidal systems, and it gives in simple language as lucid an account of these properties as exists, though unfortunately no mention is made of the Donnan membrane equilibrium theory. In the course of the presentation frost and drought resistance of plants and the preparation of emulsions and sprays are discussed.

The second part, which deals with the soil colloids, falls rather short of this high standard. The author gives a clear account of his views on the structure of clay particles, but his description of the other properties of soil colloids is less satisfying.

The third part, which deals with the colloids of plant and animal life, rises again to the earlier standard. It contains a clear description of the present views on fibre structure and on the colloidal properties of carbohydrates and proteins. The last two chapters deal with the colloid chemistry of milk and butter-making, also of smoke damage and sprays.

The book can be confidently recommended to all who want an introduction to the general principles of colloid chemistry.—E. W. RUSSELL.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the opening General Meeting of the session on October 24, Dr. W. T. Calman, C.B., F.R.S., President, in the Chair, Dr. A. C. Smith gave a lecture illustrated with coloured lantern-slides on plant collecting in Fiji. The general characters of the low-land and mountain vegetation were described: the former had been considerably altered by cultivation, but this did not extend to the higher altitudes which retained their original character. A concession for felling trees of Kauri (*Agathis vitiensis*) had been granted to a New Zealand company, but, in reply to a question, Dr. Smith stated that it concerned only a limited area and there was no danger of the indiscriminate felling which had denuded the Kauri forests of New Zealand. Mr. H. N. Ridley remarked on the general similarity of strand vegetation—that, for instance, of Christmas Island in the Indian Ocean resembled that described by Dr. Smith in the Fiji Islands.

At the meeting on November 7 Miss Edith L. Stephens gave an account of a water-side collecting trip along the Linyanti River, a tributary of the Zambesi on the boundary of Northern and Southern Rhodesia. The character of the vegetation was shown by means of lantern-slides and by pictures of a number of the water-plants collected. A similar trip was also made in the Mozambique area.

Dr. J. R. Baker described the work by himself and others on the study of seasons in a tropical rain-forest, the New Hebrides. Definite seasons were indicated by meteorological observations and confirmed by observations on the flowering period of a limited number of plants.

The President announced that the King of the Belgians had expressed his willingness to become an Honorary Fellow of the Society and he was elected by the unanimous vote of the

Fellows present. The President referred to his Majesty's interest in Natural Science, shown especially in connection with the development of the National Park in the Congo.

At the meeting on November 21 the President announced the death of one of the eldest Fellows, John Cameron (elected 1879), formerly Superintendent of the Government Botanic Gardens, Bangalore, India. Mr. S. Savage read a paper on the relation of Caspar Bauhin's 'Pinax' (1623) and Burser's Herbarium, now at Upsala, to the 'Species Plantarum' of Linnæus. It was evident from Linnæus's copiously annotated copy that the 'Pinax' was an important source in the compilation of the 'Species' of 1753. Burser was a pupil of Bauhin's, and is frequently cited by Linnæus as authoritative for his species. Notes of the determination of Burser's specimens in the annotated copy of the 'Pinax' show that in some cases the types of Linnean species must be sought in Burser's Herbarium.

Dr. H. Hamshaw Thomas, F.R.S., followed with a paper entitled 'Cosmic Rays and the Origin of Species.' Exposure to the action of X-rays has been shown to effect alteration in certain species, and the speaker suggested that the origin of new species might be sought in the action of cosmic rays. These are normally far weaker than X-rays, but their power increases with increase in latitude and altitude, and it has been shown that occasional greatly increased "cascades" occur at high altitudes. It was suggested that the greater endemism on mountain ranges as compared with the lowlands might be explained by the more vigorous action of cosmic rays.

We tender hearty congratulations to Prof. F. O. Bower, who celebrated his eightieth birthday on November 4, and Mr. H. N. Ridley, who will reach the same age on December 10. The present volume of this Journal supplies evidence of their continued virility. Prof. Bower, pre-eminent in morphology, is represented by his important book, 'Primitive Land Plants,' described by his reviewer (p. 199) as "one of the most important contributions to botanical thought yet made in this century"; and Mr. Ridley's long devotion to Malayan botany is represented by a paper in the present number.

Mr. W. R. Philipson, B.A., late exhibitioner of Downing College, Cambridge, has been appointed to an Assistant-Keepership in the Department of Botany, British Museum. Mr. Philipson gained a first class in both parts of the Natural Sciences Tripos at Cambridge and has worked for two years as a research student in the Kew Herbarium. A paper by him on abnormal spikelets in the genus *Agrostis* appeared in the March number of this Journal.

INDEX.

For Classified Articles, see—Obituaries; Reviews. New Genera, species, and varieties, and new names are distinguished by an asterisk.

The Index to the Supplements is included above.
