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THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

THE AFRICAN SPECIES OF THE GENUS *ORTHOSIPHON* Benth.

By Maurice Ashby, Ph.D., D.I.C.

The genus *Orthosiphon*, characterized by its relatively long corolla-tube and capitate style-apex, was described by Bentham in 1830 in an account of the tribes and genera of the Labiatae published in the 'Botanical Register' (xv. sub t. 1300; 1830). It was included in the tribe Ocimoideae, next to the genus *Ocimum*, which it closely resembles. At that time *Orthosiphon* was represented only by a few Indian species, and it was not until many years later that the wealth of African material was discovered.

The critical nature of the generic distinctions within the group Ocimoideae has led in the past to the inclusion of a number of anomalous species under *Orthosiphon*. The majority of these have already been discussed in two previous papers in this Journal, on *Hemizygia* (1935, 312) and *Endostemon* (1936, 121), and it now remains to consider the true species. These may conveniently be grouped into three sections, which, although somewhat difficult to define concisely, are quite distinct in appearance. Of these sections the first (*Serrati*) is restricted in its geographical range to the Transvaal, while members of the third (*Pallidi*) are found only in the Abyssinia–Somaliland region, except *O. pallidus*, which occurs as far west as Dahomey and also in Arabia and India. The remaining section (*Eu-Orthosiphon*) is widely distributed over tropical Africa, Madagascar, and India, with a few species in China and Malaya. The African species of the genus include the great majority, and it is with these that the present paper is concerned. They are reduced to thirty in number, and an amplified description of the genus is given below.

In the enumeration of specimens the following abbreviations are used to indicate the herbaria in which they are deposited :—

B =Botanical Gardens and Botanical Museum, Berlin.
BM=British Museum (Natural History).
Br =State Botanic Garden, Brussels.
F =Museum and Botanic Gardens, Florence, Colonial Herbarium.
G =Conservatoire and Botanic Gardens, Geneva.
HN=Natal Herbarium, Durban (Natal Government Herbarium).
K =Royal Botanic Gardens, Kew.
P =Natural History Museum, Paris.
TM=Transvaal Museum, Pretoria.

In the citation of type-specimens the herbarium having the holotype is quoted before the word " type," and herbaria to which specimens of the duplicate set from the type-gathering have been distributed are noted after the word " type."

I have pleasure in expressing my thanks to Mr. J. Ramsbottom and Dr. G. Taylor for their encouragement and assistance, and to other members of the staff of the British Museum (Natural History), where this work was carried out, for the facilities afforded me. I am indebted also for loans of material to the authorities of the institutions named above.

ORTHOSIPHON Benth. in Bot. Reg. xv. sub t. 1300 (1830).

Herbs or sometimes undershrubs usually erect and branching, sometimes with tuberous roots. *Stems* usually 4-angled, rarely 6-angled or terete. *Leaves* opposite and decussate or rarely ternately arranged, rarely in a basal rosette, sessile or petiolate ; lamina usually serrate or crenate at the margin, often gland-dotted, especially beneath. *Inflorescence* of verticillasters borne in terminal or axillary racemes or rarely with the flowers arranged irregularly on the axis ; verticillasters usually 2–6-flowered, sometimes many-flowered ; bracts usually more or less persistent, small and inconspicuous or rarely rather large. *Calyx* usually slightly declinate when flowering, more sharply declinate and more or less accrescent in fruit, tubular ; tube glabrous or sparsely pubescent within, cylindrical to campanulate, usually straight, unequally 5-toothed at the mouth (=2-lipped, the posterior lip entire, the anterior lip 4-fid) ; posterior tooth broadly ovate to suborbicular with the margin more or less decurrent on the tube ; lateral pair of teeth narrowly triangular to subulate from a deltoid base ; anterior pair subulate, usually exceeding the lateral pair. *Corolla* exserted beyond the teeth of the calyx, tubular ; tube glabrous within or with two pilose areas near the base, cylindrical or slightly widened at the mouth, usually straight ; mouth distinctly 2-lipped, not truncate laterally ; posterior lip shortly 3–4-lobed, more or less erect ; anterior lip entire, concave, usually straight. *Stamens* 4, in 2 pairs, usually lying in the anterior lip of the corolla or rarely exserted beyond it, the filaments all free and usually glabrous ; posterior pair inserted in the upper half of the corolla-tube (or rarely near the base) ; anterior pair inserted near the mouth of the corolla-tube, the filaments well separated at their insertion ; anthers reniform, 1-celled. *Disk* usually enlarged anteriorly. *Ovary* deeply 4-lobed, the lobes glabrous. *Style* only rarely exserted beyond the anterior lip of the corolla, entire or emarginate at the apex, obtuse and more or less capitate. *Nutlets* oblong to suborbicular and slightly compressed dorsally.

Distribution.—China, India, Malaya, Arabia, Socotra, tropical and South Africa, and Madagascar.

African species 17. Type-species *O. rubicundus* Benth.

Key to the African Species.

A. Floral bracts usually more than 6 mm. long and 3 mm. broad, rarely less, but then longer than the pedicels and thickly glandular-pubescent. Corolla-tube usually more than 9 mm. long. Sect. SERRATI.
  a. Leaves glandular-pubescent. Calyx-tube not more than 10 mm. long, sometimes much accrescent before the corolla has dropped ..... 1. *pseudoserratus.*
  aa. Leaves pubescent but not glandular. Calyx-tube often more than 10 mm. long, accrescent only after the corolla has dropped.
    b. Calyx-tube in flower less than 7 mm. long. Largest leaves usually more than 2 cm. long, but very variable ..... 2. *serratus.*
    bb. Calyx-tube in flower more than 7 mm. long. Leaves less than 2 cm. long..... 3. *tubiformis.*

AA. Floral bracts less than 6 mm. long and usually less than 3 mm. broad, ciliate, rarely pubescent or gland-dotted. Corolla-tube usually less than 9 mm. long.
  B. Corolla-tube relatively long (more than twice as long as its diameter at the throat), subcylindrical or sometimes gradually widened towards the mouth ; anterior corolla-lip about the same size as the posterior lip or sometimes larger. Stamens usually hidden in the anterior lip of the corolla. Petiole of leaves variable in length or absent. Sect. EU-ORTHOSIPHON.
    a. Petiole of mature leaves (at least the largest ones) more than one-quarter of the length of the lamina, or more than 1 cm. long.
      b. Racemes obscure, not more than 3 cm. long, and usually axillary. Leaves densely covered beneath with dark red sessile glands ..... 4. *ferrugineus.*

bb. Racemes conspicuous, more than 3 cm. long, and always terminal as well as axillary. Leaves often gland-dotted beneath, but the glands not dark red.
c. Lamina of leaves (at least the largest ones) more than 4 cm. long.
d. Corolla-tube well exserted from calyx, at least twice as long as calyx-tube and usually more than 6 mm. long.
e. Calyx-tube more than 7 mm. long in fruit; 4 mm. long or more in flower.. 5. *dissimilis*.
ee. Calyx-tube less than 7 mm. long in fruit; usually less than 4 mm. long in flower.
f. Lamina of largest leaves usually more than 4·5 cm. long; petiole often more than 1·5 cm. long. Leaves acute at apex, with acute serration at the margin. Verticillasters usually about 1 cm. apart on fruiting raceme. 6. *longipes*.
ff. Lamina of largest leaves usually less than 4·5 cm. long; petiole usually less than 1·5 cm. long. Leaves obtuse or rarely acute at apex, with obtuse serration or crenation at the margin. Verticillasters usually more than 1 cm. apart on fruiting raceme. 8. *australis*, p.p.
dd. Corolla-tube shortly exserted from calyx, not more than twice as long as calyx-tube and usually less than 6 mm. long. 7. *iodocalyx*.
cc. Lamina of leaves less than 4 cm. long.
d. Petiole (of some leaves at least) more than 0·6 cm. long.
e. Petiole only just over one-quarter the length of lamina, and then only on the lower leaves. Corolla-tube about twice as long as calyx-tube. Low caespitose herb ..... 20. *Wilmsii*, p.p.
ee. Petiole usually one-third the length of lamina or longer on all leaves. Corolla-tube often more than twice as long as calyx-tube. Herb or undershrub, more or less woody, with spreading branches.
f. Leaves ovate, cuneate at base; when mature the lamina usually more than 2·5 cm. long and petiole usually more than 1 cm. long. Erect herbs, woody at base ..... 8. *australis*, p.p.
ff. Leaves deltoid; lamina usually less than 2·5 cm. long and petiole usually less than 1 cm. long. Undershrubs with spreading woody branches .... 9. *somalensis*.
dd. Petiole less than 0·6 cm. long.
e. Leaves glabrous or thinly pubescent (often smooth and glaucous beneath), entire, dentate or rather largely crenate at the margin. Lamina of the larger leaves rarely less than 1·5 cm. long, often folded along the midrib.

f. Herbs, caespitose, usually about 20 cm. high, with leaves rounded, obtuse or rarely subacute at apex. Corolla with tube fairly broad (usually nearly 2 mm.) and anterior lip about 3 mm. long ..... 20. *Wilmsii*, p.p.
ff. Herbs with spreading branches, usually considerably more than 20 cm. high, with leaves obtuse or acute at apex. Corolla with tube narrow (usually about 1 mm.) and anterior lip usually 2 mm. long.
g. Pedicels about 2 mm. long or less, usually less than 3 mm. in fruit.... 8. *australis*, p.p.
gg. Pedicels more than 2 mm. long, more than 3 mm. in fruit ..... 21. *roseus*, p.p.
ee. Leaves rather thickly pubescent, regularly and finely crenate at the margin. Lamina rarely more than 1·5 cm. long, flat ..... 19. *mollis*, p.p.
aa. Petiole of mature leaves less than a quarter of the length of the lamina, or leaves sessile.
b. Leaves (some at least) distinctly petiolate; petiole more than 0·2 cm. long.
c. Stem and leaves pubescent, with stellate hairs ..... 10. *cladotrichos*.
cc. Stem and leaves glabrous or pubescent, with simple or gland-tipped hairs.
d. Lamina of leaves (at least of the largest ones) more than 3 cm. long.
e. Leaves glabrous both above and beneath, or sometimes with scattered hairs on the nerves beneath.
f. Leaves all or most of them basal .... 13. *rubicundus*, p.p.
ff. Leaves cauline.
g. Plant decumbent; stem herbaceous and purplish; leaves ovate, rounded at base and obtuse at apex, or sometimes subacute, regularly and finely crenate at margin, glabrous on both sides, with nerves prominently raised beneath (especially near the margin), and green or purplish ..... 11. *violaceus*, p.p.
gg. Plant erect; stem herbaceous and green or woody with a brown bark; leaves ovate-lanceolate, cuneate at base and acute at apex, largely serrate at margin, with a few hairs on the nerves, which are rarely prominently raised, but obscure or rufous, brown, or purplish.
h. Rhachis finely puberulous; calyx finely puberulous, with conspicuous nerves, the lateral and anterior teeth slender and filiform; nerves beneath the leaves rufous. Dwarf branches usually present ..... 16. *rufinervis*, p.p.
hh. Rhachis pubescent; calyx more or less pubescent, with inconspicuous nerves, the lateral and anterior

teeth subulate; nerves beneath the leaves green, brown, rufous, or purplish. Dwarf branches rarely present.
i. Racemes with a cluster of small sterile bracts at apex ..... 12. *Stuhlmannii*.
ii. Racemes without sterile bracts at apex ..... 13. *rubicundus*, p.p.
ee. Leaves more or less pubescent both above and beneath.
f. Corolla-tube about 1 mm. broad, nearly three and a half times as long as broad ..... 14. *usambarensis*.
ff. Corolla-tube usually more than 1 mm. broad, less than two and a half times as long as broad.
g. Anterior lip of corolla 4 mm. long or more, with margin crispate ..... 18. *parvifolius*, p.p.
gg. Anterior lip of corolla less than 4 mm. long, with margin straight or slightly crispate.
h. Racemes tomentose; verticillasters somewhat crowded together. Leaves broadly ovate or obovate.. 15. *Schimperi*, p.p.
hh. Racemes pubescent, but rarely densely so; verticillasters more or less distant. Leaves variable, but usually ovate-lanceolate or oblong. 13. *rubicundus*, p.p.
dd. Lamina of leaves less than 3 cm. long.
e. Racemes tomentose, with long hairs; verticillasters somewhat crowded together ..... 15. *Schimperi*, p.p.
ee. Racemes more or less pubescent, with short hairs; verticillasters more or less distant.
f. Calyx-tube during flowering more than 4 mm. long and finely puberulous, with the nerves conspicuous as purplish lines ..... 16. *rufinervis*, p.p.
ff. Calyx-tube during flowering not more than 4 mm. long, pubescent to almost glabrous, with the nerves inconspicuous.
g. Stem decumbent, herbaceous and purplish; leaves ovate, rounded at base and obtuse at apex (or sometimes subacute), finely and very evenly crenate at the margin, glabrous on both sides, with the nerves prominently raised beneath, especially near the margin ..... 11. *violaceus*, p.p.
gg. Stem erect, herbaceous and green or woody with a brown bark; leaves oblong to lanceolate, ovate or suborbicular, more or less broadly cuneate at base or rarely rounded or cordate, acute or obtuse at apex, serrate at margin (or sometimes finely crenate, but then pubescent on both sides).

h. Corolla-tube exserted only just beyond posterior tooth of calyx, curved upwards. Anterior lip of corolla much longer than posterior lip, usually ascending, with margin very crispate.
i. Leaves nearly glabrous beneath, almost entire at margin; rhachis slender ..... 17. *Johnstonii*.
ii. Leaves usually thickly pubescent or puberulous beneath, serrate at margin; rhachis fairly stout ... 18. *parvifolius*, p.p.
hh. Corolla-tube exserted well beyond posterior tooth of calyx, usually straight. Anterior lip of corolla scarcely longer than, or not longer than, posterior lip, straight or slightly declinate, with margin flat or slightly crispate.
i. Leaves pubescent beneath, finely crenate at margin, lamina not more than 1·5 cm. long ..... 19. *mollis*, p.p.
ii. Leaves glabrous beneath or sometimes pubescent, serrate at margin or coarsely crenate, or rarely entire, the lamina usually more than 1·5 cm. long.
j. Leaves obtuse or rarely subacute at apex, usually shallowly serrate or crenate at margin, or rarely entire. Corolla-tube broad, less than two and a half times as long as calyx-tube, with lips fairly large ..... 20. *Wilmsii*, p.p.
jj. Leaves acute or rarely obtuse at apex, more or less deeply serrate at margin. Corolla-tube narrow, more than two and a half times as long as calyx-tube, with lips small.
k. Pedicels about 2 mm. long or less, not more than 3 mm. in fruit ..... 8. *australis*, p.p.
kk. Pedicels more than 2 mm. long, more than 3 mm. in fruit..... 21. *roseus*, p.p.
bb. Leaves all sessile or subsessile, or very shortly petiolate.
c. Leaves ternate or opposite; racemes very glandular, with verticillasters usually 2-flowered, or the flowers arranged irregularly on the rhachis ..... 22. *nigripunctatus*.
cc. Leaves opposite or very rarely ternate; racemes not glandular, with verticillasters normally 6-flowered and regular.
d. Leaves (at least the largest ones) 4 cm. long or longer.
e. Flowers, bracts, and leaves rather membranous; bracts more than 4 mm. long (usually nearly 5 mm.); leaves glabrous ..... 23. *Buchananii*.

ee. Flowers, bracts, and leaves fairly thick and opaque; bracts rarely more than 4 mm. long; leaves more or less pubescent ..... 13. *rubicundus*, p.p.

dd. Leaves less than 4 cm. long.

e. Largest leaves more than 1·5 cm. broad. 24. *pascuensis.*

ee. Largest leaves less than 1·5 cm. broad.

f. Corolla about 8 mm. or more long (from base of tube to tip of anterior lip).

g. Anterior lip of corolla much longer than posterior lip, crispate at margin. Calyx more or less pubescent, with nerves inconspicuous ..... 18. *parvifolius*, p.p.

gg. Anterior lip of corolla scarcely longer than posterior lip, flat at the margin. Calyx minutely puberulous and glandular, with conspicuous purplish nerves ..... 16. *rufinervis*, p.p.

ff. Corolla less than 8 mm. long (from base of tube to tip of anterior lip).

g. Stem very slender, sulcate. Calyx densely pubescent, with anterior teeth 3 mm. long in young fruit... 25. *heterochrous.*

gg. Stem fairly stout, not sulcate. Calyx sparingly puberulous, with anterior teeth 2 mm. long in young fruit ..... 26. *viatorum.*

BB. Corolla-tube short (less than twice as long as its diameter at throat), funnel-shaped, widening rapidly towards mouth; anterior corolla-lip much longer than posterior lip. Stamens usually exserted. Petiole of leaves long (more than one-quarter the length of lamina). Sect. PALLIDI.

a. Upper surface of leaves deeply rugose; floral bracts very broad in shape (2–3 mm. broad) ..... 27. *bullosus.*

aa. Upper surface of leaves more or less smooth; floral bracts rather narrow in shape (not more than 1·5 mm. broad).

b. Flowers relatively large; anterior lip of corolla more than 3 mm. long.

c. Lamina of mature leaves less than 1·5 cm. long (usually less than 1 cm. long). Verticillasters 2- or sometimes 4-flowered. 28. *grandiflorus.*

cc. Lamina of mature leaves more than 1·5 cm. long. Verticillasters 6-flowered.. 29. *macrocheilus.*

bb. Flowers small; anterior lip of corolla less than 3 mm. long ..... 30. *pallidus.*

SERRATI, sect. nov.

Flores bracteis magnis induti. Corollæ tubus longissimus, cylindricus; labia subæqualia.

1. **O. pseudoserratus,** sp. nov. *Caulis* obtuse quadrangulatus sulcatusque, pilis simplicibus glanduliferisque plus minusve dense obtectus; internodi 1–7 cm. longi. *Folia* opposita, patentia,

subsessilia vel petiolata; petiolus usque ad 0·5 cm. longus, glanduloso-pubescens; lamina ovata an lanceolata, basi rotundata an cuneata, apice obtuse vel acuta, margine serrata vel crenata, 2–4 cm. long. et 0·7–3 cm. lat., utrinque pilis simplicibus glanduliferisque dense pubescens vel hispidula, subtus nervatione evidente. *Racemi* simplices, c. 3–15 cm. long. (vel longiores); rhachis pubescens et glandulosus; verticillastri 6-flori, per anthesin 0·7–2 cm. inter se distantes; bracteæ persistentes, ovatæ an lanceolatæ, apice acutæ vel acuminatæ, 4–6 mm. long. et 2–4 mm. lat., pilis glanduliferis obtectæ; pedicelli 3–4 mm. longi, pubescentes et glandulosi. *Calyx* extus pilis simplicibus et glandulosis munitus, intus glaber vel minute puberulus, post anthesin vel etiam per anthesin accrescens; tubus campanulatus, 2–7 mm. longus, dente postico suborbiculare et plus minusve acuminato, c. 1·5–5 mm. long. et lat.; dentibus lateralibus anticisque subulatis basi triangularibus, lateralibus 1·5–3 mm. long. (in fructu ad 4·5 mm.), anticis 1·5–6 mm. long. (in fructu 6–7 mm.). *Corolla* extus sparse puberula, intus subglabra; tubus rectus vel leviter deflexus, apicem versus sensim ampliatus, 3·5–9 mm. long. et fauce c. 2–3 mm. lat.; labium posticum 3-lobatum (lobo medio emarginato) plus minusve erectum vel recurvatum c. 2–6 mm. long.; labium anticum plus minusve deflexum, 2–5 mm. long. *Stamina* exserta; postica corollæ tubæ basin versus inserta, filamentis basin versus pilosis, usque ad 17 mm. long. (vel longioribus); antica fauce corollæ inserta, filamentis glabris ad 8 mm. long. *Stylus* corollæ tubo ad 12 mm. exsertus, apice breviter et acute bilobatus.

TRANSVAAL. WATERBERG DISTR.: Moordrift, Oct., *Leendertz* 2243 *in Herb. Transvaal Mus.* 7347 (BM, type; TM); Potgietersrust, Nov., *Leendertz* 1494 *in Herb. Transvaal Mus.* 6592 (K, TM), same locality, 4000 ft., Dec., *Thode in Natal Govt. Herb.* 20,074 (HN). Pilgrim's Rest, *Greenstock* s.n. (BM.)

Resembles *O. serratus* in general appearance, but the flowers are smaller, the calyx earlier accrescent, and the whole plant much more glandular. Although the forms of *O. serratus* vary through a wide range, there is no intermediate link to this species among the abundant material studied.

2. O. SERRATUS Schlechter in Journ. Bot. XXXV. 431 ("*serratum*") (1897).

Geographical Range.—Common in Transvaal and Swaziland.

TRANSVAAL. Pilgrim's Rest, Nov., *Rogers* 18,341 (BM); Nelspruit, July, *in Herb. Moss* 13,773 (BM); Barberton, lower hill-slopes in stony places, 2800 ft., Sept., *Galpin* 499 (K, type). CAROLINA DISTR.: Waterval Boven, Dec., *Rogers* 14,304 (BM, TM). Elandspruitberg, 6500 ft., in shade, Dec., *Schlechter* 3866 (BM, K, TM). Also other specimens from the Transvaal.

SWAZILAND. Nr. Mafutane, fields of Low Veld, *c.* 1500 ft., Jan., *Bolus* 12,249 (BM, K).

An extremely variable species, especially in the size of flowers and leaves.

3. O. TUBIFORMIS R. Good in Journ. Bot. lxiii. 173 (1925).

TRANSVAAL. LYDENBURG DISTR.: without locality, 3500 ft., Dec., *Rogers* 25,014 (BM, type).

Known only from the one specimen, which is, however, quite distinct.

(To be continued.)

THE BREEDING AFFINITIES AND CYTOLOGY OF *LOLIUM* SPECIES.

BY T. J. JENKIN, D.SC., AND P. T. THOMAS, B.SC., PH.D.

FROM the study of large populations of living plants it appears that at least six general *Lolium* types, or groups, are sufficiently distinct to rank as independent species. These, apparently, are classifiable as :—

1. *Lolium perenne* L. (Non-annual ; wind-pollinated.)
2. *L. italicum* A. Br. (Non-annual ; wind-pollinated.)
3. *L. rigidum* Gaud. (Annual ; wind-pollinated.)
4. *L. loliaceum* Hand.-Maz.*. (Annual ; self-pollinated.)
5. *L. remotum* Schrank. (Annual ; self-pollinated.)
6. *L. temulentum* L. (Annual ; self-pollinated.)

The *L. loliaceum* material so far studied has all been derived from a single original inflorescence obtained from Australia in 1926. The plants have shown no significant variation.

The seed of *L. remotum* and *L. temulentum* has been obtained mainly from various botanical gardens, and the plants within each species have shown a considerable degree of variation, although, as a rule, the plants from any particular seed sample show no significant variation.

The greatest variation is found within the normally wind-pollinated groups, and we are not yet in a position to state whether or not all the variants within the annual types can be included in *L. rigidum* Gaud.

With six distinct types ranking as species, fifteen interspecific crosses are possible. Already, established F_1 hybrids representing eleven of these have been produced by hand-pollination following the emasculation of the florets.

All the parent species are diploids (fourteen somatic chromosomes), and the successful crosses are enumerated below. Brief notes are added concerning anther dehiscence, pollen production, and meiotic behaviour in the F_1 hybrids :—

* We are indebted to Mr. C. E. Hubbard, The Herbarium, Kew, for this determination.

Parent species.	F_1 *hybrids.*
L. perenne with *L. italicum*	Anthers dehiscent ; 25 per cent. good pollen. Rare failure of pairing of chromosomes at the first metaphase of meiosis. (Evans, 1926, 1934.)
L. perenne with *L. rigidum*.....	Anthers dehiscent ; 22 per cent. good pollen ; inversion bridge * recorded in a back-cross to *L. perenne*.
L. perenne with *L. loliaceum*	Anthers non-dehiscent ; no good pollen ; 40 per cent. of the pollen-mother-cells show univalents (unpaired chromosomes) at the first metaphase ; inversion bridges and an unequal bivalent (paired chromosomes) observed.
L. perenne with *L. remotum*	Anthers non-dehiscent ; no good pollen ; 20 per cent. of the pollen-mother-cells show univalents at the first metaphase ; inversion bridges recorded.
L. perenne with *L. temulentum*...	Anthers non-dehiscent ; no good pollen ; 30 per cent. of the pollen-mother-cells show univalents at first metaphase ; inversion bridges and interlocking bivalents observed. This cross has been described elsewhere by one of us (Jenkin, 1935).
L. italicum with *L. temulentum*...	Some anthers more or less dehiscent ; 20 per cent. good pollen, 10 per cent. of the pollen-mother-cells show univalents at the first metaphase.
L. rigidum with *L. loliaceum*	Some anthers more or less dehiscent ; 15 per cent. good pollen in immature anthers; inversion bridges observed; *a triploid plant* with 21 somatic chromosomes.
L. rigidum with *L. temulentum* ..	Anthers non-dehiscent ; 3 per cent. good pollen ; 20 per cent. of the pollen-mother-cells show univalents at the first metaphase.
L. loliaceum with *L. remotum*....	Anthers non-dehiscent ; no good pollen ; 10 per cent. of the pollen-mother-cells show univalents at the first metaphase.
L. loliaceum with *L. temulentum* .	Anthers non-dehiscent ; no good pollen ; 15 per cent. of the pollen-mother-cells show univalents at the first metaphase ; inversion bridges observed.
L. remotum with *L. temulentum* .	Anthers non-dehiscent ; no good pollen ; pairing of chromosomes excellent at the first metaphase of meiosis.

* An "inversion bridge" is formed by a chromosome possessing two centromeres (attachment constrictions), one passing to each pole at the anaphase stage of meiosis. Such bridges are usually associated with fragments which lack a centromere. Their occurrence is interpreted to mean that the plant is heterozygous for one or more inversions in the chromosomes (Darlington, 1937).

The negative results so far obtained for the remaining combinations are not necessarily significant, as they are not extensive enough to be conclusive.

Where F_1 hybrids have been obtained from reciprocal crosses with the same pair of species, the plants substantially agree at maturity both in behaviour and in morphology. On the other hand, the breeding results from different combinations differ considerably, while, as shown above, the resulting F_1 hybrids also differ significantly with regard to anther dehiscence, the production of good pollen, and in meiotic behaviour.

No failure of chromosome pairing has been observed in the *L. remotum* × *L. temulentum* hybrids, but in the other hybrids, usually two, occasionally four, and exceptionally more than four, chromosomes fail to pair at the first metaphase of meiosis. This happens in about 40 per cent. of the pollen-mother-cells in the *L. perenne* × *L. loliaceum* hybrid.

Other meiotic abnormalities observed in the present material are: incomplete association in the early (pachytene) stage of meiosis, interlocking of bivalents at metaphase, and bridge formation with associated fragments at the first and second telophase stages.

The *L. rigidum* × *L. loliaceum* hybrid is of especial interest. Only a single established F_1 hybrid of this type has yet been obtained, the pollen parent being a *F. rigidum* plant. This particular parent plant, when self-pollinated, gave progeny some of which produced normal pollen grains together with giant pollen grains carrying twice the normal gametic number of chromosomes. The *L. rigidum* parent plant had not been examined in this respect, and, being an annual, it had died before the next generation of plants had been produced. Neither is it known whether any of its progeny plants produced by self-pollination were triploids. The somatic number of chromosomes in the *rigidum* × *loliaceum* F_1 hybrid, however, was found to be 21, rather than the expected 14. The evidence is obviously incomplete, but this triploid F_1 hybrid probably carried two complete gametic sets of *L. rigidum* chromosomes and one complete gametic set of *L. loliaceum* chromosomes.

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AN ACCOUNT OF THE OCCURRENCE OF *GALIUM DEBILE* Desv. IN BRITAIN.

By C. E. Britton.

G. debile Desvaux, Pl. Angers, 133 (1818), was recorded as an addition to the British flora by the late G. C. Druce in Report B. E. C. 1924, 420, where he wrote: "In Jersey etc. I found *Galium debile*, a plant belonging to the *Palustre* section." On p. 438 of the same Report he gave the detailed Latin description from Willkomm and Lange's Prodromus florae Hispanicae, ii. 322, following by remarks on this plant and on related small narrow-leaved forms, together with a *résumé* of the varying opinions relating to this species held by French botanists.

The Jersey habitat was given as "marshes at St. Brelade, 1924," and a further Channel Islands locality mentioned was "L'Ancresse, Guernsey, 1906." Druce also referred to this species plants gathered at localities in S. Hants. Specimens from Bucks received mention as having been reported on as probable *G. debile*. Druce's note ended with the expression of the view that the European distribution was not antagonistic to *G. debile* being a native of the Channel Isles and south-western England.

In the Report B. E. C. 1926, Druce in his account of field-work for that year alludes to a visit to the Sands of Barry in quest of *Corallorrhiza*, the only other plant receiving mention being *Orchis incarnata* var. *dunensis*. On p. 116 of the same Report appears the entry "1198. *G. debile* Desv. Sands of Barry, Forfar, Druce," without comment. It is strange that the writer did not draw attention to this remarkable northward extension of a species having a supposedly Mediterranean distribution.

In "Herb. Druce" six sheets of mounted specimens are associated under the name of *Galium debile* Desv. Some of these are correctly named, others appear to belong to *G. Witheringii* Sm. With regard to the latter name, Rouy (Fl. Fr. viii. 44) has a var. β. *Witheringii* Babingt. Manual, ed. 8, 176, of his *G. palustre* subsp. *G. debile*: but few, if any, British botanists would be disposed to assign the English *G. debile* to *G. Witheringii* as a variety. The sheets are as follows:—

(1) "*Galium palustre* L. var. *debile*. Halton, Bucks, June 1911." Noted by Glück as "probable *debile*," and referred by Thellung to *G. palustre* L. The plants are in flower only and appear to be *G. Witheringii* Sm.

(2) Two gatherings. One from Beaumont, Jersey, 1906, named "*G. palustre* L. var. *constrictum* Chaub.," is immature and only in bud. It is a prickly plant referable to *G. Witheringii*

Sm. The second gathering, made by J. F. Rayner in 1924 near Beaulieu, S. Hants, appears to be small, but good, *G. debile* Desv.

(3) Also includes two gatherings. "*Galium debile* Desv. St. Brelades, Jersey, July 1924," appears correctly named. Ripe fruits are not present, but the ovaries are distinctly tuberculate. The second gathering was made by Miss Todd at Lyndhurst, S. Hants, and also appears correctly named.

(4) From Sands of Barry, Forfar, July 1926. Two intermingled species, most of the material belonging to *G. uliginosum* L., a smaller quantity represents *G. Witheringii* Sm.

(5) A second sheet from the locality previously mentioned displays a plant with very prickly stems, panicle-branches divaricate in fruit, fruiting pedicels divergent, straight, 2–3 mm. long, immature fruit rugulose, but not tubercular-granulose, mature fruit absent. The characters given prevent this plant being correctly referred to *G. debile* Desv. and enable it to be identified with *G. Witheringii* Sm.

(6) A later gathering of *G. debile* from the Lyndhurst locality.

In the 'Comital Flora' (1932) Druce adopted the name *G. constrictum* Chaub. for the species, *G. debile* Desv. being cited as a synonym, and credited it to the vice-counties 1 [West Cornwall], 11 [S. Hants], and 90 [Forfar]. As to these records, the Druce Herbarium confirms S. Hants only. The Forfar record is erroneous, and as to that from West Cornwall confirmation is lacking, as no published record can be traced, and the plant is unknown to local botanists as a Cornish species. The entry for v.c. 1 is probably a typographical error, as I am informed that such entry is absent from the MS. of the 'Comital Flora.'

On Sept. 14, 1931, Mr. F. M. Day found growing around a small pool at Chudleigh Knighton, Heathfield, near Newton Abbot, S. Devon, a slender *Galium*, which he correctly identified as *G. debile* Desv. Mr. Day has since visited the locality several times during August and September and has ascertained that the plant occurs in fair quantity by the sides of several pools.

For the opportunity of studying fresh material of the Devon plant, I am indebted to Mr. G. T. Fraser, who also sent for inspection an example of *G. debile* from the same locality gathered by C. Eyre Parker so long ago as June 1851. This specimen, mis-named *G. saxatile*, was discovered by Mr. Fraser in the Herbarium of the Torquay Natural History Society.

A description, prepared from Devon specimens, follows :—

Rhizomes filiform, much-branched. Stems (20)–40–(50) cm., tufted, erect or ascending, filiform below, 5 mm. diam. above, branched, median and upper internodes elongated (40)–60–(70) mm., angles produced; pricklets short, triangular, often absent or represented by obtuse bases. Leaves oblanceolate-linear, acuminate or aristate, becoming narrowly linear by recurving

of margin, pricklets intra-marginal above and on midrib beneath, cauline (4)–6–(15) mm. in whorls of (5)–6–(7), rameal 4–(8) mm. subequal, in whorls of 4. Panicle-branches erect-spreading; bracts lanceolate, 2–4 mm.; cymes (3)–4–(6)-flowered; pedicels 1 (1·5–2) mm., obliquely erect; ovary papillose; corolla 2 mm., purplish or white suffused with purple. Mature carpels orbicular, 1·5 mm., with crowded minute tubercles, one carpel usually abortive; outer pedicels incurved and fruits ±connivent.

British distribution: S. Devon (v.c. 3), S. Hants (v.c. 11). Also in Jersey. Other records are erroneous or require confirmation.

A NEW *SCAPANIA* FROM IRELAND.

By W. E. Nicholson, F.L.S.

Scapania apiculata Spruce, var. nov. **Jonesii** (Schiffner MS.).

Corticola. Lobus posticalis et lobus anticalis dentati, dentibus 1–3 cellulis constructis, apice obtuse acuti, non apiculati; cellulæ minores, superæ 10–15 μ, medianæ 15 μ, ad basin 15×18 μ parietibus validis trigonis multo minoribus. *Gemmæ* apice foliorum glomeratæ, virides, bicellulares, ovales, 15×12 μ.

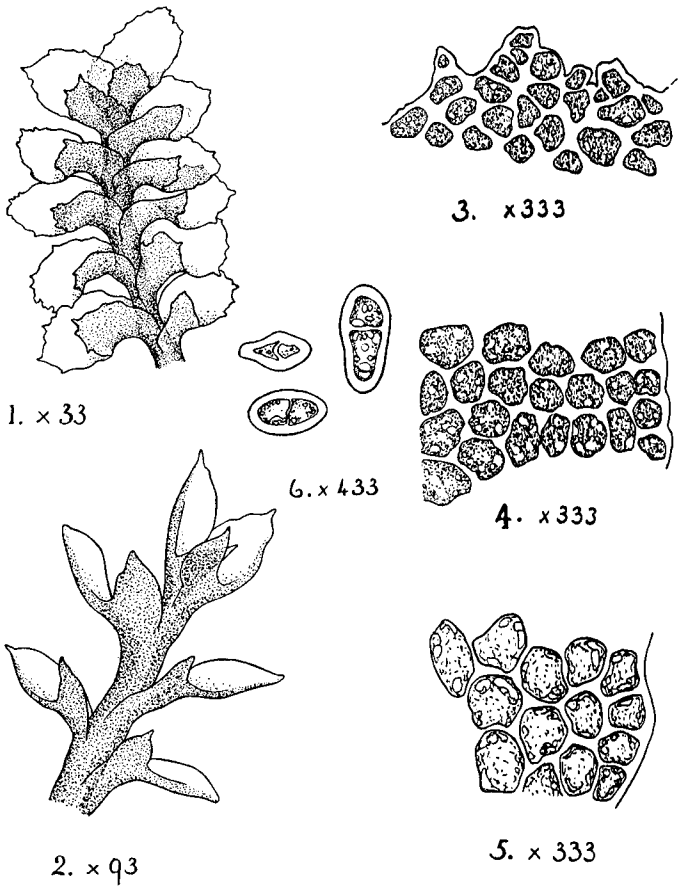
Hab. On the living bark of *Arbutus Unedo* by water in company with *Frullania Tamarisci* var. *cornubica* forma *corticola*, *Plagiochila punctata*, *P. tridenticulata*, and other species, Cromagloun, Killarney, Ireland. Leg. D. A. Jones and F. E. Milsom, August 1935.

I was at first inclined to describe this plant as a distinct species, as the less apiculate, sharply denticulate leaves give it a very distinct appearance, but a closer study brought out points of essential resemblance with *S. apiculata*, of which it is probably a strongly hygrophilous form, as suggested by Dr. Schiffner. Although *S. apiculata* has the leaves generally quite entire, Dr. K. Müller, in his excellent monograph of the genus *Scapania*, speaks of the postical lobe of *S. apiculata* as rarely having one or two small teeth towards the apex, and he actually figures such a form. In some of the smaller specimens of the variety the leaves are almost entire and they are more apiculate than they usually are in well-developed specimens of the variety. The difference in the cell-structure is certainly noteworthy, but the size of the cells and of the trigones is rather variable, and the cells are of the same character as in the type. The green colour and larger size of the gemmæ are also consistent with the plant being an hygrophilous form.

It is true that the mature gemmæ have proved to be two-celled, as pointed out to me by Miss M. E. Malins of Leeds University, to whom I am indebted for the accompanying figure.

I had at first taken them to be unicellular as described for *S. apiculata*, but several species of *Scapania* have gemmæ of both kinds.

The differences are, I think, consistent with the plant being a form from a moister substratum than the type. The plant has



Scapania apiculata Spruce var. *Jonesii* (Schiffner MS.) Nicholson.

1. Stem with leaves. 2. Slender stem. 3. Apical cells. 4. Median cells. 5. Basal cells. 6. Gemmæ.

the slightly verruculose cuticle which I have found in all the specimens of *S. apiculata*, which I have examined. Stephani speaks of *S. apiculata* as *corticola*, but the original plant was gathered by Spruce on rotten wood; Dr. Müller in his 'Monograph' and Herr Buch in his 'Die Scapanien nord Europas

und Siberien' both speak of it as growing exclusively on rotten wood, and my only gathering in Switzerland in 1913 was certainly on that substratum. Rotten wood dries rapidly and produces rather xerophytic conditions, and *S. apiculata* has all the characteristics of a xerophyte. The more humid conditions under which the present plant was found growing in Ireland would, I think, account for the differences between it and the type. The plant was sent to Dr. Schiffner accidentally mixed with other things by the late Mr. D. A. Jones, A.L.S., who had done so much to further the study of British hepatics, that it is only fitting that his name should be commemorated in this very notable addition to the British flora.

ISOETES HYSTRIX AT THE LIZARD.

By R. Melville.

The Lizard peninsula is an ideal place to spend a holiday at any time of the year, but in mid-May it is a paradise for both botanist and ornithologist. Though rather too early for the clovers, the sea-cliffs bear a blue carpet of *Scilla verna*, and the valleys are golden with gorse. Many of the rare plants of the locality are to be seen already, and it was while searching for one of these that a *Juncus* was uprooted in a damp spot in Kynance Valley on the evening of May 16. The *Juncus* proved to be *J. bufonius*, but with it came a plant having the appearance of a scaly bulb with a tuft of grass-like leaves. This could scarcely be anything else but *Isoetes Hystrix* Dur. The old blackened leaf-bases characteristic of this species could be seen, though no spores were visible under a hand-lens. All the likely damp spots in the neighbourhood were searched for further specimens without success until dusk fell. On the following day the specimen was sent to Mr. F. Ballard at Kew, who confirmed the identification.

At the time the writer was unaware of the old disputed record of Mr. Fred Robinson, who found a single plant in Carthillian Valley in June 1919 (Journ. Bot. 1919, 322). History would have been repeated had the visit been one of those fleeting hunts for rarities so many botanists make to the area. The scene was revisited on May 17, and drier spots above the place of the original find were examined. Here numerous plants were seen, mostly not more than an inch high, growing in a friable peat in open formation, but associated with other plants having curled grass-like leaves, making their recognition difficult. Once the type of habitat favoured by the plant and the identity of its usual associates had been discovered, it was a relatively simple matter to explore the neighbourhood and determine its distribution.

Isoetes Hystrix occurs at the Lizard over quite a large area wherever suitable conditions are found. In the writer's experience this area extends from a little to the south of Vellan Head southwards along the coast to a point south of the Lion Rock above Pentreath beach, and reaches inland for half to three-quarters of a mile. It is quite possible that the plant extends some distance beyond the limits explored. In fact, when Mr. N. Y. Sandwith searched for it about a month later he found specimens a short distance to the north-west of the Lizard village and in Carthillian Valley. The last locality is of especial interest, since it is the scene of Robinson's record which Druce first acclaimed (Rep. B. E. C. 1919, 693), but later regarded as an error ('Comital Flora,' 391). In view of the recent finds, however, there does not seem to be any reason for discrediting the earlier record. Robinson's specimen apparently was growing in an unusually dry spot with *Trifolium strictum* and *T. Bocconii*. This, coupled with the lateness of the season, has probably misled botanists to search both too late and in the wrong type of habitat. This year the plant was in good condition in May, but after a further three weeks' hot dry weather, Sandwith found it with some difficulty, so parched as to be nearly unrecognizable.

The Lizard lies at the northern limit of distribution of *I. Hystrix*, and, to judge from written accounts, the Lizard habitat differs considerably from the damp sandy and gravelly places where it usually occurs in France and North Africa. At the Lizard the soil is a light friable peat of no great depth overlying serpentine. The plant is found on gentle slopes facing southward, in places where the peat is kept constantly damp in winter by seepage of water from higher levels. It also occurs, perhaps less commonly, where a shallow pan of water has stood upon the peat in winter. Places with a northern exposure, but apparently otherwise suitable, were always without *Isoetes*, nor could it be found on the eastern side of the peninsula on the serpentine at the northern end of Kennack Bay. It is apparent, therefore, that temperature is a very important factor in the environmental conditions for *I. Hystrix* and probably for some of the other rare plants of the area with a similar type of distribution. No doubt, an investigation of the physical conditions of such habitats on the serpentine on the east and west sides of the peninsula would throw much light on this question.

Of the plants commonly associated with *I. Hystrix* at the Lizard, *Juncus capitatus* is one of its most constant companions. It appears generally that where the environmental conditions are suited to the *Juncus* they are also adapted to the needs of the *Isoetes*. The dominant plant in the association is usually either *Scilla verna* or *Allium sibiricum*, though the two often occur together and form an open community. With these, many of the rarer plants of the area are found, including the

clovers mentioned above, *Arenaria Gerardii*, *Moenchia erecta* and not infrequently a *Riccia*. Material of the *Riccia* brought back to Kew was found to be in atypical condition, and was kept until normal growth enabled Mr. C. V. B. Marquand to identify it as *R. sorocarpa* Bisch. *Festuca* spp. occur here and there in the open *Scilla verna* formation, and contribute to the difficulties of distinguishing the *Isoetes* in this association of wiry-leaved plants.

The size of the *Isoetes* plants varied greatly. The smallest seen bore three or four leaves on a very small corm and was without the black tridentate remains of leaf-bases. The largest had about twenty leaves with their bases swollen with spores and numerous remains of older leaf-bases. Such variation in size is difficult to reconcile with the statement in Babington's Manual' that this species is an annual. Several living plants brought back to Kew died down completely during the summer, but put forth a new tuft of leaves in September. There is no doubt, therefore, that the plant is perennial, with its resting phase in the dry season. The statement in the literature that the spores are white also calls for comment. In the fresh state they are a dove-grey, and can be seen as dark masses through the translucent cells of the leaf-base. On drying they acquire a chalky whiteness.

Specimens from two localities have been deposited in the Kew Herbarium, and it is hoped that the living specimens will survive in the fernery.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

By E. G. Baker.

Bauhinia lambiana, sp. nov. *Caulis* scandens? rami glabri. *Folia* integra coriacea lanceolata, basi subcordata, usque ad 16 cm. longa 3·5–6·5 cm. lata, glabra, 3–5-nervia. *Petioli* 1·5 cm. longi. *Inflorescentia* corymboso-racemosa. *Pedicelli* 1·5 cm. longi. *Alabastri* pars inferior cylindrica; pars superior globosa. *Calycis* tubus cylindricus, ±2 cm. longus; limbus 5-partitus; partes ovatæ acutæ 7–9 mm. longæ. *Petala* 5 inæqualia, 1·8–2·5 cm. longa, ovata obtusa vel subacuta, unguiculata, glabra. *Stamina* 3 fertilia. *Ovarium* compressum oblongum, stipitatum, margine ferrugineo-pilosum, 6–7-ovulatum. [*Legumen* ignotum.]

Hab. Borneo: Mt. Lambia, alt. 1000 ft., May 28, 1895, *H. D. Haviland* and *C. Hose* 2029 (Type in Herb. Mus. Brit.).

This species belongs to the Section *Phanera*, and is allied to *B. Burbidgei* Stapf and *B. Creaghii* Baker, but differs in the much longer distinctly lanceolate leaves.

Albizzia (Eualbizzia : falcifoliæ) **Sherriffii,** sp. nov. *Arbor* 6–9 m. alta ad *A. Julibrissin* Durazz. et *A. stipulatam* Boiv. accedens, differt primo intuitu foliolorum ambitu diversa et calycibus majoribus et petalis longioribus.

Rami brunneo-tomentosi. *Folia* bipinnata ; *petiolis* 2–3·5 cm. longis ; rachi 10–20 cm. longa brunneo-tomentosa ; pinnis 8–16-jugis, 5–10 cm. longis oppositis vel suboppositis fere sessilibus ; foliolis 13–27-jugis 5–10 mm. longis 1·5–3 mm. latis rectangulari-oblongis subfalcatis apice acutis basi truncatis, costa submarginali, supra glabris subtus pubescentibus. *Pedunculi* 7–10 cm. longi brunneo-tomentosi ; capitula 6·5–7·5 cm. diam. *Flores* sessiles majusculi. *Calyx* 6–6·5 mm. longus extus brunneo-tomentosus, 5-dentatus, dentibus acutis 1–1·5 mm. longis. *Petala* 10–12 mm. longa, eburnea, pubescentia. *Stamina* plurima, patentia, 3–3·8 cm. longa ; filamenta capillacea, basi in tubum 7–8 mm. longum connata. *Ovarium* lineare fere glabrum ; stylus ±3 cm. longus. [*Legumen* ignotum.]

Hab. South Tibet : Sanglung, Nyam Jang Chu, alt. 5500 ft., March 22, 1936, *F. Ludlow* and *G. Sherriff* 1222. (Type in Herb. Mus. Brit.)

" Tree 20–30 ft. Sepals green. Petals creamy, stamens white, except in centre flower, where stamens are thickened where they come out of the tube and are golden yellow. On banks of stream."

There are two glands on the upper surface of the leaf-rachis—a large one near the base and a smaller one between the uppermost pair of pinnæ. There is also a gland on the peduncle about 1 cm. from the head. Flowers about 40–50 in a head, usually one larger than the others.

Crotalaria (Sphaerocarpae) **Gamwelliae,** sp. nov. *Annua* erecta gracilis ad *C. stenorhampam* Harms et *C. floridam* Welw. accedens. *Caules* 40–70 cm. alti, sparse pubescentes. *Folia* petiolata trifoliolata, foliolis terminalibus oblanceolatis 15–30 mm. longis 4–9 mm. latis subtus strigoso-pubescentibus, petiolis pubescentibus gracilibus 5–20 mm. longis. *Flores* flavi, in paniculis dispositi, pedicellis 2–3 mm. longis. *Calyx* in toto 6–7 mm. longus, dentibus lineari-lanceolatis 4–5 mm. longis. *Vexillum* oblongo-obovatum, 10–11 mm. longum, 7–8 mm. latum. *Carina* 9–11 mm. longa, apice in rostrum attenuata. *Alæ* 8–10 mm. longæ. *Legumen* globosum vel subglobosum, ±2-spermum, 4–5 mm. longum.

Hab. North Rhodesia : Abercorn District, alt. 4000–4800 ft., open spaces amongst timber, light soils, April 1934, *Miss A. H. Gamwell* 216. (Type in Herb. Mus. Brit.)

This is a slender graceful herb allied to *C. stenorhampa* Harms, but differing in the manner of growth ; it has not several stems arising from a perennial rootstock. The calyx segments are linear-lanceolate, longer than the tube. The pod is globose or subglobose, smaller than in *C. florida*. *C. Gamwelliae* is also allied to *C. acuminatissima* Bak. fil., but that plant differs in the swollen root, smaller leaves, and small standard.

Tephrosia iringae, sp. nov. *Herba* perennis. *Caules* 10–27 cm. longi graciles pubescentes. *Stipulæ* lineares 5–10 mm. longæ. *Folia* 5–13-, sæpissime 7–11-, foliolata ; foliolis angustis linearibus subtus pubescentibus apice acutis vel obtusis 20–33 mm. longis 2·5–5·5 mm. latis, petiolis brevibus 4–12 mm. longis. *Flores* mediocres axillares et interdum in racemis terminalibus dispositi, graciliter pedicellati, pedicellis 5–10 mm. longis. *Calyx* in toto 4–6 mm. longus, lobis acuminatis. *Vexillum* extus pilis dense vestitum, apice emarginatum basi cordatum, cum ungue ±15 mm. longum, ±15 mm. latum. *Alæ* cum ungue 15 mm. longæ, ±6 mm. latæ. *Carina* dorso rotundata, cum ungue 11–12 mm. longa, 4–5 mm. lata. *Ovarium* ±6-ovulatum. *Legumen* immaturum lineare sericeum, stylo hirsuto.

Hab. Tanganyika Territory : Iringa province, Msima Stock Farm, alt. 5500 ft., August 10th, 1933, *P. J. Greenway* 3524. (Type in Herb. Mus. Brit.)

"A perennial tussock herb with bright magenta flowers and trailing stems. Very common throughout the area in *Hyparrhenia* Mountain grassland and most conspicuous after burns."

The distinguishing features of this plant are the wiry trailing stems, the narrow pubescent leaflets, and bright magenta, generally axillary, flowers.

Aeschynomene nyikensis Baker var. nov. **mossambicensis.** *Frutex* 3–5 m. alt. *Cortex* rubrofarinaceus. *Flores* minores. *Vexillum* panduriforme circ. 11 mm. longum. *Alæ* ±10 mm. longæ.

Hab. Portuguese East Africa : Distr. Niassa, *A. R. Torre* 369. Flowers orange-coloured. (Type in Herb. Mus. Brit. ; Herb. Coimbra.)

Lonchocarpus pallescens Welw. var. nov. **pubescens.** *Arbor* circ. 12-pedalis. *Folia* imparipinnata 3–5-foliolata, foliolis terminalibus majoribus anguste ellipticis vel oblongo-ellipticis 7–11 cm. longis 2·5–4 cm. latis, nervis secundariis utrinque 6–9, apice obtusis, foliolis lateralibus minoribus 3–7 cm. longis 1·2–2·3 mm. latis subtus pubescentibus et reticulatis. *Flores* in paniculis densis pedunculatis dispositi. *Calyx* in toto 7 mm. longus, extus tomentosus, lobis 2 superioribus connatis obtusis, lobis lateralibus 3–4·5 mm. longis. *Vexillum* suborbiculare, basi unguiculatum, cum ungue 12 mm. longum, et 12 mm. latum. *Alæ* cum ungue 12 mm. longæ et 5 mm. latæ. *Carina* dorso rotundata, cum ungue 12 mm. longa. *Ovarium* lineare 5–6-ovulatum. [*Legumen* ignotum.]

Hab. North Rhodesia : Abercorn District, alt. 4800 ft., *Miss A. H. Gamwell* 244. (Type in Herb. Mus. Brit.)

On red soil in orchard-bush.

Flowers in August. Leaves come out in September. Only one tree about 12 ft. First time of flowering for six years.

Differs from the species by the leaflets, which are fewer in number, pubescent, and strongly reticulate below.

Hibiscus sparseaculeatus, sp. nov. *Frutex* ad *H. diversifolium* Jacq. accedens, differt primo intuitu foliis minoribus, petiolis brevioribus, calycibus brevioribus, caulibus ad basin pedicellorum aculeatis.

Rami lignosi hinc inde aculeati. *Folia* parviuscula, ovata interdum lobata, margine serrata, in specimine nostro 10–25 mm. longa, 10–25 mm. lata, petiolis gracilibus 10–18 mm. longis. *Flores* breviter pedunculati ad apicem racemosi. *Epicalycis bracteolæ* 7–9, 5–7 mm. longæ, lineares vel lineari-lanceolatæ. *Calyx* ±12 mm. longus, segmentis lanceolatis marginibus incrassatis. *Petala* lutea 40–45 mm. longa. *Columna staminea* 30–35 mm. longa. *Capsula* immatura acuta, 10–12 mm. alta, seminibus glabris.

Hab. SOMALILAND: Sheik Pass, *G. Freemantle.* (Type in Herb. Mus. Brit.)

A rigid woody shrub with stems aculeate at the base of the pedicel.

A plant collected in Somaliland by *A. Donaldson Smith,* Nov. 29, 1894, probably belongs here.

BY K. P. BISWAS.

Cardamine Smithiana, sp. nov., inter species sectionis Papyrophylli foliis et inflorescentia differt.

Herba annua vel perennis, erecta, superne sparse ramosa. *Folia* distantia, 5·5–13·5 cm. longa, 3–9 cm. lata, petiolata (petiolis 1–4 cm. longis), basalia trifoliolata, bifoliolata vel superne ad basin inflorescentiæ nonnumquam simplicia, unifoliolata; foliolum subsessile, 5–11·5 cm. latum, ovatum vel cuneato-ovatum, elliptico-oblongum vel plus minusve elliptico-oblanceolatum, terminale interdum inciso-dissectum, margine profunde crenato-serratum vel inæqualiter lobulatum, lobulis et crenis manifeste mucronatis, omnia utrinque glabrissima. *Racemus* 6–9·5 cm. longus, terminalis, interdum ramosus, e basi ad apicem uniformiter floriferus. *Flores* pallide purpurei, circiter 6 mm. longi, 10 mm. diametro, pedicellis circiter 5–7 mm. longis. *Sepala* 2–3 mm. longa, 1–2 mm. lata, nervis 3–4 convergentibus apice glandulose punctata, margine albida vel hyalina, dorso pallide viridia, utrinque glabra, apice obtusiuscula vel acuta. *Petala* 5–6 mm. longa, 4–5 mm. lata, pallide purpurea, obovato-cuneata, apice late rotundata. *Stamina* interiora 4, 4–5 mm. longa, exteriora 2, 3–4 mm. longa, basi glandulosa, glandulis ·5–·8 mm. longis, solitariis vel geminatis. *Ovarium* circiter

½ mm. longum, ·5–·8 mm. latum; styli circiter 1 mm. longi; stigma globosum capitatum. *Capsula* subtenuiter pedicellata, subhorizontalis, nonnumquam recurvata.

Hab. TIBET: Donga La, "dense aggregata," alt. 2900 m., July 25, 1933, *F. Ludlow* and *G. Sherriff* 324. (Type in Herb. Mus. Brit.)

This species is quite distinct from the rest of the species of the section *Papyrophyllum* O. E. Schulz. It resembles *C. furcata* Greene, *C. ovata* Benth., and *C. africana* L. in its general features, but is readily distinguished by its glabrous, stouter, ascending taller growth, much larger and broader 3-foliate, 2-foliate or sometimes unifoliate leaves, the terminal leaflets sometimes deeply laterally dissected, irregularly lobed, or deeply incised crenate-serrate, lobes distinctly mucronate; sepals with 3–4 distinct veins, converging to a brown gland-dotted structure below the apex.

Named after Sir William Wright Smith, Regius Keeper, Royal Botanic Garden, Edinburgh.

SHORT NOTES.

AN OMITTED SURREY SPECIES.—The cotton-grass, *Eriophorum latifolium* Hoppe, a plant of very restricted distribution in S.E. England, finds no mention in the pages of the 'Flora of Surrey' by C. E. Salmon as completed by W. H. Pearsall. In the earlier county flora of J. D. Salmon and J. A. Brewer this cotton-grass is duly entered with the one locality of boggy meadows at Reigate Heath. A second Surrey locality was brought to notice during 1937 by Mr. A. Beadell, who brought specimens for identification. The locality, visited by the writer, is a small swamp draining into the Eden Brook, situated in district IX. of Salmon's flora.—C. E. BRITTON.

GLABROUS STELLARIA MEDIA.—Usually a pubescent plant with hairy pedicels and calyx, ciliated petioles, and internodes with alternate single lines of hairs. An uncommon form from the Hebrides is subglabrous, with the pubescence restricted to the internodal lines. Plants destitute of hairs in all parts, including the internodes, were found at Nottingham by Mr. R. Bulley. To such a completely glabrous form Beck (in Fl. v. Nied. Oesterr. I. 364) gave the name of var. *glaberrima.*—C. E. BRITTON.

PLUTEUS PATRICIUS Schulz.—My friend Mr. A. E. Thomas visited several times last autumn what appears to be an old saw-mill yard at Snitterfield Bushes, near Stratford-on-Avon, and brought me back a large number of specimens of *Pluteus cervinus,* growing on the habitat which it loves, mouldering sawdust.

Most of them were exactly typical, the pileus varying in colour from grey to deep brownish-grey, and sometimes even becoming blackish-grey. Amongst these were large numbers of specimens identical in every respect, except in colour, and some of them nearly 9 in. in diameter; the pileus was nearly and sometimes quite colourless, showing very few traces of brownish fibrils. When these were in the young state, half opened, they looked exactly like button specimens of the common mushroom (*Agaricus campestris*), but of course were betrayed at once by the total absence of a ring. The gills also remained of the usual pink colour for *P. cervinus*, even when the flattened pileus measured 8 in. across. It is evident that *P. patricius* is only a colour variety of *P. cervinus*, but I have never seen such striking specimens before; even the spores were exactly similar in the variety and in the type.—W. B. Grove.

The Red Whortleberry.—Dr. Burtt Davy's note in the November number on the second flowering of *Vaccinium Vitis-idaea* has brought confirmatory notes from several field botanists.

Miss M. S. Campbell has found flowers frequent in August and September in Perthshire, and has an early record of flower on May 16, 1929, in the same district (near Aberfeldy). Plants bearing ripe berries were well distributed among the later flowering ones.

Mr. R. C. L. Burgess writes:—

"Vaccinium Vitis-idaea always has two flowering periods in Sutton Park, Warwickshire, and the first time I ever saw it in flower was September 7. At the same time it was fruiting well. It does the same thing in Cannock Chase, but is never so floriferous in the autumn as early summer. The hybrid *Vaccinium* also flowers in May and September, but I have only seen it in the field in early May, though we have herbarium specimens from N. Staffordshire dated September."

Dr. W. Watson from Somerset writes:—

"By the side of the Pennine track leading from Greenfield to Crowden flowering shoots of this plant are of regular occurrence from August to October. There seems to be no definite break between the flowering in June and the later flowering. A flowering plant in my herbarium is marked 17/6/09. During the last twenty years my occasional visits to the locality have been in August and September, and I have records of flowering for the following dates: 14/8/19, 13/8/20, 16/8/21, 1/8/23, 24/8/26, 2/9/27, 17/8/31, 20/8/33, 21/8/34, 8/9/36. These dates record the time when I first saw the plant in flower for that particular year. In most cases it was seen later in the year."

REVIEWS.

Die Blüten der Coniferen. Edited by Max Hirmer.—Teil 3. (a) *Entwicklungsgeschichtliche Untersuchungen über die Microsporophyllgestaltung der Coniferen.* By Helmut Dluhosch. 4to, pp. 20, 7 pls., 19 figs. (b) *Über die fossilen Resten der männlichen Coniferen-Blüten.* By Max Hirmer. Pp. 4, 3 figs. *Bibliotheca Botanica*, Heft 114, Lief. 3. E. Schweizerbart'sche Verlagsbuchandlung: Stuttgart, 1937. Price R.M. (Auslands) 17.25.

This is the third of a series of articles on the nature of the cone structures in Conifers, and deals with the androstrobilus or male cone. In contrast to the parts in the ovulate cone the stamens are commonly accepted as some form of simple sporophylls. Although these sporophylls are frequently looked upon as essentially fertile leaves it is now common, influenced as so many morphologists are by the bearing of our modern knowledge of Devonian plants on questions of general morphology, to consider the stamens as some form of modified sporangiophoric structures, not perhaps in the strict sense in which the term sporangiophore is used in the Articulatae, and still less, of course, as suggesting any relationship to that group, but in the sense of a primitive structure carrying sporangia and upon which the photosynthetic differentiation which we associate with the leaf was never impressed. In this paper the thesis is maintained that the basal form of the conifer stamen is such a structure, peltate in form, centrally stalked, and carrying marginal sporangia radially arranged. It is represented in living Conifers by *Taxus*, while in other Conifers the abaxial area only is considered to have remained fertile, the adaxial part becoming sterile and modified in various ways. Such a conception is, of course, nothing new. It was propounded by Celakowsky, for example, as far back as 1897, and frequently by others in the intervening period. This paper examines the question, however, in representative Conifers of all families from the point of view of the development of the young structures in the bud. This aspect, indeed, had already been studied by other workers, notably for *Torreya*, *Larix*, and *Pseudotsuga*: but it is useful to have the range of examination extended now over most genera of the group. The illustrations and line drawings are numerous and excellent, the collection of drawings of the mature stamens of at least one species from each of twenty-seven different genera being particularly worthy of note, even though *Athrotaxis cupressoides* is credited with only two sporangia when it commonly has more, a point which has actually been used to support a suggestion that this species should be separated as a special genus.

Without elaborating details it may be admitted that the results of the developmental study can be readily interpreted in

support of the theoretical claim, even in such cases as the species of *Cupressus*, where the young stamens look much more like a leaf than a radially peltate organ. When, however the whole is presented, as is done here, in a series from *Taxus* through *Torreya* and the Podocarps, a tendency towards early development of the sterile area can be emphasized which permits an easy relation of the *Cupressus* type to the more *Taxus*-like forms. Ultimately, of course, the basal hypothesis must be confirmed from fossil evidence. Recognizing this Prof. Hirmer has added a short note on those fossil male cones which can with any degree of certainty be related to the Conifers. Undoubtedly the Liassic strata provide us with *Cheirolepis*, in which the stamens are as peltate as in any *Taxus*, but it is perhaps a weakness in the theory that the Palaeozoic cones, admittedly very poorly known, possess apparently only scale- or leaf-like stamens. Whatever the final issue may be, and this must ultimately depend on further fossil discoveries, this paper certainly fills many gaps in our knowledge of conifer ontogeny. It is claimed, for instance, that the double row of pollen-sacs in *Araucaria* (and in other genera, such as *Taxodium*) is derived from the horizontal splitting of originally uniform archesporial zones, suggesting that the adult condition is not primitive but derived.

No attempt can be made here to analyze critically a theoretical position which has sturdy opponents both of the sporangiophoric conception of the stamen in general as well as of the more particular conception of the *Taxus* type as basal. But a fuller elaboration than has yet been made of the comparative homologies of the pollen and ovulate cones on the basis of the ideas put forward in these three papers would prove interesting if only to discover how Prof. Hirmer and his students would interpret the male cone of *Austrotaxus*. It matters a great deal whether we consider the axillary structure here as a branching stamen or a greatly reduced cone.

There are some oddities in nomenclature—*Arthrotaxis* instead of *Athrotaxis*, *Thuja* also appearing as *Thuia*, and the constant use of the lower case in specific names where capitals might be expected, as in *Cupressus macnabiana*, to mention a few. But these are only small blemishes.—J. DOYLE.

Zell-Nekrobiose und Protoplasma-Tod. By W. W. LEPESCHKIN. 8vo, pp. ix, 198, text-figs. 10. Borntraeger: Berlin, 1937. Price R.M. 13.

THIS book is the first to be devoted to the changes occurring in the cell and protoplasm during the process of death. It is, of course, now recognized that just as the animal body dies by degrees, some parts remaining alive long after others, so the death of the cell is a gradual one. The author is well known

for his contributions to our knowledge of cell-death, and in this book he has brought together our present information on the subject and illuminated it with some theoretical considerations. The book is divided into two parts, one dealing with the general phenomena of cell-death and the other with the characteristics of death brought about by special means, such as mechanical injury or killing by heat, cold, drying, anaesthetics, and mineral salts. In chapter v. the interesting question of the production of heat and radiant energy on the death of the cell is considered. From the author's work in this field, which began in 1929, it seems clear that on treating yeast and blood-corpuscles with poisons such as $HgCl_2$ or chloroform a small amount of heat is produced as the cell dies. In chapter vi. the author's vitard theory, which he first put forward in 1935, is discussed. Vitard is short for vitaproteid, the proteid in question being an unstable protein-lipoid complex, which may be combined with other organic substances or with salts. It is the breakdown of the vitards that is responsible for the production of heat and of radiation on the death of the cell. It has, of course, been very generally held that the substances in the living cell exist in a higher state of complexity than in the dead. Lepeschkin's theory gives precision to it by defining the particular complexes. The author has produced a very valuable book, which is thoroughly well documented, the literature list containing nearly nine hundred references, to which the author himself contributes fifty-five.—V. H. B.

Dynamische Botanik. By FRIEDRICH BOAS. 8vo, pp. 185, text-figs. 64. Lehmann: Munchen, 1937. Price R.M.12.

THE high-sounding title of this book is explained by its subtitle as a physiology of indigenous plants for biologists, medical men, pharmacists, chemists, agriculturists, and gardeners. "Dynamic" botany is thus plant-physiology in its widest sense—a study of the activities of the plant. In one part of the book the author gives an alternative definition as the "study of the potentialities of the plant." The field thus included is the whole of plant-physiology, large portions of biochemistry, and some portions of ecology. The author's mode of approach is to select certain subjects from this vast field and devote a chapter to them. The poisonous property of many species of *Ranunculus* leads on to a consideration of the toxicity of the active principle which will work in a dilution of 1 in 100,000. From this the author passes to other activating and inhibiting substances which work in very low concentrations, *i. e.*, vitamins, hormones, and growth substances generally. In another section the question of drought resistance is taken up, and from this the stimulating effects of minute amounts of bone acid and of zinc are brought into the picture. Other sections deal with light responses, with

responses to gravity, the action of salts on plants, the response of the potato to mineral fertilizers and particularly to sulphate, saponin-bearing plants and the action of saponin, fermentation problems, etc. A very wide field is thus covered, and the treatment is fresh and stimulating and up to date throughout. The book is thus very well done within the limits set. The various chapters, however, give one an impression of a series of samples of physiological botany, and the material seems too specialized and detailed to be suitable for most of the readers referred to in the subtitle.—V. H. B.

Flora of South-eastern Washington and of adjacent Idaho. By HAROLD ST. JOHN. 8vo, pp. xxv, 531, map and 11 text-figs. Students Book Corporation, Pullman, Wash., U.S.A., 1937. (Price not stated.)

THIS is a fully descriptive flora of a comparatively small area in the Pacific North-west United States, mainly in Washington territory, but spreading into the north-west corner of the adjacent eastern state Idaho. The author, now on the staff of the University of Hawaii, Honolulu, who was for nine years Professor of Botany in the State College of Washington, acknowledges the help of specialists, former students, and local botanists in its compilation, and his indebtedness to the work of earlier botanists, especially Profs. C. V. Piper and R. K. Beattie, who published a work with the same title in 1914.

The phytogeography of the area is indicated in a map that forms the frontispiece. It includes arid regions with sparse and mainly shrubby vegetation, grass-lands or prairies, open pine forests, moist dense conifer woods on the mountain slopes, and a higher montane flora. The general characters are described in an Introduction. The flora consists of 459 genera, 1187 species, and 286 subdivisions of species, over 80 per cent. of which are indigenous. The arrangement follows the Englerian system, and the nomenclature is that of the 'International Rules.' Only genuine common names are given; book-made English names are avoided. There is a key to the families and genera, and under the latter to the species; full descriptions are also included. Each species is referred to its life-zone. Synonyms are occasionally cited, especially where the name adopted differs from " edition 1," which refers presumably to Piper and Beattie's Flora, though this is not stated. There are a few new species, duly diagnosed in Latin, and new combinations.

The book impresses one who is not familiar with its flora as a careful and authoritative presentation of the flora of the area concerned. The general get-up of the volume is excellent, and it opens flat.—A. B. R.

Vergleichende Morphologie der höheren Pflanzen. By Dr. WILHELM TROLL. Bd. i. Lief. 3. Roy. 8vo, pp. xii. 509–955, text-figs. 368. Gebruder Borntraeger: Berlin, 1937. Price R.M. 39.50.

THIS third part of Troll's elaborate morphological monograph is preceded by a new preface in which the author seeks again to justify the subtitle of his book: 'The Renaissance of Morphology through the spirit of German science.' Attention was already drawn in our review of Part 1 to the inadvisability of emphasizing a national aspect of science, which should of course be of an international character. But modern conditions in Germany may require national prejudice on the part of its professors. This we consider a pity, as also the statement in the preface that the efforts of English morphologists are characterized not by fruitful advances of the subject but by destructive tendencies. This, we presume, the author considers to be due to their not adhering strictly, as Troll does, to the conception of an architype or " Urpflanze," the primitive organs of which undergo various modifications due to the varying needs and requirements of the plant.

After making this criticism of the spirit in which the work was undertaken, we have nothing but praise for the thoroughness and ability with which this comprehensive account of plant morphology is carried out.

Continuing his treatment of the vegetative organs the author discusses the differences between acrogenous division or true dichotomy and axillary or phyllogenous branching, giving examples of both in the group of ferns, and discussing the dichotomy true or false as represented in some phanerogams like the Doum palm, *Hyphæne thebaica*, *Aloe dichotoma*, and some of the Nymphaeaceae. An account is given of the varying arrangements of supernumerary axillary buds and also of subcotyledonary budding. At this point various species of *Linaria* are discussed and well figured, the author giving a very useful *résumé* of Raub's recent work in this connection. The peculiar features of such hypocotyledonary budding in the Orobanchaceae and Balanophoraceae are also very clearly described and figured. There follows a consideration of the modifications of lateral buds or shoots for purposes of vegetative reproduction, such as the bulbils of *Dentaria*, *Ranunculus Ficaria*, etc. A short discussion of dwarf shoots in the conifers and of fruiting spurs in fruit trees is included in the chapter dealing with the relationship of symmetry to modes of branching. A very interesting chapter deals with growth forms in trees and shrubs, and is followed by a very complete account of the modifications met with in orthotropic and plagiotropic shoots respectively. This leads on to a consideration of rhizomes and other food-storing structures, such as tubers and

bulbs. A special chapter deals with hypocotyledonary tubers such as are formed in some of the Umbelliferae, in *Cyclamen*, *Eranthis*, etc. The modification of the vegetative organs in climbing plants leads to the discussion of the morphology of tendrils. The part concludes with a very complete account of succulent plants, both Cactaceae, Euphorbiaceae, and others, illustrated, as is the whole of the book, with a wealth of figures, both half-tone and line drawings. These will be most useful alike to students and teachers of botany. They will also appreciate the list of relevant morphological publications, amounting to 550 references, given at the end of this part.—F. E. Weiss.

The Botanical Society and Exchange Club of the British Isles. Report for 1936.

As in previous years this Report appears in two parts. The first is now issued under the names of the Hon. Secretary, Mr. J. F. G. Chapple, and the Hon. Editor, Mr. P. M. Hall, and follows largely the new lines adopted in last year's Report under the supervision of the Society's Publications Committee. The "Plant Notes," however, have been given greater prominence, with the object of adequately acquainting members with additions to the British flora, including newly described forms, and also with changes in nomenclature. As presented this year, these notes are both interesting and important. The "Plant Notes" are followed by "Plant Records," which, as usual, are very numerous in spite of a reduction in the proportion of aliens. In a very few cases, e. g., *Jasione montana* var. *major*, identifications seem open to question.

Some of the succeeding papers are of exceptional interest. Miss M. S. Campbell, under the title "Three weeks' botanising in the Outer Hebrides," contributes a long and careful list of the plants seen, with adequate bibliography, which may well form a basis for a future complete Flora of the group. The editor himself writes an equally important paper, "The Irish Marsh Orchids," which is illustrated with several plates. Mr. Hall visited Ireland last year, with Mr. N. D. Simpson, for the special purpose of investigating these plants, and the views here expressed, which do not entirely agree with those of their predecessors in the field, deserve very careful consideration. Among shorter papers Prof. Heslop Harrison has a *résumé* of the flora of Raasay and the adjacent islands which has notable features, and the "Explanation of the Bramble Plates of Syme's 'English Botany,'" as furnished by Dr. W. Watson, should be useful. It is noticed, in a list of "Pansy Records" by Mrs. Drabble, that *Viola lutea* f. *Curtisii* (Forster) is given for Pembrokeshire, and *V. Curtisii* Forster f. *Forsteri* for Wigtownshire. This appears to indicate two different species, which surely is not intended! The final

paper, excluding reviews, abstracts from literature, and bibliography, is by Dr. W. A. Sledge, who maintains that Gibson's *Carex pseudo-paradoxa* is really a variety of *C. diandra* Schrank.

The second part of the Report, by the Distributor, Mr. E. C. Wallace, shows a contribution of 1803 specimens by 18 members—a falling off even from last year—but there is no lack of interesting notes.

The continued diminution in the Exchange is a matter for regret, but the Report, as a whole, will be generally regarded by botanists as definitely more worthy of a Botanical Society and Exchange Club than those of former years.

H. W. Pugsley.

The Natural History of Raasay and adjacent Islands. Edited by J. W. Heslop Harrison, D.Sc., F.R.S. Reprinted from the 'Proceedings of the University of Durham Philosophical Society,' x. pt. 5 (pp. 246–351), 1937.

This volume, which is furnished with a sketch-map and numerous photographic plates, deals with the geology of the islands, and the phanerogams and higher cryptogams, as well as the lepidoptera and other groups of insects inhabiting them. The plants and insects were found during visits in the summers of 1934, 1935, and 1936.

The list of plants takes the form of a complete Flora of the islands, and includes some species of remarkable interest in addition to numerous vice-county records. The most notable discoveries are *Cicendia pusilla*, *Juncus pygmaeus*, and *J. capitatus*, but the records for the two rushes are not entirely satisfactory. Many species of the larger critical genera are listed, but with no indication of their having been subjected to expert examination. The occurrence of *Ranunculus reptans* L. and *Myosotis brevifolia* C. E. S. is noteworthy. The *Orchis incarnata* of the list is presumably *O. latifolia* L., and the *O. praetermissa* Dr. is probably not that species. In perusing the chapter on the lepidoptera it is refreshing to read that one of the most abundant butterflies is *Irgynnis aglaia* L.

The book is well printed and the plates excellent, and the botanical chapter forms a welcome addition to Scottish local Floras.

H. W. P.

BOOK-NOTES, NEWS, etc.

Linnean Society of London.—At the General Meeting on November 11 the President, Mr. John Ramsbottom, O.B.E., M.A., from the Chair, reported the death of Dr. John Augustus Voelcker, C.I.E., F.L.S. Prof. Eric Ashby gave an account of a paper on "Physiological-ecological investigations in the wilderness of Judaea," by Dr. M. Evenari and R. Richter; and Dr. V. J.

Chapman of his paper entitled "A revision of the Marine Algae of Norfolk."

At the General Meeting on November 25 the President, from the Chair, reported the death of Mr. Charles Gilbert Rogers, C.I.E., F.L.S. Thirteen new Fellows were elected, and Mr. Francis Rilstone was elected to the Associateship.

Prof. T. A. Stephenson discussed the effect of ocean-currents on the distribution of animals and algae on the South African coasts. His remarks, illustrated by lantern-slides of maps and coast-scenery, indicated a fauna and flora on the south coast distinct from that obtaining on the Atlantic side, subjected to the northward cold current, and from that on the east side, bathed by the warm southward-flowing Mozambique current. The zonation of the rock-inhabiting plants and animals on the coast was described.

The Botanical Secretary gave an account of a paper by Dr. H. H. Allan on the origin and distribution of the naturalized plants of New Zealand. Lantern-slides were shown illustrating the advent in time of the introduced species, their distribution among the great groups of families, extension, and other points.

At the General Meeting on December 6 an annotated copy of William Sole's 'Menthæ Britannicæ' was exhibited—the book a gift to the Society from Mr. Francis Druce; and Mr. Spencer Savage gave an account of it. Sole, practising as an apothecary-surgeon in Bath, had made himself an authority on the British Mints by twenty-five years of study of them in cultivation before he published this book (1798). With the book in his possession and having been supplied by Sole with living plants, Sir James Edward Smith prepared a new account of the mints which the Linnean Society published. The annotations embody Sole's reactions to the changes Smith had made. It may be said that if Sole knew more of some of the plants than Smith, Smith had fuller access to the literature than Sole.

Mr. N. H. Howes gave an account of a saline lagoon in Essex wherein remarkably little phyto-plankton exists. It is asked on what the smaller animals subsist: but these were shown to be much less abundant per unit of water than in the sea water of the English Channel.

INDIAN SCIENCE CONGRESS ASSOCIATION.—The Twenty-fifth (Silver Jubilee) Session will be held in Calcutta, January 3–9, 1938, under the Presidency of Sir James Jeans, F.R.S. A representative deputation of the British Association, which the Editor of this Journal has been invited to join, will attend the meeting.

In the Editor's absence Mr. I. H. Burkill, M.A., F.L.S., has kindly consented to take charge of the Journal. Mr. Burkill's address is "Clova," The Mount, Leatherhead, Surrey. Dr. Rendle hopes to return early in March.

TAXONOMY AND GENETICS.

BY W. B. TURRILL, D.Sc., F.L.S.

[From a paper read at the meeting of the British Association, Nottingham; September 1937.]

IT is impossible to give any very accurate figures of the number of species of animals and plants known to biologists, because the standard of "species" varies so much. If one accepts a mean between the extremes of splitting and lumping, one has probably to take a figure exceeding a million, but less than two millions. On a similar basis one might say that for the Spermatophyta a figure near 250,000 is a fair approximation, and that this is being added to at the rate of about 1500 a year. These rough figures indicate something of the magnitude of the taxonomist's task, and also emphasize the absolute necessity of classification, if for no other purpose than for "finding one's way" in the biological kingdoms. Further, they suggest that the criteria which could be used for classification are likely to be exceedingly numerous. The general systems of classification which have been prepared by botanists and zoologists are essentially based on morphology, including, especially for some groups, anatomy. Structure is usually easier to determine and to define than function, and can very largely be preserved in specimens stored for reference in museums and herbaria.

We find, therefore, that practically all biologists use, for the purpose of stating the results of their researches in such a manner that they can be understood and verified, a classification and nomenclature which has been established by taxonomists on the basis of structure, and which can be referred to as orthodox or, from the standpoint taken here, as "alpha." It is hardly necessary to remind readers of the great achievements of this alpha taxonomy. It has been built up without help from the newer branches of biology—cytology, ecology, genetics, etc.,—and yet it is impossible to conceive that they could have made their rapid progress without it. It is not always appreciated what a tremendous mass of detailed facts are accumulated in taxonomic publications, many of them of extreme importance to students of evolution, heredity, and distribution. Further, probably only a taxonomist working in one of the large museums or herbaria can realize how much still remains to be done by the established taxonomic methods, more especially, but by no means entirely, in tropical faunas and floras. There must be a continuation of the pioneer work of describing organisms in such a way that they can be readily recognized, and naming and classifying them so that they fit into a system by the use of which all future research on them can be correlated. Any remarks made later are to be understood not as destructive criticisms of this

alpha taxonomy which, in the present state of biology, is indispensable, but as constructive efforts leading ultimately to an improved and perfected " omega " taxonomy which shall enable all biological knowledge to be made readily accessible—an ideal which will probably never be reached, but can be approached.

Alpha taxonomy is, justifiably, conservative. In practice, taxonomists, as a body, do not readily adopt new terms and concepts, and, in theory, their nomenclature is fixed. Since taxonomy is the basis of all other biological work, this relative stability is highly commendable. It only becomes objectionable when its rigidity forms an obstacle to progress. The formulation of subsidiary systems, such as those of Turesson, Danser, and Rensch, is to be encouraged, but it is undesirable that they should be assimilated into general taxonomy until they have been thoroughly tested, and the assimilation can be so made as as not to lead to confusion between the old and the new.

Great biological advances have been made in recent years, by extending experimental methods to the problems of heredity, variation, and adaptation. Only a few examples of how the new facts suggest modification in taxonomic method and outlook are discussed here. The taxonomist groups organisms into families, genera, species, varieties, etc. For a number of reasons " species problems " are most fundamental. Experimental methods are, with few exceptions, limited to and below the species level, because we can experiment between species and within species by controlled breeding and by transplanting. These experimental methods should throw some light upon, at least, the following problems of importance to the taxonomist :—

1. The degree of plasticity of genotypes.
2. The occurrence and constancy of correlation of characters.
3. The occurrence and nature of sterility barriers.
4. The evaluation of characters.
5. The recognition of hybrids.
6. The phylogeny of species.

Actually the alpha taxonomist classifies phenotypes; but he usually assumes, often correctly but usually without experimental proof, that he classifies together the phenotypes of one genotype. Our knowledge of the plasticity of even common plants is very meagre and even facts already known are sometimes ignored. Thus, in the recent monograph by Pilger (1937) on *Plantago*, *P. major* is subdivided into intra-specific groups on characters some of which have been shown by the transplant experiments at Potterne to be reactions of one genotype to different environmental conditions. The numerous apomicts of *Taraxacum* are exceedingly plastic, and it is difficult, if not impossible, to determine and delimit them by means of the usual descriptions. The geneticist breeds large numbers of

individuals under relatively uniform conditions. Those conditions should be more precisely described than they usually are, and more parallel experiments should be conducted under different conditions. The taxonomist would like to see more correlation in experiment between the geneticist and the autecologist.

Genetical research involves the analytical study of many characters. The degree to which these characters are correlated has led to the recognition of linkage and crossing-over. The taxonomist recognizes his species by the constancy of association of certain characters, but has, by alpha methods alone, to estimate such constancy from the examination of small unequal samples. In the species of *Silene* of the *S. maritima* group a very interesting series of facts has been established by research at Kew and Potterne. Full accounts are in process of publication in the Kew Bulletin,' and only a brief reference is possible here to one of many important results. *Silene maritima* and *S. Cucubalus* (*S. vulgaris*) are well-known species. More than a dozen morphological differences between them can be enumerated, but every one of these is found to " break down " in some, mostly a few, individuals, and this apart from hybridization. This " break down " in complete correlation of characters has mainly been ignored by taxonomists, and only the intensive genetical studies which have been made contemporaneously with extensive field analyses has revealed its occurrence and extent. Two examples must suffice here. *Silene maritima* has broad obloid capsules with reflexed teeth ; *S. Cucubalus* has ovoid capsules with erect teeth. The F_1 is intermediate and segregation is complex in F_2. In certain far inland populations of *S. Cucubalus*, as for example at Hog's Back, Surrey, we have found 2 to 3 per cent. of plants of *S. Cucubalus* with capsules of the shape and with the teeth of *S. maritima*. Similarly, *S. Cucubalus*-like capsules can be found, though very rarely, in populations of *S. maritima*. "Armadillo" seeds are the rule in *S. maritima* ; " tubercled " seeds in *S. Cucubalus*. A varying proportion, usually about 3 to 10 per cent. of *S. Cucubalus* plants have, however, armadillo seeds, and populations of *S. maritima* show from 0 to 50 per cent. tubercled seeds. Armadillo is always recessive to tubercled, and the F_2 segregation usually approximates to 3 : 1, within or between the species. The last pair of characters of those we have studied, which we found to break down, was zygomorphy versus actinomorphy. In spite of this the two species keep essentially distinct, and, except with known or suspected inter-specific hybrids, there is no difficulty in determining a given plant specifically. The taxonomist must obtain data of the degree of correlation, not merely of its occurrence.

Sterility, in the broadest sense of the term, is of many degrees, and, as based on causes, of different kinds. As a barrier between species it is often, but by no means always, associated with other

barriers, such as difference in ecological or geographical distribution. When sterility is complete between genotypes it obviously results directly in their isolation and in the isolation of the characters by which they are distinguished. The distinctness of buttercup species in a meadow would not be maintained without sterility barriers. Marsden-Jones and Turrill have found complete sterility between *Centaurea Scabiosa* on the one hand and microspecies of *C. nigra* on the other, both in experiments and in the wild, though plants of those species often grow close together. On the other hand, *Centaurea nigra*, *C. nemoralis*, and *C. Jacea* hybridize freely with the production in nature of complex hybrid swarms. The main facts of this behaviour have now been correlated from the genetical, cytological, and taxonomic standpoints. It is expected that the experiments which, with field-work, will have extended over fifteen years, will be completed by 1940, and a full account published as soon after as possible. Species in the genus *Nemophila* have been shown by Chittenden and Turrill to breed true to definite characters, to be intersterile, and to be morphologically distinct but closely related. Varieties within the species are fertile one with another.

Taxonomists have to evaluate the characters they use. Some characters are considered "generic," others "specific," others "varietal." On the whole, genetical research has not so far given much help in providing a more objective basis for this evaluation of characters. Marsden-Jones and Turrill find no essential difference in kind or in genetical behaviour between specific and intra-specific morphological characters in *Silene*. This, of course, is apart from their selection by different habitat conditions. Kristofferson says (1926): "in *Malva*, the crosses show a series from the most simple to the most complicated types of segregation, and the only difference between species and variety crosses is the complexity of the species segregations." The whole question of a classification of morphological characters on their genetical behaviour and the possibility of incorporating such data in general taxonomy requires much further research, in which all aspects should be fully investigated.

Very frequently the taxonomist has to deal with specimens that do not exactly fit into his scheme of species and varieties. Sometimes he is fairly sure that the specimens are of hybrid origin and he may be able to suggest the probable parentage. The occurrence of parallel mutations, which is probably wider than is often recognized, and the complexity of back-crossing and crossing between segregates of specific crosses, make such suggestions very tentative, unless experiments can be made or the results of controlled experiments are available for reference. It may here be urged that the full value of genetical experiments is lost unless material is preserved, by herbarium and other methods, for taxonomic use.

How far phylogenetic speculation should be used as a basis for classification is a question which it would take too long to discuss here. Mere correlation of characters alone is insufficient to do more than suggest phylogeny, which should only be based, in the existing state of knowledge, on either a palaeontological time-scale or, at present in a very limited manner, on cytogenetics. The origin of *Spartina Townsendii* and *Galeopsis Tetrahit* by hybridization, and the cytogenetical relationships of *Oenothera* microspecies and of certain groups in *Salix* show that hybridization is one important factor in evolution, and one that may, in part, explain the complex reticulation which every systematist finds when he attempts to classify any group of sexually reproducing plants.

A few only of the connections between taxonomy and genetics have been mentioned. Since the relationship between taxonomy on the one hand and cytology, ecology, palaeontology, and branches of physiology on the other is at least as close, it would be easy to justify the contention that taxonomy is a suitable meeting-ground for all branches of biology. Certainly, the newer discoveries and ideas of our genetical, cytological, and ecological colleagues are leading to an "experimental taxonomy" in the sense that tentative schemes of classification are being tested with the possibility that they may finally be incorporated in an improved general taxonomy. There are, however, certain dangers which have to be guarded against. Chief of these is the logical fallacy of circular argument. If, for example, it is desired to ascertain the relationship between a certain type of genetical behaviour and morphology, it would lead to wrong deductions if a classification were used that had been built up on a mixed morphological and genetical basis. One would merely extract what one had put in without independent proof of its truth. The best way to avoid this danger is to have a wide general classification in the making of which all criteria have been fully considered, *i. e.*, a classification approximating as nearly as possible to an omega taxonomy, and at the same time to have subsidiary classifications, every one of which is based on only one kind of attribute. These subsidiary classifications should be the ones to be compared together for purposes of deduction from correlation of characters or data. Further, most often there are reasonable alternative classifications possible. This is certainly true of morphological classifications, and no doubt of cytological, genetical, etc. The chances are that agreement is greater between some one of the alternative morphological classifications and some one of the alternative cytological or genetical classifications than between other combinations. In actual taxonomic research this usually works out by cytological, genetical, or other investigations suggesting changes in a given morphological classification, the basis still remaining morphological. Since taxonomy, and

especially identification and its associated nomenclature, is basic to genetics, ecology, cytology, etc., it should be as precise and stable as possible. Taxonomists have, therefore, to face the difficulty of maintaining an unchanging (or relatively unchanging) system and at the same time incorporating new data largely derived from investigations which have used taxonomy as a tool.

The following suggestions are therefore put forward for consideration :—

(1) It is essential that alpha taxonomy (based entirely or essentially on morphology) should be maintained. Its methods can, of course, be extended and improved without alteration of fundamental principles. This alpha taxonomy gives and must continue to give the first approximation towards the wider complete knowledge regarding organisms, which biologists seek.

(2) Subsidiary classifications, for special purposes and often on a very limited and deliberately abstracted number of attributes, should be prepared whenever they are thought desirable or likely to give valuable information of a particular kind. Turesson (1922) stresses ecological, Danser (1929) stresses sterility-fertility, Rensch (1929) and Du Rietz (1930) phyto-geographical aspects. All of these authors, however, retain at least a large part of orthodox taxonomic method, concept, and nomenclature. Apart from these limited, but useful, expansions of alpha taxonomy, many kinds of more specialized classifications have been proposed—for example, on the basis of chromosome number (diploids, triploids, etc.), of habit, of habitat, of cross- or self-sterility, etc.

(3) There should be continued experimentation as to how the new kinds of data can be incorporated in and used in taxonomy. This free " experimenting taxonomy " need not be bound by the traditions of alpha taxonomy, of which it will represent an easily modifiable fringe, in the main advancing but always ready to evacuate positions no longer tenable. By trials and errors this " experimenting taxonomy " will enable, one hopes, orthodox relatively stabilized taxonomy to incorporate new data and so to advance, gradually and cautiously, from an alpha position towards a far-off omega perfection of the classification of all biological knowledge.

(4) The recently formed "Association for the Study of Systematics in relation to General Biology " should receive the active support of all biologists, whatever their special lines of work. It is only through such a central and co-ordinating association that our ideals can be approached. An account of the formation of this Association has been published in ' Nature ' of July 24, 1937, p. 163, and a leading article in the issue for August 7, 1937, pp. 211–12 outlines many of its aims.

In this short paper I have attempted to draw attention to some of the potentialities of taxonomy as a meeting-ground for the different branches of biology, using genetics as an example. If my remarks do something to remove the common misconception that taxonomy is merely a dry museum or herbarium study, hidebound by tradition, and limited to the preparation of technical descriptions, identifications of specimens, and problems of nomenclature, they will achieve an important function. If, further, they serve to attract some younger biologists to studies helping directly towards an " omega " taxonomy they will have fulfilled their main purpose. It remains a fact that taxonomy is now in an interesting condition, and one does not really know what it may bring forth.

[A much longer paper covering the relationship of taxonomy to other branches of biology, not merely genetics, has been accepted for publication in ' Biological Reviews,' Cambridge. To this paper has been appended a full list of references.]

GLOSSARY.

Phenotype.—An organism as defined by its visible or demonstrable characters.

Genotype.—An organism as defined by its hereditary constitution.

Apomict.—An organism propagated entirely without fertilization.

Autecology.—The study of the life-history of a single kind of organism, with special reference to environmental factors (whence autecologist).

Linkage.—The constant or high correlation of characters owing to the close association of hereditary units (genes) on the same chromosome.

Crossing-over.—The reassociation of linked factors owing to the exchange of corresponding segments of half-chromosomes (chromatids).

F_1.—The first filial generation—usually the first generation after a cross.

F_2.—The second filial generation obtained by selfing or interbreeding individuals of an F_1 family.

THE AFRICAN SPECIES OF THE GENUS *ORTHOSIPHON* BENTH.

BY MAURICE ASHBY, PH.D., D.I.C.

(Concluded from p. 10.)

EU-ORTHOSIPHON, sect. nov.

Flores bracteis parvis induti. Corollæ tubus ±longus, cylindricus vel aliquanto fauces versus leviter ampliatus; labia subæqualia.

4. O. FERRUGINEUS Balf. f. in Proc. Roy. Soc. Edinb. xii. 91 (1884).

SOCOTRA: Wadi Digal, 1625 ft., Mar., *Schweinfurth* 518 (K); without locality, Dec., *Balfour* 420 (K, type; BM), and 1897 *Bent* s.n. (K).

By its general habit and inconspicuous racemes this species is readily distinguished from all others.

5. O. DISSIMILIS N. E. Brown in Kew Bull. (1906) 166.

PORTUGUESE EAST AFRICA. Railway between Beira and Massikessi, Nov.–Dec., *Cecil* 20 (K, type).

6. O. LONGIPES Bak. in Dyer, Fl. Trop. Afr. v. 373 (1900).

Geographical Range.—From Uganda and Tanganyika Territory to Angola and Northern Rhodesia.

ANGOLA. LOANDA DISTR.: 30 miles inland from Ambriz, *Monteiro* s.n. (K, type). CUANZA SUL DISTR.: Mumbonda, country of the Quissamas, Mar., *Gossweiler* 8375 (BM; K).

UGANDA. Serene, Teso, 3600 ft., after cultivation, Dec.; *Chandler* 198 (K).

TANGANYIKA TERRITORY. Mpwapwa, clay hill-slopes, Mar., *Hornby* 95 (K); Kirangi, Mar., *Phillips* 8K (K).

NORTHERN RHODESIA. Mazabuka, 4000 ft., Mar., *Woods* s.n. (BM).

7. O. IODOCALYX Briq. in Engl. Bot. Jahrb. xix. 174 (1894).

ANGOLA. "Upper Congo Region," R. Quango, Sept. 1876, *Pogge* 353 (B, type).

8. O. AUSTRALIS Vatke in Linnaea, xl. 179 (1876), and xliii. 86 (1881–2).

O. liebrechtsianus Briq. in Bull. Soc. Bot. Belg. xxxvii. 1, 84 (1898).

O. Hildebrandtii Bak. in Dyer, Fl. Trop. Afr. v. 368 (1900).

O. mombasicus Bak. *tom. cit.* 369 (1900).

O. rabaiensis S. Moore in Journ. Bot. xliv. 26 (1906); var. *parvifolius* S. Moore *loc. cit.* "*parvifolia.*"

O. silvicola Gürke in Engl. Bot. Jahrb. xli. 327 (1908).

Geographical Range.—Widely distributed, mostly along the east coastal region, from southern Abyssinia to Transvaal.

ANGLO-EGYPTIAN SUDAN. MONGALLA PROV.: Msai, NW. of Lake Rudolf, nr. the Abyssinian border, 3000 ft., Jan., *Donaldson Smith* s.n. (BM); Mongalla, Bahr el Jebel, *Nathan in Sudan Govt. Herb.* 1652 (K).

ABYSSINIA. GALLA HIGHLANDS: in woods nr. Mana, Apr., *Ellenbeck* 2005 (B, type of *O. silvicola*). Lake Rudolf distr. to Gondokoro, El Dere, Boran, *Donaldson Smith* s.n. (BM).

UGANDA. E. Ankole, 4400 ft., Oct., *Eggeling* 607 (982) (K); Jinia, Busoga, 3900 ft., Sept., *Brown* 96 (K).

KENYA COLONY. UKAMBA PROV.: Kitui, in shade of a wood, May, *Hildebrandt* 2746 (B, type of *O. Hildebrandtii*; BM, K). Rabai, Nov., *Taylor* s.n. (BM, type of *O. rabaiensis*); Mombasa, *Boivin* s.n. (P), and July, *Sacleux* 898 (P), same locality, *Wakefield* s.n. (K, type of *O. mombasicus*). Kisauni, Dec., *Taylor* s.n. (BM, type of *O. rabaiensis* var. *parvifolia*)—and other localities.

TANGANYIKA TERRITORY. WEST USAMBARA: Kongei, 3700 ft., Feb., *Greenway* 3355 (K).

NYASALAND. Nyika Plateau, Nacheni, 1500 ft., Sept., *McClounie* s.n. (K).

PORTUGUESE EAST AFRICA. MOZAMBIQUE: Rios de Sena, mixed sandy earthy ground, *Peters* s.n. (B, type). Lourenço Marques, Polana Beach, Oct., *Moss* 11,886 and 14,110 (BM)—and other specimens.

TRANSVAAL. BARBERTON: Kaapmuiden, Dec., *Rogers* 25,044 (BM).

BELGIAN CONGO. Upper Congo, Mossanze, Sept., *Descamps* s.n. (Br.); M'Towa, Oct., *Descamps* s.n. (Br.) (types of *O. liebrechtsianus*).

A very variable species, especially in the leaf-characters.

9. O. SOMALENSIS Vatke in Linnaea, xliii. 87 (1881–2).

O. calaminthoides Bak. in Kew Bull. (1895) 225.

BRITISH SOMALILAND. Meid Mts., Serrut, *c.* 5000 ft., Apr., *Hildebrandt* 1428 (type; BM, K). Biher, 1897, *Lort Phillips* s.n. (BM); without locality, June 1895, *Lort Phillips* s.n. (K, type of *O. calaminthoides*).

10. O. CLADOTRICHOS Gürke in Engl. Pflanzenwelt Ost-Afr. C, 349 (1895).

NYASALAND. Nyika Steppe, in marsh, Sept., *Holst* 3922 (B, type).

Based on a single specimen, which is unique in the genus by reason of its indumentum of stellate hairs on the stem and leaves.

11. O. VIOLACEUS Briq. in Engl. Bot. Jahrb. xix. 178 (1894).

ANGOLA. HUILLA: Lopollo, in rocky thickets, Dec., *Welwitsch* 5173 (type; BM, K).

12. O. STUHLMANNII Gürke in Engl. Pflanzenwelt Ost-Afr. C, 349 (1895).

TANGANYIKA TERRITORY. Mwanza, May, *Stuhlmann* 4168 (B, type).

Only the type-material has been seen; this is largely in fruit, but is characterized by a cluster of sterile bracts at the apex of each raceme. It is possibly an abnormal plant of *O. rubicundus*.

13. O. RUBICUNDUS (D. Don) Benth. in Wall. Pl. As. Rar. ii. 11 (1831).

O. coloratus Vatke in Linnaea, xliii. 86 (1881–2).
O. salagensis Bak. in Dyer, Fl. Trop. Afr. v. 368 (1900).
O. shirensis Bak. *loc. cit.*
Plectranthus Alleni C. H. Wright in Kew Bull. (1908) 437.
Coleus wulfenioides Diels in Not. Roy. Bot. Gard. Edinb. v. no. xxv. 231 (1912).
O. Mairei Lévl. in Fedde, Repert. Sp. Nov. xii. 532 (1913).
O. pseudorubicundus Lingelsh. and Borza, *op. cit.* xiii. 389 (1914).
[*O. atacorensis* Chevalier, Explor. Bot. Afr. Occ. Franç. 515 (1920) *nomen nudum.*]
Ocimum cuanzae I. M. Johnston in Contrib. Gray Herb. N.S. lxxiii. 39 (1924).
Orthosiphon wulfenioides (Diels) Hand.-Mazz. in Meddelanden från Göteborgs Botaniska Trädgård, ix. (30 Apr., 1934).
Geographical Range.—China, India, and widely distributed in tropical Africa.
Gold Coast. N. Territories, Salaga, May, *Kraus* s.n. (K, type of *O. salagensis*). Wuchian to Black Volta River, Kunta, Mar., *Kitson* s.n. (BM), and other localities in N. Territories.
Nigeria. Sokoto and Kontagoro Provs., in bush, May, *Dalziel* 360 (K); Bichikki, 2200 ft., May, *Leley* 186 (K).
Belgian Congo. Katanga: Kafubo River, Nov., *Quarré* 802 (Br.).
Uganda. Teso, 3600 ft., Mar.-Apr., *Chandler* 640 (K).
Kenya Colony. Ukamba Prov.: Kitui, barren places, May, *Hildebrandt* 2747 (type of *O. coloratus*; BM, K), and *Scott Elliot* 6206 (BM); Kapenguria, 7000 ft., grassland, May, *Napier* 1935 (K); Embere, Rumbias, 4000 ft., rather open savannah, Nov., *Graham* 2299 (K).
Tanganyika Territory. Generally distributed, collected by *Carson*, *Migeod*, and others.
Nyasaland. Shire Highlands, Mandala, Dec., *Scott Elliot* 8543 (K). Mt. Mlanje, Zomba, Sept., *Whyte* 138 (BM) and *Whyte* s.n. (K). Without locality, *Buchanan* 137 (K, type of *O. shirensis*); 1891, *Buchanan* s.n. (BM) and 1895 *Buchanan* 134 (BM).
Northern Rhodesia. Broken Hill, under trees, Dec., *Kassner* 2028 and 2028 *bis* (BM, B), and other specimens.
Southern Rhodesia. Bulawayo, Jan., *Rand* 143 (BM). Sebakwe, 4000 ft., Dec., *Eyles* 71 (BM), and other material.
Portuguese East Africa. Mozambique, Dec., *Dawe* 327 (K).
Transvaal. Zoutpansberg: Elim, Dec., *Obermeyer in Herb. Transvaal Mus.* 29,238 (TM); Tshakoma, Nov., *Obermeyer in Herb. Transvaal Mus.* 31,570 (TM).
The species covers a wide range of variation, but it is considered that without extensive studies of the plants in their natural environment no useful purpose can be served by the recognition of smaller groups, as all possible intermediate stages occur. Furthermore, no clue is given by the geographical distribution, for specimens from China and India are in many cases indistinguishable from the Central African plants.

14. O. usambarensis Gürke in [Phys. Abk. K. Akad. Wiss. Berlin (1894) 38] Engl. Pflanzenwelt Ost-Afr. C, 349 (1895).
Kenya Colony. Bome (?) River, 100 ft., Aug., *Kassner* 318 (BM).
Tanganyika Territory. Usambara: Maschaua, steppe country, July, *Holst* 3561 *a* (type; K).

15. O. Schimperi Benth. in DC. Prodr. xii. 51 (1848).
[*Ocimum coloratum* Hochst. in Flora, xxiv. Intell. 1, 23 (1841) and in Engl. Hochgebirgsflora Trop. Afr., 358 (1892) *nomen nudum.*]
Anglo-Egyptian Sudan. Niamniam, Nganje, July, *Schweinfurth* 3941 (K).
Abyssinia. Summit of Mt. Scholada, among stones, June, *Schimper* 313 (K, type; BM). Without locality, *Petit* 128 and s.n. (*ex Herb. Franqueville*) (K).
Resembling *O. rubicundus*, but distinguishable by its crowded inflorescence and generally also by the densely pubescent leaves.

16. O. rufinervis G. Taylor in Journ. Bot. lxix. Suppl. 2, 153 (1931).
Cameroons. Buar, *Mildbraed* 9329 (BM; K).
Angola. Bié: Vila da Ponte (Forte P. Amelia) in herb-grown thickets, Dec., *Gossweiler* 3993 (BM, type). Benguella, country of the Ganguellas and Ambuellas, *Gossweiler* 3993 (K). Without locality, *Gossweiler* 3349 (BM).

17. O. Johnstonii Bak. in Dyer, Fl. Trop. Afr. v. 373 (1900).
Tanganyika Territory. Without locality, Kilimanjaro Expedition, 50–60 miles from the coast, *Johnston* s.n. (K, type).

18. O. parvifolius Vatke in Linnaea, xliii. 87 (1881–2).
Kenya Colony. Common in Naivasha, Kenya, Ukamba and Seyidie Provs. Collected by *Hildebrandt* (2745 type; BM, K), *Scott Elliot* (6556), *Kassner* (284), *Endlich* (232), *Mearns* (68), and others.
Tanganyika Territory. Well distributed in Mwanza, Arusha, Tabora, and Kondoa Districts.

19. O. mollis Bak. in Kew Bull. 1895, 225, "*molle.*"
O. Buryi S. Moore in Journ. Bot. xlv. 233 (1907).
British Somaliland. Berbera, *Bury* 18 (BM, type of *O. Buryi*); between Dubar and Hammer, Jan., *Lort Phillips* s.n. (BM); Wagga Mt., *Bury* s.n. (BM); Golis Range, *Drake Brockman* 53 (K), June, *Lort Phillips* s.n. (K, type).

20. O. WILMSII Gürke in Engl. Bot. Jahrb. xxvi. 81 (1898).
O. glabratus Benth. var. *africanus* in DC. Prodr. xii. 51 (1848).
O. neglectus Briq. in Bull. Herb. Boiss. 2me sér., iii. 988 (1903).
O. inconcinnus Briq. *tom. cit.*, 991 (1903).
Plectranthus Bolusii T. Cooke in Kew Bull. (1909) 377.
O. Wilmsii var. *komghensis* N. E. Br. in Dyer, Fl. Cap. v. 1, 256 (1910).
Geographical Range.—Transvaal, Natal (and Cape Province ?).
TRANSVAAL. WATERBERG: Potgietersrust, *c.* 3600 ft., in thickets, Feb., *Bolus* 11,011 (K, type of *Plectranthus Bolusii*). Nr. Lydenburg, Dec., *Wilms* 1115 (type; BM, K). Crocodile River, Dec., *Burke* 162 (K, type of *O. glabratus* var. *africanus*). MARICO: Lino Kano, Aug. 1876, *Holub* s.n. (K). Matebe Val., Oct., *Holub* s.n. (K); Kouderiver, 4600 ft., Nov., *Schlechter* 3728 (BM, K)—and other material.
NATAL. Camperdown, 2500 ft., Oct., *Wood* 4963 (type of *O. inconcinnus*; HN, K). Sydenham, nr. Durban, 500 ft., Sept., *Wood* 8538 (K, HN)—and other material.
CAPE PROVINCE (introduced ?). KOMGHA: nr. Kei River, among stones, Nov., *Flanagan* 477 (K, type of *O. Wilmsii* var. *komghensis*).
S. AFRICA—without locality, 1846, *Zeyher* 1357 (BM, K).

21. O. ROSEUS Briq. in Engl. Bot. Jahrb. xix. 174 (1894).
ANGLO-EGYPTIAN SUDAN. BAHR EL GHAZAL PROV.: Land of the Bongos, River Roah, Dec., *Schweinfurth* 2765 (K). Niamniam, on River Mabode, May, *Schweinfurth* 3818 (type; K).
The species is based on very scanty material.

22. O. NIGRIPUNCTATUS G. Taylor in Journ. Bot. lxix. Suppl. 2, 152 (1931).
ANGOLA. Malange, open thickets towards N'Golo, Aug., *Gossweiler* 1036 (BM, type; K), same locality, in bush veld, Sept., *Young* 940 and 955 (BM), Vulangombe, in grassy thickets after the fires, July, *Gossweiler* 1031 (BM). LUNDA: Xassengue, dry veld, Sept., *Young* 722 (BM), same locality, Oct., *Young* 1014 (BM).
A distinct species by reason of the irregular and very viscid inflorescence, which suggests alliance with the genus *Fuerstia*. The ternate arrangement of the leaves is shared by *O. pascuensis* and *O. serratus*.

23. **O. Buchananii** (Bak.), comb. nov.
Ocimum Buchananii Bak. in Fl. Trop. Afr. v. 348 (1900).
Geographical Range.—Kenya Colony, Nyasaland, and Rhodesia.
KENYA COLONY. Without locality, 1914, *Prescott Decie* s.n. (BM).
NYASALAND. Shire Highlands, common, *Buchanan* 81 (K, type); also Zomba and Blantyre.

SOUTHERN RHODESIA. Salisbury, Jan., *Marshall* s.n. (BM).
Characterized by the membranous nature of the leaves and inflorescence.

24. O. PASCUENSIS G. Taylor in Journ. Bot. lxix. Suppl. 2, 152 (1931).
ANGOLA. BIÉ: River Cubango, Catoco, in poor gravelly pastures, Nov., *Gossweiler* 2276 (BM, type; K).

25. O. HETEROCHROUS Briq. in Engl. Bot. Jahrb. xix. 173 (1894).
ANGOLA. "Upper Congo Region," on River Quango, Sept., *Pogge* 366 (B, type).
SOUTHERN RHODESIA. Without locality, *c.* 5000 ft., Jan., *Walters in Colonial Herb., Dept. Agric., S. Rhodesia* 2226 (K).

26. O. VIATORUM S. Moore in Journ. Linn. Soc. Bot. xxxvii. 199 (1905).
UGANDA. Mulema, Jun., *Bagshawe* 327 (BM, type).

PALLIDI, sect. nov.

Flores bracteis parvis induti. Corollæ tubus brevis, fauce abrupte ampliatus; labium anticum quam posticum longius. Folia longe petiolata.

27. O. BULLOSUS Chiov. in Ann. Bot. Roma, xiii. 406 (1915).
ABYSSINIA. OGADEN: Fra Baghei Godudu and Audinle, Oct., *Paoli* 938 (F, type).
ITALIAN SOMALILAND. Forest of Iscia Bidoa, Oct., *Paoli* 1219 (F).
Characterized by bullate leaves and reniform-apiculate floral bracts.

28. O. GRANDIFLORUS Terrac. in Bull. Soc. Bot. Ital. (1892), 124; descr. ampl. Chiov. in Ann. Bot. Roma, xiii. 407 (1905).
ABYSSINIA. OGADEN: Gerar Amaden, Apr., *Baudi and Candeo* s.n. (F, type).

29. **O. macrocheilus,** sp. nov. *Herba* ramosa c. 8–15 cm. alta; caulis obtuse quadrangulatus vel teres, pilis albis obtectus; internodi 0·3–2·5 cm. longi. *Folia* patentia longe petiolata; petiolus 0·5–1·3 cm. longus, pubescens; lamina late lanceolata an triangularis, basin late cuneata, apice obtusa, margine grosse sed obtuse serrata, 1–2·7 cm. long. et 0·8–1·5 cm. lat., utrinque pilis albis ±pubescens, nervis præsertim. *Racemi* simplices c. 3–6 cm. longi; rhachis minute puberulus et glandulosus; verticillastri 6-flores, per anthesin c. 1–1·5 cm. inter se distantes; bracteæ minutæ, persistentes, ovatæ, margine ciliatæ, c. 1 mm. longæ; pedicelli 3 mm. longi, puberuli. *Calyx* extus puberulus et sparse glanduloso-punctatus, intus glaber, in fructu leviter accrescens; tubus campanulatus, 2 mm. longus; dente postico suborbiculare, c. 1–2 mm. long. et lat.; lateralibus anticisque

triangularibus apice subulatis, c. 1 mm. longis; anticis in fructu ad 2 mm. accrescentibus. *Corolla* extus labiis puberula, intus infra bases staminum posticorum pilosa, aliis partibus glabra; tubus rectus apicem versus ampliatus, fauce lateraliter compressus, 4–5 mm. long., ore c. 3×2 mm.; labium posticum 3-lobatum, 3–6 mm. long., suberectum; anticum 4–6 mm. long. per anthesin rectum vel leviter deflexum. *Stamina* in corollæ labio antico inclusa, filamentis glabris, postica supra mediam partem corollæ tubi inserta, c. 4 mm. long., antica fauce corollæ inserta c. 2·5 mm. long. *Stylus* aliquanto corollæ labio antico exsertus, apice capitatus vel emarginatus.

ABYSSINIA. BORAN: Mt. Gof, Nov., *Donaldson Smith* s.n. (BM, type), same locality, 3900 ft., *Delamere* s.n. (BM).

Closely resembling *O. pallidus*, but distinguished by its larger flowers and leaves. This difference is regarded as significant, because in the numerous specimens of *O. pallidus* studied the flowers were uniformly small.

30. O. PALLIDUS Royle ex Benth. in Hook. Bot. Misc. iii. 370 (1833).

Ocimum reflexum Ehrenb. ex Schweinf. Beitr. Fl. Æthiop. 126 (1867).

Orthosiphon Ehrenbergii Vatke in Linnaea, xxxvii, 316 (1872).

[*Ocimum farsanianum* Ehrenb. ex Vatke, *loc. cit. nomen synonymum.*]

[*Ocimum nepetæfolium* Hochst. ex Vatke, *loc. cit. nomen synonymum.*]

[*Ocimum reflexum* Schweinf. ex Vatke, *loc. cit. nomen synonymum.*]

Orthosiphon reflexus (Ehrenb.) Vatke in Linnaea, xliii. 85 (1881–2).

Var. *pallidus* Terrac. in Annu. Inst. Bot. Roma, v. 101 (1894).

Orthosiphon incisus Chevalier in Bull. Soc. Bot. France, lxiii. mém. 8, 199 (1912).

Geographical Range.—From Dahomey and Anglo-Egyptian Sudan to Abyssinia, Somaliland, Arabia, and India.

DAHOMEY. Atakora Mts., 1000–1950 ft., Somba country from Toukountouma to Kototangon, cultivated fields, Jun., *Chevalier* 24,120 (P, type of *O. incisus*).

ANGLO-EGYPTIAN SUDAN. Gebel Uaratab, nr. Suakin, Jun., *Schweinfurth* 249 (B); Erkawit, between Suakin and Berber, Sept., *Schweinfurth* 277 (K); Wadi Kansisrob, Elba, Jan., *Newberry* 238 (BM).

ERITREA. Nr. Saati, Feb., *Schweinfurth and Riva* 330 (K). Habab, dry places, Sept., *Hildebrandt* 431 (BM).

ABYSSINIA. Plain of Hamedo, 1000–5400 ft., Sept., *Schimper* 383 (B, type of *O. Ehrenbergii*; BM); Sabra, *Schimper* 190 (K, P); Dehli Dikeno, mountains, 4000–5000 ft., Sept., *Schimper* 1363 (P).

BRITISH SOMALILAND. Ahl Mts., Mar., *Hildebrandt* 850 (BM; B "*O. reflexus* Ehrenb."); Hahimarch, Jun., *James and Thrupp* s.n.; without locality, *Godman* s.n. (BM).

SOCOTRA. Without locality, Feb.–Mar., *Balfour* 269 (BM, K).

Doubtful or excluded species, and those of which no material has been seen:—

O. ambiguus Bolus in Journ. Linn. Soc. Bot. xviii. 394 (1881). No material.

O. angolensis G. Taylor in Journ. Bot. lxix. Suppl. 1, 154 (1931). This species, in common with *Ocimum Cameroni* (Baker) R. E. Fries and *Hemizygia tuberosa* Hiern, has a floral structure with distinct affinities to the genus *Becium* (see Journ. Bot. lxxiii. 357).

O. bigibber Chiov. Raccolte Botanische fatte dai Missionari della Consolata nel Kenya, 103 (1935). No material.

O. Bolusii N. E. Brown in Dyer, Fl. Cap. v. 1, 258 (1910). No material.

O. breviflorus Vatke in Linnaea, xliii. 88 (1881–82) is **Geniosporum Hildebrandtii** (Vatke), comb. nov. *Ocimum Hildebrandtii* Vatke, *tom. cit.* 83.

O. macranthus Gürke in Engl. Bot. Jahrb. xxvi. 84 (1898), is *Syncolostemon macranthus* (Gürke) Ashby in Journ. Bot. lxxiii. 357.

O. Merkeri Gürke in Engl. Bot. Jahrb. xxxvi. 208 (1905). No material.

O. minimiflorus Chiov. in Nuov. Giorn. Bot. Ital. (1922) nov. ser. xxix. 114 (1923). No material.

O. Newtonii Briq. in Bull. Herb. Boiss. sér. 2, iii. 990 (1903). No material.

O. nyasicus Baker in Dyer, Fl. Trop. Afr. v. 373 (1900) is **Plectranthus nyasicus** (Baker), comb. nov.

O. obscurus Briq. in Bull. Herb. Boiss. sér. 2, iii. 989 (1903). No material.

O. varians N. E. Brown in Dyer, Fl. Cap. v. 1, 256 (1910). No material.

The following have been transferred to *Hemizygia* (see Journ. Bot. lxxiii. 312 and 343 (1935)):—

O. adornatus Briq.
O. affinis N. E. Brown.
O. albiflorus N. E. Brown.
O. canescens Gürke.
O. decipiens N. E. Brown.
O. Elliottii Baker.
O. Engleri Perkins.
O. foliosus (S. Moore) N. E. Brown.
O. Garrardi N. E. Brown.
O. heterophyllus Gürke.
O. Holubii N. E. Brown.
O. humilis N. E. Brown.
O. latidens N. E. Brown.
O. Laurentii De Wild.
O. linearis Benth.
O. Marquesii Briq.
O. messinensis R. Good.
O. Mossianus R. Good.
O. Muddii N. E. Brown.
O. natalensis Gürke.

O. ornatus (S. Moore) R. Good.
O. persimilis N. E. Brown.
O. petrensis Hiern.
O. pretoriæ Gürke.
O. pseudornatus R. Good.
O. Rehmannii Gürke.
O. rhodesianus S. Moore.
O. Rogersii N. E. Brown.
O. Schinzianus Briq.
O. stenophyllus Gürke.
O. subvelutinus Gürke.
O. teucriifolius (Hochst.) N. E. Brown.
O. Thorncroftii N. E. Brown.
O. transvaalensis Schlechter.
O. Welwitschii Rolfe.
O. Woodii Gürke.

The following have been transferred to *Endostemon* (see Journ. Bot. lxxiv. 121 (1936)) :—

O. cleistocalyx Vatke.
O. diffusus Benth.
O. dissitifolius Baker.
O. Ellenbeckii Gürke.
O. glutinosus Chiov.
O. gofensis S. Moore.
O. hispidus Benth.
O. Hoeki De Wild.
O. Homblei De Wild.
O. Kelleri Briq.
O. malosanus Baker.
O. menthæfolius Briq.
O. obbiadensis Chiov.
O. retinervis Briq.
O. scabridus Briq.
O. tenuiflorus Benth.
O. tomentosus De Wild.
O. tubulascens Briq.
O. unyikensis Gürke.
O. villosus Briq.
O. Wakefieldii Baker.

NOTES ON BRITISH CHAROPHYTES.

By G. O. Allen.

The following records from amongst charophytes I have examined since 1933 represent, so far as I am aware, extensions of their known range :—

Nitella opaca Ag. var. attenuata Gr. In going through the charophytes in the Hiern herbarium for the Devonshire Association I found a specimen of *N. opaca* with very elongated branchlets that appears to fall within this variety. It was collected by Mr. W. P. Hiern in May 1895 from a stream next Dove's Moor (Bulkworthy parish), N. Devon, v.c. 4.

Mr. G. T. Fraser has also sent me some beautiful specimens, ♀ and ♂, which he collected in May 1937 from Hennock Reservoirs, S. Devon, v.c. 3. Hb. Mus. Brit. G.O.A. 361.

In December 1936 my attention was drawn to what proved to be *N. opaca* at Haslemere, Surrey, v.c. 17, by Mr. R. C. Blockey, of the Educational Museum there. I then just noted it as in immature condition. In October 1937 I gathered some myself from the same place, a delightfully clear small pond that is fed from a spring. It is not as slender as var. *attenuata* should be, but it agrees in the branchlets, which freely bear ripe antheridia, being exceptionally long and lax, and hence very different in appearance from the usual form, with its short branchlets and dense fruiting heads. I did not succeed in finding any ♀ plants at all. Hb. G.O.A. 368, Mus Brit.

N. flexilis Ag. Mrs. Stewart Sandeman found this plant in Loch Ussie, E. Ross, v.c. 106, in 1936. Hb. Mus. Brit.

N. mucronata Miq. In October 1936 in the River Wey, near Little Frensham Pond, Surrey, v.c. 17, I came across one or two clumps of this in a little slack water below the piles of a small bridge. Unfortunately it was without fruit, though in a well-grown condition. It is decidedly rare in the British Isles, and one of the few to be found in running water. My plant was characterized by the frequency of 3-celled dactyls (instead of the normal 2-celled), as in the variety *gracillima*, but differs from that in being rather a stouter form than usual. The following day I happened to gather a little more of it towards dusk, and did not discover till it had been lying some hours in a dish that it included four young crayfish. In this connection it may be of interest to quote a passage from Huxley's ' Crayfish ' (p. 9), where, speaking of the food of these animals, he writes " Calcareous plants such as the Stoneworts (*Chara*) are highly acceptable " ; so possibly they may have been feeding on the *Nitella*. Hb. G.O.A. 341, Mus. Brit., Kew.

In August 1937 Mr. D. F. Leney, of the Surrey Trout Farm, Haslemere, obtained a remarkable form of this species, bearing ripe fruit plentifully, in a reservoir at Scolescombe, near Hastings, E. Sussex, v.c. 14. Instead of the uniformly lax growth the fertile whorls form dense heads as in var. *heteromorpha* Kütz., which is found on the continent. This variety does not appear to have been recorded before from the British Isles. In their ' Review of the British Characeae,' 1880, H. and J. Groves considered Borrer's specimen from West Grinstead, West Sussex, v.c. 13, to be " near var. *heteromorpha*," but there is no reference to this opinion in ' British Charophyta.' It is illustrated in Migula's " Die Characeen " (Rabenhorst's ' Kryptogamen-Flora '), p. 151, and in his ' Synopsis Characearum Europaearum,' fig. 31, p. 41. Hb. Kew, G.O.A. 367, Mus. Brit.

(Mr. J. E. Lousley recorded in this Journal (lxxiii. 260) his finding the typical form at Alfriston, East Sussex, in August 1931.)

N. hyalina Ag. The gathering by Mr. N. Douglas Simpson in July 1913 of this species in Llyn Idwal, Cwm Idwal, Carnavon, v.c. 49, is of exceptional interest, as previously the only known locality was Looe Pool, West Cornwall, v.c. 1, where the late Canon Bullock-Webster discovered it in 1898. It was still there in 1914. In August 1933, in response to an enquiry of mine, he wrote : " It is not much use looking for *N. hyalina* in Looe Pool now I think. It seems to have gradually died away. I think it is really an alien. Perhaps fruit brought on birds' feathers from France or Spain." Mr. Simpson's plant was in a sterile condition, and the authors of ' British Charophyta ' had not

seen a ripe oospore from the British Isles. It is our only heteroclemous *Nitella*.

TOLYPELLA GLOMERATA Leonh. Miss E. F. Noel collected this at Laugharne, near Carmarthen, v.c. 44, in May 1937 in a cart-rut.

(CHARA BRAUNII Gmel. This species still exists in its one British locality, Reddish Canal, Lancs., v.c. 59, having been obtained there this year by Miss E. S. Todd. It was first found there in 1883, and is considered as having been probably introduced accidentally from Egypt.)

C. CONTRARIA Kütz. Dr. G. Taylor collected this species in Gladhouse Reservoir, Edinburgh, v.c. 83, in July 1935. Hb. Mus. Brit.

The var. *hispidula*, of which there are few records, was obtained very sparingly by Mr. J. P. M. Brenan in Wilstone Reservoir, near Tring, Herts, v.c. 20, in July 1937.

C. ACULEOLATA Kütz. This was collected by Mr. J. F. G. Chapple at Bosherton, Pembroke, v.c. 45, in August 1937. The only other Welsh record for this rare plant is Anglesea.

C. DELICATULA II Ag. (This widely distributed species was found in Keston ponds, W. Kent, v.c. 16, in June 1919 by Mr. St. J. Marriott; and in the marshes at Minster, Thanet, E. Kent, v.c. 15, by myself in August 1923.) It was obtained by Mr. W. P. Hiern near South Molton, N. Devon, v.c. 4, in June 1893, and by Mr. G. T. Fraser at Kingsteignton, S. Devon, v.c. 3, in August 1936.

In the 'Fragmente' this species was treated as a subspecies of *C. fragilis* Desv. (now to be known as *C. globularis* Thuillier), and it was not till about 1917 that Groves began to refer to it as a separate species. As to the ambiguity about nomenclature, see 'British Charophyta,' ii. 67.

It is sometimes rather difficult to distinguish it from *C. aspera* Willd. if the latter happens to have inconspicuous spine-cells and is sterile, particularly if one has only a dried specimen for examination. It is always far easier to determine a charophyte when it is either in a fresh state or preserved in quite weak formalin.

The var. *annulata*, a small densely tufted form that is very different in appearance from the typical, was obtained in Raasay Island, Inner Hebrides, v.c. 104, by Mr. R. B. Cooke in May 1936. Previous Scotch records are from Sutherland W., Orkney, and Shetland. Hb. Mus. Brit.

A NEW VARIETY OF *MYRIOPHYLLUM ALTERNIFLORUM* DC.

BY H. W. PUGSLEY, B.A., F.L.S.

WHILE botanizing about Lough Neagh with Dr. Lloyd Praeger last August, I noticed in the adjacent Lough Beg a very dwarf and compact form of *Myriophyllum*, which could only belong to *M. alterniflorum* DC. among our described species; and, as it looked very distinct, I collected such specimens as I could find, all unfortunately without flowers or fruits. On my return home I found in the British Museum Herbarium an exactly similar specimen, with flowers and fruits, gathered in Lough Neagh on 13 July, 1867, by S. A. Stewart, who referred it to *M. alterniflorum*, remarking "very slender form if not a distinct variety." There is a better sheet of the same plant in Herb. Druce, at Oxford, collected in Lough Neagh on the same date by George Dickie and labelled *M. alterniflorum*, and a third example has been traced in Herb. A. Bennett, now at South Kensington, obtained by Dr. Praeger in Lough Ree, Co. Longford, on 28 June, 1899.

All of these plants possess the characteristic inflorescence and fruit of *M. alterniflorum* DC., but they are still slenderer in habit, with leaves only 3–5 mm. in length, and segments measuring 1 mm., as compared with leaves 10–25 mm. long, with segments of 6–20 mm., in the usual form. This very small and compact foliage gives the plants a neat appearance, very different from that of ordinary *M. alterniflorum*.

On consulting the general herbaria at the British Museum and at Kew, I can find no European material matching this Irish form, although a few northern specimens (S. O. Lindberg, Stockholm, 1852, and Pl. Finlandiæ Exsicc. no. 825, at Kew, and Hansen, Hb. Slesv.-Holst. no. 289, at the Museum) show some approach towards it. But the North American examples at both establishments are quite uniform and clearly identical with the form of these Irish lakes. These are (1) J. R. Churchill, Sargent's Bay, Lake Memphremagog, Quebec, 1903; (2) Robinson and Schrenk, Fl. of Newfoundland, no. 169, Whitbourne, 1894; (3) Fernald, Wiegand, etc., Fl. of N.W. Newfoundland, no. 28749, Brig Bay, 1925 (1–3 in Herb. Kew.); (4) Banks, Newfoundland, 1766; (5) Macoun, no. 4935, Hull, Quebec, 1894; and (6) Wiegand and Hotchkiss, Fl. of N.W. Newfoundland, no. 28750, St. Barbe Bay, 1925 (4–6 in the British Museum Herbarium).

It may be seen by a reference to Britton and Brown's 'Illustrated Flora of N. United States, Canada, etc.' (ed. 2, ii. 615; 1913), that this compact plant with dwarf foliage is the prevalent if not the only form of *M. alterniflorum* known in North America, where it has been regarded as the typical species. Britton and

Brown's description states that its leaves are 3–5 mm. long, and their accompanying figure (no. 3083) is quite characteristic, showing foliage of much less than half the size of that of *M. spicatum* L. and *M. verticillatum* L. as depicted in the same volume.

M. alterniflorum was originally described in De Candolle's 'Flore Française' (tom. v., or vol. vi. p. 529; 1815), and was distinguished from *M. spicatum* L. by being slenderer and more delicate in all its parts, with the more distant and finer leaf-lobes alternate and not opposite, the flower-spikes small, only an inch long, and the flowers always alternate, the lower 2–3 together, the upper solitary. The description was taken from a plant of the River Erdre, near Nantes. Grenier and Godron (Fl. Fr. i. 588; 1848) give a much wider French distribution, comprising Vosges, Reims, Côte d'Or, Auvergne, Valley of the Loire, Vannes, Vire, and La Manche. I have not seen De Candolle's original specimen, but numerous French exsiccatae in British herbaria (*e. g.*, Hance, Maine et Loire, 1852; Gadeceau, Lac de Grand Gien, Loire Inférieure, 1906; and Wirtgen, Pl. Rhenan. vii. 332, and xvi. 297 *bis*, Vosges) clearly show that the plant intended is the form usual in Britain and generally through Western Europe. This normal form occurs likewise in Iceland (*Hooker*), Greenland (*Trapnell*), and the Azores (*Trelease*).

M. alterniflorum is well figured in English Botany Suppl. 2854, and this plate, with Flora Danica, t. 2061, and Coste, Fl. France, no. 1303, may be profitably compared with the figure of the American plant as given by Britton and Brown (*l. c.*).

The existence in eastern North America of a *Myriophyllum* similar to *M. alterniflorum* DC. of Europe, but yet obviously different, might seem to indicate that the two plants are not conspecific, but after carefully comparing the available material, which seems adequate for forming a conclusion, I am unable to find any points of distinction in the inflorescence and the fruit, and therefore think that the foliar difference, which is so striking and certainly seems constant, can only be held to constitute a varietal or race character. It is therefore proposed to distinguish the American plant as a variety of *M. alterniflorum* DC. thus :—

β **americanum**, var. nov.

M. alterniflorum Britton & Brown, Illust. Fl. N. United States, ed. 2, ii. 615 (1913) et auct. amer., non aliorum.

Icon. Britton and Brown, *l. c.* fig. 3083.

Exsicc. Fl. N.W. Newfoundland, nos. 28749 (type) and 28750; Fl. Newfoundland, no. 169; Macoun, no. 4935; J. R. Churchill, Quebec, 1903, in Hb. Kew.; Stewart, Lough Neagh, Antrim, 1867; Praeger, Lough Ree, Longford, 1899, both in Hb. Mus. Brit.; Pugsley, no. 550.

Planta caulibus tenuibus plerumque densiuscule foliatis gracillima. Folia minima, vulgo 3–5 mm. longa, laciniis capillaceis 5–11 mm. longis prædita. Flores fructûsque ut in typo.

M. alterniflorum var. *americanum* is of interest to British botanists as an addition to the list of North American plants growing in Ireland whose status in that country is uncertain. It has evidently inhabited Lough Neagh for at least seventy years, and its peculiar aspect was duly noted in 1867 by Stewart, who seems to have found it while in company with Professor Dickie. By a curious coincidence these two botanists must apparently have passed over the habitats of *Spiranthes stricta* Rydb. on that occasion and failed to detect it, perhaps owing to the early date of their visit (13 July).

A NOTE ON MR. PUGSLEY'S *MYRIOPHYLLUM ALTERNIFOLIUM* VAR. *AMERICANUM*.

By R. Lloyd Praeger.

This slender form of *Myriophyllum alterniflorum* has been familiar to me for fifty years now as especially characteristic of Lough Neagh, where I first collected it in company with N. A. Stewart. He was of opinion then that it was a habitat-form produced under the special conditions prevailing—great exposure and a sandy bottom; and I never went further into the matter. During the last three seasons I have been examining the Lough Neagh flora especially, in view of the forthcoming new edition of the 'Flora of the North-East of Ireland.' This curious *Myriophyllum* was found on the shores of all the five counties which border the lake—Down, Antrim, Londonderry, Tyrone, and Armagh; and also particularly well developed in the adjoining shallow sandy Lough Beg, in Antrim and Londonderry. It often grows in only a few inches of water, when its short, much branched habit and extreme slenderness, as seen through the moving water, have caused me sometimes to believe I was looking at *Fontinalis*. I am extremely glad that Mr. Pugsley's recognition of it as something quite unusual in the British Isles has led to his demonstration of it as a North American plant—another of the small group of Transatlantic plants whose European headquarters lie in Ireland. Typical *M. alterniflorum*, which is common in Ireland, and especially so in the acid waters of the west, I have never seen in Lough Neagh or Lough Beg; the water there is rather alkaline, with a pH as high as 7. Its place is taken in Lough Neagh by *M. spicatum*, which in Ireland inclines to be calcicole, and to favour the wide areas occupied by Carboniferous limestone, though it occurs in every county in the country.

It is many years now since I collected the variety in Lough Ree, as quoted by Mr. Pugsley, and I can give no details till I have revisited the lake; but I believe it was widespread there, and I also saw it in the other great limestone lake of the Shannon—Lough Beg.

The last paragraph of Mr. Pugsley's suggests that the possibility of introduction should be allowed for. I do not think that on the evidence there is the smallest reason for thinking that it is not indigenous in Ireland.

MENTHA HIRCINA Hull.—II.

By A. L. Still.

In the number of this Journal for April 1937 there appeared a note on the above Mint, in which the following points were dealt with :—

1. The identity of Hull's plant.
2. The relationship of this to the plant from which Fraser compiled his description in 'Menthæ Britannicæ.'
3. The connection between *M. hircina* Hull var. *hirsuta* Fraser and other Mints.

The purpose of the present note is to clear up some misconceptions in the previous discussion, in the light of further material and information which have become available.

With regard to (1).—In the Kew Herbarium there is a sheet of Sole's bearing two specimens, one of which is labelled, in Sole's hand, "*M. piperita sylvestris*," and under that name "*M. hircina* Hull." The specimen is not a good one from which to draw up a description, as it consists of the upper portion only of the plant, but it serves to establish the identity of Sole's and Hull's plants.

Among a set of Sole's Mints presented to the Linnean Society in 1797 and recently rediscovered at the Society's Rooms, there is an excellent specimen of *M. piperita sylvestris* (sive *latifolia*) Sole, which can be taken as a type for *M. hircina* Hull. On comparing Sole's figure with his specimen it can only be said that the plate is misleading and does not give a good idea of the plant. I must therefore acknowledge that my identification of this with *M. hircina* Hull var. *hirsuta* Fraser was an error. Speaking generally, it may be said that *sylvestris* Sole was a Peppermint generally resembling *officinalis* in habit, but with ovate, acute, or acuminate leaves, boldly and regularly serrate. The stem and lower leaves have scattered hairs on them, while the upper stem and leaves, especially the petioles, are pubescent. The spikes are much as in *officinalis*, but grey with hairs on the calyx-teeth. It seems that this was a local form occurring near Bath; and it does not appear to have been found elsewhere

or recently. I think it is unfortunate, because unnecessary, that Hull should have renamed it.

With regard to (2).—The specimen from which Fraser drew up his description of *M. hircina* Hull is now in his collection at Kew. It was gathered by Stonestreet, but no locality is given. An older label says: "*M. piperita* D. Buddle." In the April paper I said that the plant seemed to be a hairy form of *M. piperita* L. var. *subcordata* Fraser, and I am still of that opinion. The leaves are too narrow for *sylvestris* Sole and the spike too hairy in all parts. During 1937 I have gathered a similar form in two places, one wild and one from a cultivation; and have a specimen gathered by Mr. Lousley in Worcestershire. There is no doubt in my own mind that these represent "sports," and are associated in cultivation with exhaustion of the soil.

With regard to (3).—In August last Mr. R. H. Corstorphine kindly showed me a colony of Peppermint at Fern Den, Angus, with which grew a patch of a hairy Mint, identical in all essentials with those found at Danehill, Aldborough, Bedwyn, and Weston in Gordano. In this locality, no *M. aquatica* occurred anywhere near, and this species is very local in Angus, so that hybridity is unlikely. Nor was there any *longifolia* to be seen, and this species is, to the best of my knowledge, only represented in Angus by its hybrids *alopecuroides*, *villosa*, and *nemorosa*. It seems, therefore, that the idea of *M. hircina* Hull var. *hirsuta* Fraser, being a hybrid of *aquatica* × *longifolia* must be discarded, and with it the identification with *M. pubescens* Willd. Apparently no authentic sheet of the last exists; but Willdenow's description does not fit the plant we are discussing. I am firmly convinced that we have to deal with a "sport" of *M. piperita* L. var. *officinalis* Sole, as suggested in the previous paper. A question of nomenclature arises here. For the present I am marking these plants *M. piperita* L. var. *officinalis* Sole, lusus *pilosus*. In the case of the hairy form of var. *subcordata* Fraser, the same procedure is followed.

To summarize.—The plant from which Fraser drew up his description of *M. hircina* Hull does not seem to be identical with Hull's plant, but probably a hairy sport of the Black Peppermint var. *subcordata* Fraser. Hull's plant was the same as *M. piperita sylvestris* Sole, apparently a local form and possibly now extinct. *M. hircina* Hull var. *hirsuta* Fraser seems to be a sport from *M. piperita* L. var. *officinalis* Sole.

References.

Sole, Menth. Brit. 53, t. 24 (1798): Hull, Brit. Fl. i. 127 (1799); Fraser, Menth. Brit. 221, in Rep. Bot. Exchange Club for 1926 (1927); Still, Journ. Bot. 102, April 1937.

SHORT NOTES.

EPIPACTIS RUBIGINOSA Cranz.—In Col. Godfery's Monograph ('Monograph and Iconograph of Native British Orchidaceae,' 1933, 80) the colour of the flowers in Britain is given as wine-red, rarely dull rose or greenish. Such plants are about 12–20 cm. high. Col. Godfery also says that in South France and Switzerland the plant is usually much taller, 20–40 cm., and with much brighter coloured, rosy flowers (as shown in Correvon's 'Album des Orchidées de l'Europe').

Mr. J. S. Wallsman has called my attention to the fact that at Arnside Knott and Newbiggin Crags there are good numbers of plants which in size and colour belong to the Continental type. Unfortunately, at Arnside the plants are near a public foot-path and are constantly picked. These plants grow in rather less arid and exposed positions than the commoner British and Irish form. As it happens, I have a specimen, gathered many years ago at Arnside, of the taller, rosy-coloured form.—T. STEPHENSON.

ISOETES HYSTRIX AT THE LIZARD.—Dr. Melville, in his very interesting account of the occurrence of *Isoetes hystrix* at the Lizard, mentions that Dr. Druce, in 'The Comital Flora of the British Isles,' treats Mr. F. Robinson's 1919 record of the plant for Caerthillian Valley as an error, and states that there seems no longer any reason for discrediting that record.

It may be as well to put on record that the doubt attaching to the earlier discovery was solely due to the circumstances of the find. Robinson made no claim to any recollection of gathering the plant; he simply found a single corm in his vasculum after emptying it of other plants. As some at least of these were clovers from Caerthillian he was confident he must have gathered the *Isoetes* with them.

I visited the Lizard with him in June 1919 (he was then staying at Perranporth), but it was on a second visit a few days later that the *Isoetes* was found. I was shown the plant, then rather a dry-looking specimen, by the late Mr. E. Thurston, to whom it had been sent for his inspection, and a good deal of correspondence passed between Robinson, Thurston, and myself.

It was always highly probable, indeed, that the plant had come from Caerthillian, but Robinson was not only a very energetic collector, but was constantly exchanging with others in other districts. I myself had sent him many Cornish plants and had received from him a great number of specimens not only of Norfolk plants, but of others he had received from Scotland and elsewhere. Hence a single semi-dried specimen of *Isoetes* in his vasculum might conceivably have been overlooked, and so might have come from any part of the country.

Neither in Robinson's note in this Journal (1919, 322) nor in Druce's note (Rep. B.E.C. 1919, 693) was there any mention of the peculiar circumstances of the find, but Druce was well aware of the facts and as time passed and no one else succeeded in finding the plant at the Lizard he seems to have become convinced that the record was a mistake.—F. RILSTONE.

REVIEWS.

Geschichte der Botanik von den ersten Anfängen bis zur Gegenwart. Von MARTIN MOEBIUS, Emeritus Professor of Botany, Frankfurt-a.-M. 8vo, pp. vi, 458. Gustav Fischer: Jena, 1937. Price R.M. 18.

To write a new history of botany requires no doubt some justification. This the author realizes, and he pleads in his preface that, during the last fifty-six years which have passed since he commenced his studies in Heidelberg under Pfitzer, he has lived through a period of such wonderful progress in the science of botany that he has felt impelled to give an account of the development of botany, of which he was a witness and to which, we may add, he made considerable contributions. Since his retirement from his professorship he has also had leisure to take up the study of the history of botany in which he was always interested, and this has led him to extend the scope of his history to the beginnings of botany, concerning which much information has accumulated during the last twenty years. Archæological studies have brought to light specimens and representations of the plants known to and used by ancient peoples, and investigators like Senn, Bretzl, and Singer have shed new light on early botanical writings.

The first two chapters of Moebius's history, dealing with Botany in Ancient Times and in the Middle Ages respectively are full of interest and are written in a lucid and attractive manner. It is only in the third chapter dealing with the sixteenth and seventeenth centuries that the author comes to the period with which Sachs's History begins and Moebius's treatment and division of the subject-matter differs both from that of Sachs and also from that of Reynolds Green, who continued Sachs's History up to the end of the nineteenth century. After dealing with the various systems of classification, artificial and natural, and with the influence of the Darwinian theory on classification, the author devotes a special chapter to each group of plants, which enables the non-specialist to obtain with ease a clear idea of the progress in each of the groups. It is perhaps due to Moebius's own work and interest in the Algæ that these take up some nine chapters. The information concerning the various groups is quite up to date. We find, for instance, an account of the alternation of generations in *Laminaria* and also reference to Dr Knight's observations on *Ectocarpus*. Other groups are less carefully done. Holloway's valuable contributions to the Lycopodiales and Psilotales are not mentioned, and in the case of the Devonian Psilophytales credit is given to the researches of

Kräusel and Weyland, but Kidston and Lang, who first described *Hornea* and *Rhynia*, are not mentioned, and an ordinary reader would imagine that the former two were the discoverers of these primitive land-plants.

The anatomical and physiological chapters of the book are excellent, as one would expect from Moebius's special interest in this side of botany, and here again the subject-matter is brought up to date, as, for instance, by a full discussion of auxin and other growth-promoting substances.

The really new feature of this history, however, is the inclusion of chapters dealing with applied botany and with aids to the study of the subject. Agricultural Botany is followed up from the Stone Age and from early Egyptian methods of cultivation to the present time, and the progress of horticulture and forestry are equally dealt with. The educational aspect includes the development from ancient times of botanical gardens, herbaria, text-books, and microscopical technique. It seems strange that no mention is made of Linnæus's herbarium and its ultimate home in London, even though the space allotted to herbaria is not very extensive. Indeed, in many chapters the careful reader will note omissions which detract from the completeness of the book. None the less, botanists will be grateful to the author for this very comprehensive and careful compilation of the history of their science. There are copious footnotes giving references to important publications and also short biographical notes of various botanists who have contributed to the advancement of botanical knowledge. So far as British botanists are concerned, these are not always complete and sometimes incorrect. John Parkin (p. 145) is referred to as C. L. Parkin of the U.S. Forest-service, and in dealing with palæobotany the author speaks of W. C. Williamson and his school in "America." But some such inaccuracies in details do not detract from our admiration of the compendiousness of Moebius's work, and we express our indebtedness to the author for this very excellent history of botany.—F. E. Weiss.

Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. XI. Band. *Heterokonten.* By A. Pascher. Lief. 3, pp. 321–480. Akademische Verlagsgesellschaft: Leipzig, 1937. Price R.M. 20.

This part of the Heterokontae volume opens with a very useful artificial key to the sixty-one genera of Heterococcales distinguished by the author, only sixteen of which are dealt with in this instalment. Of these ten (viz., *Diachros, Ellipsoidion, Excentrochloris, Monallantus, Nephrodiella, Pleurochloridella, Pleurogaster, Prismatella, Rhomboidella, Sklerochlamys*; are new the last three, as well as *Excentrochloris* and *Pleurochloridella* are monotypic. There are a large number of new species, the vast

majority of which are rare, and only once hitherto observed. The descriptions are mostly detailed and illustrated by an abundance of clear figures. Like other parts of this volume, already previously discussed, the present one affords a very marked extension of our knowledge of the range of form within the Heterokontae.—F. E. Fritsch.

Plant Life Forms. By C. Raunkiaer. Translated by H. Gilbert-Carter. 8vo, pp. vii, 104, 77 text-figs. Oxford University Press, 1937. Price 5*s*.

In an Editorial Preface Prof. A. G. Tansley defines the object of this publication—namely, to introduce Raunkiaer's work to those teachers, students, and amateurs of botany to whom the much larger book in English is not accessible. To those unacquainted with Raunkiaer's work a subsidiary title seems necessary. By life-forms is understood those biological types which enable a plant to survive the season that is unfavourable to plant-growth. The standard used is the means by which the bud at the persistent growing point is protected during the unfavourable season by bud-scales, or by more or less burying in the ground, or by immersion in water or mud. Annuals which carry on from season to season by seeds form a special type. The types are more or less characteristic of different climates and conditions, and their occurrence becomes an expression of the climate.

There are many varieties of the types, and these are described in detail and illustrated by clearly drawn diagrams. As Prof. Tansley suggests, the book will form an excellent introduction to the study of our native plants in the field, and thanks are due to Mr. Gilbert-Carter for making it available to English-reading students, and to the Oxford Press for an admirable and reasonably priced production.—A. B. R.

Illustrated Guide to the Trees and Flowers of England and Wales. By H. G. Jameson. Crown 8vo, pp. xi and 159, with very numerous small figures. Ed. 3. Simpkin, Marshall, Hamilton, Kent and Co., 1937. Price 3*s* 6*d*.

This is an excellent book for such as would teach themselves the names of plants in order to inform children aright, and a book children themselves could be taught to use. The introduction states that it "is intended to help the ordinary nature-lover . . . . to find out the names of such trees and flowers as he meets with." This purpose is carried through with simplicity and clearness.—I. H. B.

BOOK-NOTES, NEWS, ETC.

'THE FLORA OF SUSSEX' was published in the last week of 1937. It had been virtually completed nearly two years ago, but could not be printed at once for lack of funds, a circular soliciting subscriptions, though met with some generosity, not producing a sufficient amount. Fortunately, Mr. K. Saville, a publisher in Hastings, undertook to carry out the printing and publication on terms which the Botanical Section of the South-eastern Union of Scientific Societies was able to meet, and this has been accomplished. Advantage was taken of the delay to revise thoroughly the nomenclature—brought up to date by Mr. A. J. Wilmott, while Dr. A. B. Rendle went through the text. Col. A. H. Wolley-Dod, as editor, is entirely responsible for the subject-matter and botanical notes, having received valuable advice in respect of the latter from various eminent botanists.

The 'Flora' enumerates 1413 species for the county. There are chapters or sections in the Introduction on the Topography and Geology of the county, and botanical notes of the older and more important botanists who have contributed to it, from the time of W. Turner and Gerard to the present day. Biographies are not given. There is a list of species of special interest in the county, and another of the more casual aliens. Special care has been taken to grade the aliens which are named in the systematic portion of the book, into those which are accepted as an integral part of its flora and those which are not, the former only being numbered in the series.

The 'Flora' may be purchased from K. Saville, 16 Robertson Street, Hastings, present price 15*s.* 6*d.* post free, but this may be raised later, so orders should be placed at once.

THE PLANTS OF CARDIFF.—In 1937 the National Association of Head Teachers assembled in conference in Cardiff. For the occasion a guide to Cardiff was published under the title 'The Book of Cardiff' (Oxford University Press). To this book Mr. H. A. Hyde contributed a condensed, very interesting, and pleasingly illustrated account of the "Plant-distribution in the Cardiff District" (pp. 28–38). He described from an ecological standpoint the features of the vegetation in the eastern half of the county of Glamorgan and the western edge of Monmouth, *i. e.*, the country easily accessible from Cardiff.

'THE BRITISH FERN GAZETTE.'—The first part of this (part 4 of vol. vii.) under the editorship of Mr. A. G. Alston has appeared.

PROFESSOR JAMES SMALL'S 'TEXT-BOOK OF BOTANY.'—A fourth edition of this has appeared. It closely resembles the third, which was reviewed on its appearance in this Journal (1934, p. 93). The new edition has the same number of pages as the third,

and is published at the same price—21 shillings (J. & A. Churchill Ltd., London). Here and there slight alterations have been made in the text, and here and there intercalations: the diagram of the nitrogen-cycle has been improved; a section defining auxins has been inserted, and the pages dealing with the theories of geotropic movement rewritten.

A NEW BRITISH FLORA.—A new British Flora, under the editorship of Professor Tansley, Mr. A. J. Wilmott, and Mr. J. S. L. Gilmour, is now in course of active preparation. We have been asked by the editors to publish a list of contributors and the groups that they have undertaken, so that any botanists who may have interesting notes or specimens of any particular group can communicate with the appropriate contributor. The editors would be very grateful for any assistance that can be given in this way

Eight of the contributors (those marked B.M. in the first of the two following lists) may be addressed at the British Museum (Natural History), Cromwell Road, South Kensington, London, S.W. 7; and twelve (those marked K.) may be addressed at the Royal Botanic Gardens, Kew, Surrey. The addresses of the others are given.

In the second or subject list the family and generic names and the sequence of genera in Compositae and Leguminosae are taken from the IXth edition of the 'London Catalogue,' and are not necessarily those which will be used in the 'Flora.'

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Alphabetical List of Groups, with Contributors.—*Aceraceae*—Sealy; *Alismaceae*—Dandy; *Amaranthaceae*—Wilmott; *Amaryllidaceae*—Pugsley; *Apocynaceae*—Stearn; *Aquifoliaceae*—Sealy; *Araceae*—Gilmour; *Araliaceae*—Bullock; *Aristolochiaceae*—Sledge; *Berberidaceae*—Stearn; *Boraginaceae*—Wade; *Campanulaceae*—Milne-Redhead; *Caprifoliaceae*—Bullock; *Caryophyllaceae*—Turrill; *Celastraceae*—Sealy; *Ceratophyllaceae*—Tutin; *Chenopodiaceae*—Wilmott; *Cistaceae*—Warburg; *Compositae*: *Eupatorium* to *Senecio*—Philipson; *Carlina* to *Serratula*—Sledge; *Centaurea*—Turrill; *Cichorium* to *Crepis*—Lousley; *Hieracium*—Pugsley; *Hypochoeris*—Lousley; *Leontodon*—Lousley; *Taraxacum*—Turrill; *Lactuca* to *Scorzonera*—Lousley; *Coniferae*—Jackson (A. B.); *Convolvulaceae*—Clark; Cornaceae—Bullock; *Crassulaceae*—Jackson (A. K.); *Cruciferae*—Butcher; *Cucurbitaceae*—Valentine; *Cupuliferae*—Warburg; *Cyperaceae*—Ballard, except *Carex*—Nelmes and Lousley; *Dioscoreaceae*—Stearn; *Dipsacaceae*—Burtt; *Droseraceae*—Wilmott; *Elaeagnaceae*—Sledge; *Elatinaceae*—Exell; *Empetraceae*—Wilmott; *Equisetaceae*—Alston; *Ericaceae*—Airy-Shaw; *Eriocaulaceae*—Dandy; *Euphorbiaceae*—Sledge; *Filices*—Alston; *Frankeniaceae*—Bullock; *Fumariaceae*—Pugsley; *Gentianaceae*—Gilmour, except *Gentiana*—Pugsley; *Geraniaceae*—Warburg; *Gramineae*—Hubbard, except *Agrostis*—Philipson, and *Festuca*—Howarth; *Haloragaceae*—Wilmott; *Hydrocharideae*—Dandy; *Hypericaceae*—Clark; *Illecebraceae*—Turrill; *Iridaceae*—Stearn; *Juncaceae*—Richards, except *Juncus alpinus*—Richards and Lousley; *Labiatae*—Anthony, except *Mentha*—Still and Metcalf, *Origanum*—Jackson (A. K.), *Thymus*—Wilmott, *Calamintha* and *Salvia*—Pugsley, *Prunella* and *Galeopsis*—Gilmour; *Leguminosae*—Gilmour, except *Lupinus* to *Ononis*—Sealy, *Anthyllis*—Turrill, *Vicia* and *Lathyrus*—Burtt; *Lemnaceae*—Tutin; *Lentibulariaceae*—Hall; *Liliaceae*—Stearn; *Linaceae*—Melville; *Loranthaceae*—Sledge; *Lycopodiaceae*—Alston; *Lythraceae*—Bullock; *Malvaceae*—Baker; *Marsiliaceae*—Alston; *Monotropaceae*—Airy-Shaw; *Myricaceae*—Warburg; *Naiadaceae*—Dandy, except *Potamogeton*—Dandy, Taylor, and Butcher, *Zannichellia*—Rendle, *Zostera*—Tutin, *Naias*—Rendle; *Nymphaeaceae*—Exell; *Onagraceae*—Ash; *Oleaceae*—Gilmour; *Orchidaceae*—Hall; *Orobanchaceae*—Pugsley; *Papaveraceae*—Taylor; *Plantaginaceae*—Baker; *Plumbaginaceae*—Pugsley; *Polemoniaceae*—Gilmour; *Polygalaceae*—Wilmott; *Polygonaceae*—Britton, except *Rumex*—Lousley; *Portulacaceae*—Exell; *Primulaceae*—Melville, except *Anagallis*—Weiss and

Marsden-Jones; *Ranunculaceae*—Butcher; *Resedaceae*—Exell; *Rhamnaceae*—Sealy; *Rubiaceae*—Britton; *Rosaceae*: *Prunus*—Warburg; *Spiraea*—Valentine; *Dryas*—Valentine; *Geum*—Marsden-Jones; *Fragaria* and *Potentilla*—Valentine; *Alchemilla*—Wilmott; *Agrimonia* and *Poterium*—Valentine; *Rosa*—Wolley-Dod; *Sorbus*—Wilmott; *Pyrus* to *Cotoneaster*—Warburg; *Salicaceae*: *Salix*—Wilmott; *Populus*—Jackson (A. B.); *Salviniaceae*—Alston; *Santalaceae*—Sledge; *Saxifragaceae*—Wilmott; *Scrophulariaceae*—Lousley, except *Euphrasia*—Pugsley, *Rhinanthus*—Wilmott, *Melampyrum*—Britton; *Selaginellaceae*—Alston; *Solanaceae*—Clark; *Tamaricaceae*—Exell; *Thymelaeaceae*—Sledge; *Tiliaceae*—Hyde; *Typhaceae*—Tutin; *Umbelliferae*—Norman; *Urticaceae*—Melville; *Vacciniaceae*—Airy-Shaw; *Valerianaceae*—Burtt; *Verbenaceae*—Taylor; *Violaceae*—Hall.

LINNEAN SOCIETY OF LONDON.—At the General Meeting of 6 January, 1938, the President, Mr. John Ramsbottom, O.B.E., M.A., from the Chair reported the deaths of two Fellows and one Associate—Mr. E. T. Browne, Sir Algernon P. W. Thomas, K.C.M.G., and Mr. Richard F. Towndrow. Mr. A. C. Gardiner, M.A., F.L.S., gave an account of the phytoplankton of the River Shannon between Lough Ree and Lough Derg. The Shannon is there a large slow-moving river; and the gradual disappearance in its moving waters of the life which multiplies in the upper lough is very interesting. Prof. F. E. Weiss, in the absence of Dr. M. Evenari, gave an account of the observations made by the latter on the spreading of roots of desert plants in the soil of the wilderness of Judaea and on the structure of the transpiring organs.

At the General Meeting of 20 January, a resolution was passed expressing the profound sense of loss felt on the death of Dr. A. B. Rendle. Then Mr. T. G. Tutin gave an account of vegetation observed in the Andes of Peru and Bolivia in the neighbourhood of Lake Titicaca and of Lake Poopo.

UNIONS OF NATURALISTS.—The Annual Meeting of the North-Western Naturalists' Union will take place on 8 February, 1938, at Manchester, under the President J. W. Jackson, D.Sc., F.L.S.

The Annual meeting of the Yorkshire Naturalists will be at Hull on 3 December, 1938.

The Sixteenth Annual Conference of the South-western Naturalists' Union will take place at Cheltenham by kind invitation of the Cotteswold Naturalists' Field Club from 3 to 6 June (Whitsuntide).

Scientific excursions have been arranged to Painswick Beacon, Stroud Valley, Forest of Dean, and the south Malverns. The President of the Union is F. R. Rowley, F.R.M.S., of Exeter.

The forty-third Annual Congress of the South-Eastern Union of Scientific Societies will be held at Worthing from 21 to 25 June inclusive, under the presidency of Professor Julian Huxley, Secretary of the Zoological Society. In the Botanical Section Dr. T. A. Sprague will give, as his presidential address, an account of sixteenth century herbals in relation to the British flora.

NEW YORK BOTANIC GARDEN.—Dr. William J. Robbins, Professor of Botany in the University of Missouri since 1919, has been called to be Director of the Garden.

CORRIGENDA IN THE 'FLORA OF SUSSEX.'—The following corrections should be made :—

Introduction, p. xlix. The proper title of Mr. Belt is "President of the Hastings Natural History Society," and *not* "Librarian at the Hastings Public Library."

Insert "E. J. Bedford has kindly supplied the photographs for the plates in the end of the book."

p. li. The number in Sussex should be 1413.

p. 561. *Add* to the List of Subscribers "L. A. W. Burder."

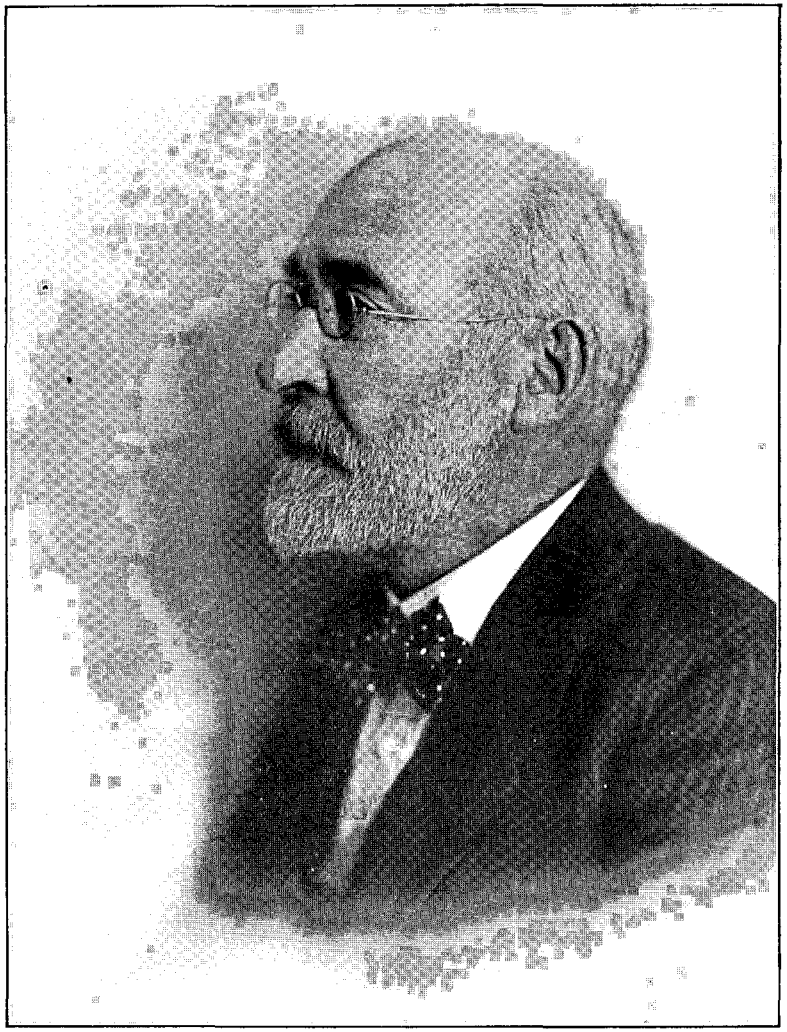
p. 560. By a printer's omission *Epipactis leptochila* is apparently excluded from Sussex. Only the Saxonbury Hill record should be so excluded. That for Phillis Wood stands.

ALFRED BARTON RENDLE,

1865–1938.

B.A. Cambridge, 1887; M.A., 1891.
B.Sc. London, 1887; D.Sc., 1898.
F.L.S., 1888; Secretary, 1916–1923; President, 1923–1927.
F.R.S., 1909; Council, 1929–1931.
Assistant, Department of Botany, British Museum (Nat. Hist.), 1888; Keeper, 1906–1930.
A contributor to this Journal since 1891 and its editor, 1924–1938.
Died 11 January, 1938.

Scientific communications for the Journal should be directed to Mr. J. Ramsbottom, M.A., O.B.E., at the British Museum (Nat. Hist.), S. Kensington, London, S.W. 7.



DR. ALFRED BARTON RENDLE

ALFRED BARTON RENDLE.

(With Portrait.)

Alfred Barton Rendle was the eldest child and only son of John Samuel Rendle and Jane Wilson Rendle. He was born in London on 19 January, 1865. He was sent to school at Lewisham, and then to St. Olave's, Southwark, and afterwards to St. John's College, Cambridge. From early in his schooling he won scholarships such as almost paid for his education: they were gained at school and at Cambridge; and there was an exhibition from London University won in 1886 at the Intermediate Examination in Science. At his first school he had been taught to know the common British plants: at St. Olave's the interest was kept alive, and his knowledge enlarged by informal instruction during recreation hours: at Cambridge he came under the teaching of S. H. Vines, then University Reader in Botany; and, when, in 1888, he had taken the highest places in his examinations, his wish was to remain in Cambridge as one of the research school which Vines was anxious to build up. But Vines unexpectedly left Cambridge for Oxford, and Rendle in need of a salary applied for and obtained the post of Assistant in the Botanical Department of the British Museum, vacated by H. N. Ridley when he became Director of Gardens, Singapore.

Some ships, as they leave port, have their course set for the whole voyage: some have courses subject to repeated re-adjustment. Rendle, like the former, had his whole course set on leaving port. It was not a course charted by the teaching at Cambridge, where the student's attention was directed chiefly to the physiological processes within the plant: but Rendle had made use of the living plants cultivated in the University Botanic Garden, had taught himself to know them, and by that self-help had made himself not unfitted for his new work of naming and helping to keep in order the collections of the great institution which he joined. The Gymnosperms, Monocotyledons, and Apetalae became his peculiar charge. He had written, while yet at Cambridge, under the influence of Vines, three small papers on the cell-structure of onions and lupins; but from the day of his leaving Cambridge such botany was put into the background, and he allowed his new duties to dominate his research entirely. He was soon publishing papers in Systematic Botany and all the first were on Monocotyledons. A list of his papers, far too long to be given, suggests that a keen conception of duty had more influence in directing him than any other attribute. Two relatively early papers of outstanding merit must be named—his paper on *Nipadites* in the 'Journal of the Linnean Society' (xxx. p. 143, 1895), and his paper on *Naias* in the Society's 'Transactions' (ser. 2, v. p. 379, 1899). His volume on Monocotyledons and Gymnosperms in the Catalogue of plants collected

by Welwitsch in Angola, published by the Trustees of the British Museum in 1899, should be named also.

He sought and obtained election to the Linnean Society in 1888; and from the very first was a regular attendant at the meetings, where he met other biologists in London. The publication of his paper on *Naias* was followed by a visit to the greater herbaria of Europe, and thereby he met the continental systematists.

He had had a little experience of teaching at Cambridge by way of demonstrating to elementary students. On taking up his work in the British Museum, his senior colleague, James Britten, saw in him that ability in expounding which breaks out also in reviewing, and made considerable use of him in the "review pages" of the *Journal of Botany*. In 1894 he obtained a lectureship at The Birkbeck Institute, afterwards Birkbeck College, teaching on two or three evenings of the week from 7 to 9.30 P.M. Those who attended his lectures say that he was never dull; but one finds that he was happier in expounding the fundamentals to elementary students than in endeavouring to fire the imagination of the more advanced.

The older botanists who saw his work, realized the unremitting care with which he did his tasks, whether appointed or self-appointed, and began to ask his services. Engler in Berlin obtained from him an account of *Naias* for the 'Pflanzenreich' (1901), and Thiselton-Dyer one of the African Convolvulaceae for the 'Flora of Tropical Africa' (1906). He set himself at this time to prepare a text-book on "The Classification of Flowering Plants," the first half of which, that on the Gymnosperms and Monocotyledons—his own particular subjects,—was issued in 1904. In the preface he wrote "the greater part of volume ii. has been written"; but volume ii. did not appear until 1925, when he was constrained to admit that "increasing official and extra-official duties" had poured upon him. Of volume i. there was a second edition in 1930.

In 1906 he became Keeper of the Department of Botany in the British Museum.

Rather earlier than this Maxwell Masters had persuaded the Royal Horticultural Society to take advantage of his knowledge, and the meetings of the British Association had become an attraction to him.

In 1902 an extension of teaching at Birkbeck College made day-classes imperative, and he handed over some of his work. On becoming Keeper of Botany he gave up the evening teaching.

In 1905 he took a conspicuous part in the deliberations of the International Botanical Congress which, meeting in Vienna, devoted its greatest energies to a revision of the rules for Botanical Nomenclature. Thenceforward his counsel was in demand always on this subject and at all congresses. In 1909 he was elected a Fellow of the Royal Society. A year later he was made botanical

editor for the 11th edition of the 'Encyclopaedia Britannica' (1910 1911). In 1911 he was elected President of the South London Botanical Institution in succession to the founder, A. O. Hume, with whom he had been closely associated in its establishment. In 1916 he was President of Section K of the British Association, and in the same year he was elected Botanical Secretary of the Linnean Society. In 1919 he was President of the Botanic Section of the South-eastern Union of Natural History Societies, and President of the Quekett Microscopical Club. In 1923 he was elected President of the Linnean Society and re-elected yearly for the usual term of a presidentship. The Royal Horticultural Society now found him a very useful member of several committees, and made him their Honorary Professor of Botany. In 1927 he was President of the South-eastern Union (as stated above, he had been sectional President earlier). The Union was meeting at Hastings; and in his Presidential Address he advocated the preparation of the 'Flora of Sussex,' which has just issued from the press (published in December last). From 1929 to 1931 he served on the Council of the Royal Society. In 1931 and 1932 he was President of the South-western Naturalists' Union.

These honours brought tasks with them, which he shouldered in full measure, presiding in meeting, council, or committee, or taking his place with unfailing regularity, addressing meetings when a Presidential Address was required, and going thoroughly into all the business to be transacted.

When James Britten died in 1924 he shouldered two new charges, both from Britten: the one was the editorship of the *Journal of Botany*, the other the preparation of a new edition of Britten and Boulger's valuable 'Bibliographical Index of British and Irish Botanists.' Also in the same year he edited the 7th edition of Bentham's 'British Flora.' The Journal demands a few unsigned pages every month from the pen of its editor—these he wrote for fourteen years: and it demands a sound editorial judgment—many a young author contributing to its pages has found the right touches put to the meaning by his kindly critical hand. It was always kindly: and the charity of his outlook towards others is easily detected in the wording of the many obituary notices contributed by him to the Journal.

The Royal Horticultural Society, which had bestowed on him its Victoria Medal of Honour in 1917, bestowed the Veitch Memorial Medal on him in 1929 for conspicuous services.

Retirement in 1930 from the post of Keeper of the Department of Botany in the British Museum did not mean leisure. In 1903 he had collaborated with William Fawcett (died 1926), who was then on leave and was working out orchid collections made in Jamaica. This collaboration developed into the preparation of a 'Flora of Jamaica,' financed partly by the Colony and

published by the Trustees of the British Museum: of it five volumes out of seven have appeared, and Rendle was working towards another up to the date of his departure in December last for India as a delegate of the British Association to the twenty-fifth (silver jubilee) session of the Indian Science Congress Association.

On the voyage to India he took a chill, and in Bombay went into hospital hoping for a quick recovery and to reach Calcutta in time; but the chill had awakened some latent trouble and he was sent home. He reached the house near Leatherhead which he had built for his retirement, and there death occurred peacefully three days after he had been brought back, at the age of almost 73.

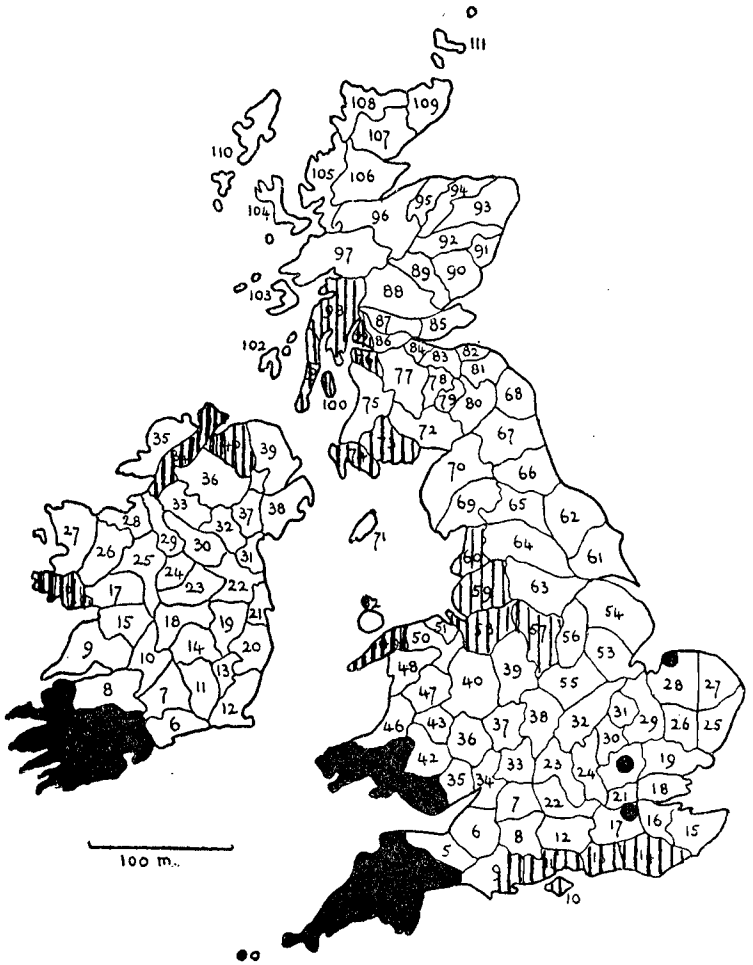
There is something more to be said yet about his work, something with a peculiarly appropriate place in this Journal, as it relates to the British Flora. It is not merely that he edited an edition of Bentham's 'British Flora,' or that he initiated the 'Flora of Sussex' and read the whole of it in manuscript, and materially forwarded the publication of Salmon's 'Flora of Surrey,' or that as Keeper of the National Herbarium he was in intimate contact with almost all workers on British Botany, and that for their easy work he separated out a European Herbarium at South Kensington. It is that in and out of season he did all he could to prevent the destruction of our rarer plants. He was Chairman of a section of the Selborne Society devoted to the protection of wild plants, a member of a Wild Plant Conservation Board of the Council for the Preservation of Rural England, and his address to the delegates of Corresponding Societies at the British Association's Conference of Delegates, Blackpool, 1936, was on the subject. On a copy of that address, lying before the writer, he had altered the title to "The Preservation of Native Floras, especially our own": and one feels that this exactly expressed his interest.—I. H. Burkill.

THE DISTRIBUTION OF *BARTSIA VISCOSA* L.

By E. J. Salisbury, D.Sc., F.R.S.

The present note is occasioned by a recent discovery of *Bartsia viscosa* L. in Hertfordshire. This species belongs to the Southern Oceanic element of the British Flora (*cf.* Salisbury, "The East Anglian Flora" in Trans. Norfolk & Norwich Nat. Soc. xiii. 191–263 (1932)), and is commonly found at low levels, growing in situations that may be submerged during the winter months, but remain moist during the summer. It is not infrequently a feature of the dune slacks and coastal fresh-water marshes of the west. Lloyd Praeger has, however, recorded its occurrence in the mild climate of Kerry up to an altitude of

700 ft., and H. Knocke ('Flora Balearica,' p. 286) mentions its occurrence at 700 m. From its general south-western distribution on the European continent and around the Mediterranean, one would infer that *Bartsia viscosa* is favoured by mild oceanic



Map showing distribution of *Bartsia viscosa* in the British Isles. For description, see text.

conditions, and the distribution in the British Isles is in accord with this view. In the accompanying map the comital and vice-comital areas in which the species has been found are shown. Where the abundance ranges from being locally very common

to locally frequent the areas are shown black. The areas where the abundance is of a lower order are shown by vertical shading. For distinctness outlying stations are indicated by black spots irrespective of the abundance in each. It is noteworthy that, in Ireland and Britain alike, the maximum frequency and abundance is in the south-west, and they both tend to diminish northwards. In England, where the difference in humidity between east and west are so marked, we note a diminution also from west to east.

Whilst *Bartsia viscosa* is almost absent from the east side of England, there are, as is shown in the map, three outlying stations from which this species has been recorded. One of the most interesting of these is the discovery of the species at Hunstanton by Mr. T. G. Tutin, recorded in this journal in 1936 (lxxiv. 297). This occurrence is in accord with the presence of other oceanic species in the north-east of Norfolk, to which I called attention when discussing the flora of East Anglia (*l. c.*). I may take this opportunity of placing on record another even more interesting occurrence of this type at Hunstanton, namely *Wahlenbergia hederacea*, which Sir J. J. Thompson informs me he used to find on the dunes there, though now extinct. In this connection we may recall the fact, noted in Pryor's 'Flora of Herts,' that a specimen of *W. hederacea* stated to have been gathered in Hertfordshire was exhibited at Whetstone Flower Show at some time prior to 1876, at which time conditions in the country generally were wetter and the general water table higher.

But, to return to *Bartsia viscosa*, the other two outlying stations are in Hertfordshire and Surrey. The latter is mentioned in Salmon's 'Flora of Surrey' (p. 498, 1931), where it is stated that Mr. S. A. Chambers found this species in some quantity by the site of a new road near Carshalton in 1927, but that a year later only two examples appeared. *Bartsia viscosa* is an annual species, and the fact that it was present in "some quantity" in 1927 would suggest that the plants were derived from seeds of plants of the previous year, as, whatever the means of introduction—apart from deliberate sowing, of which there is no evidence, and which is extremely unlikely,—not more than a few seeds would be likely to be transferred to one spot. This species is a late flowering plant, and its seeds do not usually ripen till September, and it is therefore not perhaps irrelevant that the autumn of 1926 was a particularly fine one, and that during September of that year the rainfall was only 80 per cent. of the annual average for 1881–1915. (It is, moreover, significant that in the Balearic Islands the plant begins to flower at least two months earlier than in Britain (Knocke, *l. c.* ii. 396).

The discovery of *Bartsia viscosa* in Hertfordshire, which occasioned this note, was in the north of the county. From 1926 to 1930 Mrs. M. A. Holmes was having extensive landscape

gardening schemes carried out at 'The Node,' near Welwyn, involving *inter alia* the construction of three artificial sheets of water, which together totalled about five acres of free water surface. In order to retain this water a considerable bank of earth had to be constructed to form the boundary of the lowest of these ornamental lakes. As a consequence of this feature and the situation of the lakes, they are, though sheltered, free to a considerable degree from the effects of cold air drainage, which so often results in low temperatures in the neighbourhood of ponds or lakes situated in hollows, for here the cold air can flow over the earthern dam towards the lower part of the valley. Though no temperature data can be furnished, it is not unreasonable to suppose that the lower margin of the lake occupies a situation milder than usual for such locations and where, moreover, the falling temperatures of autumn would not be accentuated. It was here in the marshy grass margin that I found, this September, several patches of individuals of *Bartsia viscosa* sufficiently numerous to justify the assumption that they had arisen from seed shed the previous year. That the originally introduced seeds were carried by water-fowl seems most probable, since the seeds are quite small, being about a quarter of a millimetre in width, and a third of a millimetre in length. The shape is ellipsoidal and slightly flattened. The surface is nearly smooth and readily wetted, so that the seed is well suited to carriage on the feet of water-birds. Tests showed that the moistened seeds adhered readily to any wet surface and that, moreover, they float. So, whilst owing to the small size and light weight of the seeds they are doubtless dependent on wind dispersal for scattering around the parent plant, for longer distances transfer is dependent on water or bird transport. In this particular area Mrs. Holmes informs me that migrant birds were frequent visitors soon after the artificial lakes were constructed. When *Bartsia viscosa* first appeared is not known, but it was not till some years after the lakes were constructed, so that introduction by human agency during construction of the lakes or the planting of the extensive shrubberies on either side is highly improbable.

This record would appear significant from two aspects. Firstly, the emphasis it places on the ecological conditions, and, secondly, the attention it draws to the efficacy of natural means of dispersal for bringing seeds to any favourable station.

As I have said, the distribution suggests that two factors, namely humidity and temperature, play an important part in determining the limits of this species. Respecting the former it is of interest to note that during the recent very dry seasons there has been a very marked diminution in the abundance and vigour of individuals of *Bartsia viscosa* in the damp meadows near Stowborough in Dorset, and perhaps elsewhere, though this is the only locality I have repeatedly visited. The fact

that the species does not occur in the water meadows of the east suggests that the climatic humidity is of more importance than the edaphic, which might well be an outcome of the low water-conducting efficiency of these semi-parasites. Further, *Bartsia viscosa*, unlike *B. Odontites*, which prefers clays, frequents sandy soils which are not very retentive of water.

Attempts to establish *Bartsia viscosa* by the pond in my own garden at Radlett have failed, not because the plants did not grow and flower, but either because the seeds produced were not viable or failed to germinate. Since seeds brought from Devonshire and sown by the pond produced flowering plants, one is led to believe that the southern trend in the distribution of this oceanic species is connected with the late development of its seeds, and it may be the necessity for a higher temperature for their maturation than normally obtains during September in the north and east is a salient factor in determining its restricted range.

NOTES ON THE FLORA OF THE BERMUDAS.— FRESHWATER ALGÆ FROM BERMUDA.

By Florence Rich, M.A., F.L.S. *.

The following is an account of a few freshwater algæ collected in Bermuda by Dr. A. B. Rendle. So little work has been done on the algæ of these islands that, although the collection now under consideration cannot be looked upon as fully representative, even an imperfect list may serve a useful purpose. In the 'Flora of Bermuda' by N. L. Britton, published in 1918, is a list of algæ contributed by Marshall A. Howe, but the species enumerated are almost all marine.

The pieces of freshwater on the island from which algæ may be collected are few, and some of these, owing to drainage, are rapidly disappearing; those that now exist are just the remains of the original low-lying marshes. There are no rivers or streams, so that the inhabitants have to depend on rain for their water-supply, each house having its own storage tank.

The collections were made in March and April 1933, and the samples all came from ponds and marshes in low-lying districts.

The latitude of the islands is about 32° N., and the nearest mainland is that of the southern United States nearly 600 miles distant. They are surrounded by deep abysses of ocean, the enormous depth of 2500 fathoms being reached 50 miles both to the north and south. The question as to how these algæ

* From the Botanical Department, Queen Mary College, University of London.

have been introduced is a very interesting one, which, in the similar case of the Azores, has been discussed by Bohlin (1901).

Bermuda appears to be a locality not very favourable to the growth of freshwater algæ: this may be due in part to the absence of lakes and rivers, and in part to the influence of spray from which probably no place on the island is free in stormy weather—no spot is more than a mile and a half from the sea, and violent storms come from the Atlantic. Most of the algæ observed are of wide distribution, and therefore, presumably, hardy; as an example may be cited the seven species of the Oscillatoriaceae now found, all of which are cosmopolitan. A certain resemblance can be noted to the algal flora of the Azores, as quite a dozen species recorded from thence occur in the following list. In several instances only one or two individuals of a particular species were observed, this indicating, in all probability, that at other times of the year they occur in greater abundance.

In the sample from Spittle Pond (Tube No. 9) some of the branches of *Enteromorpha* and *Cladophora* were thickly coated with a luxuriant growth of epiphytic algæ, only a few of which could be determined. Spittle Pond is said to be distinctly brackish, and its denizens, therefore, cannot be strictly said to come within the purview of a paper on freshwater algæ.

Desmids are not entirely absent from the collection, but only a small number were found—one species of *Pleurotaenium*, two of *Cosmarium*, and one or two of *Staurastrum*, all sparsely represented. These occurred in the samples taken from Devonshire Marsh, which is about as far from the sea as any place on the island can be. They may be leading a struggling existence owing to contamination by organic matter, as the marsh is said to be rather a foul one; incidentally it may be mentioned that it was here that some Flagellates were found, organisms favouring waters rich in organic nutriment.

Diatoms are poorly represented: sixteen species in the 'Challenger' Collection were attributed to Bermuda by O'Meara and Castracane, but these are all marine. About a dozen species have now been observed, but they are not present in sufficient numbers to render possible a preparation suitable for exact determination. However, in a ditch on the edge of Devonshire Marsh (Tube No. 8) there occurred many beautiful examples of *Navicula ambigua* Ehrenb.

Ten or eleven Flagellates were found, all in Devonshire Marsh, but only in small numbers; the most interesting of these is a form of *Tropidoscyphus*, a genus of which only three species have hitherto been described.

The Myxophyceae (Blue-Green Algæ) are represented by nearly twenty species.

It is rather disappointing that the forms in the collection which appear to differ from those already known do not lend

themselves, in the available preserved material, to satisfactory description. One species of *Phacus*, one of *Tropidoscyphus*, and one of *Dermocarpa* appear to be new. The occurrence of *Oedogonium oelandicum*, a species which seems to have been previously known only from Sweden, is of interest *.

The author desires to express her thanks to Professor F. E. Fritsch, F.R.S., for his kindly advice.

Enumeration of the Samples.

4. Devonshire Marsh, March 20. Duckweed and a good deal of organic debris. *Scenedesmus* sp., *Raphidonema brevirostre*, *Oedogonium* (sterile), *Cosmarium Regnellii*, *Amphora ovalis* f., *Navicula* sp., *Nitzschia* sp., *Euglena spirogyra*, *Trachelomonas hispida*, *Tolypothrix* sp., *Anabaena oscillarioides* var. *tenuis*.

5. Devonshire Marsh, March 20. Duckweed. *Rhizoclonium hieroglyphicum*, *Diploneis elliptica*, *Nitzschia* sp., *Euglena spirogyra*, *Phacus pleuronectes*, *Trachelomonas volvocina*, *Nostoc* sp., *Anabaena oscillarioides* var. *tenuis*, *Oscillatoria laetivirens*, *O. splendida*.

8. Ditch, edge of Devonshire Marsh, March 28. Organic debris. *Cosmarium Regnellii*, *Ophiocytium cochleare*, *Navicula ambigua*, *Navicula* sp., *Hantzschia amphioxys*, *Nitzschia* sp., *Phacus acuminata*, *P. pleuronectes*, *P. triqueter*, *Phacus* sp., *Trachelomonas abrupta*, *T. Lemmermanni*, *T. oblonga* var. *truncata*, *Tropidoscyphus* sp., *Chroococcus* sp., *Oscillatoria sancta*, *O. tenuis*.

9. Spittle Pond (brackish), April 1. *Enteromorpha* sp., *Cladophora* sp., *Xenococcus* sp., *Oncobyrsa* sp., *Dermocarpa* sp., *Chamaesiphon* sp.

10. Devonshire Marsh, April 4. *Characium Brunnthaleri*, *Scenedesmus* sp., *Oedogonium oelandicum* f., *O. monile*, *Cosmarium Regnellii*, *Staurastrum polymorphum* f., *Characiopsis pyriformis*, *Ophiocytium cochleare*, *Tribonema bombycinum* f., *Eunotia arcus*, *Cymbella* sp., *Peridinium* sp., *Tolypothrix* sp., *Anabaena oscillarioides* var. *tenuis*, *Phormidium Retzii*.

12. Pembroke Marsh, April 5. *Tribonema bombycinum* f. *minor*.

15. Devonshire Marsh, April 18. *Tribonema bombycinum* f. *minor*.

16. Warwick Pond, April 19. *Oscillatoria Bonnemaisonii*, *Phormidium Valderianum*.

17. Warwick Marsh, April 22. *Tribonema bombycinum* forma, *Characiopsis pyriformis*, *Oscillatoria* sp.

18. Warwick Pond, April 22. *Cladophora* sp., *Enteromorpha* sp.

* Since writing the above, I find that this species is known from Woods Hole, Massachusetts, and other American stations.

Systematic Enumeration of the Species observed *.

Class CHLOROPHYCEAE (Isokontae).

Characium Brunnthaleri Printz. (Fig. 1, I, J.) Long., 16–24 μ; lat., 3–7·5 μ. Growing on *Oedogonium*. Shape variable. Very similar to *Characium strictum* A. Br., a species which is known to grow on *Oedogonium*, but in view of the comparison drawn by Printz (1915, p. 15) between these two species it seems best to classify it as above.

Sample 10. Rather common.

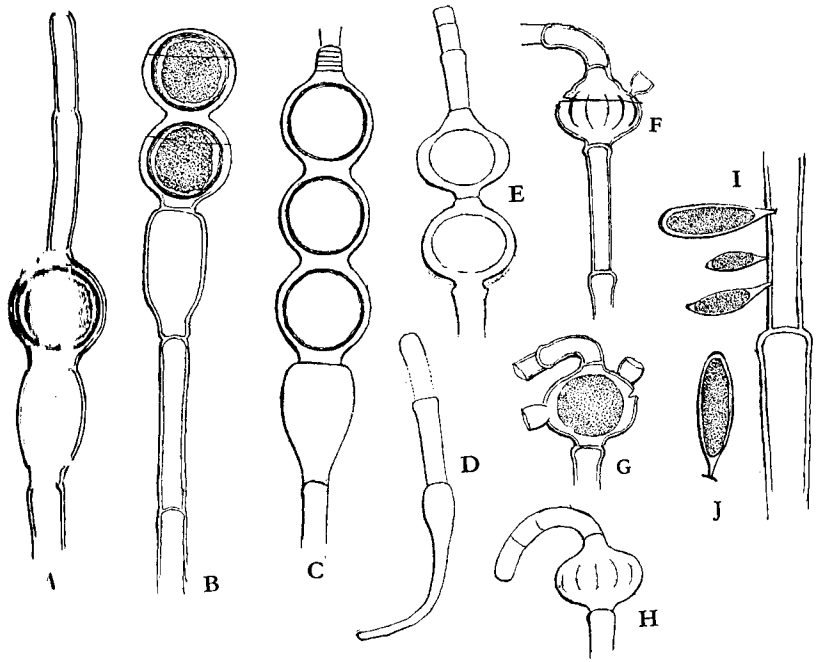


Fig. 1.—A–C, *Oedogonium monile* (Berk. & Harv.) Wittr.; D–H, *Oedogonium oelandicum* Wittr., forma nov.; I, J, *Characium Brunnthaleri* Printz.

Scenedesmus acuminatus (Lagerh.) Chodat. Long. cell., 10 μ; lat., 3·5 μ.

Sample 4. Very rare.

S. denticulatus Lagerh., forma. Long. cell., 15–20 μ; lat., 5–7 μ.

Samples 4 and 10. Very rare.

* The sequence is that of F. E. Fritsch in 'The Structure and Reproduction of the Algæ,' 1935.

ENTEROMORPHA sp. Four species of this genus have already been recorded from Bermuda.

Samples 9 and 18. Common.

CLADOPHORA sp. Main stems 80–100 μ broad. Branches usually single. Some branches thickly overgrown with blue-green epiphytes.

Samples 9 and 18. Common. Five species have been recorded from Bermuda.

RHIZOCLONIUM HIEROGLYPHICUM (Ag.) Kütz. Filaments 25 μ wide.

Sample 5. Rare.

Already recorded from Bermuda.

RAPHIDONEMA BREVIROSTRE Scherffel; Nygaard, 1932, Trans. Roy. Soc. S. Afr. 134, fig. 29. Filaments, consisting of about four cells 4 μ wide, tapering at the ends; one end more attentuate than the other.

Sample 4. Very rare.

OEDOGONIUM OELANDICUM Wittr., forma nov. (Fig. 1, D–H.) (Hirn, 1900, p. 273.) Crass. cell. veget., 7–9 μ; altit., 5–6-plo major; crass. oogon., 32–38 μ; crass. oosp., 24–25 μ; crass. cell-androsp., 8 μ; crass. nannandr., 8–10 μ.

Dicœcious, gynandrosporous, oogonia single or two together, depressed globose, vertically plicate in the median portion, opening by an operculum which is supra-median, oospore spherical or slightly depressed, not quite filling the oogonium, membrane smooth. The supporting-cell is not tumid. The vegetative cells are slightly capitate, and the terminal cell is obtusely rounded. The androsporangia, which are 2–3-celled, are situated above the oogonia. The dwarf male is oboviform, one-celled, and is seated on the oogonium. The curving of the filament above the oogonium, after the discharge of the androspores, is characteristic (fig. 1, F, G).

The form under consideration resembles *O. oelandicum* Wittr. in its capitate cells, its oogonium with longitudinal folds, and its unicellular dwarf males. But not more than two oogonia were ever observed together, whereas in the type there may be seven, and the androsporangia were not more than two in number, whereas in the type there may be six. The vegetative cells, again, were not so wide as in *O. oelandicum*, but these differences do not seem sufficient to warrant the proposing of a new variety. This species comes near *O. megasporum* Wittr., which, however, is idiosporous. It is also near *O. boreale* Hirn, which is larger.

O. oelandicum appears to be known hitherto only from Sweden, hence the rather full description of it now given *.

Sample 10. Common.

* See footnote on p. 74.

O. MONILE (Berk. & Harv.) Wittr. (Fig. 1, A–C.) Crass. cell. veget., 10–12 μ, ca. 6-plo major; crass. cell. suffult., 18 μ; crass. oogon., 32–38 μ; crass. oosp., 35–36 μ.

Oogonia single, or up to four in series, globose, opening by an operculum, slit superior; oospore globose, nearly filling the oogonium, membrane thick; supporting cell tumid; vegetative cells very slightly capitate. No dwarf males or androsporangia were seen, in spite of prolonged search.

This *Oedogonium* resembles *O. hians* Nordst. & Hirn, but there the oogonia are as a rule single. *O. monile* is said to have a sculptured mesospore, the structure of which is difficult to see. Wittrock, who established the species, did not find any dwarf males; they evidently do not preserve well (Hirn, 1900, p. 229).

Sample 10. Common.

The type and certain *formæ* are known from Australia and South America.

OEDOGONIUM sp. Sterile filaments were observed in samples 1 and 10.

PLEUROTAENIUM TRABECULA (Ehrenb.) Naeg. Only one empty semicell was observed, which, however, undoubtedly belonged to this species.

Sample 5. Isolated.

COSMARIUM REGNELLII Wille. Long. cell., 14–17 μ; lat., 13–14 μ; isthm., 4–5 μ. Ends straight, or very slightly concave. Some of the individuals observed closely resembled *C. sexangulare* Lund. forma *minima* Nordst., but as most of them showed the straight, broad, truncate apex characteristic of *C. Regnellii* the above determination is probably correct. (*Cf.* W. & G. S. West, 1908, p. 89.)

Samples 4, 5, 8, and 10. Very rare.

COSMARIUM sp. (2). Only one individual seen.

Sample 10. Isolated.

STAURASTRUM POLYMORPHUM Bréb., forma (West and Carter, 1923, British Desmidiaceae, v. p. 125, pl. xliii. fig. 2). Long. cell., 33 μ; lat., 38–40 μ; isthm., 7·5–8·5 μ.

Dorsal margin rather strongly convex, causing the length of the cell to be a little greater than usual. The short stout processes are tipped with three minute spines, and are provided with four series of minute denticulations. Vertical view triangular, lateral margins slightly concave.

Sample 10. Very rare.

This is a variable species of almost world-wide distribution.

Class XANTHOPHYCEAE.

CHARACIOPSIS PYRIFORMIS Borzi (*Characium pyriformis* A. Br.). (Fig. 2, A–C.) Long. cell. (cum stip.), 20–26 μ; lat., 4·5–6·5 μ.
Epiphytic on *Tribonema*.
Samples 10 and 17. Rather rare.

OPHIOCYTIUM COCHLEARE A. Br. Filaments about 6 μ wide; coils consisting of two to three turns. The ends were not clearly seen, as the rare individuals observed were mixed up with débris.
Samples 8 and 10. Very rare.
A widely distributed species.

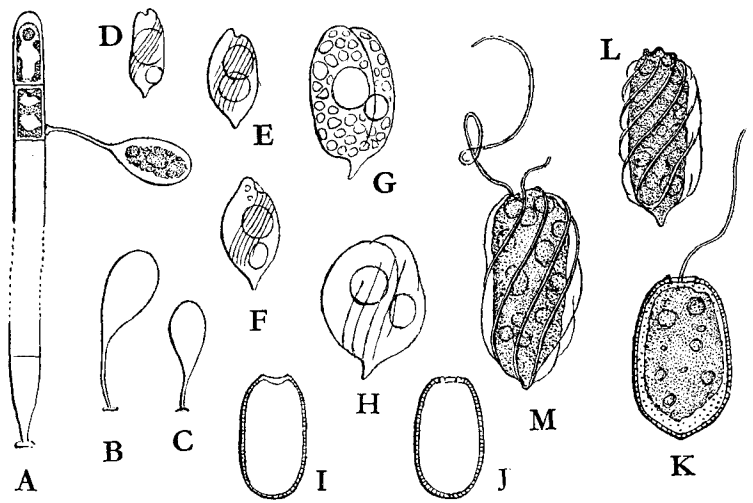


Fig. 2.—A, *Tribonema bombycinum* Derb. & Solier forma *minor* (Wille) G. S. West, with epiphyte; B, C, *Characiopsis pyriformis* Borzi; D–F, *Phacus* sp.; G, H, *Phacus acuminata* Stokes; I, J, *Trachelomonas abrupta* Swir. emend. Deflandre; K, *Trachelomonas Lemmermannii* Wolosynska emend. Deflandre; L, M, *Tropidoscyphus* sp.

TRIBONEMA BOMBYCINUM Derb. & Sol. forma MINOR (Wille) G. S. West. (Fig. 2, A.) Filaments 4–5 μ wide.
Samples 10, 12, 15, and 17. Rather rare. Widely distributed.

Class BACILLARIOPHYCEAE.

EUNOTIA ARCUS Ehrenb. Long., 83–97 μ; lat., 9–10 μ; striae in 10 μ=12. Larger than the type.
Sample 10. Rather rare.
A widely distributed Diatom.

AMPHORA OVALIS Kütz. (Form or variety, but very few individuals seen.)

Sample 4. Very rare.
A common Diatom.

CYMBELLA sp.
Sample 10.

DIPLONEIS ELLIPTICA (Kütz.) Cleve. Long., 22–28 μ; lat., 16 μ; striæ in 10 μ ca. 12.
Samples 4 and 5. Very rare.
A common Diatom.

NAVICULA AMBIGUA Ehr.; W. Smith, 1853, pl. xvi. fig. 149. (Syn. *N. cuspidata* Kütz. var. *ambigua* (Ehr.) Cleve.) Long. cell., 78–84 μ; lat., 20–21 μ.
Sample 8. Common. The only Diatom at all common in the collection. Widely distributed.

NAVICULA spp.
Samples 4, 5, and 8.

HANTZSCHIA AMPHIOXYS (Ehr.) Grun. f. CAPITATA O. M. Long. cell., 70 μ.
Sample 8. Very rare: but widely distributed in the world.

NITZSCHIA spp.
Samples 4, 5, and 8. Rare.

Class DINOPHYCEAE.

PERIDINIUM sp. Two or three cysts were observed.
Samples 9 and 10.

Class EUGLENINEAE.

EUGLENA SPIROGYRA Ehrenb.; Lemmermann, Brandenburg Algæ, 1910, p. 498, fig. 18 on p. 483. Long cell. (spin. incl.), 91–100 μ; lat., ca. 10 μ
Samples 4 and 5. Rare.
A widely distributed Flagellate.

PHACUS ACUMINATA Stokes. (Fig. 2, G, H.) Long. cell., 26–28 μ; lat., 20–24 μ. Fold reaching almost to the hinder end. Two paramylon grains.
Sample 8. Rare.
Known from North America and other places.

P. PLEURONECTES (O. F. M.) Duj. Long. cell., 42–50 μ; lat., 32–34 μ. The fold extends only a short way down the cell.
Samples 5 and 8. Rare.

P. TRIQUETER (Ehrenb.) Duj.; Deflandre, 1927, p. 217, fig. 25. Long cell., 54–60 μ; lat., 36–40 μ. The fold reaches nearly to the hinder end. The striæ are longitudinal, and there is one large paramylon grain.
Sample 8. Rare.

PHACUS sp. (Fig. 2, D–F.) Long. cell., 15–20 μ; lat., 10–11·5 μ. The cells are small, variable in shape, with the posterior end in the form of a small spine. There are two paramylon grains, one in front of the other. The membrane is spirally striated. The flagellum was not seen.

One of the smallest species of *Phacus* hitherto described is *P. agilis* Skuja, which may be identical with the one now figured, but in that the end is not so regularly pointed and the paramylon grains are apparently different.

There is also a resemblance to *P. oscillans* Klebs, but that has only one paramylon grain and is larger.

P. aenigmatica Drez. is also somewhat like, but it has three paramylon grains.

Sample 8. Rare.

Another species of *Phacus* is present in sample 9; it is very rare.

TRACHELOMONAS ABRUPTA Swir., emend. Deflandre. (Fig. 2, I, J.) (Deflandre, 1926, p. 95.) Long. cell., 22–23 μ; lat., ca. 12 μ.

Cells cylindrical, sides parallel (fig. 2, I) or slightly convex (fig. 2, J); membrane densely and finely scrobiculate, light brown.

Sample 8. Rare.

This seems to be a widely distributed species.

T. HISPIDA (Perty) Stein, forma. Long. cell., 24 μ.

Sample 4. Rare. Very few individuals seen.

T. LEMMERMANNII Wolosynska, emend. Deflandre. (Fig. 2, K.) Long. cell., 28–29 μ; lat., 16–17 μ. Cells pale brown; posterior pole conical with rounded extremity; sides straight, converging slightly towards the upper end; membrane scrobiculate.

This comes very near *T. conica* Playf. forma *punctata* Defl., which, however, has parallel sides.

Sample 8. Very rare.

Known from both eastern and western hemispheres.

? T. OBLONGA Lemm. var. TRUNCATA Lemm.; Deflandre, 1926, p. 69, fig. 136. Long. cell., 11 μ; lat., 9–10 μ.

Sample 8. Very rare. Too few individuals seen to make this determination certain.

T. VOLVOCINA Ehrenb.

Diam. cell., 18–19 μ.

Sample 5. Rare. A very widely distributed *Trachelomonas*.

TROPIDOSCYPHUS sp. (Fig. 2, L, M.) Long cell., 32–36 μ; lat., 15–18 μ. The sides are parallel; the anterior end is flattened and the posterior pointed. In material preserved in formalin

the flagella are often difficult to see; in three instances I could detect at least one flagellum, but it was not clear, amongst débris, that what looked like a second was not the curved-back tip of the first. The ribs were very prominent. In side-view it appears to be a little flattened.

Of the few known species of *Tropidoscyphus* it seems to be nearest to *T. ovatus* Skuja.

Sample 8. Rare.

Class MYXOPHYCEAE (CYANOPHYCEAE).

? CHROOCOCCUS MINOR (Kutz.) Naeg.; Geitler, 1932, p. 240, fig. 116 *g*. Cells four together, 3–4 μ wide.

Sample 8. Very rare.

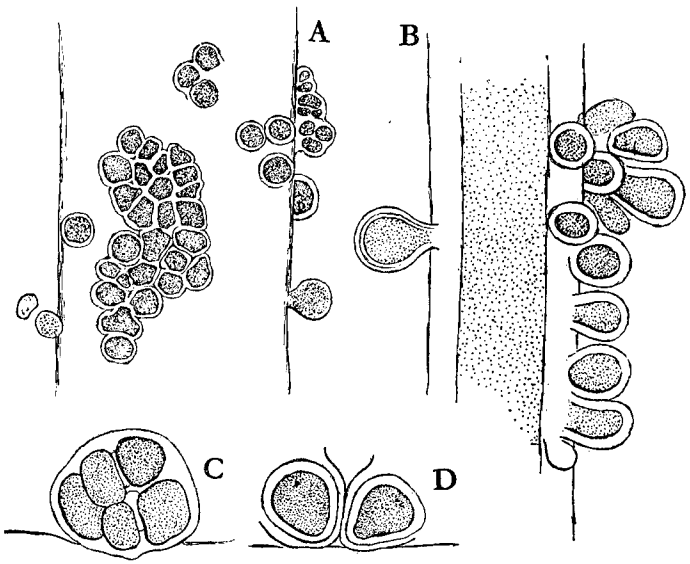


Fig. 3.—A–D, *Xenococcus* (?) *Cladophorae* Tilden. A, less highly magnified than the others.

? C. MINUTUS (Kütz.) Naeg. Cells two together, about 10 μ wide.

The somewhat similar *Chroococcus turgidus* (Kütz.) Naeg. has been recorded for Bermuda, but in that species the membrane is stratified, whereas here it does not appear to be so.

Sample 8. Rare.

XENOCOCCUS (?) CLADOPHORAE Tilden; Geitler, 1932, p. 336. (Fig. 3, A–D.) Cells irregular, on an average 10 μ wide, forming an incrustation on *Cladophora*; blue-green, with a

colourless membrane which often shows two layers. I think the species now observed must be the same as that originally described by Tilden as growing on *Cladophora* on the coasts of British Columbia.

Sample 9. Common.

ONCOBYRSA sp. On *Enteromorpha* were growing cushions (up to 40 μ in diameter) of minute cells arranged in radial lines, which I take to belong to a species of *Oncobyrsa*. It is probably marine, though the degree of salinity of the water in which it was found was not ascertained.

Sample 9. Common.

DERMOCARPA sp. (Fig. 4.) Cells 8–12 μ in diameter, spherical, blue, surrounded by a colourless stratified membrane. It was growing on *Enteromorpha*, to the surface of which the cells were attached by means of a pad of mucilage which stained up well with methyl-blue. The spores appear to be formed successively and not simultaneously (see figure).

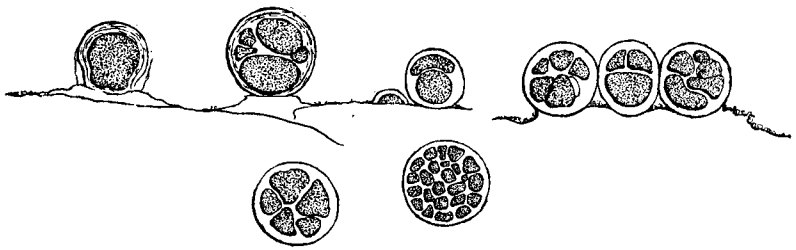


Fig. 4.—*Dermocarpa* sp. growing on *Enteromorpha*.

It seems to be near *Dermocarpa sphaerica* Setchell & Gardner (Geitler, 1932, p. 363), but in the description of that species I can find no special reference to the mucilage-pad connecting the cells with the host-plant, and the spores are said to be formed simultaneously. Anand has recently described (Journ. Bot. 1937, Suppl. p. 42) a *Dermocarpa* (*D. Enteromorphae*) growing on *Enteromorpha paradoxa* Kütz., but in that the cells are very much larger, and there is no marked mucilage-pad.

Sample 9. Common.

CHAMAESIPHON GRACILIS Rabenh.; Geitler, 1932, p. 423, fig. 242. Cylindrical sporangia, about 2 μ wide and 26–36 μ long. Growing on *Enteromorpha*.

Sample 9. Rather rare.

? TOLYPOTHRIX DISTORTA Kütz. var. PENICILLATA (Ag.) Lemm. Lat. fil., 12–16 μ; lat. trich., 7–8 μ. Cells a little shorter than wide. The plant-mass was not observed, hence the determination is a little doubtful; such filaments as were seen seemed

to agree with the above (see Geitler, 1932, p. 719). The false branches are often parallel to the main filament.

Sample 4. Rather rare.

The type is cosmopolitan, and is known from the Azores.

? T. TENUIS Kütz.; Geitler, 1932, p. 716, fig. 458 *a*. Lat. fil., 5–6 μ; lat. trich., 8–10 μ. Cells usually a little longer than broad. Branching rare. Plant-mass not seen, hence determination doubtful.

Sample 10. Rather rare. This species is widely distributed.

NOSTOC sp. One small colony was observed in Sample 5. (*Nostoc commune* Vauch. has already been recorded for Bermuda.)

ANABAENA OSCILLARIODES Bory var. TENUIS Lemm. (Fig. 5, A–C.) Lat. cell., 4–5 μ; lat. heteroc., 4–6 μ; spor., 5–7 $\times$ 10–14 μ.

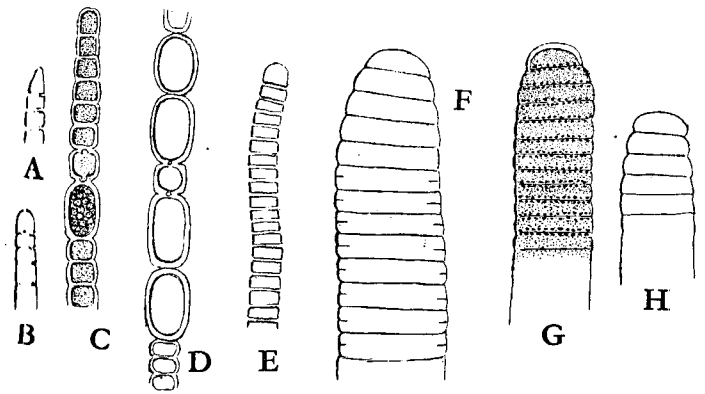


Fig. 5.—A–D, *Anabaena oscillarioides* Bory var. *tenuis* Lemm.; E, *Oscillatoria tenuis* Agardh; F, *Oscillatoria Bonnemaisonii* Crouan; G, H, *Oscillatoria sancta* (Kütz.) Gom.

Pseudovacuoles are sometimes present. The end-cell is narrowed, and may be either conical or broadly rounded (see fig. 5, A, B). The heterocysts are round or quadrate. The spores are cylindrical (becoming elliptical when mature), single, or two together, and usually adjacent to the heterocysts. In the pointed end-cell of some filaments it resembles the very closely allied *Anabaena torulosa* (Carm.) Lagerh., but it does not show the constricted spores which are sometimes observed in that species; *cf.* Geitler, 1932, p. 887. The occurrence of both pointed and rounded end-cells serves to confirm Geitler's contention that *A. oscillarioides* and *A. torulosa* are one and the same species.

Samples 4, 5, and 10, occurring mainly on the roots of duckweed. The type is cosmopolitan.

OSCILLATORIA BONNEMAISONII Crouan; Gomont, 1892, p. 215. (Fig. nostr. 5, F.) Trichomes with slightly attenuated, non-capitate ends, 20–24 μ wide. Cells 3–4 μ long, very slightly constricted at the joints; partitions not granulate.

Sample 6. Rather rare.

O. LAETIVIRENS (Crouan) Gomont, 1892, p. 226, pl. vii. fig. 11. Lat. trich., 6 μ.

Sample 5. Rather rare.

O. SANCTA (Kütz.) Gomont, 1892, p. 209. (Fig. nostr. 5, G, H.) Trichomes 14–15 μ wide, distinctly constricted at the joints, abruptly narrowed at the apex; end-cell flattened, with thickened membrane. Cells about one-sixth as long as broad, granulated at the joints.

Sample 8. This is a well-defined species of cosmopolitan distribution, and is known from the Azores.

O. SPLENDIDA Grev.; Gomont, 1892, p. 224, pl. vii. figs. 7, 8. Trichomes 2 μ wide, attenuated at the apex, with a few granules at the joints; end-cell with an inflated apex.

Sample 5. This species also is of world-wide distribution.

O. TENUIS Agardh; Gomont, 1892, p. 220. (Fig. nostr. 5, E.) Trichome 4–5 μ wide.

Sample 8. Another cosmopolitan species.

PHORMIDIUM RETZII (Ag.) Gom. Filaments more or less straight, 6 μ wide, scarcely constricted at the joints; not attenuated at the end, not capitate, though the outer membrane of the end-cell is slightly thickened. Cells usually longer than broad. Sheath thin.

Sample 10. Rather common. Cosmopolitan.

P. VALDERIANUM Gomont, 1892, p. 167. Trichomes 2 μ wide, not constricted at the joints, but with one granule at each end of every cell. End-cell rounded, without calyptra.

Sample 16. Rather rare. Cosmopolitan.

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SHORT NOTES.

ANAGALLIS ARVENSIS L. var. CARNEA Schrank.—My knowledge of the plant usually named as above is limited to Cornwall, but here, at any rate, it seems to be something more than a form of *A. arvensis* with flesh-coloured flowers. That, as far as I can find, is all the importance most of the British Floras assign to it. Its range of habitat is different from that of typical *A. arvensis*. It is especially a sand-dune plant, occurring plentifully on the dunes at Perranporth, and also in the Scilly Islands (plentiful on sand dunes, Carn Near, Tresco, Isles of Scilly—J. E. Lousley, B. E. C. 1936 Report (1937), 267). It occurs, too, on headlands along the coast. Occasionally it is found inland, but probably most of such inland occurrences are directly due to the conveyance of dune sand to farm land. At Lambourne, Perranzabuloe, I have found it on a stony waste place near a small depot of sand, and at Ventongimps in the same parish I once saw it in some quantity with ordinary *A. arvensis* and a purple-flowered form covering heaps of peaty clay dug from ditches with which dune sand had been freely mixed to lighten it for agricultural use.

I have never found var. *carnea* growing with root crops or corn, though *A. arvensis* is, of course, often very plentiful with such crops. In S. T. Dunn's 'Alien Flora of Britain' *A. arvensis* is said to be a widely spread weed of roadsides, cultivated, and waste places, native on sand dunes in England as well as in southern and western Europe, though not often recorded in England from natural habitats and possibly confined as a native to the south-western counties. Scarlet-flowered *A. arvensis* certainly occurs in our sand dunes, doubtless as a native, in a less robust form than that of cultivated ground. The poverty of the habitat may be the only reason for this weaker habit, though in view of the apparent disinclination of var. *carnea* to grow in richer soil there is the possibility that the native scarlet-flowered plant, too, is of a different race from that of the fields. In habit var. *carnea* is very different from the prostrate, wide-spreading growth usual with *A. arvensis*. The average plant of var. *carnea* consists of four to six semi-upright stems, often all less than 4 inches long, and as far as I have seen it preserves the same habit as a casual in inland stations. F. N. Williams ('Prodromus Florae Britannicae,' 432) considered that this upright habit of var. *carnea* pointed to its hybrid origin from a cross of *A. arvensis* L. and *A. latifolia* L.—H. KILSTONE.

· · · DROSERA AND BUTTERFLY.—In my herbarium there is a very small specimen of both *Drosera rotundifolia* and *D. longifolia*, with parts of the damaged and somewhat bleached wings of a Meadow Brown Butterfly (*Maniola jurtina* L.) adhering to the leaves. The two Sundews were growing together in thick masses on Ashcott Peat-moor, N. Somerset, Aug. 7, 1925; and I kept the two specimens to show the wings of the butterfly. In removing the little plants, of course, the dead butterfly became still more damaged. I cannot say if by chance the insect fell dead on the Sundew, but I believe not.—H. S. THOMPSON.

OBITUARY.

WILLIAM BYWATER GROVE.

WILLIAM BYWATER GROVE was born at Birmingham in 1848. At school he excelled in classics and mathematics; in 1871 he passed the Mathematical Tripos (*senior optime*) at a Cambridge that knew not botany. He taught a great variety of subjects in private schools; was Headmaster of Birmingham High School for Boys at Queen's College from 1887 till it was closed in 1900; lecturer in Horticultural Botany and Chemistry at Studley Horticultural College till 1908, and lecturer in Botany at Birmingham Municipal Technical School from 1905 to 1927. Throughout he keenly supported the Birmingham Natural History Society, was in turn librarian, secretary, and President, and contributed about twenty papers to the 'Midland Naturalist,' mostly on the fungi of the midland plateau. For many years he was Honorary Curator of the University Herbarium, and an inspiration and a joy on the botanical excursions. He received the M.Sc. (*honoris causa*) in 1936.

He started to teach himself botany in 1868, and mycology in 1881, the year before the commencement of Saccardo's 'Sylloge fungorum,' the author of which Grove soon acclaimed as "standing head and shoulders above all the other mycologists of the age." From 1884 to 1886 appeared the first three parts of his "New or noteworthy Fungi" in the *Journal of Botany*; and from that time he stood, especially among the microfungi, a mycologist in his own right—a well-informed and accurate observer, equipped with adequate draughtsmanship and a flair for apt description, and animated with the true collector's urge. During the years of his headmastership, the exacting study of the microfungi mostly lapsed, but was resumed shortly after, and continued, with one further break, nearly to the end; "New or noteworthy Fungi.—Part XIII.," in 1933, marked his hundredth paper.

In 1913 appeared his first major work, 'British Rust Fungi,' a book of international calibre, that has been standard here for

a quarter of a century. In 1931 appeared the three volumes of Grove's translation of the Tulasnes' 'Selecta fungorum carpologia': an exact, euphonious, and most scholarly rendering of one of the great masterpieces of cryptogamic botany; he completed it on his eightieth birthday. It was a digression, however, and time was pressing. For years, his heart had been set on monographing the British Coelomycetes—"to set before the English speaking reader, for the first time in his own language, and so far as it is illustrated by the British species of the group, a panoramic view of the skilful structure erected by the inimitable genius of Saccardo, some fifty years ago, to include them all in one scheme." Happily for British mycology he won the race, and the second and final volume of his 'British Stem- and Leaf-fungi (Coelomycetes)' appeared in 1937, shortly before his death. That this marks a beginning and not an end, he was vividly aware; his comment, addressed to a generation that knows not the woods, is pure Grovian: "Whatever is done, one thing remains firm. Rotating on a laboratory stool is not the only way, perhaps not even the best way, of solving Coelomycetous secrets."

He died on January 6, 1938, and is survived by his daughter, Nora.—E. W. MASON.

BOOK-NOTES, NEWS, ETC.

'LEBENSGESCHICHTE DER BLÜTENPFLANZEN MITTELEUROPAS.' Forty-seven years ago Professors O. von Kirchner, E. Loew, and C. Schröter issued the first part of this book on the plan of giving in detail the life-histories of all the flowering plants of Germany, Austria, and Switzerland. Since then the first two of the authors have died, and the third—may he live long!—is well advanced in years. Professor W. Wangerin of Dantzig has become joint-author with him. In all over 5,000 pages have been published; but at a moderate estimate the plan of the work demands yet another 10,000. Fortunately the work has a great value, however incomplete, for each genus of plants is treated apart, and may be taken detached from the rest; but the promoters had been wiser to have planned a more elastic work, and more documentation in the text. It should be classed with works of reference; for no one is going to sit down to read anything so enormous; and it should have been made more of a dictionary.

The new part (sheets 62–73, *i. e.*, pp. 953–1144, of volume 2, part 1), price R.M. 12, is on the Mistletoe. Though of nearly 200 pages, it does not reach the end of the subject. The writer of the part is Professor Wangerin, and he has done his work well. But had it not been that the plan of the Lebensgeschichte demanded a discussion of the genus *Viscum* before less worked

subjects be discussed, this green parasite could have been left in the safe keeping of Tubeuf's 'Monographie der Mistel' (1923), with gain to botanists at large. In fact, the promoters of the Lebensgeschichte were too sanguine. The cost of their first part was 3*s*. 6*d*. for its 96 pages; the cost of the same amount of printing is three times as much now; and the literature to be gathered together nearly one hundred times as much. Will the work ever be complete?—I. H. B.

In connection with the movement for the preservation of the fauna and flora of the Empire, attention has been drawn to the imperfection of our knowledge of the fauna and flora of Fiji and the Western Pacific High Commission Territories. It is accordingly of interest that these Governments have recently expressed the hope that the subject will attract more attention in future. Adequately qualified naturalists desirous of devoting a few months to such studies in these territories under favourable conditions should consult the Under Secretary of State, Colonial Office, Downing Street, S.W. 1, on the subject.

The Third International Congress for Microbiology will be held at New York, September 2–9, 1939. There will be nine sections, one of which is Fungi and Fungous Diseases, with Dr. B. O. Dodge, New York Botanical Garden, as convener. The registration fee will be five dollars, which will not include the cost of a banquet ticket or a copy of the 'Proceedings of the Congress.'

At the celebrations of the Quartercentenary of the University of Coimbra held in December, Mr. J. Ramsbottom was one of the sixteen recipients of honorary doctorates. An interesting account of the various ceremonies which commemorated the final establishment of the University at Coimbra in 1537 is given in 'Nature' for January 8. The University was founded at Lisbon in 1290 and was moved to Coimbra for the first time in 1308, and twice transferred back to Lisbon (1337 and 1377) before its definitive move.

The name of Elias Magnus Fries ranks as the highest in the history of Mycology. Unfortunately, some of his writings are now to be obtained only with difficulty, and amongst the rarest is his monumental 'Monographia Hymenomycetum Sueciæ,' published in two volumes, the first of 526 pages in 1857 and the second of 380 pages in 1863; the edition was limited to one hundred copies. Dr. Werner Klinkhardt of Liebigstrasse 6, Leipzig, proposes to issue an "unchanged reprint" of the work if he can secure a sufficient number of orders; the price to subscribers for the two volumes bound in cloth is 75 Marks less 25 per cent. "Valuta-Nachlass."

Correction.—Journ. Bot. lxxv. p. 345, line 18, for "*U. sativa* Lindley" read "*U. stricta* Lindley."

STUDIES OF BRITISH POTAMOGETONS.—I.

By J. E. Dandy, M.A., and G. Taylor, D.Sc.

It was not until towards the end of last century that the study of the genus *Potamogeton* L. received special attention from British botanists. About that period the pondweeds stimulated the critical interest of certain amateur botanists, notably Alfred Fryer (1826–1912) and his friend Arthur Bennett (1843–1929). Fryer, who had the advantage of living in his native Cambridgeshire within easy reach of aquatic habitats rich in pondweeds, devoted himself to a monographic survey of *Potamogeton* in Britain, and to that end carried out extensive field-studies which he supplemented with careful observation of cultivated plants. His published work, always scholarly in its presentation, showed that he had a genuine understanding of Potamogetons as living organisms. Unfortunately the magnificently illustrated monograph which he began to publish in 1898 remained unfinished at his death, though it was continued from his notes by W. H. Evans in 1913 and was eventually concluded by Bennett in 1915 with an account of the sections *Chloephylli* and *Coleophylli* *. Bennett had comprehensive interests in the British flora, but paid particular attention to *Potamogeton* and became an acknowledged authority on the genus, not merely as it occurs in Britain but as it is represented throughout the World. His work, however, lacked consistency and was confused as the result of inaccurate observation, especially in his later years. Moreover, although he published voluminously on the British species his writings were not improved by their "contradictory and unfinished style" to which Fernald has already made reference (in Mem. Gray Herb. iii. 8 (1932)) in a criticism of Bennett's work on North American pondweeds. The conclusion cannot be avoided that any elucidation of taxonomy for which Bennett was responsible was more than offset by the confusion which he left for future workers to resolve. More recently W. H. Pearsall (1860–1936) engaged himself in the study of *Potamogeton*, and, for British botanists, the mantle of Bennett fell on him. Pearsall lived for many years in the English Lake District, and made valuable observations on the life-histories and ecology of the pondweeds which occur in that region. His published work, culminating in his 'Notes on *Potamogeton*' †, was largely an attempt to apply Hagström's elaborate classification to British Potamogetons; unfortunately, however, his results were often marred by inaccurate identification.

* Fryer, A., and Bennett, A., 'The Potamogetons (Pond Weeds) of the British Isles', London, 1898–1915.

† In Bot. Soc. & Exch. Club Brit. Is. ix. 148–156 (1930) & 380–415 (1931).

No account of *Potamogeton* has yet been published which gives a comprehensive survey of the British species with satisfactory details of their distribution. It is our ultimate aim to present a monographic study of the genus as it occurs in Britain, and with this end in view we invite the co-operation of botanists in sending us material for examination. In the meantime, we think it may be useful to publish this series of preliminary notes on points of interest as they arise.

I. The Typification of *Potamogeton pusillus*.

Potamogeton pusillus L., type of the subsection *Pusilli*, was one of the twelve original species of *Potamogeton* in Linnaeus's 'Species Plantarum' (1753). Since Linnaeus's time *P. pusillus* has been variously delimited—even *P. Friesii* and *P. rutilus* have been included as subspecies or varieties—but whatever the limits assigned to the species by post-Linnaean authors there appears to have been general agreement that typical *P. pusillus* is represented by the common "*P. pusillus*" of Europe, a plant with convolute open stipular sheaths and narrow three-nerved leaves in which the midrib is bordered by lacunae. By the beginning of the present century *P. pusillus*, as interpreted by the majority of authors, comprised a mixture of two widely distributed species, which, though superficially alike in the dried state, are actually very distinct plants with important differences in habit, in the nervation of the leaves, in the form and position of the winter-buds, and particularly in the structure of the stipular sheaths. One of these two species is strictly North Temperate and Subarctic with a circumboreal distribution; it has convolute open stipular sheaths and includes the common "*P. pusillus*" already mentioned. The second species, which has closed (tubular) stipular sheaths, extends much further south, reaching South Africa in the Old World and southern Mexico in the New; it was described by Fries in 1828 under the name *P. gracilis** and by Bivona-Bernardi in 1838 under the name *P. panormitanus*. Confusion between these two species persisted until Hagström, by careful comparison, discovered the essential differences between them. In Neuman's 'Sveriges Flora' (1901), pp. 792–3, 801–3, Hagström recognized the two species as distinct, restricting the name *P. pusillus* to the first and taking up the name *P. panormitanus* for the second, but at that time he was unaware of the important difference in the structure of the stipular sheaths. Subsequently, however, following a more intensive study of the genus, he published his elaborate monograph, 'Critical Researches on the Potamogetons' †, a feature of which was his masterly elucidation of the

* Non *P. gracilis* Wolfg. (1827).

† In K. Svensk. Vetenskapsakad. Handl., Ny Följd, lv. 5, 1–281, figs. 1–119 (1916). Where it is necessary to cite this work we shall use the abbreviation "Crit. Res."

morphological differences that exist between these two species which have been so much confused under *P. pusillus*. In this work Hagström for the first time pointed out the difference in the structure of the stipular sheaths, and stressed its importance in the classification of the subsection *Pusilli* by using it as the basic character in separating two series: *Pusilli convoluti* (for his "*P. pusillus*" and other species with convolute open stipular sheaths) and *Pusilli connati* (for *P. panormitanus* and allied species with closed stipular sheaths). His work on these species received the wide recognition it deserved, and has been largely accepted by specialists in *Potamogeton*, notably by Pearsall in Bot. Soc. & Exch. Club Brit. Is. ix. 151, 154 (1930) and by Fernald in Mem. Gray Herb. iii. 60, 80 (1932).

When we began a study of British Potamogetons in 1937 we considered it advisable at an early stage to examine the types of Linnaeus's species of *Potamogeton*, since there has been controversy about the application of some of the names and none of them has been dealt with by the modern type-method. An investigation into the case of *P. pusillus* seemed particularly desirable, for an obvious lacuna in Hagström's account of the species was his failure to discuss or even mention the type. Linnaeus (Sp. Pl. i. 127 (1753)) published the species in the following form:—

> "12. Potamogeton foliis linearibus oppositis alternisque distinctis: basi patentibus, caule tereti. *Fl. suec.* 147. *Dalib. paris.* 56.
> Potamogeton foliis linearibus alternis remotis. *Roy. lugdb.* 213.
> Potamogeto[n] pusillum, gramineo folio breviore. *Vaill. paris. t.* 32. *f.* 4.
> *Habitat in* Europæ *paludibus*. ⊙".

Except that the word "distinctis" replaced "distantibus", the definition was copied, as indicated by Linnaeus, from his 'Flora Suecica' (1745). In that work (p. 52) the species appeared as "147. Potamogeton foliis linearibus oppositis alternisque distantibus, basi patentibus, caule tereti", with six pre-Linnaean synonyms (including the two cited in the 'Species Plantarum') and the geographical note "Habitat *in paludibus & lacubus prope* Upsaliam *copiose*". In the Linnean Herbarium the species is represented by a single sheet, named "12. *pusillum*" by Linnaeus himself and known to have been in the herbarium in 1753. This sheet bears three separate specimens which are taxonomically identical and may well have come from the same individual plant; to the left is a flowering branch, to the right another (smaller) flowering branch with a sterile branch below it. The sheet lacks any indication of the locality or collector, but in the absence of evidence to the contrary it is permissible to assume that the specimens are Swedish and that they came

from the neighbourhood of Uppsala. They agree with Linnaeus's definition of *P. pusillus* and clearly rank as syntypes of the species. Superficially they would pass for either of the two species which have been so much confused under *P. pusillus*, but careful examination shows that they undoubtedly belong to the species with closed stipular sheaths—*i. e.*, they are conspecific with *P. panormitanus* and not with the open-sheathed species to which Hagström restricted the name *P. pusillus*.

According to the map published by Almquist in Act. Phytogeogr. Suec. i. fig. 305 (1929) both these species occur in the vicinity of Uppsala*, and it is therefore possible that Linnaeus knew them both but did not distinguish between them. In those circumstances it would be unreasonable to argue that he intended his *P. pusillus* to represent one species rather than the other. It may have been merely by chance that the plant which he preserved in his herbarium belonged to the species with closed sheaths rather than the one with open sheaths, but, be that as it may, his herbarium sheet provides the only syntype material from which a lectotype can be chosen. We therefore take as lectotype of *P. pusillus* the larger flowering specimen, on the left of the sheet. With regard to the two synonyms quoted by Linnaeus under *P. pusillus*, we are unable to identify Royen's plant from the brief description, but Vaillant's figure clearly indicates the species with closed stipular sheaths and thus agrees with the specimens in the Linnean Herbarium.

In view of these facts the name *P. panormitanus* Biv. (1838) must be replaced by P. PUSILLUS L. (1753). The "*P. pusillus*" of Hagström, Pearsall, Fernald, and other authors must take the name P. BERCHTOLDII Fieb. in Oekon.-techn. Fl. Böhm. ii. 1, 277 (1838), since there appears to be no earlier legitimate name for this common and variable species, which includes *P. pusillus* var. *tenuissimus* Mert. & Koch and *P. pusillus* subsp. *lacustris* Pearsall & Pearsall f.

In Britain, as elsewhere, the name *P. pusillus* has been used for more than one species, though usually it has been misapplied to *P. Berchtoldii*. It is obvious, therefore, that all British records of *P. pusillus* require re-investigation, and this we hope to do in the course of revising the British species of the genus.

* Nearly two centuries have elapsed since Linnaeus published his 'Flora Suecica', and it is now impossible to obtain reliable information as to the relative frequency of the two species round Uppsala at the time when Linnaeus was working. We are kindly informed by Prof. N. E. Svedelius *in litt.* that great changes have taken place round Uppsala in the local habitats for aquatic plants since Linnaeus's time, and many small lakes and ponds have diminished or disappeared.

THE FLORA OF SOUTHAMPTON ISLAND, HUDSON BAY.

BY NICHOLAS POLUNIN, M.A., M.S., D.PHIL.

(Department of Botany, Oxford; Research Associate, Gray Herbarium, Harvard University).

RATHER more than 200 miles from north to south and a similar distance from east to west, Southampton Island lies around lat. 64° N. and long. 84° W. in the mouth of Hudson Bay. It has an area of some 20,000 square miles, of which about two-thirds are occupied by limestone and one-third by gneiss (*cf.* Manning, 1936, map on p. 237). The country is almost everywhere low and rolling, having been heavily glaciated, but, except for numerous lakes and occasional perennial patches of snow, the whole area is free for colonisation by plants (which indeed cover about half the surface), there being no ice-cap.

The first botanical exploration of this very considerable land-mass was carried out by Captain W. E. Parry and certain of his officers (Edwards, Fisher, Hooper, and Lyon) in 1821. This was a mere amateur reconnaissance made during brief landings on the north coast; forty-eight species of vascular plants were collected, of which twenty-eight were recorded by Hooker (1825) from the gatherings of Parry and Edwards. After this, except for a single specimen taken by Dr. L. E. Borden during the cruise of the 'Neptune,' it appears that no botanical work was attempted on the island for a whole century—indeed, until 1922 when Therkel Mathiassen and Jacob Olsen of the Danish Fifth Thule Expedition visited it for archæological and other purposes and collected a few plants (Grøntved, 1936).

In 1928 the island was visited for the first time by a scientifically trained biologist, the late Dr. M. O. Malte (then Chief Botanist of the National Museum of Canada), who wrote me that he had obtained about eighty species in the single day he had ashore near the Hudson's Bay Company's trading post in South Bay. According to my computation, there are in this collection of Dr. Malte's no less than thirty-seven species and subsidiary forms not previously known from the island. Two summers later the American ornithologist G. M. Sutton, after wintering on the island, made a further very useful collection of plants which (with another collection made at Chesterfield Inlet on the adjacent mainland) has recently been described in detail by Raup (1936); Sutton's collections added a further twenty-six to the species and forms already gathered on the island, and, of course, a much greater number to those hitherto recorded in the literature (*cf.* Raup, 1936, p. 17).

In 1933, Southampton and some closely adjacent smaller islands which seem properly to belong to it were visited by the

Norcross-Bartlett Expedition, a few plants (including some noteworthy additions) being collected by J. B. Angel, while the following year I had the good fortune myself, when accompanying the Canadian Eastern Arctic Expedition, to spend a day on the island (in the vicinity of the Hudson's Bay Company's post in South Bay) making a primary ecological survey of the chief plant communities, and also collections and notes which resulted in yet further additions to the known flora. Meeting there my old friend Thomas Manning of Cambridge, I asked him to collect more plants for me ; this he very kindly did. Finally, revisiting the island for a few hours in 1936 as a member of the Canadian Government Party on the Eastern Arctic Patrol of that year, I was pleased to find that Messrs. Pat Baird and G. W. Roley, who had come out from England with Manning's new expedition, had also been collecting plants industriously.

Thus no less than fifteen people (see table on p. 95) have collected plants on Southampton Island. I have seen most if not all of their material, in my own or one or another of the main herbaria of Europe and North America, and find represented in their collections no less than 151 species and twenty subsidiary forms of vascular plants. This is an increase of more than 60 per cent. to the flora recorded by Raup (1936), and it seems desirable to publish in full the following list of all these species and forms that have been collected on the island. Even now the flora must be far from completely known ; the ease with which additions are still being made and the lack to this day of any record of such common and widespread arctic plants as *Catabrosa algida*, *Koenigia islandica*, and many others suggest that the species alone may well be brought up to 200 with further exploration.

In conformity with the climate the flora is, of course, arctic in type, including most of the high-arctic plants occurring in the Canadian Arctic Archipelago, almost all of which are of circumpolar distribution. A few relatively southern but often circumboreal species are also represented. Of the plants whose range is restricted to North America the majority are " Western " in their affinity, as is indeed to be expected from the geographical position of the island and the fact that Sir Thomas Roe's Welcome, the strait separating it from the mainland of the North-West Territories, often freezes over in winter and so allows an easy path for migration from that quarter.

The order and nomenclature followed in the list given below are essentially those of Gray's ' Manual of Botany,' ed. 7 (1908),—with such modifications as seem desirable in the light of recent researches by Professor M. L. Fernald and others or as are necessitated to bring the whole into line with my forthcoming ' Botany of the Canadian Eastern Arctic.—Part I.' Since fuller citations of localities etc. will be found in this work, which will

shortly be going to press, I have not thought it necessary to mention here the localities *within* Southampton Island—except for three species which have not been found on the main island but instead only on one of the small adjacent islands which for phytogeographical purposes are best treated with it.

Abbreviations of collectors' names :—

A. Angel in 1933 (specimens in the U.S. National Herbarium).
Ba. Baird in 1936 (British Museum).
Bo. Borden in 1904 (National Herbarium of Canada).
E. Edwards in 1821 (British Museum).
F. Fisher in 1821 (British Museum).
H. Hooper in 1821 (Linnean Society of London).
L. Lyon in 1821 (recorded in his book).
Mal. Malte in 1928 (Nat. Herb. Canada).
Man. Manning in 1934 (Brit. Mus., etc.).
Mat. Mathiassen in 1922 (Copenhagen).
O. Olsen in 1922 (Copenhagen).
Pa. Parry in 1821 (Brit. Mus., Kew, Copenhagen, etc.).
Po. 34. Polunin in 1934 (Nat. Herb. Canada, Harvard, Brit. Mus., etc.).
Po. 36. Polunin in 1936 (Nat. Herb. Canada, Harvard, Brit. Mus., etc.).
R. Roley in 1936 (Brit. Mus.).
S. Sutton in 1930 (Harvard, Gray Herb.).

An asterisk before the name of a plant indicates that it has not been recorded earlier for Southampton Island.

POLYPODIACEAE.

Cystopteris fragilis (L.) Bernh.—O., Ba.
Dryopteris fragrans (L.) Schott. (*Thelypteris fragrans* (L.) Nieuwl.).—S., A., Po. 36.

EQUISETACEAE.

Equisetum arvense L.—S., Po. 34 & 36, Man., Ba.
E. variegatum Schleich.—Mal., S., Po. 34 & 36, Man., Ba.

LYCOPODIACEAE.

Lycopodium Selago L.—Mal., S., Man., Po. 36.

GRAMINEAE.

Hierochloe alpina (Sw.) Roem. & Schult.—H. (note only), Mat., S., Po. 34 & 36, Man.
**H. pauciflora* B. Br.—A., Po. 36, Ba.
Alopecurus alpinus Smith—Pa., Mat., Mal., S., Po. 34 & 36, Man., Ba.
Arctagrostis latifolia (R. Br.) Griseb.—H. (note only), Pa., Mat., Mal., S., Po. 34 & 36 ; *f. *aristata* Holmb.—Mal., S.

Calamagrostis neglecta (Ehrh.) Gaertn. var. *borealis* (Laestad.) Kearney (incl. *C. confinis* (Willd.) Nutt.).—Mat.
**Deschampsia brevifolia* R. Br.—Man., Po. 36.
Trisetum spicatum (L.) Richter—S.; *var. *Maidenii* (Gand.) Fernald—Po. 34, Man.
Pleuropogon Sabinei R. Br.—Pa., S?.
Poa glauca M. Vahl—Pa., Mal., Po. 34 & 36, Man.; *var. *tenuior* Simmons—Po. 34.
P. arctica R. Br. (*P. rigens* of authors)—E., H., Pa., Mat., Mal., S., Po. 34 & 36, Man., Ba.
**P. pratensis* L. (s. l.)—Man.
P. alpina L.—Po. 36.
Colpodium fulvum (Trin.) Griseb. (*Arctophila fulva* (Trin.) Rupr.)—Po. 36; *var. **effusum** (Lange) n. comb. (*Arctophila effusa* Lange, Conspectus Floræ Groenlandicæ, p. 167, 1880)—Mal., S., Po. 34 & 36, Man., Ba.
Dupontia Fisheri R. Br. †—Mal., S., Po. 34 & 36.
**Puccinellia phryganodes* (Trin.) Scribn. & Merrill—Mal., Po. 34 & 36.
**P. paupercula* (Holm) Fernald & Weatherby—Mal., Po. 34.
**P. Vahliana* (Liebm.) Scribn. & Merrill—Po. 36.
Festuca brachyphylla Schultes—H. (note only), Mat., Mal., S., Po. 34 & 36, Ba.
Elymus arenarius L. var. *villosus* E. Meyer—Pa. (not seen, but cited by Hooker 1825, p. 409), Mat., Mal., S., Po. 34, Man.

CYPERACEAE.

Eriophorum Scheuchzeri Hoppe—H. (note only), Pa., Mat., S., Ba.
E. callitrix Cham.—S., Ba., Po. 36.
E. angustifolium Roth ‡—H. (note only), Pa., Mat., Mal., S., Po. 34 & 36, Ba.
**Kobresia Bellardii* (All.) Degland—Po. 34.
**K. simpliciuscula* (Wahlenb.) Mackenzie—Mal., Po. 34 & 36.
**Carex nardina* Fries—Mal., Po. 34 & 36; *var. *Hepburnii* (Boott) Kukenthal—Mal., Po. 34.
**C. maritima* Gunnerus (s. l.) (*C. incurva* Lightf.)—Mal., Po. 34.
**C. chordorrhiza* Ehrh.§—Po. 36.
C. ursina Dewey—Mat., S.
**C. bipartita* All. (incl. *C. glareosa* Wahlenb.) †—Mal., Po. 34 & 36, Ba.
C. rupestris All.—S., A., Po. 34 & 36.

† Subsidiary forms of this species will be dealt with in my forthcoming "Botany of the Canadian Eastern Arctic.—Part I."

‡ Probably belonging to this species is the plant recorded by Hooker (1825, p. 407) as "*Eriophorum gracile*," which name was frequently applied to slender specimens of *E. angustifolium* by C. B. Clarke and others.

§ Not previously recorded from anywhere in the Canadian Arctic Archipelago.

C. scirpoidea Michx.—Pa., Mal., S., Po. 34 & 36, Man.
**C. bicolor* All.—Po. 34 & 36.
**C. vaginata* Tausch.—Po. 34 & 36.
**C. capillaris* L.—Mal., Po. 34 & 36; *var. *Porsildiana* Polunin † MS. (Meddelelser om Grønland, 1938)—Mal.
C. atrofusca Schkuhr (*C. ustulata* Wahlenb.)—Mal.; S., Po. 34 & 36, Man.
C. misandra R. Br.—Pa., Mat., Mal., S., Po. 34 & 36.
**C. rariflora* (Wahlenb.) Smith—Mal., Po. 36.
**C. holostoma* Drej.†—Po. 36.
** "C. concolor* R. Br." ‡—Po. 34 & 36.
Carex aquatilis Wahlenb.—Po. 34 & 36; var. *stans* (Drej.) Boott—H. (note only), Pa., Mat., Mal., S., Man., Po. 34 & 36, Ba.
**C. salina* Wahlenb.†—Po. 34; *var. *subspathacea* (Wormskj.) Tuckerm.†—Po. 34.
**C. saxatilis* L.—Po. 34.
**C. physocarpa* Presl. †—Po. 34 & 36.
C. membranacea Hook. (*C. membranopacta* Bailey)—Pa., Mat., Mal., S., Po. 34 & 36, Ba.

JUNCACEAE.

**Luzula spadicea* (All.) DC.—Mat. as "*L. parviflora*."
L. nivalis (Laestad.) Beurl.—Pa., Po. 34 & 36.
L. confusa Lindeb.—Pa., Mat., Mal., S., Po. 34 & 36.
Juncus arcticus Willd.—Mal., S., Po. 34, Man.
J. biglumis L.—Mal., S., Po. 34 & 36.
**J. albescens* (Lange) Fernald—Mal., Po. 34 & 36.
**J. castaneus* Smith—Mal., Po. 36.

LILIACEAE.

Tofieldia borealis (Wahlenb.) Wahlenb. (*T. palustris* of authors)—Mal., S., Po. 34 & 36.

SALICACEAE.

Salix reticulata L.—Mat., S., Po. 34 & 36, Man., Ba.
S. herbacea L.—Mat., Po. 34 & 36, Ba.
S. arctica R. Br. (incl. *Salix anglorum* Cham.)—L. (not seen, but mentioned by Lyon (1824, p. 46)), Mat., Mal., S., Po. 34 & 36, Ba.
**S. arctophila* Cockerell—Po. 36.

‡ Not previously recorded from anywhere in the Canadian Arctic Archipelago.

† This is *Carex rigida* Good. (1794, non Schrank, 1789), but unfortunately the type-specimen of Robert Brown's *C. concolor* belongs instead to *C. aquatilis* var. *stans*, and so yet another name will have to be found for our plant. The problem will shortly be dealt with by Mr. A. J. Wilmott of the British Museum.

**S. hudsonensis* Schneider—Mal., *fide* Floderus.
? S. cordifolia Pursh var. *callicarpaea* (Trautv.) Fernald—S., prostrate, named and recorded by Raup (1936, p. 22), but possibly only *S. arctica*. Also ? Po. 36, atypical.
S. Richardsonii Hook.†—Mal., S., Po. 34 & 36, Man., ? Ba.
S. calcicola* Fernald & Wiegand ‡—Mal.; var. **Nicholsiana var. nov. A typo differt foliis obovatis, ad basim angustius fastigatis; stipulis persistentibus, lanceolatis vel anguste-ovatis, integris vel subintegris. Type in British Museum.—Po. 36, no. 2273.
S. alaxensis (Anderss.) Coville (*S. speciosa* Hook. et Arn.)—Mat., S., Ba., Po. 36.

BETULACEAE.

**Betula glandulosa* Michx.—Man.

POLYGONACEAE.

Oxyria digyna (L.) Hill—Mat., S., Po. 34, Man.
Polygonum viviparum L.—Mat., Mal., S., Po. 34 & 36.

CARYOPHYLLACEAE.

Silene acaulis L. var. *exscapa* (All.) DC.—Mal., S., Po. 34, Man.
Lychnis furcata (Raf.) Fernald—S., Po. 36.
L. apetala L. (*Melandryum apetalum* (L.) Fenzl)—H., Pa., Mat., O., Mal., S., Po. 34 & 36, Man., Ba.
Cerastium alpinum L. (s. l.) §—H., Pa., Mat., Mal., S., Po. 34 & 36, Man., Ba.
Stellaria longipes Goldie—Mal., S., Po. 34 & 36, Man., Ba.; f. *humilis* (Fenzl) Ostenfeld ex Grøntved (1936, p. 39) (*Stellaria longipes* γ *humilis* Fenzl in Ledeb. Fl. Ross. i. p. 387, 1842: *Stellaria Edwardsii* R. Br.)—Pa. (not seen, but cited by Hooker (1825, p. 390) as "*S. Edwardsii*"), A., Po. 34.
**S. crassifolia* Ehrh.—Mal., Po. 34, Man.
S. humifusa Rottb.—O., Po. 34, Ba.
Arenaria peploides L.—S., Po. 34, Man., Ba.
A. rubella (Wahlenb.) Smith (*A. propinqua* Richardson: *A. verna* L. var. *pubescens* (Cham. & Schl.) Fernald)—Pa. (not seen, but cited by Simmons (1913, p. 81) as in Kew Herbarium), Mal., S., Po. 34.
I. Rossii (R. Br.) Fenzl †—Pa., S.‡, Ba., Po. 36.
** Arenaria uliginosa* Schleich.§—Po. 36.
**Sagina intermedia* Fenzl—Po. 36.

RANUNCULACEAE.

Ranunculus hyperboreus Rottb.—S., Po. 34.
**R. nivalis* L.—Po. 36.
R. sulphureus Soland.—Pa., S., R.
R. pygmaeus Wahlenb.—S.
R. pedatifidus Smith var. *leiocarpus* (Trautv.) Fernald—Mal., S., Po. 34, Ba.

PAPAVERACEAE.

Papaver radicatum Rottb.—L. (not seen, but mentioned by Lyon, 1824, p. 46), S., A., Po. 34 & 36, Man., Ba.

CRUCIFERAE.

Cochlearia officinalis L. (s. l.) (incl. *C. groenlandica* L.)—F., Mat., Mal., S., Po. 34 & 36, Ba.
Eutrema Edwardsii R. Br.—Pa. (not seen, but cited by Hooker, 1825, p. 388), Mal., S., Po. 34 & 36, Ba.
Cardamine bellidifolia L.—S., Po. 36.
C. pratensis L. var. *angustifolia* Hook.—E. (note only), Mal., S., Po. 34 & 36, Ba.
Lesquerella arctica (Richardson) Watson—F., O., S., Po. 36.
Draba alpina L.—F., Mal., S., Po. 34 & 36, Man., Ba.; var. *nana* Hook. emend. Fernald—Bo., S., Po. 36, Ba; var. **inflatisiliqua** var. nov. A forma typica differt siliquis glabris nec ovatis nec oblongis nec complanatis sed *fusiformibus*, apice basique acutis, orbiculatis vel ellipticis in sectionibus transversis.—Mal., S., Po. 34 (type in Gray Herbarium, Harvard University, co-type in National Herbarium of Canada, Ottawa) & 36.
**D. subcapitata* Simmons—Po. 36.
D. fladnizensis Wulf. (incl. *D. lactea* Adams)—Mat., S., Po. 34 & 36, Ba; *f. **glabrata** (Lindblom) n. comb. ‖ (*D. Wahlenbergii* Hartm. γ *glabrata* Lindblom in Stockholm Akad. Handl. p. 46, 1839).—S.¶, Po. 34 & 36.

† Subsidiary forms of this species will be dealt with in my forthcoming "Botany of the Canadian Eastern Arctic.—Part I."

‡ Also some intermediate (*S. calcicola* × *Richardsonii*?)—Mal., Po. 34 & 36.

§ Named and published by Raup (1936, p. 23) as "var. *legitimum* Lindblom," but the material is all glandular and hence cannot be so referred. Another phase of this extremely variable species is represented by the specimens reported by Raup (1936, p. 23) as "*Cerastium cerastioides*," which must accordingly, for the time being at least, be excluded from the flora of Southampton Island.

† Subsidiary forms of this species will be dealt with in my forthcoming "Botany of the Canadian Eastern Arctic.—Part I."

‡ Not recorded by Raup, but the specimen named and published (1936, p. 23) by this authority as "*A. uliginosa*" belongs to *A. Rossii*.

§ Previous reports from the Arctic Archipelago (including Raup's from Southampton Island) belong to other species, but I have also found it represented in my collections in the British Museum made in 1931 on Akpatok Island.

‖ Not previously recorded from anywhere in the Canadian Arctic Archipelago.

¶ Not recorded by Raup, but present on a sheet including *D. alpina* var. *nana* and *Ranunculus pygmaeus* all labelled "*Cochlearia groenlandica*."

? *D. crassifolia* Graham—Po. 36, a doubtful scrap gathered in a hurry in semi-darkness.
D. nivalis Liljebl.—Mal., S., Po. 34 & 36, Ba.
D. glabella Pursh—Mat. †, Mal., S., Man., Po. 34 & 36, Ba.
D. cinerea Adams—E. †, Mal., S., Po. 34.
**Arabis arenicola* (Richardson) Gelert—Mal.
**A. alpina* L.—Ba.
Braya purpurascens (R. Br.) Bunge ‡—Mal., S., Po. 34 & 36, Ba.
Parrya arctica R. Br.—Pa.

SAXIFRAGACEAE.

**Saxifraga rivularis* L.—Po. 34, Ba.
S. cernua L.—Mat., O., Mal., S., Po. 34 & 36, Man. ; f. **latibracteata** (Fernald & Weatherby) n. comb. (*S. cernua* var. *latibracteata* Fernald & Weatherby in Rhodora, xxxiii. p. 234, 1931)—S., Ba., Po. 36 ; *f. *bulbillosa* Engler et Irmscher §—Po. 36.
S. caespitosa L. (*S. sileniflora* of authors, incl. Raup, 1936, p. 26).—Mal., S., Po. 34 & 36, Ba. ; *f. *uniflora* (R. Br.) Engler—Po. 34, Ba.
**S. stellaris* L. var. *comosa* Retz.—Po. 36.
S. nivalis L.—F., Mal., S., Po. 34 & 36, Ba. ; *var. *labradorica* Fernald §—Mal., Po. 34 ; *var. *tenuis* Wahlenb.—S. part, Po. 36.
S. aizoides L.—H., E., Pa., Mat., Mal., S., Man., Ba., Po. 36.
S. tricuspidata Rottb.—H., Pa., O., Mal., S., Po. 34 & 36, Man., Ba. ; *f. **subintegrifolia** (Abrom.) n. comb. (*S. tricuspidata* var. *subintegrifolia* Abromeit in Bibl. Bot. xlii. p. 36, 1899)—Man.
S. Hirculus L.‡—H., Pa., Mat., Mal., S., Po. 34 & 36, Ba.
S. oppositifolia L.—H. (note only, saying "abundant everywhere that we landed," *i. e.*, including Southampton I.), Mat., Mal., S., Po. 34 & 36, Ba.
Chrysosplenium alternifolium L. var. *tetrandrum* Lund (*C. tetrandrum* (Lund) Fries)—E. (note only), Mal., S., Po. 34 & 36, Ba.

ROSACEAE.

**Rubus Chamaemorus* L.—Ba., Walrus I. only.
**Potentilla emarginata* Pursh—Po. 36.

† Raup (1936, p. 25) gives *Draba glabella* as "Previously known from Southampton Island," but the early record should be transferred to *D. cinerea*, which is represented by a good specimen in the British Museum collected by Edwards during Parry's Second Voyage.
‡ Subsidiary forms of this species will be dealt with in my forthcoming "Botany of the Canadian Eastern Arctic.—Part I."
§ Not previously recorded from anywhere in the Canadian Arctic Archipelago.

**P. nivea* L.—Po. 34 & 36, Man. ; var. *subquinata* Lange—S., var. *pallidior* Sw.—Po. 34.
P. Vahliana Lehm.—H. (note only), Mat., Mal., S., Po. 34 & 36.
**P. pulchella* R. Br.—Ba., Walrus I. only.
Dryas integrifolia M. Vahl—Pa., Mat., O., Mal., S., Po. 34 & 36, Man., Ba. ; *f. **intermedia** (Nathorst) n. comb. (*Dryas octopetala* f. *intermedia* Nathorst in Öfv. K. Sv. Vet. Akad. Förh. xli. p. 24, 1884) : *D. octopetala* L. subsp. *integrifolia* (M. Vahl) Hartz f. *intermedia* (Nathorst) Hartz).—Mal., Po. 34 & 36.

LEGUMINOSAE.

Astragalus alpinus L.—Mal., S., Po. 34 & 36.
Oxytropis hudsonica (Greene) Fernald (*O. arctica* of authors)—H., Mal., S., A., Po. 34.
O. Maydelliana Trautv. (*O. campestris* of authors)—H., Pa., Mat., Mal., S., Po. 34 & 36, Man.
O. arctobia Bunge—Mal., S., Po. 34 & 36, Man.

EMPETRACEAE.

Empetrum nigrum L. var. *hermaphroditum* (Lange) Sørensen—Mat., Mal., S., Po. 34 & 36, Ba.

ONAGRACEAE.

Epilobium latifolium L.—Mal., S., Po. 34 & 36, Man.
E. davuricum Fischer var. **arcticum** (Samuelss.) n. comb. (*Epilobium arcticum* Samuelsson in Bot. Not. p. 260, 1922) : *E. alpinum* of authors)—Mal., S., Po. 34 & 36.

HIPPURIDACEAE.

Hippuris vulgaris L.—S., Po. 34, Ba.

PYROLACEAE.

Pyrola grandiflora Radius (*P. rotundifolia* L. var. *pumila* Hook.)—S., Man., Po. 36.

ERICACEAE.

Ledum palustre L. var. *decumbens* Ait.—S., Po. 34 & 36, Man.
Rhodendron lapponicum L.—S., Po. 34 & 36, Man.
Cassiope tetragona (L.) D. Don—H., Pa., Mat., Mal., S., Po. 34 & 36, Man., Ba.
Arctostaphylos rubra (Rehder & Wilson) Fernald—Mal., S., Po. 34 & 36, Man., Ba. Much of the material approaches *A. alpina* (L.) Spreng. in its small and more or less ciliate leaves.
Vaccinium uliginosum L. var. *alpinum* Bigel.—Mat., Mal., S., Po. 34 & 36, Man.
V. Vitis-Idaea L. var. *minus* Loddiges—S., Ba., Po. 36.

PLUMBAGINACEAE.

Armeria labradorica Wallr. (*Statice labradorica* (Wallr.) Hubbard & Blake) f. *glabriscapa* (Blake) Mal.—S., Man., Po. 36.

BORAGINACEAE.

Mertensia maritima (L.) S. F. Gray var. *tenella* Fries—Mat., S.

SCROPHULARIACEAE.

Pedicularis lapponica L.—S.
P. sudetica Willd.—Pa., Mal., S., Po. 34 & 36, Ba.
P. lanata Cham. & Schlecht.—Mat., Mal., S., Po. 34 & 36, Man., Ba., R.
P. hirsuta L.—S., Po. 34 & 36, Ba.
P. flammea L.—Mal., S., Ba.
P. capitata Adams—Pa. (not seen, but cited by Hooker (1825, p. 402) as "*P. Nelsonii*"), Mat., Mal., S., Po. 34 & 36, Ba.

CAMPANULACEAE.

Campanula uniflora L.—H. (note only), Mat., S., Man.

COMPOSITAE.

Erigeron eriocephalus J. Vahl—S., Man., approaching *E. unalaschkensis*.
**E. unalaschkensis* (DC.) Vierh. (*E. uniflorus* of authors)—Pa., Po. 36.
**Antennaria angustata* Greene—Po. 36.
**A. labradorica* Nutt.—A., north side of White Island, Frozen Strait. This specimen is in the U.S. National Herbarium and is, according to my notes, "not quite typical, but probably correct."
Matricaria inodora L. var. *nana* (Hook.) Torr. & Gray (*M. grandiflora* (Hook.) Britton)—Mal., S. Po. 34, Man., Ba.
Chrysanthemum integrifolium Richardson—H. (note only), Pa., Mat., Mal., S., Po. 34 & 36.
Senecio palustris (L.) Hook. (incl. some material which is referable to var. *congestus* (R. Br.) Hook.)—O., S., Man., Ba.
Taraxacum lacerum Greene—H. (note only, but presumably referring to this species), S., A.
**Crepis nana* Richardson—A., north side of White Island, Frozen Strait.

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THE BRITISH ASSOCIATION DELEGATION IN INDIA.

BY A. H. REGINALD BULLER, D.SC., F.R.S.

THE British Association for the Advancement of Science sent a Delegation of about one hundred persons to the Silver Jubilee Meeting of the Indian Science Congress Association. The meeting was held at Calcutta, January 3–9, and was presided over by Sir James Jeans. The Delegation included the following botanists :—Prof. V. H. Blackman, Prof. A. H. R. Buller, Dr. C. D. Darlington, Prof. & Mrs. F. E. Fritsch, Prof. R. R. Gates, Prof. J. W. Harrison, Sir Arthur Hill, and Dr. A. B. Rendle.

On the way out Dr. Rendle was not well, but at Port Said he and I took a long walk through the city and enjoyed seeing its varied sights, including its ornamental trees and shrubs. That was Dr. Rendle's last botanical excursion, for, unfortunately, as the voyage proceeded, he grew worse, and at Bombay he was obliged to leave the party and return home. Shortly after his arrival in England, as readers of this Journal must have learned with great regret, he passed away.

The Delegation sailed from London on board the P. and O. steamer 'Cathay' on November 26 and landed at Bombay on December 16. A pre-congress and a post-congress tour, in special trains, had been arranged by the Indian Association.

The pre-congress tour included :—Bombay (University of Bombay, Parsee Towers of Silence, Hindu burning ghat); Hyderabad (Osmania University, where the instruction is given in Urdu, and the neighbouring Golconda Fort and tombs); Aurangabad (with visits to Daulatabad Fort and the rock caves of Ellora and Ajanta); Sanchi (great Buddhist Stupa); Agra (Taj Mahal, Agra Fort, Agra College); New Delhi (Viceroy's House, Imperial Institute of Agricultural Research); Delhi (Fort, Pearl Mosque, Kutb); Dehra Dun (Forest Research Institute); Mussoorie (ridge with view of snowy ranges of Himalayas); Benares (Benares Hindu University, the Ganges, Sarnath where Buddha first preached); Darjeeling (Botanical Garden, view of Kinchinjunga, Tiger Hill); and Calcutta.

The post-congress tour included :—Madras (University of Madras, Aquarium, Hindu temple) ; Bangalore (Indian Institute of Science) ; Mysore (the Palace, hill view of city, hydro-electric works, jungle) ; and Bombay.

At Port Said, on the outward journey, Dr. Rendle and I noted the following ornamental plants :—*Casuarina equisetifolia, Eucalyptus globulus, Phoenix dactylifera, Quercus Ilex, Ficus Carica, Ligustrum ovaliforme, Lantana Camara* and species of *Bougainvillaea, Poinsettia, Cotoneaster, Hibiscus, Jasminum,* and *Ipomaea* ; and, growing along the banks of the Suez Canal, we saw the great grass, *Arundo Donax*, and plantations of the Australian *Casuarina equisetifolia*. The *Casuarina* trees were well-grown and, at sunset, Kites were seen flying about them as if going to roost in their branches. At Aden the Delegation landed, visited the town of Crater, and walked around the ancient and enormous tanks and through the Gardens of Sheikh Othman. Aden Peninsula is a mass of barren volcanic rocks upon which rain rarely falls. Its natural vegetation is most scant and the Gardens are kept alive by constant watering with slightly brackish water drawn up 150 feet from wells. On the golf course at Aden there is no grass and the greens are called " browns." By the Tanks we saw our first Banyan tree, and in the Gardens species of *Hibiscus, Bougainvillaea, Oleander, Cassia,* and *Croton*. At the oasis of Sheikh Othman, to which we drove, there were many Date Palms.

On arrival at Bombay, the Delegation was officially received by the Vice-Chancellor of the University, and at the function a garland of flowers was put around Sir James Jeans. Subsequently, Sir James was garlanded many times, and this pleasant Indian mode of welcoming an honoured guest was also experienced by several other members of the Delegation.

We visited the Towers of Silence, where vultures dispose of the Parsee dead, and in the grounds saw Mango trees. The Parsees, followers of Zoroaster, have a temple there in which they keep the sacred fire burning night and day continuously. The fuel used is the strongly scented wood of the Sandalwood tree. We also saw a Hindu burning ghat where a body was being cremated over large logs of wood.

Before beginning our pre-congress tour, we were each given a copy of ' An Outline of the Field Sciences of India.' This useful handbook, published by the Indian Science Congress Association in November, 1937, and edited by Dr. Sunder Lal Hora, contains a chapter entitled " An Outline of the Vegetation of India " by Mr. C. C. Calder, Superintendent of the Royal Botanic Gardens, Calcutta, and Director of the Botanical Survey of India.

At Agra we visited that masterpiece of the Mogul emperors, the Taj Mahal. On the outside of this beautiful building, which stands in a garden of Cypress trees and overlooks the broad Jumna River, there are carved in relief on the marble the graceful

forms of tulips, lilies, narcissi, and other bulbous plants ; and in the interior the cenotaphs of Muntaz and her husband, Shah-Jahan, are profusely inlaid with gems in flowered patterns.

At Agra College, Professor K. C. Mehta took us through his laboratory and his rust greenhouse, and gave us an account of his work—now in its fifteenth year—on the Rust disease of cereals in India. It has been conclusively established that in the plains, during October and November when the cereal crops are sown, there is no local source of infection ; and, apparently, the suspected alternate hosts play but little part in the annual origin of the rust disease. From a study of the spread of the disease in the plains as well as in the hills, extending over a period of seven years, Professor Mehta is convinced that the foci of infection lie in the hills and hilly tracts, where rusts oversummer in the uredo-stage. To lessen the incidence of the rust disease in the plains, Dr. Mehta therefore recommends : (1) sowing of wheat and barley in Nepal in October instead of August–September ; (2) suspension of the first crop (sown in April–June) in the Nilgiris and Palni hills ; and (3) destruction of self-sown plants and tillers of wheat and barley 1–2 months before the sowings in the hills and hilly tracts (3000 ft. above sea-level) in general. Professor Mehta believes that his recommendations in respect to the Nilgiris and Palni hills could be acted upon by the Government with but little expense and that, if carried out, they would result in a considerable increase in the yield of Indian wheat and barley.

At the Imperial Institute of Agricultural Research at New Delhi there were various botanical exhibits, among them the hybrid Sugar-canes raised by Rao Bahadur R. S. Venkatraman, at Coimbatore. By hybridization in and with the genus *Saccharum*, Venkatraman has sought during the past twenty-five years to improve the Indian Sugar-canes, and already the area in which improved canes are grown is upwards of 70 per cent. of the total. Inter-varietal crosses have been made within the species *Saccharum officinarum* ; economically important inter-specific hybrids have been obtained from *S. officinarum* and *S. spontaneum* ; and inter-generic crosses have been made between *Saccharum* and *Sorghum* with a view to shortening the life-cycle of the sugar-cane, and between *Saccharum* and *Bambusa* for the introduction into the sugar-cane of greater vigour. The Bamboo parent grows to 60 feet high, but the F_1 generation consists of short plants closely resembling sugar-canes, thus showing the dominance of *Saccharum* characters. Whether or not the intergeneric crosses, which are of great interest botanically, will yield anything of economic value remains to be determined by further investigation.

At the Imperial Institute I visited the laboratory of Plant Pathology and there renewed acquaintance with Dr. G. W. Padwick, the newly appointed Imperial Mycologist, and met

Dr. M. Mitra and Dr. B. B. Mundkur. Dr. Mitra has discovered a new bunt, *Tilletia indica*, and Dr. Mundkur a new smut, *Urocystis Brassicæ*. The latter fungus has the peculiarity of forming large and curious galls on the roots of Mustard. Dr. Mundkur gave me some carbonized grains of *Triticum sphaerococcum*, which were obtained at Mohenjo Daro, a pre-Aryan city in the Indus valley, and are, according to archæological authorities, at least 4,000 years old. In this material Dr. Mundkur found some tiny fungus bodies which he regards as smut spores.

At Dehra Dun we visited the Forestry Research Institute, inspected its museum, and went through its laboratories and experimental factories. The Institute for some thirty years has been carrying on research upon the growth of trees and the profitable use of timber and other forest products. It was founded primarily for the benefit of the Indian Forest Department, for which it has produced results of acknowledged economic value, but its work has also been of use to other government departments, to Indian States, and to industrialists. In the experimental factories, among other things, we saw machinery at work: (1) producing wall-boards and insulation boards from bagasse (crushed sugar-cane after extraction of the juice); (2) producing printing paper from *Dendrocalamus strictus* (bamboos grown in Orissa); and (3) testing the strength of various kinds of timber in respect of bending, compression, hardness, shear, glue adhesion in triple plywood, etc. In the wood workshop section we saw the veneer-cutting plant in operation. About 8,000,000 plywood packing boxes for tea are imported into India every year. There are two plywood mills in India, but these contribute only a very small proportion of the tea-boxes required, and the Institute is assisting this young industry in its attempt to meet foreign competition. On departing we were each given as a souvenir a writing-pad of excellent bamboo paper made in the Institute.

At the Benares Hindu University we visited the Botanical and other Departments, and then attended a Degree Congregation in a huge tent erected with the help of bamboo poles. At the ceremony several of our members, including Professor V. H. Blackman, were given honorary degrees.

From Siliguri we drove in motor-cars up to Darjeeling, which stands at a height of 6,900 feet above sea-level. We had an excellent driver, with Mongolian features, who knew no English. The pace permitted was ten miles per hour. The road wound round and round great mountain spurs amid forest and tea plantations on terraced slopes, and ever up, up, and up, past the 4,000-foot level, past the 5,000, and past the 6,000, until after three and a half hours of progress we arrived at our destination, where Bhutea women porters, who greeted us with smiles, carried our bags on their backs into the Mount Everest Hotel. During

the ascent we saw Bamboos, Tree ferns, and Rhododendrons, and we thought of Joseph Hooker and his famous botanical explorations. Early next morning from the windows of the hotel we watched the sun rise on Kinchinjunga (28,146 ft.) as in snowy grandeur it towered up above its sister peaks some 15 miles away. The botanists found much to interest them at Darjeeling. There were: the tea-gardens, whose terraces could be seen up to a height of about 6,000 feet; a Botanical Garden on a hill-side with many fine trees and other plants, mostly out of flower; groves of *Cryptomeria japonica* planted all about Darjeeling and formed by tall conical trees with thick trunks; in the market place vegetable produce and, in an adjoining street, two querns, at one of which sat two women grinding grain; and, finally, the wild plants growing about the hills. *Primula malacoides* was in flower on a bank not far from gardens, close by a wild *Mahonia*; and we particularly noticed a fern, with large compound leaves and stems about as thick as a finger, *Gleichenia gigantea*, which was climbing freely over various bushes.

We drove to Tiger Hill (8,500 ft.). Our cars wound in and out among the hill-sides for a distance of about seven miles, and then we climbed the last 700 feet. From the top we saw a magnificent panorama of mountains stretching half-way around the horizon; and we looked over one great range hoping to see Mount Everest; but, unfortunately, although two peaks, right and left of it, were often more or less clear of cloud, Mount Everest, 100 miles distant, never came distinctly into view. But we were well rewarded for our journey; for, as the sun set, there were glorious tints of red and purple—red in the west and on the mountains and vast purple shadows. The sun went down in golden splendour and the leaden shadow of the earth rose on the eastern sky. When all was over and the whole earth was growing dark, we hurried down the 700 feet to our car, and then we drove with the help of headlights along the narrow road with numerous sharp S-shaped curves, downwards for 2,000 feet, and on to Darjeeling. An error in steering might have brought us to serious disaster; but our driver was excellent, and we arrived back at the Hotel in the dark, but safe and sound, and ready for tea.

In the Botany Section at the Calcutta meeting of the Indian Science Congress Association, Professor B. Sahni delivered his Presidential Address on "Palæobotany in India, a Retrospect"; and, in the course of a week, this was followed by numerous papers, a few special lectures, and six discussions on: (1) Discrepancies between the chronological testimony of fossil plants and animals (Sections of Botany and Geology); (2) The absorption of salts by plants (Sections of Botany and Chemistry); (3) Algal problems peculiar to the tropics with special reference to India; (4) The

dissemination of cereal rusts in India ; (5) A national Herbarium for India ; and (6) The species concept in the light of cytology and genetics (Sections of Botany, Zoology, and Agriculture). On January 6, at the seventeenth annual meeting of the Indian Botanical Society, Professor S. R. Bose gave his Presidential Address on "The Effects of Radiation on some Polypores in Culture," and this was followed by a Conversazione with botanical exhibits and a luncheon given by the Botanical Society of Bengal.

In the afternoon of January 6, the members of the Botany Section proceeded by steamer down the River Hooghly to Sibpur to attend the one hundred and fiftieth Anniversary celebration of the Royal Botanical Gardens. The function was presided over by the Nawab of Dacca, Minister for Industries and Agriculture, Bengal. Sir James Jeans, on behalf of the British delegation, offered the Gardens his hearty felicitations, and Sir Arthur Hill commented on the similarity of the situation of Kew Gardens and the Sibpur Gardens. He remarked that while Kew was located near London, the first city in the Empire, the Sibpur Garden was near Calcutta, the second city of the Empire, and both were on the banks of two of the busiest rivers in the world. Dr. K. P. Biswas, the Superintendent of the Gardens, welcomed the guests, outlined the history of the Gardens, and reviewed the economic benefits which India had derived from Sibpur. Among these benefits he included : (1) a demonstration that the Teak tree could not be grown for timber in Bengal as, in the muddy soil of the Gangetic delta, its trunks become hollow near the base ; (2) the introduction of exotic timber trees ; (3) the introduction of exotic plants now found in private gardens ; (4) the final establishment of the tea industry in Assam and northern Bengal ; (5) the initiation of Potato-growing ; (6) the cultivation of quinine Cinchonas of the Andes and the establishment of a factory in the Darjeeling district, whence the Government hospitals and dispensaries have obtained large supplies of quinine required for the treatment of malaria ; (7) help given to the Agri-Horticultural Society of India in the improvement of Indian cotton and Indian jute ; (8) assistance given in the introduction of the best kinds of sugar-cane from the West Indies ; and (9) experiments on the cultivation of such economic plants as flax, hemp, rhoa or ramie tobacco, henbane, vanilla, coffee, India-rubber, Japanese mulberry, cardamoms, tapioca, and cocoa.

After the function was over, we walked about the Gardens, admired the beautiful Oreodoxa palm avenue, and visited the famous Banyan tree (*Ficus bengalensis*). This tree, from whose branches figs were hanging, is now about 163 years old and the circumference of its crown measures 1,151 feet. It has 641 aerial roots actually rooted and grown into posts, and it is still extending. Its main trunk, which was 51 feet in girth, decayed and has been removed, so that the tree is now in three parts ; but three young

Banyan trees have been planted near where the original trunk was, and the intention is at some future time to graft these three trees together and also on to the three pieces of the original tree, and so once more to construct a single vegetative body.

At a special degree congregation of the University of Calcutta the Chancellor conferred the degree of Doctor of Law, *honoris causa*, on ten members of the Delegation, including the writer.

The Indian Association for the Cultivation of Science elected Mr Arthur Hill to be the Ripon Professor for the year 1938, and, in this capacity, he delivered three lectures at the Association during the week of the Calcutta meeting.

A short visit was made to the Bose Institute founded by the late Sir Jagadis Chandra Bose, and some of Bose's remarkable experiments were demonstrated to us. A detached, partially wilted, sagging leaf of one of the herbaceous Compositæ was placed in a glass vessel containing warm water, and its shadow was projected on to a screen. Immediately after the leaf had thus been given access to water, it began to recover and, with surprising speed, it soon became stiff and upright once more. And with the help of very sensitive apparatus making graphic records it was shown that the petiole of a compound leaf of one of the Leguminosae had risen very slightly in correspondence with the lowering of the temperature of the air during a recent brief storm.

In the streets of Calcutta and its suburbs we noticed Neem trees (*Melia Azadirachta*), Banyan trees (*Ficus bengalensis*), the sacred Pipal tree (*F. religiosa*), and other species of shade trees which we could not identify. Near the Race-course, in one tree, a Brain Fever bird called loudly and monotonously, and in and out and round about another tree flew several large fruit-bats, known as Flying Foxes ; and everywhere flying about the city were the scavenging Kites and Indian Crows, ever on the alert and searching for unconsidered trifles.

On the railway journey from Calcutta to Madras, from the carriage windows, we saw widespread stretches of rice fields broken up into irrigated plots and parted by earth divisions or *bunds* along which in some places were set stately rows of Palmyra palms (*Borassus flabellifer*) ; and we also saw many Coconut palms, wild Date palms (*Phoenix sylvestris*), and, near Madras, some fine plantations of *Casuarina equisetifolia*.

At Madras a visit was made to Professor M. O. P. Iyengar's laboratory at the University and here his own algal cultures and those of his pupils were examined.

With a Madras friend, I entered a Toddy Palm grove and saw the inflorescences of several of the Coconut trees (*Cocos nucifera*) bent down into black bowls set high in the trees and presumably exuding sweet sap from their wounds.

Among the palms grown for ornament in Madras we noticed : the Cabbage palm (*Oreodoxa regia*), the Royal palm (*Licuala grandis*), and *Caryota urens*. In the Adyar Gardens, in which stands the Hall devoted to the cult of Theosophy was seen a splendid Banyan tree with a crown of leaves 300 feet in diameter, a perfect central trunk, and radiating arms supported by a great many rooted posts. This tree is said to be one of the three finest Banyan trees in India. In a beautiful private garden, the owner had one of his bearers pierce the leaf-bases of two Traveller's Trees (*Ravenala madagascariensis*) so that I might see the water, which had accumulated there, gush out into a tumbler.

At Mysore, where we were guests of the Maharaja, a few of the party drove into the jungle where we saw huge sandy erections raised by white ants, traces of wild elephants, a hyaena, jungle fowl, and jungle people who never venture into towns ; and, at one place, we rode on the backs of working elephants up and around a hill, past tall Bamboos, and through a wood in which grew Teak, Rosewood, and other commercial timber trees.

On the second day at Mysore, Sir Frederick Hobday and I, in one of the Maharaja's cars, drove about 150 miles through the countryside : we visited a Pinjrapole (to which decrepit cattle are brought and in which they are kept alive until the last moment), a very well managed Veterinary Institute, the Maharaja's stables in which were about 100 horses, and a cattle fair. The fair was being held at Chunchanakatte, some 34 miles from Mysore, and 10,000 cattle had already been assembled there. We were told by the director of the fair that within a few days the number of cattle would be increased to 25,000. Altogether, that day, Sir Frederick and I must have passed on the roads at least 400 bullock wagons, each drawn by two bullocks. The population of India (excluding Burma) in 1931 was 338,170,632 ; and, according to the ' Outline of the Field Sciences of India,' the number of bulls and bullocks, cows, and young stock of the Ox tribe in India is 168,000,000. From these statistics it follows that in India there is one animal of the Ox tribe for every two human beings ; and in keeping with these statistics were the sights witnessed by Sir Frederick and myself on the day we spent together in the country around Mysore.

On the way home from Bombay, the ' Strathaird,' on which we had embarked, called at Port Sudan, and this enabled us to view the bottom of the harbour through a glass-bottomed boat and to see there strange and fantastic corals, sponges, and algæ, and fishes of varied form and colour swimming over them. At Port Sudan, too, we saw *Ipomaea biloba* (*I. pes-caprae*) creeping over the sandy shore. A runner of one of these plants was measured and found to be 45 feet long !

Many of us landed at Suez, drove over the desert to Cairo, saw the pyramids and the Sphinx at Gizah, examined the

magnificent Tut-ankh-amen collection in the Cairo museum, and then took the train to Port Said where we rejoined our boat. We noticed how sparse is the vegetation in the desert, but had no time to study it. Here and there were low thorny bushes with camels feeding upon them. At Cairo, brown again changed to green with Date palms, Bougainvillaeas, and *Hibiscus*. On sailing from Port Said our botanical observations had perforce to come to an end.

On the way west through the Mediterranean, one afternoon under unusually favourable conditions, we gazed upon the snow-covered peak of Mount Etna, and, at night, we saw Stromboli coughing and two red-hot streams of lava pouring down its side. Subsequently we called at Marseilles, Gibraltar, Tangier, and Plymouth ; and, finally, on February 4, at Tilbury, we stepped once more on to English soil.

We all felt that the visit of the Delegation to India had been a great success and most profitable. For the warm hospitality that was extended to us both publicly and privately we owe a deep debt of gratitude to the Indian Government, Rulers, and people ; and we shall never forget the pleasure that was ours in meeting our Indian colleagues face to face and learning from them at first-hand some of the results of their scientific investigations.

A NEW SPECIES OF *SPHAEROTHYLAX*.

By G. Taylor, D.Sc., F.L.S.

Since the genus *Sphaerothylax* Bisch. was originally defined, its limits have been confused by varied interpretation of the floral structure. Bischoff in founding the genus (apud Krauss in ' Flora,' xxvii. Bd. 2, 426, t. 1 (1844)) described the androecium as follows :—" Stamina 3, collateralia, basi connati, 2 lateralia sterilia, intermedium bifidum, antheras 2, loculis inaequalibus gerens." While it is now generally accepted that the two lateral structures at the base of the androecium, which Bischoff regarded as lateral staminodes, are rudimentary perianth-segments, the interpretation of the intermediate fertile organ has been disputed. Most recent authors regard it as being formed of two fused stamens, the filaments being connate throughout their length. This view has been accepted in the treatment of the family presented by Baker and Wright in the ' Flora of Tropical Africa ' and repeated by A. W. Hill in the ' Flora Capensis ', while Engler, in his recent comprehensive account in the second edition of the ' Pflanzenfamilien ' and in earlier works, has also adopted this interpretation. Examination of the type-species, *S. algiformis* Bisch. from Natal, reveals that the fertile organ consists of a single stamen with a broad filament and anther. The filament is so expanded towards the apex that the lobes of the deeply

cleft anther appear separate. Engler, depending upon supposed numerical distinction in the androecium, restored the genus *Anastrophea* Wedd., based on *A. abyssinica* Wedd., on the ground that it had a single stamen, but the floral structure is essentially the same as in *Sphaerothylax*.

With the discovery of the present species from southern Tanganyika Territory to Transvaal, part of the wide gap in the known geographical range of *Sphaerothylax* is filled, and it is probable that the genus is also represented northwards in East Africa where suitable conditions occur. From repeated observations on herbarium specimens it would appear that the flowers are cleistogamous. Within the unruptured spathella the ovary is usually full of well-formed seeds, and little time elapses after emergence from the spathella before dehiscence takes place, sometimes the two processes being practically simultaneous.

S. Wageri G. Tayl. was first collected in Nyasaland in 1887, and it has remained unrecognised for half a century, although several further collections have been available. During 1934 and 1935 Dr. V. A. Wager collected in northern Transvaal a very fine series of specimens providing an adequate conception of the species which is named in honour of their collector.

Sphaerothylax Wageri G. Tayl., sp. nov. *Herba* caulescens, saltem juventute foliifera ; caules rufescentes vel purpurascentes, plus minusve teretes, simplices vel ramosi, usque ad 20 cm. longi. *Folia* angustissime linearia vel filiformia, basi leviter dilatata, integra vel parte superiore plerumque in segmenta capillaria partita, ultimo decidua. *Flores* in foliorum axillis fasciculati, fasciculis numerosis secus caulem hic illic dispositis. *Spathellae* sphaeroideae vel ellipsoideae. *Pedicelli* in fructu usque ad 4 mm. longi. *Stamen* 1 ; filamentum fere usque ad 1 mm. longum ; anthera 4-lobata, apice profunde bifida, polline didymo. *Ovarium* sessile, subsphaeroideum vel ellipsoideum, 8-costatum ; stigmata crassa, erecta vel patentia, subpersistentia, usque ad 0·2 mm. longa. *Capsula* subsphaeroidea vel ellipsoidea, usque ad 1·25 mm. longa et 0·75 mm. lata, valvis 2 subaequalibus altera persistenti altera decidua.

Tanganyika Territory. Iringa Prov. : Njombe Distr., Njombe, alt. 1594 m., red lichen-like herb on wet rocks in water spray of a rocky river bed, Aug. 1933, *Greenway* 3515 (Herb. Brit. Mus. ; Herb. Kew.).

Nyasaland. Blantyre Distr. : Shire Highlands, nr. Blantyre, 1887, *Last* s.n. (Herb. Kew.).

Northern Rhodesia. Serenje Prov. : Kaombi River, alt. 1400 m., submerged or partly so at water's edge, attached to rocks, stem and flowers purple, May 1930, *Lloyd* s.n. (Herb. Brit. Mus.).

Southern Rhodesia. Salisbury Distr. : Rua River, nr. Salisbury, alt. 1520 m., reddish filamentous plants, tightly fixed to rock under rushing water, May and June 1918, *Eyles* 1321 (Herb. Brit. Mus. ; Herb. S. Afr. Mus. 25407), 1322 (Herb. Brit. Mus.), 1346 (Herb. Brit. Mus. ; Herb. Kew. ; Herb. S. Afr. Mus. 25408). Without precise locality, *Hislop* Z 141 (Herb. Kew.).

Transvaal. Lydenburg Distr. : Woodbush Falls between Nabie and Lydenburg, adhering to rocks in strong running water, May 1934, *Wager* s. n. (Herb. Brit. Mus. ; Nat. Herb. Pret. 16445) ; Nabie, running water in densely forested kloof, large and branching, June 1935, *Wager* s.n. (Herb. Brit. Mus., type ; Nat. Herb. Pret.).

BIBLIOGRAPHICAL NOTES.

(VI. Nyman's 'Conspectus Florae Europaeae.' By William T. Stearn (Lindley Library, Royal Horticultural Society, Westminster).

At the time of its publication Carl Fredrik Nyman's 'Conspectus Florae Europaeae, seu Enumeratio methodica Plantarum phanerogamarum Europae indigenarum' (8vo, Örebro, Sweden) was a great boon to botanists concerned with the critical study of European plants, and even now its usefulness as a guide to synonymy and geographical distribution has not entirely gone, since Richter and Gürke's later and more elaborate 'Plantae Europeae' (1891–1903) was unfortunately never finished. Works of this kind nearly always contain nomenclatural transfers, and to date these with precision is desirable. The titlepage of Nyman's 'Conspectus' shows that it was published "1878–1882." Contemporary references and internal evidence establish the contents and issue of the four original parts as follows :—

Part 1, pp. 1–240.	1878 (probably Sept. or Oct.).	Flora, lxi. 448 (1 Oct. 1878) ; Journ. of Bot. xvi. 347–350 (Nov. 1878) ; Bull. Soc. bot. France, xxv., Bibl. 130 (1878) ; Friedländer, Nat. Nov. i. 11 (Jan. 1879).
Part 2, pp. 241–492, preface "L.B." dated "Sept. 1879."	1879 (Oct.).	Friedländer, Nat. Nov. i. 195 (Oct. 1879) ; Flora, lxii. 496 (1 Nov. 1879) ; Journ. of Bot. xvii. 348–389 (Nov. 1879).
Part 3, pp. 493–676.	1881 (probably July).	Friedländer, Nat. Nov. iii. 125 (Aug. 1881) ; Journ. of Bot. xx. 24–27 (Jan. 1882).
Part 4, pp. 677–858, preface "Quum nunc etiam" dated "20 Sept. 1882," and title.	1882 (Oct.).	Friedländer, Nat. Nov. iv. 204 (Nov. 1882) ; Journ. of Bot. xx. 371–375 (Dec. 1882).

To complete the work Nyman compiled two supplements. Supplementum i, dated "1883–4," consists of "Acotyledoneae

vasculares et Characeae Europae," occupying pp. 859–879, and an " Index Specierum, Subspecierum, Varietatum," occupying pp. 882–1046. Both also exist as independently-paged works, and the " Acotyledoneae " seems to have been originally issued in this state, " e Conspectus Florae Europaeae seorsim impr." either late in 1883 or early in 1884. Supplementum i comprising both was first offered for sale (*fide* Friedländer, Nat. Nov. vi. 112) in May 1884.

Ernst Roth's unofficial supplement, ' Additamenta ad Conspectum ' (46 pages ; Berlin), has its titlepage dated " 1886," its preface " Nov. 1885." Nyman had received a copy by December 15, 1885, as his critical comments upon it (*cf.* Bot. Notis. 1886, 72–75, or Bot. Centr. xxvi. 358–360 ; 1886) at a meeting of the Botaniska Sällskapet in Stockholm on that day indicate. Friedländer of Berlin offered it for sale in December 1885 (*cf.* Nat. Nov. vii. 276), which may be accordingly taken as its date of publication.

Supplementum ii by Nyman is dated " 1889–1890." It appeared in two parts :—

Pars prima, pp. 1–224 and prefatory note, 1889 (Nyman's introduction is dated " Novembr. 1889 " ; Friedländer, Nat. Nov. xi. 389, offered it for sale in December 1889, which may be taken as its date of publication).

Pars altera, pp. 225–404 and preface, 1890 (Nyman's preface is dated " Jun. 1890 " ; Friedländer, Nat. Nov. xii. 323 offered it for sale in July 1890, which may be taken as its date of publication).

Nyman was born at Stockholm on August 14, 1820, and died there on April 26, 1893. He studied at Uppsala and from 1855 to 1889 was conservator of the botanical section of the Riksmuseet at Stockholm. In 1844 he visited Malta and Sicily.

For a list of his publications, see Th. O. B. N. Krok, 1925, Bibl. bot. Suecana, 560–562.

CVII. Haworth's ' Supplementum Plantarum Succulentarum.'

The preface to Adrian Hardy Haworth's ' Supplementum Plantarum Succulentarum . . . Adjungitur Narcissorum Revisio ' (160 pages, London) is dated from " Queen's Elms, Chelsea, May 1819 ". The minutes (unpublished MS.) of the meeting of the Horticultural Society of London on June 1, 1819, record the gift to the Society's library of a copy from the author, a gift made between that date and the previous meeting on May 18, 1819. Haworth's work contains descriptions of many new species ; their date of publication can accordingly be taken as May 1819.

SHORT NOTE.

Nomenclature of Duthiea Manz.—It is unfortunate that Artemio Valderrama Manza, revising the genera of articulated corallines (Proc. Nat. Acad. Sci. U.S.A. xxiii. 44–48 (1937)), overlooked the valid publication of *Duthiea* Hackel in Verhandl. k.-k. zool.-bot. Gesellsch. Wien, xlv. 200 (1895) for an Indian grass and used it again for an alga. The only legal course is to make a new name for the alga :—

DUTHIOPHYCUS Tandy, nom. nov.

[*Duthiea* Manza in Proc. Nat. Acad. Sci. U.S.A. xxiii. 48 (1937)], *non* Hackel in Verhandl. k.-k. zool.-bot. Gesellsch. Wien, xlv. 200 (1895).

The appropriate new combination is :—

Duthiophycus Setchellii (Manza) Tandy, comb. nov.
Duthiea Setchellii Manza, *loc. cit.*

In combining the patronymic Duthie with *phycus*, it is my intention to maintain the personal connection with Miss A. V. Duthie, who collected the type, as well as proximity to *Duthiea* in an index. I have deliberately suppressed the phonetically redundant " e."—Geoffrey Tandy.

REVIEWS.

Annals of the Royal Botanic Garden, Calcutta. Vol. xiv. part 1. *An Account of the Genus* Dioscorea *in the East.*—Part I. *The Species which twine to the left.* By D. Prain and I. H. Burkill. Large 4to, pp. vi, 210, 85+5 plates. 2 vols., 1937. Price Rs. 75, £5 13*s.*

This admirable monograph, a worthy continuation of the fine series emanating from the Royal Botanic Garden, Calcutta, represents the work of more than thirty years on a large and difficult genus which is of great importance from an economic point of view. Yams, the underground storage organs of species of *Dioscorea*, are one of the most important tropical foods, but the taxonomy of the genus and the specific identity of the wild or cultivated forms has been in great confusion. Sir Joseph Hooker, when elaborating the genus for the ' Flora of British India ' (1892), and Sir George Watt, when working at the species for his ' Dictionary of the Economic Products of India,' were both impressed with the need for careful study of the species in all stages of growth. As a result Sir George King, Director of the Gardens, and Sir George Watt commenced the growth in the Calcutta Gardens of all the Indian species procurable. On King's retirement in 1898, his successor, David Prain, assumed

collaboration with Watt, who a few years later gave place to the junior author of the present monograph. When Sir David left India for Kew in 1906, I. H. Burkill continued the systematic study of the material in cultivation in the Calcutta Gardens, and when transferred to Singapore in 1912 extended his study to other Asiatic species, and on returning to England in 1925 continued his work at Kew.

The supreme value of the monograph lies in its careful description and illustration of the organs (tubers, rhizomes, or corms), by which the plants persist from season to season; but the plant as a whole, stem, leaf, flower, fruit, and seed, has been described as fully as material available allowed. The excellent detailed plates will suffice to name any species included. Collections in all the important herbaria have also been studied, and have afforded useful information as to geographical distribution. Other modern revisions of the genus have been published. E. B. Uline in the 'Pflanzenfamilien' (1897) suggested a subdivision into subgenera, and a complete monograph, by R. Knuth, appeared in the 'Pflanzenreich' in 1924. But these authors depended on herbarium material, and in the light of the present monograph their work is seen often to be faulty. This is well illustrated by a comparison of the subdivisions of the genera adopted by Prain and Burkill with that of earlier workers. The subgenera suggested by the latter are discarded and replaced by ten sections which often run counter to the earlier subdivision.

For the sake of completeness, three western species are included—one, *D. pyrenaica*, forming the monotypic section *Borderea*, is a very rare dwarf species from the Pyrenees, the two others occur in eastern Europe and the Caucasus respectively. Of the remaining nine sections, eight are characterized by twining to the left; the remaining large section *Enantiophyllum*, in which twining is to the right, will appear in Part II., which will also contain general sections of historical and phytographical interest.

Synonymy is fully discussed and straightened out. Dialect names and economic uses are included.

A special feature is the detailed geographical distribution included for each species. Fourteen geographical divisions are recognized, and under their subdivisions every specimen examined is cited.

A large proportion of the seventy-six species included have been described by the authors during the progress of the work.

Many of the plates are from drawings by Indian artists, the late Matilda Smith of Kew also contributed, and a number are by the junior author. The production of the plates has been aided by a contribution from the Bentham-Moxon Fund.—A. B. R.

Dr. L. Rabenhorst's Kryptogamen-Flora von Deutschland, Oesterreich und der Schweiz. XI. Band. *Heterokonten.* By A. PASCHER. Lieferung 4 (pp. 481–640). Akadem. Verlagsgesellsch., Leipzig, 1938. R.M. 20.

THIS fourth part of Pascher's Heterokontae is almost entirely occupied with a consideration of the remaining (23) genera of Pleurochloridaceae, but the last pages deal with *Gloeobotrys*, one of the two genera constituting the new family Gloeobotrydaceae. Of the Pleurochloridaceae here considered, eight genera are new, viz., *Trachycystis*, *Chlorarkys*, *Keriosphaera*, *Chlorokoryne*, *Trachychloron*, *Aulakochloris*, *Vischeria*, and *Tetrakonton*; the first four of these are monotypic. The majority of the species dealt with in this instalment are freshwater forms, but it also includes the two marine genera *Meringosphaera* and *Schilleriella*. The subject-matter is full of detail and accompanied by many excellent illustrations.—F. E. FRITSCH.

Mother Earth, being Letters on Soil addressed to Professor R. G. Stapledon, C.B.E., M.A. By GILBERT WOODING ROBINSON. Thomas Murphy & Co.: London. 5*s.* 6*d.*

IN books with similar titles one is accustomed to find strong criticisms of the person supposed to be addressed. Here there is nothing of the sort, but a simple account of the modern views of soil and their influence on agriculture. There is a good deal of information, but this could have been presented much better without the silly pretence of letter-writing, with its inartistic assumption of ignorance on the part of one who is chosen to be addressed because of his eminence in the subject.

The Kandy Flora. By A. H. G. ALSTON. 8vo, pp. xvii, 109. Government Record Office, Colombo, 1938. 3·50 Rupees.

THIS work is a school flora for the district of Kandy in Ceylon. In it four hundred and four species have been well illustrated, and briefly described in simple language. The grasses and cryptogams are considered to be outside the scope of the work and a list of them is given as an appendix. A glossary of scientific terms forms a second appendix, while ecology is briefly dealt with in an introductory chapter. This is the only cheap, fully illustrated book yet produced on any tropical flora, and should be of value to students throughout tropical Asia. Unfortunately the work has been published ten years after the author completed it, apparently without being revised by him.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on Feb. 3, Mr. R. E. Holttum gave an account of "Leaf-fall in a Non-seasonal Climate (Singapore)." Regular observations of the flowering and leaf-change of a number of species have been made. The climate at Singapore is sufficiently regular for many trees to show a regular periodicity almost independent of climate, whereas the same trees in other climates would be strictly annual with leaf-fall at a definite season. Even such trees, however, are occasionally upset, and may show marked irregularity after a number of regular periods. Different individuals of the same species may also show marked differences of behaviour. Mr. I. H. Burkill followed with a paper on "The Contact of the Portuguese with African Food-plants which gave Words such as 'yam' to European Languages"—an unusual paper giving much information about the changes in native names and their botanical significance.

At the General Meeting on Feb. 17, Professor R. Woltereck was to have given a paper, but was unable to complete his journey to England because of illness. Dr. E. B. Worthington spoke on "Some Aspects of British Freshwater Research."

The General Meeting on March 3 was devoted to exhibits, among which were:—Cantonese paintings on leaves of *Ficus religiosa* (Mr. J. Ramsbottom); *Completoria complens* Lohde in fern prothalli, a presumed first record for Britain (Dr. B. Barnes); some natural *Leucadendron* hybrids (Mr. S. Garside); some interesting members of the Proteaceae, Loranthaceae, and other families from Queensland (Mr. C. E. Hubbard); *Telaranea*, a genus of Hepatics, new to Europe, discovered in Ireland (Dr. P. W. Richards); and some stages in the development of the cystocarp in *Chaetangium saccatum* (Miss M. T. Martin).

150TH ANNIVERSARY OF THE LINNEAN SOCIETY.—The Linnean Society of London will celebrate the 150th Anniversary of its foundation in May this year. The special proceedings will open on May 24 at 6 P.M. with the address by the President. This will serve to introduce a symposium to be held on the morning of May 25th on "The Concept of Species from the Time of Linnaeus to the Present Day." The morning of May 26th will be occupied with a symposium on "Geographical Isolation as a Factor in Species Formation." The afternoons and evenings are to be devoted to social functions, including a dinner and a reception.

DR. GEORGE TAYLOR, Assistant Keeper in the Department of Botany, left England on March 12th to make botanical collections

in south-eastern Tibet. He is joining Mr. F. Ludlow and Capt. G. Sherriff who have previously visited this region and now propose to extend their investigations eastwards from the Tsari District.

DR. W. H. PEARSALL, reader in Botany at Leeds University, has been appointed to succeed Professor B. H. Bentley as Professor of Botany at Sheffield University, and Dr. J. S. Turner, senior demonstrator in Botany at Cambridge University has been appointed Professor of Botany at Melbourne University in succession to the late Professor A. J. Ewart.

SIR ALBERT SEWARD, formerly Professor of Botany at Cambridge and Master of Downing College, has been elected a Trustee of the British Museum.

ROYAL SOCIETY.—In the list of recently elected Fellows of the Royal Society are the names of Professor W. Brown, Imperial College, London, and Dr. Kenneth M. Smith, Virus Research Station, Cambridge.

THE International Federation for Documentation will hold its fourteenth International Conference on Documentation under the Presidency of Sir William Bragg, O.M., P.R.S., at Lady Margaret Hall, Oxford, from Wednesday, 21st September, to Sunday, 25th September. Thereafter, members of the Conference will visit the Science Museum, London, on Monday, 26th September.

Advantage will be taken of the meeting being in England to hold Joint Sessions on the mornings of Saturday and Sunday with the Association of Special Libraries and Information Bureaux.

Papers will be read upon aspects of the following, and other, subjects: Theories of Classification, Cataloguing, and Indexing—Methods and Apparatus used in the Organisation of Libraries, Archive Repositories, Registering and Filing Centres—Photographic and other Copying Processes in their Application to Bibliographical Problems—The Making of Abstracts from Periodical Literature; possibilities of co-operation—Directories of Information—Exchanges between Publishing Bodies, National and International—The Loan of Books and Documents; principles and possibilities—The Practical Application and Use of Bibliographies. In particular an effort will be made to obtain adequate representation of the varying points of view of workers in diverse fields. At a recent International Congress the view was expressed that it was desirable to widen the bases of International Bibliography and Documentation. At the forthcoming Conference a special attempt will be made to secure authoritative reports upon the present state of bibliographical work in such fields of

learning as Archæology, Archive work, Economics, History, and Linguistic Studies, in addition to the Natural Sciences and their Applications.

The Secretary is Miss M. Gosset, The Science Library, South Kensington, London, S.W. 7.

'CHRONICA BOTANICA.'—This periodical in its first three years was issued annually, and many will regret its new format, though the fact that it is to be published bimonthly enables it to become more what its secondary title claims, "International Plant Science Newsmagazine.' Part 1 of vol. iv. contains 96 pages and is unbound; the annual subscription is 7 guilders 70 cents, post free. It begins with a short account of "The Association for the study of systematics in relation to general biology," by W. B. Turrill. Then follow 16 pages of "Scientific Communications," which are preliminary notes (one describing a new genus of Lauraceae) and summaries of recent researches, 17 pages of "Plant Science Forum," comprising critical reviews and controversies, and 6 pages of "Quotations" from periodicals. The remainder of the part is similar to the previous volumes, giving as it does information about International Congresses, Miscellaneous News, Personalia, Herbarium News; there are also Queries and Notes of New Periodicals and New Books.

Dr. Verdoorn has put a great deal of energy into the 'Chronica Botanica' since its foundation. He has now got it more into the form in which he first planned it. Its success depends upon whether individual botanists are sufficiently interested in general botanical news to subscribe to it.

'THE OBSERVER' for March 6th, in recording the voting of a special credit of £11,000 by the Municipal Council of Paris for the upkeep of its suburban trees, remarks on the fact that the horse-chestnuts of the boulevards and avenues are gradually becoming asphyxiated by smoke, dust, and motor fumes, and are being replaced by planes. As 12,000 of them (about one-seventh) still remain they may occasionally figure in newspapers and in examination questions owing to flowering a second time when rains follow very dry and hot summers.

'LEBENSGESCHICHTE DER BLÜTENPFLANZEN MITTELEUROPAS.'—A further part of this publication has rapidly followed the last and completes the account of Loranthaceae by W. Wangerin and F. Buxbaum. Two pages continue the long account of *Viscum* which occupied 200 pages of the last number, and pages 1147 to 1231 deal with the two species *Loranthus europaeus* and *Arcenthobium Oxycedri*: there are 54 text-figures. The price for the present instalment is 6 R.M., less 25 per cent.

DR. CARRISSO'S BOTANICAL MISSION TO ANGOLA.

BY A. W. EXELL, M.A., F.L.S.

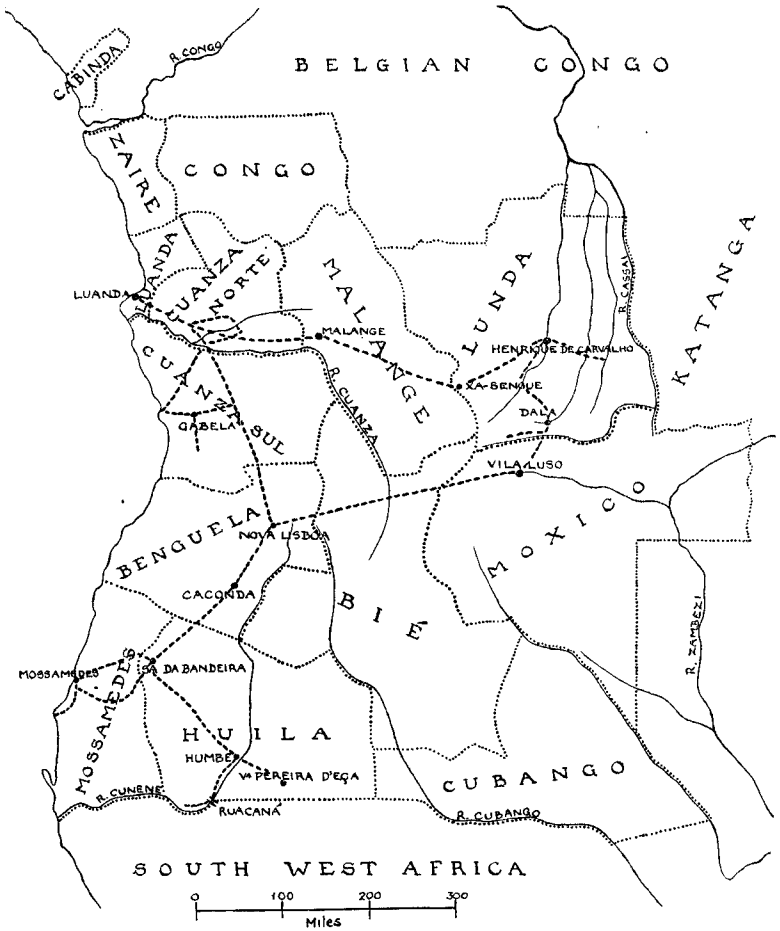
THE British Museum has been long and intimately connected with botanical investigation in Angola, and I myself had worked for a dozen years at its flora, so that it was with the greatest satisfaction that I received an invitation from Dr. Carrisso to join the Botanical Mission to the Colony, which he had been charged to undertake on behalf of the Portuguese Colonial Ministry, and permission from the Trustees of the British Museum to accept it.

We landed at Luanda, a picturesque and in some ways attractive old town, about the middle of March 1937, towards the end of the hot rainy season. There we met our companions, Dr. and Sra. Carrisso, Dr. Mendonça, Mr. John Gossweiler, and Sr. F. Souza, all old friends, and Dr. Jara de Carvalho. Dr. Carrisso and Dr. Mendonça had already, in former years, made two extensive journeys through the country, and Mr. Gossweiler's thirty-seven years' experience of botanical collecting there had given him an unrivalled knowledge of it, so we were glad to leave all arrangements in their expert hands.

While preparations were being made, we had an opportunity to see the coastal region between Luanda and the River Dande. It is undulating, low, sandy country lacking water, and hence nearly uninhabited, except near the town, which obtains a fair water-supply in pipes from the River Bengo. At that time of the year the land was green and attractive-looking, but obviously little cultivated, except for occasional plantations of cassava. The vegetation is of savanna type, an association of baobab with the tree-like *Euphorbia conspicua* being most characteristic. In places, perhaps where the soil is more purely sandy, this gives place to *Sterculia tomentosa*. The red-flowered *Aloe littoralis* gives a touch of colour to the scene which strikes one rather as fantastic than beautiful, especially at dusk when the tall stiff Euphorbias form strange patterns against the evening sky.

Another interesting consociation is that of a palm, a species of *Hyphaene*, which, according to Mr. Gossweiler, flourishes where there is underground water available. When the ground becomes definitely swampy the arboreal vegetation disappears, giving place to an uninteresting-looking association of Gramineae and Cyperaceae. Further inland there are large thicket areas forming a kind of maqui of evergreen shrubs, among which species of *Strychnos* are abundant. Here and there are almost pure consociations of a species of *Copaifera*, which produces a very good copal. This region is inhospitable, and was a great barrier to travellers before the coming of the motor-car. Except for paths made by charcoal burners the thickets are nearly impenetrable and animal life is scarce.

Two large rivers, the Bengo and the Dande, enter the sea north of Luanda. We spent some interesting hours in the thick vegetation which clothes the banks of the latter. There is here a curious mixture of moisture-loving, almost gallery-forest types, together with baobabs and Acacias belonging to the savanna



Map of Angola showing route ------

vegetation. Grewias and various leguminous trees and shrubs are very abundant, and so are dragon-flies, many of them of great beauty. We noted large plantations of oil-palms and sugar-cane, and there was a considerable native population along the river-valley.

Since Luanda is practically cut off from the interior during the rainy season as far as the roads are concerned, we had to take our car, lorries, and equipment by railway to Malange. The journey is an interesting one, as all three main vegetational regions are traversed. For almost eighty-five miles the railway crosses the dry littoral region already described ; then the scene changes rapidly as the train climbs up towards the plateau. We had a few glimpses of the Cazengo Forest which clothes the escarpment. This we visited later. Then on top of the plateau begins the typical savanna and dry forest vegetation which covers the greater part of Angola and extends right across the high southern African table-land as far as the Transvaal.

At Malange we were most hospitably entertained by His Excellency the Governor of the Province, who put all his resources at our disposal. While the motor transport was being assembled and tested we made a number of interesting excursions. The first was to the magnificent 300-ft. waterfall of the River Lucala at Duque de Bragança. Here a number of interesting plants were collected from the cracks in flat rocks at the summit of the fall.

We also visited the Condo Falls on the River Cuanza, and collected with some difficulty a species of *Tristicha* (Podostemaceae) growing on rocks in the centre of the fall. Near the waterfall there was the usual rather more luxuriant vegetation and a few quite tall trees.

The third excursion took us back in a south-westerly direction to the famous rocks of Pungo Andongo, where both Welwitsch and Livingstone were once living at the same time. The former made very extensive collections there and probably left few novelties for later comers. There is something awe-inspiring about these strange rocks which tower up almost perpendicularly above the plateau, and it is little wonder that the natives used to worship them. Visible for many miles they appear, as indeed in reality they are, something quite extraneous to the general landscape. They are formed of a very coarse conglomerate and bear no relationship to the surrounding geological formations. Opinion among geologists is that they are the terminal moraine of a great Triassic glacier. Several plants are endemic, so far as we know, to these rocks, and we were particularly glad to find the tiny *Sedopsis sedoides* growing in crevices in the bare rock, the only plant, apparently, capable of withstanding the extreme heat to which the rock-surface is raised during the day.

We left Malange on 1 April, making due east towards the province of Lunda, a district only recently effectively occupied by the Portuguese. At this time of the year we were faced by many difficulties, owing to floods, broken bridges, and soft mud, so that we had a rough journey before we crossed the River

Cuango into Lunda and made a comfortable camp at Xa-Sengue. Here we made extensive collections in the dry forest.

Lunda is inhabited by the " Chiokwe " (or " Quioco " in Portuguese), a primitive race once of considerable war-like reputation. Somewhat skilled in the manufacture of iron weapons, they established a superiority in armaments over the neighbouring tribes, invaded Lunda from the south-west, and drove out the original inhabitants, the Lundas, who fled across the River Cassai into the Lunda province of the Belgian Congo. We obtained the assistance of the local medicine-man to give us the native names of the plants, and were astonished by his botanical knowledge. He recognized nearly every plant after careful examination, and we were amused to note that his names often closely followed our own classification. Thus all Crotalarias seemed to be called " caposi," and he never gave that name to a specimen of any other leguminous genus. Every plant which is not good to eat he considered to be a remedy for some ailment or other, and we felt that we were doing the neighbourhood quite a service by monopolising the attention of its medical officer. Here, too, at Xa-Sengue we were fortunate enough to see some good native dancing. Solo performances were given by the witch-doctors in their fantastic grass garments, while the women acted as a kind of chorus.

From Xa-Sengue we went eastwards to Vila Henrique de Carvalho (formerly Saurimo), the capital of the province, where we explored the surrounding country fairly thoroughly and obtained, we hope, a reasonable knowledge of the Lunda vegetation.

Lunda is a plateau 3000–5000 ft. high, covered by a deep deposit of sand, and crossed in a north–south direction by numerous parallel V-shaped river-valleys. The vegetation is mainly dry forest (Leguminosae—Combretaceae—*Monotes*—*Diospyros*, etc.) alternating with extensive stretches of grassland known as " chanas." These " chanas " of Lunda are a feature of great interest, and caused much discussion. They are covered mainly by a few dominant grasses, which are much shorter than the tall *Hyparrhenia* species of the tall-grass-savanna and dry forest region. Scattered in the grass are very characteristic rhizomatous undershrubs usually sending up sarmentose shoots to a height of three to six feet. They are typically species of *Tetracera*, *Combretum*, *Annona*, *Eriosema*, *Geissaspis*, *Aeschynomene*, and various Rubiaceae. Most of them are also to be found in the undergrowth of the dry forest, where, when opportunity occurs, they often grow to greater heights as climbers or scramblers. In the " chanas " the grass is regularly burnt during the dry season, leaving the blackened rootstocks of these shrubs, which sprout again during the following rainy season. Dr. Carrisso was strongly of the opinion that the " chanas " owe their origin

to these bush-fires and that the climatic climax would be dry forest throughout this region. Mr. Gossweiler is equally convinced that the alternation of forest and grassland is due to differences of soil and of elevation. One can at least say that the fires strongly favour the grassland at the expense of the forest and that a new balance between the two is thus set up, but it is doubtful whether the " chanas " owe their origin entirely to fire. Fire is a dominant factor to the extent that the whole vegetation of a large part of the great southern African plateau must of necessity be composed of fire-resisting or fire-enduring species. Even if the general facies of the vegetation is not much changed, there is every reason to suppose that the species-content has been profoundly modified. Mr. Gossweiler showed me a very illuminating example of how exotic trees planted along the roadsides had been completely killed by fire, while the adjoining indigenous vegetation had suffered little apparent damage.

The dry forest belongs to what Rübel calls " hiemisilva," and is at first sight of very uniform aspect, although it varies considerably in composition. In Lunda it is perhaps more mesophytic than xerophytic, and there is, moreover, a considerable development of epiphytic lichens. Towards the south of Angola this type of forest becomes progressively drier, species of *Berlinia*, *Bauhinia*, etc., being largely replaced by *Acacia*.

At about halfway down the sides of the river-valleys the water of the plateau drains out, forming characteristic clearly defined marshes known in the region as " tengas." The boundary is so sharply marked that, without exaggeration, one can stand with one foot in the dry forest amidst typical subxerophytic vegetation and the other foot among Utricularias and Droseras. The marshes have a vegetation very rich in species, the genera *Utricularia*, *Xyris*, and *Polygala* being particularly well represented. There is no development of peat, and the water is not completely stagnant, but must be draining slowly downwards towards the river, since there is nearly always a considerable slope. Beneath the surface of the " tenga " there always seems to be a ferruginous pan, a kind of bog-iron which probably plays a very important part in the ecology of the formation. Trees are absent in the " tengas," and even shrubs are very rare and probably occur only where there is either a slight elevation or a current of running water.

Along the edge of the river itself there is typically a narrow belt of gallery-forest of true rain-forest type, though depending largely on edaphic conditions. There is a sudden and violent contrast between the blazing heat of the " tenga " in the midday sun, and the comparatively cool, very moist, greenhouse atmosphere of the gallery-forest with its tall trees, tangled lianes, and typical preponderance of Rubiaceae. Dr. Carrisso has suggested that this gallery-forest can develop only where the

actual current of the river brings oxygenated water in contact with the roots. Its development seems to be completely inhibited in the surrounding marshland. In the rivers themselves are to be found a number of Nymphaeaceae and Hydrocharitaceae.

From Vila Henrique de Carvalho we penetrated as far east as Muriege, a desolate spot not far from the eastern frontier, and afterwards moved south to Dala, near a magnificent waterfall on the River Chiumbe. The rainy season was now over, and it began to get very cold in the early mornings. From Dala we paid a visit to the Protestant Missions near the valley of the River Cassai. My wife stayed at the charming Mission house at Biula, where she made some interesting collections along the River Chikoso, while Dr. Mendonça and I went on to Luma through some beautiful country. Here we were given a great welcome and every assistance. The forest had been carefully conserved for more than thirty years, with immense improvement to the amenities of the district and with great advantage to botanical collecting.

Southwards from Dala we crossed the wide valley of the River Cassai with its extensive marshes and entered the province of Moxico, coming into touch once more with civilisation at Vila Luso on the Benguela Railway. Here we made some collections in the marshes of the River Luena, a tributary of the Zambezi.

Now the dry season had begun, the grass was drying up and bush-fires became frequent. We had to make for the south as quickly as possible before the vegetation there was completely parched. The rains had been exceedingly heavy all over the country, but particularly in the southern provinces, where all the bridges had been demolished. We hoped to get through as early as possible, but knew we should have many difficulties.

From Vila Luso my wife and I accompanied Dr. and Sra. Carrisso by rail as far as Camacupa in the province of Bié. From there we went by road across the high Benguela Plateau to Nova Lisboa. This part of the country is the most successfully colonized region. The climate is excellent. A considerable amount of coffee is grown, and wheat does well at the higher altitudes. The new town of Nova Lisboa is well planned and brightly lit. Here we were rejoined by Gossweiler and Mendonça, who came all the way by road through some difficult country infested by pugnacious wild bees. A few short excursions were made, the most interesting being one to Quipeio and the upper waters of the River Cuito. Here we found a small area of dense vegetation along the banks of the river. A fine species of *Podocarpus* was characteristic and is probably confined, at least in Angola, to this and perhaps to a few similar localities. We also collected species of *Rhus*, *Dombeya*, *Salix*, *Pittosporum*, *Faurea*,

Memecylon, *Ficus*, and many Rubiaceae. A fine *Hypericum* about fifteen feet high was also a conspicuous feature. We left this mountainous region, whose peaks, the highest in the country, reach a height of more than 8000 ft., with regret, but consoled ourselves with the hope, destined to be a vain one, that we should be able to explore it more thoroughly on our return from the south. Although we did not reach the summits, I agree with the opinion often expressed by Mr. Gossweiler that the vegetation is no more than a continuation of that of the high plateau and that there is no hope of finding there any interesting montane species of temperate affinities.

We left Nova Lisboa for the south on 13 May. Just near the Cuima Agricultural Station we had a motor accident, which interfered with our plans. Dr. Mendonça, Mr. Gossweiler, my wife, and I continued our journey, while Dr. Carrisso went back to Nova Lisboa with the rest of the party. As we went southward the composition of the dry forest gradually changed, associations of *Acacia* spp. becoming more frequent.

Our next centre was Sá da Bandeira (formerly Lubango), the capital of the province of Huila, a cheerful, picturesque little town set in an amphitheatre of the Chela Mountains at about 5500 ft. The climate is healthy, the air keen and bracing in the day-time and cold at night. Since we saw more of this country later, I leave an account of it until our return.

The journey to Mossamedes is usually easy enough, but the river-crossings had not yet been repaired since the abnormal rains. We went from Sá da Bandeira through upland country to the summit of the escarpment of the Chela Range without difficulty. Suddenly we reached the edge of the high Angolan table-land and the Chela stretched interminably north and south, descending westwards to the dry coastal plain in confused masses of fantastically shaped rocky peaks. As we looked over it the desert seemed to send up waves of hot air and mist-like dust. We hurriedly collected what specimens we could among the rich herbaceous vegetation which here clothes the ground beneath the dry forest. There was no essential difference in the composition of the latter, no trace of rain-forest. The dry season is too prolonged, the mountains are too distant from the sea for the influence of the mist to be felt.

The descent of the Chela is a rapid and spectacular one, but it was always safe, even for our heavily laden lorry. Later, however, engine trouble hindered us and we reached Vila Arriaga (formerly Bibala) only after much difficulty. This hot unhealthy place is like a furnace in the day-time. It lies right at the foot of the Chela, which here rears itself up like a great wall. On top is the Huila Plateau with its cool European climate, below the thorn-scrub and desert, the home of game, lions, and elephants, fever and thirst. Here at Vila Arriaga we were reminded of

some of the older botanists who made collections in Angola. H. H. W. Pearson collected in the neighbourhood and so did Père Antunes, on his way to the great Catholic Mission at Huila. Welwitsch crossed the desert a little further south along the Maiombo and Bumbo Rivers, which no doubt provided him with sufficient water when he made the journey in October 1859.

As one approaches the coast trees gradually disappear, and there are many miles of thorn-scrub with *Acacia* spp., *Boscia* spp., *Terminalia pruinoides*, and various Acanthaceae. At first there is low grass of good grazing quality which supports small herds of cattle. Hay-making was in progress, a curious scene in such a setting. Strangely enough, hay is exported from this district to Cape Town. Towards Mossamedes the country grew more and more arid until it became sometimes a stony, sometimes a sandy desert. A few miles from the town we made a long descent into the curious sinister-looking valley of the River Giraul. The brilliant green of the river-banks and some still flooded areas made a striking contrast with the surrounding desert. After staying a moment to collect *Tamarix usneoides* we hurried on to the old sea-port of Mossamedes, an eastern-looking town with every street ending abruptly in the loose sand of the desert. The journey from Sá da Bandeira had taken us five days; later in the season we did the same trip in six hours.

Here at Mossamedes we met Sr. Abreu, in charge of the Angolan Forestry Service, a most cheerful energetic person who put his knowledge of the desert country at our service. Without his assistance we could have done little. The climate of Mossamedes is usually cool and invigorating, but we were unlucky enough to strike a period of east wind. This, blowing across the hot desert, made life very uncomfortable.

Near Mossamedes we had our first glimpse of the famous *Welwitschia mirabilis*. At this season the inflorescences were nearly all dried up. Many were attacked by *Sterigmatocystis Welwitschiae* (Bres.) P. Henn. Apparently *Welwitschia* does not flower during the scanty rains, but in the heavy dew in the middle of the dry season. This dew, caused by mist from the sea, is a factor of great importance to the desert vegetation, and indeed in all the coastal regions of Angola. The thin covering of grass, which is found in many parts of the Mossamedes littoral and on the edges of the desert, obviously grows, however, in the rainy season, and was quite dried up by the end of May; but many other constituents of the sparse desert vegetation seem to depend more on dew than on the scanty rainfall. The desert, plants belong mainly to the Gramineae, Compositae, Leguminosae, Acanthaceae, and Ficoidaceae. Besides the well-known *Welwitschia*, the strange dwarf tree, *Cissus macropus*, and the singular cucurbitaceous *Acanthosicyos horrida* are characteristic plants.

Conducted by Sr. Abreu we made a difficult and rather uncomfortable journey along the coast and through the treacherous

area of moving sand-dunes to Porto Alexandre, a little fish-curing town some fifty miles south of Mossamedes. Here the moving sand is a constant menace both to houses and roads, and we admired the excellent work which had been done by Sr. Abreu in planting *Casuarina* trees, which were already doing much to ameliorate conditions. We collected what little there was to get in this infertile region, and made interesting excursions over the desert to the dried-up River Coroca, one of the places visited by Welwitsch. One attempt to return to Mossamedes was frustrated by a violent sand-storm preceded by a cloud of dragon-flies which is, apparently, always a warning sign. All this time the temperature was unpleasantly high during the middle of the day, and most of us were anxious to return to the mountains. Only Dr. Mendonça seemed to retain his customary energy and collected the desert grasses with great enthusiasm.

After returning to Mossamedes we made some further trips into the desert, particularly to the north of the town and to the River Mucungo.

Dr. and Sra. Carrisso and their party now joined us once more, at Mossamedes. Since he had some work to do in the desert, in making preparations for a National Park and Game Reserve, while we had more or less finished our collecting there, we decided to part once more and make an effort to reach the extreme south of the colony. He looked rather tired after his strenuous journey from Nova Lisboa to Mossamedes, but we said good-bye to him, little thinking that we should never see him again alive.

Towards the end of May we left Mossamedes, with Sr. Abreu as our guide, in an attempt to cross the desert in a south-easterly direction by way of Pico d'Azevedo, Cahinde, and Tampa—a route which had long fallen into disuse. This would give us an opportunity to collect in regions as yet unvisited by botanists and to ascend the Chela Mountains at a different point. Everything went well across the desert proper, where we had splendid views of herds of zebra, but our troubles began in the thorn-scrub country amid the foot-hills of the Chela. Here the road entirely disappeared, and we had every conceivable difficulty in getting our heavy lorry across the numerous river-beds which seemed to cross our course every hundred yards or so. This region of short dry desert-grass is the real home of *Welwitschia*. The plant manages, it is true, to survive in the coastal desert, especially in shallow depressions, but here in the whitish sun-bleached grass were dark green Welwitschias in hundreds and thousands. It reproduces readily and there seems no danger whatever of its extinction. In fact, isolated specimens survive in the middle of the lorry-road from Mossamedes to Porto Alexandre, and the Welwitschias do more harm to the lorries than vice versa.

Two great river-beds, the Otchinjau and the Bero, caused us great difficulties in crossing, and in each of them we spent

a night. The sand was covered everywhere with tracks of lions, elephants, and rhinoceros. In the Bero we were much relieved to find a trickle of water, as our supply was nearly exhausted. At the end of the third day we reached Tampa, a Portuguese outpost at the foot of the Chela Mountains, and were glad to get on to a road again.

The Serra de Chela is here lower, and many constituents of the dry forest extend right up the mountains on to the plateau. On the way up a short visit to the waterfall of Ungueria was well repaid by a number of interesting species collected from the cool damp rocks around the fall. Stopping from time to time to make collections at various altitudes we wound up and up on to the delightful Huila Plateau and found ourselves once more at Sá da Bandeira, where we enjoyed the kind hospitality of Sr. Moreno, who was in command of the mountain artillery.

Leaving all the collections to be looked after by my wife, we left almost immediately for the extreme south, taking the route through Gambos, from which there are already small collections made by Newton and Pearson, and arrived at Humbe, near the River Cunene, the same night. With us were Colonel Moreno, our faithful companion Sr. Abreu, and Sr. Tendeiro of the Humpata Agricultural Station. The next day we crossed with some difficulty the deep muddy River Caculovar, and followed the Cunene in a south-westerly direction towards the great Ruacaná Waterfall. This country is different from anything we had seen before, though somewhat reminiscent of the littoral region near Luanda. There are many miles of dense *Acacia-Grewia-Commiphora* thickets interspersed with areas of good grazing grasses supporting considerable herds of cattle. The Cunene, during the rainy season, floods to a width of several miles and we passed through still inundated areas rich in waterplants. Various Elatinaceae and Lythraceae were abundant on the drying mud, and pools of water were full of Hydrocharitaceae, Nymphaeaceae, Utricularias, and aquatic Gentianaceae. At other times we passed through savanna country with the ubiquitous baobab and some interesting consociations of a small species of *Hyphaene*. Long before we reached them we heard the roar of the Ruacaná cataracts, but it was after nightfall before we arrived at the remains of a settlement and a tumbledown mud house where we camped for some days.

The falls were a magnificent sight, as the Cunene carries a great volume of water at this season. If they were not so inaccessible, they would surely rival Victoria Falls as an attraction to tourists. The whole region, however, seems to be badly infested with mosquitos and practically uninhabited.

We had hoped that the spray from the falls would produce a luxuriant vegetation of rain-forest type, but in this we were disappointed. Dry scrub grows right to the water's edge. The rainfall is scanty, and presumably the flow of the river is reduced towards the end of the dry season, so that the spray is insufficient to support hygrophytic vegetation. We were compensated, however, by finding many interesting herbaceous plants growing on the damp rocks and a few Podostemaceae on boulders in the current of the river. The surrounding dry forest and scrub also yielded a number of new records and probably several new species, among them a very distinct new *Combretum*.

After a short trip along the frontier to Chitado, where I was rather surprised to find *Tamarix* growing along the banks of a small river, we returned to Humbe and crossed the broad swampy Cunene in a boer-cart. From Forte Roçadas, on the other side, we made a hasty trip through thorn-scrub and cattle country, famous for its game, to Vila Pereira d'Eça (formerly Ngiva), where we were hospitably entertained by Dr. Martins of the Angola Veterinary Service. All this country is rich in cattle, but the vegetation is poor in species and everything was much dried up when we were there.

After making the long journey back to Sá da Bandeira we were much distressed the next morning to hear that Dr. Carrisso had died suddenly of heart-failure in the Mossamedes desert. We left almost immediately and travelling all night across the desert arrived the following day at Mossamedes in time for the funeral service. This sad end to a life which had been largely devoted to a study of Angola cast a deep gloom over our party, and the expedition was officially declared to be closed. Elsewhere in this Journal I have tried to express my personal appreciation (lxxv. (1937), 356–7).

As the Portuguese members of our party had to return by sea to Luanda, Gossweiler and I crossed the desert once more by the Vila Arriaga route, which was now becoming almost familiar ground. A broken axle near Vila Arriaga delayed us a day, but gave us a little time to collect in the neighbourhood. By now a few of the trees and shrubs which flower in the dry season had come out, particularly a white-flowered flat-topped *Acacia*, two or three species of *Boscia*, a species of *Euclea*, and the same new *Combretum* which we had found at Ruacaná. Here, too, we collected *Hexalobus huillensis* from the type-locality, actually in the province of Mossamedes, and not Huila, as we had erroneously but naturally supposed.

The next day I was glad to rejoin my wife, who had been left for about a fortnight with all the presses of plants. She had taken the opportunity to make a small collection at the Huila Cataract. At the same time we heard of the death of Père Bonnefoux of the Huila Mission, who sent collections to the Muséum d'Histoire Naturelle, Paris. He continued the botanical tradition of Dekindt and Antunes, whose names have long been well known in taxonomic literature.

Mr. Gossweiler had now to settle up our affairs at Sá da Bandeira and arrange for our journey back to Luanda. Meanwhile, my wife and I made several excursions with Sr. Tendeiro to the high Humpata Plateau, which is to me the most delightful part of Angola. Welwitsch was also charmed by it and spent a considerable time there, so our collections may contain but few novelties. Here the South African element of the Angolan flora is most strongly represented. The typical vegetation is a kind of maqui composed of heath-like shrubs with a number of *Protea* species and many interesting Compositae. Here, as nearly everywhere on the plateau, *Clematopsis* was very abundant, and the genus *Crotalaria* seemed to be represented by an endless number of species. Particularly charming was a dwarf annual species of *Belmontia* with large brilliant yellow flowers. It grows in wet sand. Aquatics and bog-plants were plentiful, and the banks of the River Nene provided a good hunting-ground. From the little mountain-village of Humpata, where many European plants, even oak-trees, flourish, we ascended amidst lovely mountain scenery to the well-organized "Posto Zootechnico," which has done much to improve the races of cattle and pigs in Angola. With only a few hours available we climbed up about another thousand feet almost to the highest point of the Chela Mountains, but found everything very dry on the summit.

We left Sá da Bandeira and our kind hosts at the barracks of the Mountain Artillery with much regret, and started on the seven hundred mile journey back to Luanda. At Nova Lisboa we had time for only one day's collecting among the Benguela Mountains. The vegetation was mostly dried up, but we found a few interesting Labiatae along the banks of one of the upper waters of a tributary of the Cunene.

North of Nova Lisboa we spent some time in a typical "chana," collecting the characteristic rhizomatous undershrubs, all very similar in habit and appearance, but belonging to such different genera as *Cryptosepalum*, *Hibiscus*, *Biophytum*, *Aeschynomene*, *Euphorbia*, and *Combretum*.

It was now nearly the end of June, mid-winter in Angola, but a few precocious-flowering trees were already covered with blossom. Among these were several species of *Dombeya*, one of *Anisophyllea*, and the beautiful and very conspicuous *Erythrina suberifera*, a mass of scarlet flowers.

As we gradually descended from the Benguela tableland into the province of Cuanza Sul the country became broken up into mountain-masses, but without much apparent change in the vegetation. Here are large sisal plantations belonging mainly to Germans. The rocky bed of the River Longa yielded some Podostemaceae, and a few hours later we made a long descent into the great valley of the River Cuanza, the vegetation

changing suddenly into a tropical richness with great festoons of scarlet-flowered Combretums hanging from the trees. The valley of the Cuanza is the main cotton-growing country of Angola and is characterized by dense associations of *Elaeis guineensis*. Here, according to Mr. Gossweiler, is the real habitat of the species, and not, as has been claimed, the mountain-forest region.

After spending one night at Dondo, the old port on the broad Cuanza River, once the starting-point for all travel into the interior of northern Angola and an old centre of the slave-trade, we crossed once more the broad littoral belt and arrived again in Luanda at Mr. Gossweiler's comfortable house.

When all business had been settled up and the Portuguese party had sadly embarked for Lisbon, taking Dr. Carrisso's body with them to be buried in Portugal, we were left with sufficient time for a short trip with our ever-energetic and indispensable friend Mr. Gossweiler. Packed in a single Ford truck we were soon back again at Dondo and ascending once more on to the plateau. Turning southward from Quibala, in Cuanza Sul, we made for the coffee-country of Amboim, whose centre is the cheerful little town of Gabela. Here the mountains are near enough to the sea to be enveloped in mist throughout the dry season, and there is a very fine development of forest. The sudden change from the dry plateau to the towering trees and luxuriant vegetation of the mist-zone is very remarkable. This forest reminded me of the mist-forest of S. Tomé, in the Gulf of Guinea; only the rich growth of epiphytes was lacking. We spent a few very interesting days in this cold misty country, and Mr. Gossweiler was in his element, immediately recognizing practically every tree by a glance at the trunk.

One excursion to the south took us to Vila Nova do Seles. On the way we crossed the lovely valley of the River Cuvo, along the banks of which we found an interesting climbing *Hibiscus* and a fine mauve-flowered *Randia*. The rocks in the river-bed yielded a few more Podostemaceae. Near Vila Nova do Seles, after a long search, we found good material of the remarkable annonaceous *Mischogyne michelioides*, which Mr. Gossweiler collected from the same locality, in rock-crevices, some years ago. This Seles region is enveloped at this time of the year in constant mist and the curious native villages, with houses perched on the tops of large flat-topped rocks, with ladders for climbing up to them, look very weird in the half-light. Amboim and Seles are fine coffee-country and the greater part of the forest has now been planted with *Coffea robusta*. The forest-trees, however, are left as shade-trees, and there are fine specimens of *Piptadenia africana*, *Ficus* spp., *Maesopsis Eminii*, *Chrysophyllum* sp., and many others.

From Amboim we went down again to the coast at Porto Amboim, noticing the abrupt transition between the mountain-forest and the dry littoral vegetation. From Porto Amboim northwards is hilly grassland, almost uninhabited owing to lack of water. In spite of the fact that no rain had fallen since the end of the rainy season (middle of April), already, in mid-July, the country was quite green again owing to mist from the sea. Soon we saw spread before us the immense valley of the River Longa, which we crossed by ferry. From the Longa to the Cuanza is dry undulating country covered with scrub, xerophytic forest, occasional plantations of cotton, and many deserted native villages.

With only two more days before we were due to leave Luanda we paid a hurried visit to the beautiful Cazengo forest, so intimately known and so adequately studied by Mr. Gossweiler. We arrived for the night at the old village of Golungo Alto, made botanically famous by Welwitsch, who lived there for about two years. Sorry to have no more than a glance at this fine forest-region, we consoled ourselves with the thought that no part of Angola is better known than the Cazengo and Golungo Alto forests. From Golungo Alto we followed a new, very fine road across the Serra de Muxaula through magnificent mountain-forest. Most interesting were imposing examples of *Monodora Myristica* laden with their great spherical fruits. Here also were butterflies in great profusion and my wife was disappointed that we could stay so short a time. She filled her killing-bottles in record time.

The mountain-forest gradually gave place to the littoral vegetation, patches of luxuriant growth persisting along the banks of the small rivers almost as far down as Maria Teresa on the Luanda–Malange Railway. We were back again in the region of *Dichrostachys* and *Strychnos* thickets, and completed a journey of more than seven thousand miles through Angola along the long dusty road from Catete to Luanda.

NOTES ON F. H. DAVEY'S 'FLORA OF CORNWALL.'

By F. Rilstone, A.L.S.

Viola.—Davey's remarks as to the distinctness of *Viola calcarea* Gregory and *V. hirta* L. seem fully borne out by the plants occurring in Perranporth sand-dunes. These are small-leaved, and the dark blue flowers come into bloom when the flowering season of *V. hirta* is well over. The list of localities given for *Viola canina* L. tends to obscure the peculiar distribution of that species, which is very rare in most parts of the county, only becoming at all frequent in the Lizard and Land's End districts. It is probable that some of the records of *Viola*

lactea Sm. really concern the hybrid *V. lactea*×*Riviniana*, which is of frequent occurrence. With its wealth of pale blue flowers and taller, more robust habit, it is a more conspicuous plant than either of the parents.

Veronica.—The description of *Veronica agrestis* L. as "A very common and abundant weed" is certainly a mistake. In over thirty years' acquaintance with the Cornish Flora I have only three times found this species. At Polperro (East Cornwall) and in Perranzabuloe (West Cornwall) it occurred sparingly with root-crops. The third find was of a very small form with tiny white flowers growing out of ballast on the railway-line at Lostwithiel. *Veronica polita* Fr. is rather uncommon and in my experience is usually a plant of roadsides, especially on loose stony ground by newly made roads and paths. *Veronica persica* Poir. is, of course, abundant, and the smaller paler-flowered forms are, I have found, sometimes casually passed as *V. agrestis*, though the briefest examination of the fruiting plant would show the difference. Briggs ('Flora of Plymouth') records *V. agrestis* as a common plant about Plymouth, but on enquiry some years ago at the Athenæum Museum I was told there is no specimen in the Briggs Herbarium which is preserved there.

Thymus.—Forms of *Thymus Serpyllum* L. on hedges, banks, sand-dunes, and cliff-slopes are, so far as I have been able to find, always one or other of two well-marked plants. Both have the square flower-stalks with alternate sides glabrous and hairy respectively, and fall readily under Ronniger's *Thymus neglectus* and *T. britannicus*. The former has small oval glabrous-surfaced leaves, usually sparingly ciliate, and small heads of red flowers, and forms low-growing compact sheets or cushions or thick-curtained growths hanging over steep banks. The latter is a larger looser plant with larger heads of larger, much paler flowers on longer stalks and is hoary with the hair-growth on the foliage. Long white hairs grow plentifully on the leaf-surfaces as well as on the margins and on the calyces. Plants from inland heaths are often different, having leaves glabrous or semi-glabrous, but of more or less diffuse habit with narrower leaves and more elongate flower-heads.

Ulmus.—Little was known of the Cornish elms when the 'Flora' was published in 1909, and, though their distribution was much more accurately stated in the "Supplement" by Thurston and Vigurs (1922), it may be as well to put on record that there are only two common elms in the county, the Cornish (*Ulmus stricta* Lindley) and the Dutch (*Ulmus hollandica* Miller= *U. major* Sm.). *Ulmus montana* Stokes in With. and *U. nitens* Moench are often obviously planted trees, though the latter occasionally occurs in apparently natural habitats.

Orchis.—A specimen of *Orchis pyramidalis* L., gathered near Newquay, was brought in 1936 to Dr. C. C. Vigurs. The plant thus occurs sparingly at intervals along the north coast from Bude to St. Ives. *Orchis latifolia* L. (*O. incarnata* L. of the 'Flora') is recorded for various localities. It is certainly present in the extreme west, but probably most of the other records should be put to *O. praetermissa* Dr.

O. maculata L. is said to be "very common in all the districts" and *O. ericetorum* Linton "perhaps not infrequent." This more or less transposes the actual facts. It is *Orchis elodes* Griseb. (*O. ericetorum* Linton) which is the commoner plant, while *O. maculata* (*O. Fuchsii* Dr.) is a rarity, only certainly known from the extreme west.

The only other species of *Orchis* at all common in Cornwall, apart from the very common *O. mascula* L., are the two marsh orchids *O. pardalina* Pugsley with spotted leaves and *O. praetermissa* Dr. with leaves unspotted. Where one grows the other may generally be found, though *O. pardalina* is not usually present in equal numbers with *O. praetermissa*.

Agrostis.—Under *Agropyron repens* Beauv. appears the note, "An all too common and troublesome weed." This was probably written in the belief that the "Couch grass" or "Stroil" which troubles Cornish cultivators is all *A. repens*. This is by no means true; most of it is *Agrostis gigantea* Roth. I have known for some time that the underground runners in my own neighbourhood were often produced by a form of *Agrostis alba* agg., though *Agropyron repens* also occurs, and the description of *A. gigantea* Roth. by Mr. Philipson in his "Revision of the British Species of the Genus *Agrostis* L." (Journ. Linn. Soc., Nov. 1937) led me to seek further information from Mr. W. Borlase, F.L.S., formerly Agricultural Organiser for the Cornwall County Council. I learn from him that "Couch grass" in Cornwall is mostly the *Agrostis* and only rarely the *Agropyron*. This, he says, has been especially noticed for years past on wheat stubbles. Evidently *Agrostis gigantea* is in Cornwall both widespread and plentiful, while *Agropyron repens* is far less abundant than has been supposed. The mistake is more easily understood when one remembers that the underground runners or rhizomes are chiefly seen during land-cultivation in early spring when neither flowers nor foliage are in evidence. But in the breaking of wheat-stubble in autumn the true state of affairs becomes evident, and it is rather surprising that the facts have been so long unrecorded in botanical publications.

CAREX SPICULOSA VAR. *HEBRIDENSIS* AR. BENN.

By A. J. Wilmott, F.L.S.

On July 26th, 1895, W. S. Duncan wrote to Arthur Bennett from Scarp (Outer Hebrides):—"I enclose specimen of long-glumed *Carex* which I picked up on a moor in the N.W. part of Harris on Wednesday last. I've never seen it in Harris before, and I am not certain whether I've gathered it at all before. I shall feel obliged if you will name it for me . . . and say whether it is recorded for the Outer Hebrides."

I have no copy of Bennett's answer, but on August 5th Duncan writes again, giving some account of the habitat and adding:—"It cannot be the *C. Kattegatensis*, if that has the glumes mucronate, as the glume of this has no approximation to a mucro or cusp, but has more or less of the end hyaline, often acute, at other times sub-acute and sometimes lacerate. Did you observe that the perigynium is papillose at least in the upper half? I send you a few more specimens, and hope you will soon make the plant out. If you would wish living specimens, I could get a sod for you . . . ."

Bennett refers to the plant in the September (1895) number of the *Journal of Botany* (p. 283) as:—"A very puzzling *Carex*, having much of the facies of the *acuminata* (Willd.) form of *C. glauca* Scop. (*C. flacca* Schreb.), but with two stigmas, and otherwise in some degree combining the *vulgaris*, *aquatilis*, and *salina* sections of the genus. At present I am unable to give it a certain name; I hope to get living specimens."

These living specimens he obtained, and in the next issue of the Journal (p. 315) he notes:—"The receipt of living plants . . . has proved it to be a *salina* form, but one that at present I am unable to match. From descriptions it seems to hold a middle place between *C. flavicans* Nyl. and *C. spiculosa* Fr., wanting the serrulate apex of the glumes of the latter. . . . It is a much smaller plant than the *C. kattegatensis* Fr., and forms an interesting addition to the Hebridean Flora." Bennett also refers to it in the (1895) October number of the 'Annals of Scottish Natural History' (p. 246) as:—"*C. salina* Wahlb., var. ? . . . . Mr. Duncan has just lately (26th August, 1895) sent me a turf with living specimens of this interesting *Carex*. It corresponds with nothing I have under the species for Asia, America, or Europe, and *ex descrip.* seems to come between *C. flavicans* Nyl. and *C. spiculosa* Fr., but wanting the rough apex to the glumes of the latter. I have not been able yet to see authentic specimens of the 'species' Nylander describes . . . ." There is a note on Bennett's herbarium cover:—"I do not see what this plant is *so near to as C. spiculosa* Fr.—there are the prolongations of the end of the glume, and indications of asperity here and there." Actually

Duncan's observations are more accurate, for there is no trace of a mucro or cusp; Bennett seems to be trying to make the plant fit the description of *C. spiculosa*.

In a MS. note found with the specimens in his herbarium Bennett has written :—" Considering the rarity etc. of the Finnish plant I felt dubious and sent the specimens to Dr. Almquist of Stockholm who had worked at this section of the genus for many years. He replied '20. 7. 98. Your *Carex* really resembles *C. spiculosa*, though—as you say—not exactly identical, and is undoubtedly the same hybrid." Almquist's letter, preserved in Herb. Bennett, continued, however, "*C. Goodenoughii*×*salina*. The specimen is although too incomplete that I should be able to make a sure determination." This determination was evidently sent to Duncan, who writes (18. 10. 95) thanking him and giving precise details of the locality.

Bennett therefore in 1897 (Journ. Bot. xxxv. 252) published the name *C. spiculosa* Fr. forma nov. *Hebridense* (sic) for the plant, stating that " Dr. Almquist agrees with me in considering that the specimens of *Carex* gathered by Mr. Duncan in Harris, Outer Hebrides, are the nearest to *spiculosa* of any named form, the only appreciable difference being the want, in the Hebridean specimens, of the serrulate glumes (although they are equally as elongated) of Fries's plant. . . . The difficulty with our plant is to find the *salina* parent; the only other Carices Mr. Duncan can find in the neighbourhood are *C. glauca* and two forms of *C. Goodenowii*. The peculiar colour is very marked in our plant." As synonym Bennett there cites "*C. salina cuspidata*×*Goodenowii*, *iuncella*, teste Almquist, Bot. Not. 128 (1891)," which is misleading, since that determination applied only to the original *C. spiculosa* from Russian Lapland, and Almquist's letter indicates that he was not prepared to state which forms of the two species might be concerned with the Hebridean plant. Almquist in that publication considered that another plant from " Karelia pomorica " might be *C. salina cuspidata borealis*×*Goodenowii*. It should also be noted that Bennett's reference to Prof. Bailey's remarks (the reference should read—Proc. Am. Acad. xxii. n.s. xiv. p. 85, 1887) belong solely to an American plant and have nothing to do with that from the Hebrides.

Carex spiculosa was first described by Fries in 1843 (Bot. Not. p. 99, as " n. sp."), then by Nylander in 1844 (Spicileg. Plant. Fenn. cent. alt. p. 21, as of " Fr. et Nyl."), and again by Fries in 1845 (Summ. Veg. Scand. 226). These three accounts, of which Nylander's is the most detailed, relate to the same plant, collected near Kemet in Russian Lapland. Bennett saw no authentic specimen of the Lapland plant, but, contrary to Hooker's statement (p. 159) in Boott's Illustr. Carex, vol. iv. (1867), the specimen from which the figure (t. 524) in that work was prepared was in Herb. Boott, now in the Kew Herbarium,

collected and labelled by Fries. Notes by Boott on the sheet state :—" The only specimen I have ! Observe the woolly roots," and " vaginis aphyllis ! Does this separate it from *C. salina* ? " C. B. Clarke adds a note dated " 18 July, 1901. Laid in from Herb. Boott, where it was found in his cover of '*salina*.'—This is the 'type' of Boott, tab. 524."

Boott's figure shows well the points emphasized by Fries :—The cæspitose habit, the fibrils of the lowest sheaths, the long-produced serrate midrib of the female glume. None of these characters is possessed by the Hebridean plant, and what Bennett may mean by " the peculiar colour of the plant " is not clear, for the only indications of colour in these descriptions are (i.) the plant is "*flavicans*," (ii.) the lowest sheaths are " eximie fusco-nitentes," (iii.) the female glumes are " fuscæ, nervo dorsali pallidiori," and (iv.) the fruits are " flavicantes," and none of these points seem to me very peculiar in this group. (I would observe in passing that the possession of fibrils to the lower sheaths is a character of *C. caespitosa* L., and *C. stricta* Good., lacking in *C. salina* Wahl. and *C. Goodenowii* Gay; their possession by ×*C. spiculosa* would suggest that *C. caespitosa* and not *C. Goodenowii* might be the other parent, which the cæspitose habit might be held to confirm. The " fibrils " are at least exaggerated in the figure, and are not easy to observe in the specimen. Many are certainly extraneous matter, as now observed on the mounted specimen. Moreover, the figure does not give a good impression of the slenderness of the plant, which is about a foot in height, with slender narrow leaves suggestive of those of *C. caespitosa*. Many localities are given for *C. caespitosa* in Finland (Hjelt, 1895 : Consp. Fl. Fenn. i. 274), and the coloration of the lower part of the plant is exactly the same as that shown by several specimens of that species in Herb. Mus. Brit.

The Hebridean plant, as Duncan emphasized, has glumes without any trace of a produced midrib. The midrib ends below the apex, and the hyaline point is merely the continuation of the hyaline margins. Since the projecting midrib is the character which chiefly shows the influence of *C. salina*, I am in full agreement with Groves, who wrote (note in Herb. Bennett) :—" As far as we can see the most important character of Fries's plant is the long scabrid excurrent keel and the stalked female spikes, and as these are not present in Duncan's plant we do not feel justified in admitting the species as British without further evidence. Duncan's is certainly a curious plant . . . ." (*cf.* Bab. Man. ed. (ix.) Groves, p. 462, 1904). Bennett's reply to this criticism (Ann. Scot. Nat. Hist. 1905, p. 172) is :—" This is the reason why I called it a variety, and to this Dr. Almquist agreed. Being probably a hybrid, and with the same derivation as *spiculosa*, it seemed better to do that than to give it a name as

a species," which seems a poor excuse for referring the plant to a species the special characters of which it lacks.

In 1928 G. C. Druce searched for the plant without success (B. E. C. 1928 Rep. 602, 1929—also 1931 Rep. 675, 1932), but he did not obtain Duncan's precise directions until after his return. He says, however, " although I had worked over the spot, I saw nothing like it in Harris, nor should I have thought *salina* would have grown by an inland freshwater loch two or three hundred feet above sea-level. Dr. Kükenthal, however, thinks that the specimen collected by Duncan is *Goodenowii*×*salina*=*spiculosa*, but goes no further." Druce sent Kükenthal the " fragmentary specimen " given him by Bennett in 1928 B. E. C. Rep. 602), and a note on this specimen in Herb. Druce reads :—Hancce plantam (utriculis sterilibus) pro prole hybrida habeo, nempe pro *Carex Goodenoughii*×C. *salina* Almq.= *C. spiculosa* Fr. 1. ii. 1932, det. G. Kükenthal." In spite of Dr. Druce's remark that he saw nothing like it in Harris, there is a specimen from Loch Langavat in his herbarium which except in its size is very like Duncan's. Its glumes are nearly as narrow and pointed on the whole, and some are an exact match. This he labelled *C. Goodenoughii* var. [rightly], but it bears Kükenthal's determination as *C. glauca* [!]. Bennett remarks (Ann. Scot. Nat. Hist. 1910, 50) that Kükenthal makes no mention of the Hebridean plant in his monograph in the ' Pflanzenreich.'

In 1930 Prof. Holmboe, after examining the specimens in Bennett's herbarium, determined them as " *C. salina* var. *cuspidata* of the Swedish flora." In view of the complete absence of excurrent midrib in Duncan's specimens, I cannot understand this determination.

In view of these legitimate criticisms, viz. that the Hebridean plant lacks the characters of ×*C. spiculosa* which come from *C. salina*, and that *C. salina* is not known in the Outer Hebrides and is not likely to grow near Duncan's plant, a re-examination of the locality was very desirable. An opportunity to do this occurred last year during a visit to the Islands with Mr. Francis Druce and Miss M. S. Campbell. The locality was easily traced from the directions given by Duncan to Bennett, and on July 11th we stood on what I am satisfied was the exact spot where Duncan gathered his specimens, a small grassy flat a few square yards in extent some 9 inches above a small burn above Loch Langavat two miles west of Amhuinnsuidh. Here we found a peculiar form of *C. Goodenowii* with extremely narrow glumes, of which a few at the base of the lowest spikes were like those of Duncan's plant : the majority, although quite as narrow, were obtuse or only slightly acute. Those collected in the turf match Duncan's plant exactly in habit, but less than a foot away from these were specimens which had fallen into the burn and which grew among the stones in the water. These had the same type of glume, but were stronger specimens, with creeping rhizome and otherwise just like *C. Goodenowii*. The papillosity of the perigynia, mentioned by Duncan, is merely that roughness often visible in *C. Goodenowii*. A specimen with glumes intermediate between this form and typical *C. Goodenowii* was found a few yards further down the same burn. The full list of Carices observed in the locality was *C. dioica* L., *C. pulicaris* L., *C. stallulata* Good., *C. Hostiana* DC., *C. binervis* L., *C. panicea* L. (? Duncan's ' *C. glauca* "), and forms of *C. Goodenowi* Gay; also *C. flava* L. seen by Miss Campbell by the neighbouring burn. Having none of Duncan's specimens with me I thought at the time that these narrow-glumed specimens were identical with forma *hebridensis* (Ar. Benn.), and am unable to say whether the original plant (presumably a single " clone ") is still in existence. Since, however, the form gathered by us bears some glumes identical with those of Duncan's specimens, and is otherwise indistinguishable from it when growing in the turf, I am satisfied that both are merely narrow-glumed forms of *C. Goodenowii* Gay. Such narrow-glumed forms occur in other species of *Carex*, and may well be expected, even though apparently they are rare, in such a polymorphic species as *C. Goodenowii*. Although such forms are not mentioned by Kükenthal in his monograph, I consider these Hebridean plants to represent them, and I therefore name Duncan's form *C. Goodenowii* var. *hebridensis* (Ar. Benn.), comb. nov. Dr. Druce's specimen, owing to Kükenthal's wrong determination, was among specimens of *C. glauca* in Herb. Druce, and was not found until this paper was written, but it confirms the view here expressed, being an additional link connecting ordinary *C. Goodenowii* through my specimens with the extreme form collected by Duncan.

A NEW VARIETY OF *SALIX ALBA* L.

By J. Burtt Davy, M.A., D.Phil., Ph.D.

While making a field study of the distribution of *Salix alba* var. *caerulea* Smith, the Cricket-bat Willow, I came across a very distinct variety of *S. alba* L. in collections of var. *caerulea* under cultivation in several different localities in East Anglia, Hampshire and elsewhere. In the interesting collection of willows brought together some years ago at Ryston Hall, Downham Market, Norfolk, were some well-grown specimens of this variety; these are said to have been brought from the Isle of Ely by a former owner of the estate, but the precise locality where they were found, and whether they were growing wild there, or were in cultivation, are unknown items in its history.

The tree is recognizable by a tendency of the younger branchlets to droop, and by the longer catkins with longer and more conspicuous bracteoles. It is said to be of slower growth than var. *caerulea*. It is stated, also, that its timber is less valuable than that of var. *caerulea*, and that it is used only for the cheaper classes of cricket bat; on this point, however, precise information based on manufacturer's returns as to the quality and relative value of the wood obtained appears to be lacking. Accurate tests of relative rate of growth and quality of timber would be of interest; these should, of course, be under strict control as regards the identity of the varieties tested.

The long catkins and relative length and shape of bracteoles suggest possible hybridity, with *S. fragilis* L. as one of the parents. The leaves are definitely of the *S. alba* var. *caerulea* type, and the variety may well be a segregate of a hybrid between *S. alba* and *S. fragilis*.

Dr. Björn Floderus, when examining the *Salix* collection of the Imperial Forestry Institute, expressed the opinion that this form represented a hybrid between those two species, the *S. alba* character predominating.

I have not found any named form of $\times$*S. viridis* (*S. alba*$\times$ *S. fragilis*) which matches the particular willow under discussion, nor has Dr. Floderus identified it with any of the named forms known to him. Although there is some resemblance between its catkins and those of *S. fragilis*, it is not impossible that this is a case of parallel development. In the absence of genetical evidence of origin it seems best to treat the plant as another of the several "varieties" of *S. alba* L., and I propose, therefore, to call it *Salix alba* var. *elyensis*:—

Salix alba L. var. *elyensis* Burtt Davy, in 'The Cultivation of the Cricket Bat Willow'; 'Forestry Commission Bulletin No. 17' (1936), p. 51 (in key), pl. xvi. A (catkin with pro-leaves and diagrammatic drawing of bracteoles and ovary). *S. viridis* var. *elyensis* Burtt Davy, *op. cit.* p. 47 (sphalm).

A tree up to about 50 feet in height, with slightly drooping branchlets. Allied to *S. alba* var. *caerulea* Smith, differing in the relatively longer catkins; the longer, relatively narrower, acute, rather persistent bracteoles which exceed the stamens and ovary at the flowering stage; and the shortly stipitate ovary with a distinct style. The coppice shoots of the year are greenish in winter and early spring, instead of mahogany-coloured as in *S. alba* var. *caerulea*, and the circumstomatal dots are slightly less densely distributed on the surfaces of the mature leaves. All of these characters suggest some affinity with *S. fragilis*, but the tree is more closely allied to *S. alba*.

Salix alba var. **elyensis** Burtt Davy, var. nov.—*Ramuli novelli* argenteo-adpresso-sericei, tandem glabrescentes.

Stipulæ minutæ caducæ, lanceolatæ, integræ, apice subacutæ. *Folia matura*: lamina lanceolata, usque ad 11 cm. longa et 2 cm. lata, plerumque 8–9 cm. longa et 1·5–1·7 cm. lata, apicem acutum versus longe et angustissime acuminata, basi in petiolum 0·4–0·6 cm. longum attenuata, margine dentibus glandula acuta decidua terminatis (eis *S. albae* similibus) subtiliter atque sat regulariter serrata, utrinque pilis adpressis argenteo-sericeis et punctis stomaticis albidis quam *S. albae* paullo sparsioribus instructa, subtus glauca vel subglauca tandem glabrescens. *Amenta* ♀ subcoetanea densiflora cylindrica pedunculata, ramulos breves paucifoliatos terminantia; pedunculus 0·3–0·7 cm. longus; pars florifera sub anthesin 3·0–5·0 cm. longa, axe pilis albidis breviter villosa; bracteolæ flavido-virides elliptico-lanceolatæ, 0·35–0·6 cm. (plerumque 0·4–0·5 cm.) longæ; stigmata sub anthesin superantes, basi albido-villosæ, extra ad apicem acutum vel subacutum glabrescentes, apice intus et in margine sparse pilis sat longis instructæ; ovaria glabra anguste conica, basi abrupte in stipitem brevissimum nectario quadrato æquantem angustata, apice subobtusa; styli distincti, circiter 0·03 cm. longi, stigmatibus 2 bifidis terminati. *Amenta fructifera* 1·6 cm. longa; capsulæ conicæ circiter 0·4 cm. longæ et 0·2 cm. latæ, basi rotundatæ, brevissime stipitatæ.

NORFOLK: Welney Clump, near Catchwater Bridge, Hilgay Road, Ryston Hall, 14 May, 1931, *Burtt Davy* 24789 (type for flowers), 16 June, 1931, *Burtt Davy* 24835 (type for fruits and mature leaves): Ryston Hall, *Burtt Davy* 24695, 24697, 24699, 24704, 24706, 24709, 24711, 24713, 24718, 24719, 24723 bis, 24788, 24873, 24876. HAMPSHIRE: Duck Meadow, near Blackmoor, Alton, *Burtt Davy* 25454, 25460, 25465, 25466, 25467, 25468, 25469. Type in Herb. Mus. Brit.

The male of this form, if it exists, has not yet been recognized with certainty.

Dr. Björn Floderus saw the type sheets in Aug. 1932: he notes on the sheets of *Burtt Davy* 24789, "*S. alba*$\times$*fragilis*," and on that bearing the summer leaves and fruits (*Burtt Davy* 24835), "*S. alba* and a little *fragilis*." These specimens show a close resemblance to *S. alba* L., but the possible influence of *S. fragilis* L. is suggested by the length and shape of the bracteoles, by the shortly stipitate ovary with a distinct style, and by the slightly less densely distributed circumstomatal dots on the leaf-surfaces.

The type-specimen with catkins and those with leaves are possibly from different trees in the same group.

ARUM NEGLECTUM (Towns.) Ridl.

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

This plant, confined to the south coast of England, the Channel Islands, and the north coast of France, has never been adequately described, as it has always been considered conspecific or at most a form of the very distinct *Arum italicum* Mill. of southern Europe. I have had the opportunity of studying it both wild and in cultivation for many years and of observing the differences between it and *A. italicum* Mill. I have also had the opportunity of reading the very extensive correspondence and notes of Mr. F. Escombe sent to the late Mr. A. R. Horwood, with a very large series of specimens from East Meon near Petersfield, Hants, of which I have made use in this paper.

Arum neglectum (Towns.) Ridl., comb. nov. *Arum italicum* var. *neglectum* Townsend, 'Flora of Hampshire,' 327 (1883). *Arum italicum* var. *immaculatum* Rouy, Fl. de France, xiii. 279 (probably). *A. italicum* Auct. Brit. not of Miller, Syme, Eng. Bot. ix. t. 1393 (1869); Hogg & Johnson, 'Wild Flowers,' xi. 804; Sowerby, 'British Wild Flowers,' Suppl. 1680.

Description.—Rhizome oblong, thick, 5–6·5 cm. long. *Leaves* tufted on a stout stem, 15 cm. long, petioles stout, 20 cm. long, blade fleshy light green, shining, nerves 6–7 pairs, and midrib pale yellowish green, never white. Hibernal form ovate-oblong, blunt lobes overlapping, rounded, blunt, 15 cm. long, 7·5 cm. wide in centre, 15 cm. across lobes at base. Autumnal leaves small and hastate. Spathe on a peduncle, 7 cm. long, pale translucent green, oblong-acuminate, the apex deflexed, 40 cm. long, 0·8 cm. wide. *Spadix* orange-yellow, club blunt, thick, 4·5 cm. long, stalk 2·5 cm. long. *Upper sterile organs*, whole whorl 5 mm. long, base conic, smooth, pale yellow, tapering to a filiform tail twice as long as the body. *Bare space* below 5 mm. long. *Male flowers*, whorl 5 mm. long, orange, oblong, numerous. *Bare space* below 5 mm. long. *Female flowers* sterile, globular, with slender tails, orange. *Ovaries* oblong, green, with depressed purple stigmas. Whole spike 2 cm. long. *Fruit-peduncle* 25–45 cm. long. *Fruit-spike* 14–15 cm. long. *Berries* oblong, scarlet, 1 cm. long. *Seeds* 1–2, rarely 5, ovoid, reticulate, brown, 4 mm. long.

The plant was first discovered in the British Isles by Mr. A. Hambrough at Steep Hill, near Ventnor, Isle of Wight, in February 1854. He had noticed it some years before ('Phytologist,' 1854, p. 194). It was later collected by Mr. Townsend and other botanists at Bonchurch and along the coast to St. St. Lawrence and Niton in the same island. At this time, and till recently, it was identified with *A. italicum* Miller of southern

Europe, from which it is quite distinct. In 1874 I found it growing among brambles along the wall between Anvil Point and the cliff-track to Seacombe, near Swanage, Dorset. Some years later the wall was rebuilt, the brambles and *Arum* being destroyed, and it has not reappeared there. It still persists, however, in Durleston Bay and along the coast sporadically as far as Arish Mill Gap.

It has also been found in the following localities all along the south coast, and in the Channel Islands and Brittany :—

Kent : Folkstone Undercliffe, 3 miles from Folkestone ; between Sandgate and Southcliffe (*Melville*, 1879).
Sussex : Broadmoor and Offington Lane (*F. H. Arnold*) ; Arundel Park (*Webster*, 1924).
Hants : Petersfield, East Meon, and Compton, near Winchester (*F. Escombe*).
Dorset : Swanage, Arish Mill Gap, etc. (*Ridley*, 1874).
Isle of Wight : Bonchurch, Steep Hill to Niton (*Hambrough, Townsend*).
Devon : Salcombe Regis, Sidmouth (*Wyatt*) ; Braunton (*Elliston-Wright* ; Torquay (*Carruthers*).
Cornwall : Newquay, Ponsanooth, Helston, Carbis Bay (*Ralfs*, 1877) ; Penzance (*Roberts*) ; Bude (*Thurston*).
Glamorgan : Curtynalu, on limestone (*Miss Vachell*).
Guernsey : Cobo, Kingsmill (*Marquand*, 1891).
Jersey : Bagot, Le Hocq, etc., commoner than *A. maculatum* Lester-Wright, St. Saviour's (*Louis Arsene*, 1927).
Alderney : St. Anne's (*Jackson & Airey-Shaw*, 1934).

The plant grows in light shade or under brambles, usually within a mile of the sea coast in England at least (Escombe's locality, East Meon, is however, fifteen miles from the sea), and it appears almost confined to the south coast. Escombe states that in his locality, where it is abundant, it shuns clay, marl, and sandstone, and is restricted to the chalk escarpments. In Dorset it is found often in stony ground in the Purbeck and Portland rocks.

It is usually found from sea-level to 200 or 300 feet altitude, but in Petersfield up to 768 feet, where, however, it is depauperate.

The hibernal leaves appear in December in suitable shady localities, and attain their full size and characteristic form at the end of that month or in the first weeks of January. Escombe found them at their largest in May with longer petioles. The inflorescence appears rather later than in *A. maculatum*.

The fruit-spike turns red in later July, August, or September, by which time the leaves have become fewer, smaller,

and more hastate or, more usually, have quite disappeared. The seedling leaves are ovate or oval, bluntly or round-pointed, entire and rather dusky blue-green.

Purple spots on the leaf and spathe occur occasionally but rarely, and usually on very young leaves ; according to Townsend the plants are quite as liable to be spotted as in *maculatum*, but that the spots have not a jagged outline as in the latter. I have never seen true *A. neglectum* with spots on the leaves in the Isle of Wight or elsewhere, and there are very few specimens with spotted leaves in the Kew Herbarium. I suspect that these forms are hybrids with *A. maculatum*. Escombe in his voluminous correspondence says that in the Hampshire plants the depth of spot-shades in intermediate forms between the two species varies between a scarcely distinguishable lavender-grey and the deepest pitch-black. The spots are commonest in young plants and more numerous and " spotted intermediates " occur mostly in the neighbourhood of " spotted *neglectum*." I take it that all these spotted forms in his locality where the two plants meet are hybrids. In Kew Gardens, where there are no plants of *A. maculatum*, but both *A. neglectum* and *A. italicum* growing together in abundance, there are intermediate forms between these two species, but I have failed to see a spotted form anywhere. The intermediate forms between the two latter are plants which put up the characteristic narrow hastate deep blackish green leaves with white veins occasionally, especially in January, when the leaves of both kinds appear, the two forms being mixed in the same plant and the *italicum* leaf-form soon disappearing.

Engler, in the ' Pflanzenreich,' includes this plant under *Arum italicum* Miller, from which it seems to me specifically distinct. In both plants the leaves appear at the end of the year, and in sheltered spots they are well developed by the end of December, long before those of *A. maculatum* L. appear. In *A. italicum* they are deep blackish green with very conspicuous white midrib and veins, narrow, hastate, acuminate, the basal lobes spreading, sometimes turned over upon themselves, but not overlapping each other. Later in the year they sometimes become broader and more of the shape of those of *A. neglectum*, and the white venation becomes greener, though still retaining the darker green colour. In *A. neglectum* the leaves are always broader, broadly ovate, with overlapping blunt lobes and a sinuate edge, light bright green, the veins paler. Escombe says, " varying from pallid green to yellowish to marked yellow." I have seen only pale green veins. The spathe of *A. italicum* is very similar to that of *A. neglectum* and appears about the same time, but is rather narrower. The spadix has a very similar sterile portion.

The upper sterile organs in *A. italicum* are more numerous, have the conic body covered with papillæ, and a much longer tail. The bare portions between the upper steriles and the male flowers and between the lower steriles and the female flowers is much shorter. The female flowers, ovaries, are oblong, not globose-obconic as in *A. neglectum*. The fruit-spike is usually longer and the seeds more numerous, two to four in a fruit, whereas they are usually one to two in *A. neglectum*, though I have seen more.

REVIEWS.

Marine Algæ of the North-eastern Coast of North America. By WILLIAM RANDOLPH TAYLOR. Illustrated by CHIN-CHIH JAO. (University of Michigan Studies, Scientific Series, vol. xiii.) 14 cm. (8vo), pp. vii+427, 60 pls. University of Michigan Press : Ann Arbor, 1937. Price 5 dollars.

THIS is an admirable performance, the fruit of twenty years' study of seaweeds in the field and in the herbarium. This kind of thing may be said of many taxonomic works (and it is always worth noting) ; but not always is there the additional advantage that the author has had to meet the taxonomic difficulties of an annual course of students in the field. This is to say that Dr. Taylor was peculiarly well qualified to undertake such a work as he has now produced. It is hardly necessary to stress the dangers of indefinite discrimination which beset a taxonomist isolated in his herbarium. His capacity for hair-splitting is proverbial, though often greatly exaggerated. It is not so widely realized as it ought to be, however, that the academic botanist who has not served the herbarium discipline is in even greater peril. It is unfortunately true that taxonomic literature is overburdened with work by people who publish new units without even bothering to acquaint themselves with the International Rules of Botanical Nomenclature ; nor even with the literature of the group with which they purport to deal. Between this Scylla and that Charybdis Dr. Taylor has steered a very good course. He has accepted limitations honestly and has not attempted to give his work a complexion of bibliographic detail for the purpose of making the maximum impression on the uninitiated. This does not mean that the work is deficient bibliographically. It means that Dr. Taylor has restricted himself to such references as he has actually seen and used in applying names to plants. So it comes about that references to the places of valid publication are often omitted. It is

therefore to be expected that some of his names will be assailable on taxonomic and nomenclatural grounds. As the treatment is that of a handbook and not of a monograph the first consideration is that of accuracy of application in the more immediate sense. For instance, he is content to use the name *Polysiphonia nigrescens* (Hudson) Greville with a var. *fucoides* (Hudson) Harvey without attempting to adjudicate the claim that *Polysiphonia fucoides* (Hudson) Greville is the valid name, of which *P. nigrescens* and *P. violacea* (Roth) Duby are later synonyms. Of the plant on which Yamanouchi did his classic cytological work he says : " The greater part of what has passed as *P. violacea* in American algal literature appears to be this plant [*P. flexicaulis* (Harvey) Collins], although the following much less common plant [*P. novae-angliae* Taylor] has also been called by that name." But if any botanist wishes to know what Dr. Taylor means by a particular name he may look up his reference with every confidence, both in the accuracy of the citation and of the identification.

The remarks on bibliography made below are not in any way derogatory to Dr. Taylor's beautiful and precise elaboration ; nor yet to Dr. Chin-Chih Jao's exquisite illustrations. There are keys at every important point : that is, under the Class headings there are keys to the Orders ; under the Orders, to the Families ; and so on, down to species. Distribution is given for north-eastern America only—a further example of Dr. Taylor's principle of confining himself to the more immediately verifiable records. Students of British phycology will find a great deal of valuable information about our native species ; though the difference between the two floras is too great for it to be more than supplementary. Students of American phycology will have abundant reason to be grateful to Dr. Taylor for many years to come. His work will be numbered among the classic handbooks.—GEOFFREY TANDY.

[There are one or two matters of bibliography which are worth noting. In the details at the head of the above review the esoteric symbol " 8vo " is given in parenthesis. It is not sufficiently realized that this is strictly an anatomical term and not a measure of size unless the size of the sheet, of which the page is an eighth, be stated. It is apparent that the pages resulting from printing on demy half-sheets in quarto, and on demy sheets in octavo, will be the same size. The University of Michigan Press has done a beautiful job in many respects (the binding is water- and insect-proof) ; but the anatomy of the book is not at all easy to make out owing to the fact that the sheets are identifiable (if at all) only by inspection of the spine of the book. Of this practice Esdaile's *A Student's Manual of*

Bibliography (p. 66) says : " Still less is error saved by the total omission of signatures, a recent product of the uninstructed desire for modernity." Justification of this severity should be sought in the Manual itself. It will suffice to say here that scientists, of all people, should take the utmost precautions against errors and omissions in the published versions of their work. Printers of the fifteenth century were careful enough ; they even put the exact date in the colophon. In spite of the fact that the book under notice bears the date 1937, it is possible that it was not technically published until the first week of 1938. It is, also, nowhere clearly stated that the book treats of the Chlorophyceae, Phaeophyceae, and Rhodophyceae only.—G. T.]

' LILLOA.'—The first volume of this new " Revista de Botanica " was issued on December 27, 1937, by the Instituto Miguel Lillo of the National University of Tucumán (Argentina). It is well produced and consists of 414 pages with 57 plates. The editor is H. R. Descole, who in a preface, states that the Institute was founded with a legacy from the Argentine naturalist Miguel Lillo (1862–1931) : it consists of a herbarium and library, and it is the intention of the Trustees to make it a centre of botanical investigations. ' Lilloa ' will publish original articles by the staff of the Institute and other Argentine botanists as well as by foreign contributors. Accounts of the herbarium will appear as the collections are arranged. The present volume has a photograph of M. Lillo as frontispiece and an account of his career. There are sixteen articles which are written in Spanish, prefaced by a short summary in English, French, or German.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on March 17, Mr. H. W. Pugsley exhibited specimens of *Myriophyllum alterniflorum* var. *americanum* from Ireland. Dr. W. B. Turrill then discussed " Problems of the British Taraxaca." Over 100 stocks of *Taraxacum* grown at Kew, mostly representing different biotypes, have all proved to be apomictic. It is probable that the numerous biotypes did not arise separately as the direct result of hybridization or of abnormal chromosome behaviour, but that primary hybridization preceded apomyxis, which was followed by mutation. Mutations, probably rare relative to the number of offspring, are at once " fixed " by

apomyxis, in the sense that mutational characters reappear in all the offspring.

Capt. C. Diver gave a general account of "The Plant-carpet in relation to Animal Distribution." This forms a part of the survey he has been carrying out for some years on the plants and animals of a portion of Studland Heath. It is a biological commonplace that the composition of the plant-carpet, considered in broad terms, is an important factor in limiting the distribution of animals, but the detailed investigation of a restricted area has given results interesting to botanists as well as zoologists.

At the meeting on April 7, Mr. Norman Woodhead gave a paper on "Algal Cultures from the Silt of Llyn Maeby." This lake in Anglesey, which is now the water-supply reservoir for a neighbouring village, shows the recurrent phenomenon of water-bloom, and as this is accompanied by unpleasant odours a study was made of the resting periods of the organisms concerned in this periodic development. Although Myxophyceae form a striking phase in these algal seasonal cycles they are seldom recognized in the silts themselves; they occur in large numbers in silt samples only when the culture has been maintained for some considerable period, suggesting that the conditions for their success require long spells of bright light with a relatively high temperature.

Mr. Cecil H. Hooper gave a general account of "The Pollination of British Fruit-trees and Shrubs," illustrated with lantern-slides and specimens.

At the Meeting on April 21, Mr. E. M. Marsden-Jones and Prof. F. E. Weiss, F.R.S., each described his portion of an investigation of "The essential Differences between *Anagallis arvensis* Linn. and *Anagallis foemina* Mill." As a result of detailed morphological and genetical observations, they propose to accept Schinz and Keller's subdivision of *A. arvensis* with the subspecies *phoenicea*, which includes the scarlet pimpernel and its various colour-varieties, some of them blue, and *foemina*, which is always blue-flowered.

Dr. J. C. Willis, F.R.S., read a paper on "Some Conceptions about Geographical Distribution and Origin of Species," in which he gave an account of the distribution of surnames in the Canton Vaud of Switzerland, an area much broken up into more or less isolated valleys by mountains. The figures show a good "hollow curve," and a comparison was made between the distributions of a family and of a plant species.

Mr. J. Chaworth-Musters described a general collecting visit to the Atlas, illustrating his account with a series of excellent lantern-slides.

THE VISION OF CERTAIN SMALL OPHRYS-VISITING BEES.—In 1915 Correvon and Pouyanne published (Journ. Soc. Nat. d'Hort. France, xvii, pp. 29 & 42; see also xxvi. p. 372, 1923) a very interesting account of the pollination of *Ophrys* in Algeria by male bees of the genus *Colpa*. The males emerge in the spring a month before the females, and conduct a frenzied search for their mates in which they pounce frequently on the labellum of the orchid, mistaking it for the female insect. In doing so they pollinate the flowers. In 1929 Godfery in this Journal (1929, p. 298) published additional observations on the pollination in France of species of *Ophrys* by another bee.

On March 30th last I was watching *Andrena fulva* on the downs near Leatherhead, where the males were in number about three times as many as the females and the competition for mates was keen, when a shining smooth slate-coloured pill-millipede came through the short grass of a bank where the bees nest. It was immediately the object of the attention of male Andrenas one after another, yet is totally unlike a female *Andrena*. The occurrence recalled to my mind the papers to which I have referred, and may be worth remembering as suggesting that a very close resemblance to the female insect may not be necessary in the labellum of an *Ophrys* for attracting frenzied males. But adaptation of the flower to its peculiar method of pollination ought to be a matter of comparative rapidity: i. e., *Ophrys* may be a very modern genus.—I. H. BURKILL.

PLUTEUS PATRICIUS Schulz.—The late W. B. Grove suggested in the January issue of this Journal that *Pluteus patricius* is a colour-form of *P. cervinus*. Carleton Rea in his 'British Basidiomycetae' gives specific rank to *P. patricius*. I think that many mycologists who have had long acquaintance with *P. cervinus* and *P. patricius* will agree that they are quite distinct.

P. cervinus is brown and longitudinally fibrillose. *P. patricius* is always white or light grey with more or less pointed squamules, usually most apparent in the centre of the pileus, and is generally caespitose.

Rea also gives specific rank to *P. Bullii*, formerly considered a variety of *P. cervinus* from which it is abundantly distinct in the more robust habit and dark gibbous pileus. Some of the "blackish-grey" specimens of *P. cervinus* on the old saw-mill yard at Snitterfield Bushes, near Stratford-on-Avon, may have been *P. Bullii*.

P. cervinus, *P. Bullii*, and *P. patricius* appear to be a trio of distinct species that occur throughout the year on large sawdust heaps.—E. W. SWANTON.

"A MICROBIOLOGIST digs in the Soil" is the subject of a Presidential Address given by Dr. C. Thom to the Washington Academy of Sciences (Journ. Wash. Acad. Sci. xxviii. pp. 137–153, 1938). In it he gives a critical summary of many of the varied

aspects of the soil population with frequent intermixtures of a characteristically American penetrating humour. "The demonstration that soil, instead of being all dead, harbors millions of organisms, releases that flight of imagination which pictures the soil as a sort of Lilliputian zoo in which some magic hand has eliminated all barriers and set free every grade of minute but rapacious monster to go roaring after the next lesser grade as its lawful prey. . . . Twenty-five millions of organisms to the gram of soil! Bacteria, molds, actinomycetes, myxomycetes, algae, protozoa and more complex!—they fill a microbiological jungle in which friends and foes, saprophytes and parasites, symbionts and antagonists compete with each other and with crop plants for space and food. They are a challenge to our skill in culture, to our discrimination in interpretation and to our constructive imagination in devising means to control and direct these myriads to useful ends."

THE abnormality of the English spring of this year has had a noticeable effect on the time of flowering and appearance of foliage. Thus the trees and shrubs of the south of England were clearly more advanced than those of northern France on April 9. Even down to Dijon fruit and lilac blossoms and the leaves of Lombardy poplar and birches were on the whole not so far forward as around London. A few days later *Crataegus* was in flower near Domodossala, *Wistaria* at Lugano, and Horse Chestnut at Milan, but by that time cold and drought had intervened at home, though on April 22 the oaks of southern England were in advance of those in France north of Paris.

SIR WILLIAM WRIGHT SMITH has been appointed Honorary Professor of Botany to the Royal Horticultural Society in succession to the late Dr. A. B. Rendle. The duties in the past have not been very onerous, but the R. H. S. are to be congratulated on honouring one who has done so much for the science and the practice of horticulture.

A NEW BRITISH FLORA.—We have been asked to publish the following corrections and additions in the list of contributors given in this Journal for February 1938, pp. 61–63 :—

(1) Under *Cyperaceae*, Nelmes (not Nelmes and Lousley) is responsible for *Carex*.

(2) Under *Juncaceae*, Richards and Pugsley (not Richards and Lousley) are responsible for *Juncus alpinus*.

(3) Under *Naiadaceae*, Dandy and Taylor (not Dandy, Taylor, and Butcher) are responsible for *Potamogeton*, and Butcher (in place of Dr. A. B. Rendle) for *Naias* and *Zannichellia*.

(4) Under *Rosaceae*, Mr. W. Watson, 245 Southlands Road, Bickley, Kent, is responsible for *Rubus*.

LICHENOLOGICAL NOTES FROM THE BRITISH MUSEUM HERBARIUM.—II.

BY I. MACKENZIE LAMB, B.Sc., F.L.S.

SINCE the first of this series of notes was published in this Journal (lxxiv. 174–78, 1936), I have had the opportunity of reinvestigating the type-specimens of certain rare or critical species occurring in Britain, and the descriptions based on these observations are reproduced here for the benefit of those who may not have access to original or authentic collections. Modern systematic lichenology is ill-served by the short species-descriptions deemed adequate in the latter half of the last century, and recent monographic studies have demonstrated the great importance of characters shown in the microscopic structure of the thallus and apothecia.

One asterisk (*) after the number of the vice-county denotes a new v.c. record ; two asterisks (**) indicate an addition to the British lichen-flora. The collection number of plants gathered by myself is that under which they may be found in the British Museum Herbarium.

1. DIPLOSCHISTES ACTINOSTOMUS (Pers.) Zahlbr. in Hedwigia, xxxi. 34 (1892). *Urceolaria actinostoma* Pers. apud Ach. Lichenogr. Univers. 288 (1810).

Var. CAESIOPLUMBEUS (Nyl.) Steiner in Verhandl. Zool.-bot. Ges. Wien, lxi. 45 (1911). *Urceolaria actinostoma* var. *caesioplumbea* Nyl. in Bull. Soc. Linn. Normand. sér. 2, vi. 264 (1872).

S. Devon, near Plymouth (v.c. 3*), leg. *J. Wyatt-Smith*, 1937. Previous records were from the Channel Islands, Cumberland, and the Isle of Man. Dr. Watson informs me also *in litt.* that he has observed this variety in Cornwall. These finds tend to link up the apparently discontinuous distribution. Crombie (Journ. Bot. xxiii. 196, 1885) recorded the species as well as var. *caesioplumbeus* from the Channel Islands, Sark, Chateau Point ; the only specimen from this locality present in the British Museum Herbarium is, however, var. *caesioplumbeus*. Mr. A. H. Norkett, during a recent visit to the Channel Islands, undertook a thorough search at Chateau Point for the typical *D. actinostomus*, but all the material which he gathered was var. *caesioplumbeus*. It is hence somewhat doubtful whether the typical form of this species occurs in Britain.

2. LECIDEA (Sect. *Eulecidea*) CINEREO-ATRA was published by Acharius (Lichenogr. Univers. 167, 1810), two specimens being mentioned : one from E. Germany (Lusatia), leg. *Mosig*, and one from England, exact locality unspecified. leg. *Harriman*. Sixty-four years later Th. Fries (' Lichenographia Scandinavica,' i. 509–510, 1874) gave a very good description of this species,

doubtless based on the Acharian original, for he writes, *l. c.*: " non tamen celandum, sub *L. cinereo-atra* in herb. Ach. adesse modo plantam Lusaticam nec Anglicam, de qua etiam in Univ. mentio fit." Wainio (Medd. Soc. F. et Fl. Fennic. x. 70, 1883) also mentions that he had seen the type, but since that time it has apparently been mislaid, for I failed to find it in the Acharian herbarium at Helsinki in 1937, and Lynge (in Vainio, Lichenogr. Fennic. iv. 173, 1934) has based his diagnosis of this species on some Finnish plants in Vainio's herbarium, and on Havås's and Malme's exsiccata. Therefore, in spite of the clarity of Th. Fries's description, *Lecidea cinereo-atra* was necessarily regarded as a somewhat critical species.

There is at the rooms of the Linnean Society of London a collection of authentic specimens sent by Acharius in 1809 to the Society, and it contains a sheet with two specimens labelled by him " *Lecidea cinereo-atra* Ach.", followed by the abbreviation " msc.", which has been struck out later (as shown by the difference in colour of the writing fluids employed) and replaced by " Lichenogr. univers. 167 ". This point is important, for it shows that these specimens were in Acharius's possession before the publication of his ' Lichenographia Universalis,' and that they therefore almost certainly represent type-material from one or both of the localities given in the original description. I was able to examine these specimens. They are not of the same species; the right-hand specimen, on account of its minute size, I did not venture to subject to a detailed examination, but the fact that its thallus is dull brown with the medulla I+purple-blue indicates that it is not part of the plant upon which Th. Fries based his description in Lichenogr. Scandin., but it is almost certainly the English specimen mentioned by Acharius. The left-hand specimen is larger, on a flake of schistose rock 3 by 1·2 cm., and it was possible to make a detailed microscopical analysis, the results of which were in almost complete agreement with the description (as far as it goes) given by Th. Fries. Using Lynge's key to the genus *Lecidea* (in Vainio, Lichenogr. Fennic. iv. 10, 1934) the characters shown by this specimen led with precision to *Lecidea cinereo-atra*. Therefore it is practically certain that this specimen preserved at the Linnean Society rooms is part of the type-material seen by Th. Fries, and hence, in order to establish the conception of this hitherto rather critical species on a firm basis, I append the description resulting from my investigation of it.

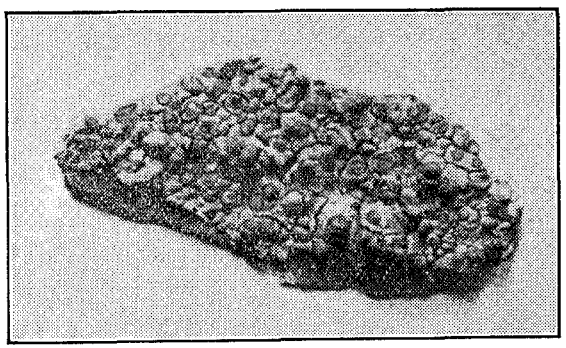
Thallus thick, unequal, verrucose-areolate, 0·5–1 (–1·5) mm. thick; edge not shown, but probably indeterminate; areolæ 0·6–1·5 (–2) mm. diam., pulvinate-convex or hemispherical-globose or more rarely ±plane with rounded-off edges, in outline variously obtusely angular (the corners rounded-off) or ±irregularly rounded; now a dirty cream-colour or ash-grey with a faint yellowish tinge, not changing colour when wetted, matt, not pruinose, not isidiate nor sorediate. Indications of a blackish hypothallus seen here and there between areolar verrucae, but very indistinct. Thallus KHO—, $CaCl_2O_2$—, internally and externally.

Cortex of thallus 32–48 μ thick, not nubilated, colourless in outer 9–15 μ, faintly dull yellowish in inner 18–30 μ, or in places completely dull yellowish; composed of strictly adnate, vertically parallel hyphæ 3–7 μ diam., with walls 0·5–0·7 μ thick, and cells 4–7 μ long, these cells being often ±isodiametric and rounded, hence forming an almost paraplectenchymatic tissue, in which, however, the union of the cells into vertically parallel hyphæ is ±obvious. Surface rather uneven from the rounded ends of the cells, not covered by any amorphous layer. *Gonidial stratum* continuous, ±regular, 60–120 μ deep. *Gonidia* protococcoid, now pallid yellowish green, round, easily isolated, 6–15 μ diam., with colourless walls 0·8–1 μ thick; contents ±disintegrated; mode of reproduction not observed. *Medulla* now somewhat opaque from air-filled hyphæ, in its lower parts enclosing particles of the substratum, colourless, not nubilated, composed of closely intertexted fine branched hyphae 1–2 μ diam., with thin distinct walls, running in various directions, with here and there irregular air-filled cavities between them.—KHO produces no colour-change in section of thallus; I merely yellows medulla, both macroscopically and microscopically.

Apothecia very numerous, irregularly scattered over thallus, isolated or contiguous and often 2–6 coalescent to form irregular masses; arising on the thalline verrucæ, at first innato-depressed, soon becoming adpressed-sessile, only slightly constricted at base, ±round or irregularly obtusely angular, 0·6–1·3 mm. diam. (groups formed by coalescence up to 1·8 mm. diam.); for a long time ±plane with distinct ±prominent, moderate, rounded, entire, black, matt or subnitid, non-pruinose, proper margin, then finally becoming pulvinate-convex, with the proper margin excluded. Disc black both wet and dry, matt, at first with a subtle greyish pruina which is worn off in mature apothecia; not infrequently minutely umbonate.

Excipulum developed as a lateral continuation of hypothecium, reddish black, composed of adnate hyphæ radiating fanwise outwards, 2·5–4·5 μ diam., with cells 4·5–8 μ long, and reddish cell-walls about 0·7 μ thick; in outer 25–45 μ, and in irregular patches further in, quantities of an amorphous, dense, black secretion lie between the cells, making the tissue opaque even in thin section. *Hypothecium* reddish brown-black in section, paraplectenchymatic, of ±isodiametric rounded or irregularly angular small cells 2–4·5 (–6) μ diam., with reddish walls about 0·7 μ thick, dense masses of black secretion lying between them and rendering the tissue very opaque. The hypothecium does

not end sharply downwards, but runs down into the subjacent thalline tissue as a " tail " composed of fine hyphæ 1·5–2·5 μ diam., with thin reddish walls, running in various directions and with few or no air-spaces between them. *Hymenium* 90–105 μ high, not inspersed, completely faint blue-green in section except in uppermost 6–12 μ, where it is blue-green blackish. *Paraphyses* not discrete, distinct, traversing copious colourless mucilage, frequently branched, 1·3–2 μ thick, colourless or with a very faint blue-green tinge, at apices clavate-capitate or submoniliform, there swollen up to 3 μ and fuliginous blue-green or blackish ; septate, often slightly constricted at septa, which are ±distinct in water and 5–14 μ apart. *Asci* 78–90 μ by 12–20 μ, colourless, but their plasm faintly yellowish (oil) ; wall 1–2 μ thick at sides, at apex thickened up to 9 μ. Spores



Lecidea cinereo-atra Ach.
Syntype specimen in the possession of the Linnean Society of London.
(Slightly over twice natural size.)

6–8 in ascus, irregularly biseriate, simple, colourless or very faintly yellowish (oil), ellipsoid or rarely slightly tapered at both ends, with distinct smooth walls 0·8–0·9 μ thick ; 14–15 by 7·5–9 μ.—KHO produces no colour-change in section of apothecium ; HNO_3 turns epithecium a beautiful rose-red ; with I, hymenium blue, darkening to blue-black.

[No pycnidia seen.]

It will be seen that agreement is fairly good between this description and those given by Th. Fries, Lynge, and others ; only in the matter of the thickness of the thallus is there some discrepancy. According to Th. Fries it is " vulgo tenuis," but in the present specimen, although varying a good deal in thickness in different places, the thallus is nowhere thin. Wainio, however (Medd. Soc. F. et Fl. Fennic. x. 70, 1883), gives the following information concerning the type : " in spec. orig. e Lusatia apothecia sunt pruinosa, thallus glaucescenti-albidus, sat crassus, areolatus." Therefore Th. Fries's statement regarding the thickness of the thallus must be discounted, and it is hard to see how Wainio's f. *tumidior* (*l. c.*) can be distinguished from the typical condition. In general, *L. cinereo-atra* can be readily separated from the various forms of *L. steriza* (Ach.) Wain. by the faintly aeruginous hymenium, blue-green blackish in the upper part, but not brownish, as in *L. steriza*. The height of the hymenium is a less reliable criterion, for certain forms of *L. steriza* have a comparatively low hymenium (90–105 μ).

The specimen from S. Devon listed as " *Lecidea cinereoatra* " by Watson in Trans. Brit. Mycol. Soc. xxi. 13 (1937) was erroneously determined by me ; it is not this species, but a form of *L. steriza*, with the hymenium high (110–130 μ) and olivaceous brown above, otherwise colourless. In order to ascertain whether any specimens of the true *L. cinereo-atra* had been included in the British Museum Herbarium under the name " *Lecidea contigua*," I have examined microscopically all individuals with a thick warty thallus, but without exception they were thick-crusted forms of *L. steriza*. Hence *ad interim* one has no grounds for assuming that *L. cinereo-atra* occurs in Britain.

3. LECIDEA (Sect. *Eulecidea*) RECENSA Stirton in Scot. Naturalist, v. 219 (1880), was described from Scotland, Rannoch, Craig Var (v.c. 88). A. L. Smith, Monogr. Brit. Lich. ii. ed. 2, 70 (1926), listed this species as synonymous with *L. rivulosa* Ach. A. H. Magnusson, on p. 31 of his " Studies in the *rivulosa*-Group of the Genus *Lecidea* " (Göteborgs Kgl. Vetensk.- och Vitterh.-Samh. Handl. ser. 4, xxix. no. 4, 1925), suggested that on account of the narrow spores it must be very nearly related to *L. arcuatula* (Arn.) Hue, a North American species, if not quite identical with it. The type-specimen of *L. recensa* is preserved in the British Museum Herbarium, and I was able to make a detailed study of it, the results of which are given in the following description.

Thallus effuse, indeterminate, up to 0·3 mm. thick, the areolæ rounded or irregularly obtusely angular, tumid-convex, 0·3–0·6 mm. diam., contiguous or ±scattered, cream-coloured or whitish grey, matt, not isidiate nor sorediate nor pruinose, KHO—, $CaCl_2O_2$—, KHO($CaCl_2O_2$)—, Pd—. No visible hypothallus.

Cortex of thallus colourless, hyaline, 10–30 μ deep, composed of indistinct intricate thin-walled hyphae 3–5 μ diam. *Gonidial stratum* dense, up to 175 μ deep in the more tumid areolae ; *gonidia* protococcoid, round, thin-walled, 6–10·5 μ diam., without any visible pyrenoid, and multiplying by transverse fission. *Medulla* around gonidia densely nubilated with dull yellowish granules which disappear on the addition of KHO ; below

gonidial stratum colourless, hyaline, of rather closely intertexted gelatinous hyphæ 3–4·5 μ thick, running in various directions, with walls 0·7–1·0 μ thick ; merely yellowed by I.

Apothecia fairly numerous, isolated or often several aggregate and coalescent, 0·4–0·7 mm. diam. (aggregate masses up to 1·5 mm. diam.), round, well constricted at base, plane or finally very slightly convex, with ±persistent, thin, matt, black, proper margin ; disc black both wet and dry, minutely roughened, not pruinose.

Excipulum of apothecium developed at sides only, dark brown-black, sharply delimited from hypothecium, composed of ±isodiametric or radially elongated cells 3–10 by 3–6 μ heavily coated with an amorphous dense brown-black substance which renders the tissue opaque in section. *Hypothecium* faintly yellowish, in very thin section almost colourless, composed of densely and intricately interwoven thin-walled hyphæ 2·5–5 μ diam., with short often rounded articles, hence in places almost paraplectenchymatic. *Hymenium* not well delimited from hypothecium, faintly yellow brownish, 60–78 μ high, with upper 9–24 μ dense brown-black in section. *Paraphyses* concrete in water, gelatinous, 1·5–2 μ thick, at apices irregularly swollen (up to 6 μ) and there dark brown, overlaid with amorphous material of the same colour. *Asci* clavate, 40–46 by 7·5–13 μ, with gelatinous colourless ill-defined walls 1–1·5 μ thick at sides, at apex thickened up to 6 μ. *Spores* 8, irregularly biseriate in ascus, strongly curved, with smooth wall 0·7–1 μ thick, rounded at both ends, colourless or with faintly greenish-yellow contents, 12–13·4 by 4–4·5 μ.—With I, hymenium blue, thickened apices of asci darker, blue-black ; hypothecium merely yellowed.

[No pycnidia seen.]

From the above description it is clear that this plant is entirely distinct from *L. rivulosa*, and shows good agreement with Magnusson's description (Göteborgs Kgl. Vetensk.- och Vitterh.-Samh. Handl. ser. 4, xxix. no. 4, 30, 1925) of *L. arcuatula* (Arn.) Hue, based on a specimen collected in North America, Maine, by Merrill. I have also found it to be identical with a specimen in the British Museum Herbarium from Newfoundland, Bay of Islands, leg. *Waghorne*, determined by Arnold himself ; only in the latter specimen the paraphyses are more discrete. Stirton's epithet *recensa*, published in 1880, must therefore be used for both Merrill's " Lichenes Exsiccati " no. 256 and the Newfoundland specimen mentioned above, and if these are identical with the type of Arnold's *L. arcuatula*, as seems probable, the latter name must become a synonym of *L. recensa*.

4. LECIDEA (Sect. *Eulecidea*) TUMIDA Massal. Ricerch. Aut. Lich. Crost. 68 (1852), as represented by Anzi, Lich. rar. Venet. no. 170 in Herb. Mus. Brit., is specifically identical with *L. sorediza* Nyl. in Bull. Soc. Linn. Normand. sér. 2, vi. 291 (1873). Arnold (Lich. Fränk. Jura, 164, 1885) listed Massalongo's plant as a form of *L. sorediza*, and in this was followed by Zahlbruckner (Cat. Lich. Univ. iii. 691, 1925). But, as has been pointed out by Lynge in Vainio, Lichenogr. Fennic. iv. 113 (1934), *tumida* is the older epithet, and must therefore have preference over Nylander's *sorediza*. In the British Museum specimen of Anzi, Lich. rar. Venet. no. 170, soredia are unmistakably present, although not very well developed ; the apothecia are mostly entirely without pruina, for which reason Vainio's f. *renudata* (Adj. Lichenogr. Lapp. ii. 53 (1883), as *L. confluens* f. *renudata*) must, it seems, be synonymous with the typical form. The internal structure of the apothecia in the Anzi exsiccata is in no way different from that found in the typical *L. sorediza*, which must henceforth be referred to as *L. tumida* f. **sorediza** (Nyl.) M. Lamb, **comb. nov.**

F. **glaucocaesia** M. Lamb, f. n. Thallo glauco-cæsio, soraliis sparsis convexis firmis albidis cæsiisve. Devon, near Plymouth (v.c. 3**), leg. *J. Wyatt-Smith*, 1937. The thallus is of a glaucous grey-blue, the range of colour being expressed by the following equivalents in Ridgeway's Color Standards (1912) : pl. xlii. 41. f. (Pale dull glaucous-blue) ; pl. xlvii. 33. f. (Puritan gray) ; pl. xlviii. 37. d. (Deep glaucous-gray). Apothecia scattered, at first semi-immersed, then becoming sessile, 0·7–1·0 mm. diam., black, dull or slightly shining, plane or somewhat convex, indistinctly marginate, not pruinose ; hypothecium dark reddish brown or olivaceous brown ; epithecium olivaceous brown ; spores 18–20 by 8–9 μ. Thallus KHO—, $CaCl_2O_2$— ; medulla macroscopically I+reddish.

5. BACIDIA (Sect. *Weitenwebera*) NAEGELII (Hepp) Zahlbr. in Oesterr. Bot. Zeitschr. lix. 439 (1909). *Biatora Naegelii* Hepp, Flecht. Europ. no. 19 (1853).

West Suffolk, near Hadleigh (v.c. 26*), on maple, leg. *R. Burn*, 1936. The typical form. Probably careful search will eventually undermine this species' reputation for comparative rarity in the British Isles.

6. BACIDIA (Sect. *Weitenwebera*) PRASINOIDES (Nyl.) Arn. in Flora, liii. 472 (1870). *Lecidea prasinoides* Nyl. in Flora, xlviii. 146 (1865).

S. Devon, Dartington (v.c. 3*), on Devonian limestone wall, leg. *I. M. L.*, 1935 (coll. no. 277 *a*). New to England ; hitherto the only records for the British Isles were from Ireland (Ireland v.c. 2, 7, 28, 33, & 37). Two kinds of gonidia are present in the thallus of this plant : large round bright green cells 18–27 μ diam. below, and smaller round bright green cells 6–8 μ diam. above. Hypothecium colourless ; excipulum flesh-coloured brown, lateral only. Paraphyses loosely coherent, not coloured at tips. Spores 3-septate, 18–22 by 2·4–2·7 μ.

7. BACIDIA (Sect. *Eubacidia*) CHLOROCOCCA (Graewe) Lettau in Hedwigia, lii. 131 (1912). *Biatora hypnophila β. chlorococca* Graewe in Vet. Akad. Förh. xix. 473 (1862).

Surrey, Limpsfield Common, near Oxted (v.c. 17), on stems of *Ulex europaeus* and *Calluna vulgaris*, leg. *A. H. Norkett*, 1937. Of interest on account of the unusual habitat. The thallus is in many places of a somewhat brighter green than in the usual pine-inhabiting form, but the internal characters tally completely. Vainio (Lichenogr. Fennic. ii. 250, 1922) records this species also on poplar, birch, alder, oak, and mountain ash.

8. *The identity of* CLADONIA CILIATA Stirton. This, in Scot. Naturalist, n. s. iii. 308 (1888), had the following description: "similis *Cl. sylvaticae* var. *sylvestri* (K—, C—), sed fibrillis numerosis, quasi rhizinoideis, albidis, fasciculatim dispositis præsertim apices versus ramulorum obsita." I was recently able to investigate the type-specimen from Scotland, New Galloway, Knockmalling Wood (v.c. 73). Apart from the presence of the white fibrillae, the plant is typical *C. tenuis* (Flk.) Harm. With KHO a dull yellowish reaction is produced, which later goes over into a pale brownish, a reaction noted for *C. tenuis* by Sandstede (Rabh. Krypt.-Fl. ix. iv. Abt. 48, 1931), and due to the presence of fumarprotocetraric acid, which gives rise also to an orange-red coloration when paraphenylenediamine is applied to the podetia *. The white fibrillae are 0·2–0·5 mm. long, 0·03–0·1 mm. thick, borne laterally and terminally in many places on the podetia, chiefly towards the apices. Under the microscope they are seen to be acuminate, colourless or faintly yellowish, often longitudinally cleft, and composed of adnate parallel hyphæ 2–3 μ thick. They contain no gonidia, and are outgrowths of the podetial cortex. This form of *C. tenuis* has been described by Sandstede (*op. cit.* p. 52) as f. *setigera* Sandst.

9. CLADONIA SUBSYLVATICA Stirton *versus* CLADONIA MITIS Sandst. *Cladonia subsylvatica* Stirton in Trans. and Proc. Bot. Soc. Edinburgh, xiv. 357 (1883), as shown by the type-specimen from Newfoundland, Brigus, preserved in the British Museum Herbarium, is identical with *C. mitis* Sandst. (Clad. Exs. no. 55, 1918). It shows complete agreement in every

* The reagent paraphenylenediamine has been recently introduced by Asahina (Acta Phytochimica, viii. 47–64 (1934)) for the more accurate investigation of the lichen-acids belonging to the Depsidone-group. More sensitive than potash, it will, in conjunction with the latter, often allow of specific determination of lichen-acids without the necessity of macro-chemical analysis. It is hence a valuable criterion for the confirmation of determinations made on morphological grounds, but its application in systematic lichenology calls for caution and a due appreciation of the actual chemical differences of which it is an indicator.

respect with Schaerer, Lich. Helvet. no. 78, indicated by Sandstede as *mitis*, and also with material in the British Museum Herbarium from N. Norway, Nordkyn, leg. *Lynge* and *Hφeg*, thus determined by Sandstede himself. At first sight it would seem as if the well-known epithet *mitis* would have to be supplanted by *subsylvatica*, but reference to the original description shows that this can be avoided, for Stirton there writes: "Meanwhile, I have thought it right to give expression to these views by constituting a new sub-species, under the name *Cladonia subsylvatica*." It is thus clear that the epithet *subsylvatica* originated as the name of a subspecies, and according to the International Rules of Botanical Nomenclature does not invalidate the subsequent specific epithet *mitis*.

C. mitis has not up to the time of writing been recorded from Britain, but a number of plants in the British Museum Herbarium under the name "*C. sylvatica*" belong here. They are:

(1) Sussex, Crowborough (v.c. 14**), ex herb. Geo. Davies.
(2) Kircudbright, New Galloway, Cairn Edward (v.c. 73**), leg. *J. Mc. Andrew*.
(3) East Perth or Forfar, Sidlaw Hills (v.c. 89 or 90**), ex herb. Forbes Young (2 specimens).
(4) Forfar, Rossie Moor (v.c. 90**), leg. *A. Croall*.
(5) Aberdeenshire, Braemar, Ben-naboord (v.c. 92**), leg. *J. M. Crombie*.
(6) Banffshire, Rothiemurchus (v.c. 94**), leg. *J. M. Crombie*.
(7) Argyllshire, Ben Cruachan (v.c. 98**), leg. *J. M. Crombie*.
(8) "Highlands of Scotland," without precise locality, leg. *Menzies*, 1778, named "*Lichen rangiferinus*."
(9) Ireland, Galway, Castle Kelly (Ire. v.c. 16**), ex herb. Miss Moseley.
(10) Ireland, Mayo, Mallaranny (Ire. v.c. 27**), leg. *W. E. L. Wattam*.
(11) Ireland, Mayo, Clare Island (Ire. v.c. 27**).
(12) Ireland, Mayo, Achill Island, Slievemore Mt. (Ire. v.c. 27**), leg. *W. E. L. Wattam*.

As far as one may judge from these few records *C. mitis* is relatively more common in Scotland and Ireland than in England. Yet the Sussex specimen shows that it is not confined to the upland and subalpine tracts, and it will probably prove to be fairly common all over the British Isles if careful search is made. It is readily distinguished from *C. sylvatica* by its lighter whitish colour, less nutant terminal branches, and mild taste, the podetia being KHO—. Asahina (Acta Phytochim. viii. 52, 1934) states that *C. mitis* gives a negative reaction with paraphenylenediamine. This statement requires some qualification; at and near the growing tips a yellow then red

coloration is quite frequently produced. This is the case in the authentic specimen from N. Norway, Nordkyn, mentioned above, and also in Stirton's type-specimen of *C. subsylvatica*. The Scottish specimens from the Sidlaw Hills and from Braemar listed above show the same faint reaction in the ultimate branches. But the coloration is never intense, as in *C. sylvatica*; the amount of lichen-acid present must be extremely small, and never sufficient to produce any perceptible bitter taste.

10. SARCOGYNE PRUINOSA (Sm.) Koerb. Syst. Lich. German. 267 (1855). *Lichen pruinosus* Sm. Engl. Bot. t. 2244 (1811).

F. ATROSANGUINEA H. Magn. in Rabh .Krypt.-Fl. ix. 5. Abt. 1 Teil, 95 (1935).

Somerset, Cheddon, near Taunton (v.c. 5**), on mortar of wall, leg. *I. M. L.*, 1937 (coll. no. 470). Thallus obsolete. Apothecia up to 1·5 mm. diam., flattened, appressed to substratum, with plane, naked, subnitid, dark reddish-black disc and thin but prominent, naked, subnitid, concolorous or somewhat darker proper margin. Hymenium 75–85 μ high. Spores circ. 5 by 2·2 μ, with a length/breadth-coefficient therefore of 2·27, *i. e.*, somewhat broader in relation to length than in the typical species, in which the coefficient ranges between 2·5 and 3·0. This agrees with Magnusson's statement (*l. c.*) that the spores may be shorter and broader in this form. It scarcely differs from f. *nuda* (Nyl.) Magn. except in the larger apothecia.

11. LECANORA (Sect. *Eulecanora*) HELICOPIS (Wbg.) Ach. Syn. Lich. 149 (1814). *Lecidea helicopis* Wbg. apud Ach. Method. Lich. Suppl. 9 (1803). *Lecanora prosechoides* Nyl. in Flora, lv. 250 (1872). *Lecania prosechoides* Oliv. Expos. Lich. Ouest France, i. 311 (1897). *Lecanora prosechoidiza* Nyl. in Flora, lxiv. 3 (1881). *Lecania prosechoidiza* A. L. Sm. Monogr. Brit. Lich. i. 347 (1918).

E. Cornwall, Looe (v.c. 2*), on maritime rocks not far above high-tide mark, leg. *I. M. L.*, 1937 (coll. no. 478). Magnusson has shown in Bot. Notiser, 437 (1932), that this specific unit embraces the forms described by Nylander as *Lecanora prosechoides* and *L. prosechoidiza*. A. L. Smith (Monogr. Brit. Lich. i. 345 & 347, 1918) has treated these as species belonging to the genus *Lecania*, on account of the alleged 1-septate character of some of the spores. When seen in water many of the spores certainly appear definitely 1-septate, but by treating with KHO, HCl, and iodine it can be seen that the appearance of a transverse septum is usually, if not always, due to protoplasmic retraction, and not continuous with the spore-wall.

12. CANDELARIELLA (Sect. *Eucandelariella*) EPIXANTHA (Ach.) Sandst. in Abhandl. Naturw. Ver. Bremen, xxi. 189 (1912). *Lecidea epixantha* Ach. in Kgl. Vetensk.-Akad. Nya Handl. xxix. 271 (1808).

E. Norfolk, Wheatfen Broad (v.c. 27*), on mortar of wall, leg. *M. J. D. Cockle*, 1937. Zahlbruckner (Cat. Lich. Univ. v. 790, 1928) uses the epithet *aurella* for this species, based on *Verrucaria aurella* Hoffm. Deutschl. Flora, 197 (1796), but as Lynge points out (Rept. Fifth Thule Exped. 1921–24, ii. no. 3, 22, 1935) this is at present a very doubtful synonym, and until the type-specimen of Hoffmann can be investigated it is better to make use of the Acharian name, which certainly refers to this plant.

13. BUELLIA (Sect. *Eubuellia*) RYSSOLEA (Leight.) A. L. Sm. Monogr. Brit. Lich. ii. 173 (1911). *Lecidea ryssolea* Leight. in Trans. Linn. Soc. Lond. ser. 2, Bot., i. 237, tab. xxxii. figs. 5 & 6 (1878).

Channel Islands, Jersey, Noirmont Point, on coarsely crystalline non-calcareous rock, leg. *A. H. Norkett*, 1937. Previously recorded only from Wales, Pembrokeshire, Fort Hill near Fishguard (v.c. 45) (the type-specimen); Cornwall, the Lizard (v.c. 1) (W. Watson in Journ. Bot. lxxi. 331, 1933); and Ireland, Howth near Dublin, leg. *Knowles*, listed by .A L. Smith (Monogr. Brit. Lich. ii. ed. 2, 189, 1926: see subsequent note). Here follows a description of Leighton's type-specimen from Fort Hill, now in Herb. Kew. :—

Thallus effuse, or here and there determinate by a black hypothallus, covering large areas of rock, ending abruptly or becoming thinner towards margin, 0·4–0·8 (–1·0) mm. thick, rimose-areolate, with cracks 0·05–0·2 mm. wide, delimiting irregularly angular areolæ 0·3–1·0 mm. diam.; areolæ plane or sometimes slightly convex, with unequal rugose surface; dirty whitish or ash-grey, but without any yellowish tinge, matt, not isidiate nor sorediate, not pruinose; KHO+yellow then blood-red, $CaCl_2O_2$—, Pd+lemon-yellow.

Cortex of thallus 20–45 μ deep, either entirely densely yellowish grey nubilated or with the outer 6–12 μ colourless and hyaline; composed of ±isodiametric irregularly angular cells 3–6 μ diam., with walls 0·5–0·7 μ thick. *Gonidial stratum* ±interrupted, 60–105 μ deep. *Gonidia* protococcoid, round, bright green, 7–12 μ diam., with colourless wall about 0·7 μ thick. *Medulla* densely yellowish grey nubilated, of rather closely intertexted colourless hyphæ 2–5·5 μ diam., with walls 0·5–0·7 μ thick. *Hypothallus* paraplectenchymatic, of ±isodiametric or slightly elongated cells 3–7·5 μ diam., with yellowish walls up to 1 μ thick; many of these cells replete with a dark reddish brown pigment.—With KHO a yellow solution flows out of section, and soon simple spicule-like red crystals characteristic of salazic acid α-methyl ether or nor-stictic acid are formed. Iodine merely yellows the medulla.

Apothecia scattered, rarely contiguous (but not coalescent), sessile from the first, well to moderately constricted at base,

round, black, up to 1·3 mm. diam. Proper margin moderate, prominent, finally becoming almost excluded, occasionally lighter than the disc (pallid brown, particularly on the lower side). Disc first plane, then becoming convex, sometimes slightly irregularly umbonate and furrowed, minutely roughened, black, matt, not pruinose.

Proper margin of apothecium a lateral continuation of hypothecium; either completely dark reddish brown, of compacted radially parallel hyphæ 2–5 μ diam., with cells 3–10 μ long and reddish brown walls 0·5–0·7 μ thick, or with an outer colourless hyaline paraplectenchymatic layer 7–36 μ deep of indistinct ±isodiametric irregularly angular cells 3–5 μ diam., with indistinct walls 0·5–0·7 μ thick. *Hypothecium* dark reddish brown, composed of densely compacted intricate hyphæ 2–4·5 μ diam., with reddish-brown walls up to 1·5 μ thick, in upper subhymenial portion mostly vertically parallel, in lower part running in various directions, tissue interspersed with clumps of ±isodiametric irregularly angular cells 5–8 μ diam., with reddish brown walls 1–1·5 μ thick. Bottom of hypothecium flat; no "tail" runs down into thalline tissue. *Hymenium* not sharply delimited from hypothecium, 70–105 μ high, pale brown or in places colourless, except for upper 6–9 μ, which is dark reddish brown. *Paraphyses* subconcrete, colourless or slightly yellowish, 1·5–2 μ thick, at apex gradually thickened up to 4·5 μ, and there dark reddish brown, this colour spreading gradually downwards. *Asci* oblong-clavate, 37–60 by 9–18 μ, with colourless wall about 1 μ thick at sides, at apex thickened up to 9 μ. *Spores* 8, biserial or irregularly massed in ascus; ellipsoid, equally rounded at both ends, 1-septate, occasionally somewhat constricted at septum, reddish brown, 12–16·5 by 6–9 μ; spore-wall smooth, 0·7–1 μ thick.—With I, hymenium blue, darkening to blue black.

[No pycnidia observed.]

In its internal characters *B. ryssolea* is closely related to *B. subdisciformis* (Leight.) Wain., the lichen-acid being also apparently the same in both. The two species may, however, be readily distinguished by the following differences:—

B. ryssolea.	*B. subdisciformis.*
Thallus-areolæ rugose, whitish or ash-grey, never with any yellowish tinge.	Thallus-areolæ ±smooth, pallid dull yellowish or cream-coloured.
Thallus ±fragile.	Thallus ±tough and coriaceous.
Hypothecium with ±flat base.	Hypothecium prolonged downwards into the thalline tissue.

Leighton's reference to "nigrofuscous" and "rusty" apothecia in his original description of "*Lecidea ryssolea*" is difficult to understand. The disc is entirely black and non-pruinose, only the proper margin being, as described above, occasionally paler.

The specimen from Ireland: Howth, near Dublin, leg. *Knowles*, which is listed under *B. ryssolea* in A. L. Smith, Monogr. Brit. Lich. ii. ed. 2, 189 (1926), is not this species, but *B. subdisciformis*.

14. BUELLIA DISCIFORMIS var. TRIPHRAGMIA (Nyl.) Oliv. is recorded in A. L. Smith, Monogr. Brit. Lich. ii. 178 (1911), and ed. 2, 193 (1926), also in Leighton, Lich.-Fl. Gt. Brit. 329 (1871), and ed. 3, 349 (1879), from one locality in Scotland, Morrone, Braemar, on shady rocks, leg. *J. M. Crombie*, 1870. The nature of the substratum is sufficient to arouse suspicion that this is incorrect, and on examination of the above-mentioned specimen in the British Museum Herbarium I found it to be the sterile thallus of *Pertusaria corallina* (L.) Arn. invaded by the parasite *Leciographa inspersa* (Flk.) Rehm. As far as I know, *Pertusaria corallina* is a new host for this parasite. Lynge has recently shown (Meddel. om Grønland, cxviii. no. 8, 181, 1937) that *Buellia geophila* (Somrft.) Lynge is the prior and correct name for the plant described by Fée as *Lecidea Lauri Cassiae* and by Nylander as *Lecidea triphragmia*. It is not improbable that it may be detected in Britain.

15. BUELLIA (Sect. *Diplotomma*) EPIPOLIA (Ach.) Mong. in Bull. Acad. Internat. Géogr. Bot. ix. 242 (1900). *Lichen epipolius* Ach. Lichenogr. Suec. Prodrom. 58 (1798).

Var. VENUSTA (Körb.) Mong. *l. c.* *Diplotomma alboatrum* var. *venustum* Körb. apud Rabenh. Flecht. Europ. fasc. xiii. no. 384 (1858), non vidi; *fide* Zahlbruckner, Cat. Lich. Univ. vii. 449 (1931).

Channel Islands, Guernsey, Moulin Huet Bay, on mortar of wall, leg. *A. H. Norkett*, 1937. The plant has the smooth rimose cretaceous white thallus and immersed to emergent apothecia characteristic of this variety. The thallus becomes yellow then orange on application of potash, this reaction being due to the formation, here and there in the medulla, of simple needle-shaped crystals of the potassium salt of either nor-stictic acid or salazic acid α-methyl ether. This reaction of the medulla has been shown by Steiner (Verhandl. Zool.-bot. Ges. Wien, lxix. 63, 1920) to be characteristic of Körber's "Lich. Sel. German." no. 191, and it therefore seems advisable to include in var. *venusta* only those plants which show it; others of the *venusta*-type, but with a negative reaction to potash, will then be included under other varieties such as *lainea* (Ach.) Oliv. Steiner (*op. cit.* pp. 61 and 63) asserts that *Buellia epipolia* differs from *B. alboatra* (Hoffm.) Br. & Rostr. in lacking longitudinal septa in the spore, these being always present in *B. alboatra*. Adherence to this view would necessitate a considerable number of recombinations in varieties and forms, and seems unjustified until the question is settled by examination of the original specimens.

STUDIES OF BRITISH POTAMOGETONS.—II.

By J. E. Dandy, M.A., and G. Taylor, D.Sc.

II. Some British Records of *Potamogeton trichoides*.

Potamogeton trichoides Cham. & Schlecht. is one of the rarer "pusilloid" species in Britain. It was not reported from this country until the year 1850, when Babington (in Henfrey, Bot. Gaz. ii. 285–288) correctly recorded it from a locality in the parish of Framingham Earl, East Norfolk, near the boundary of Bixley parish. The plant was discovered there by K. Trimmer in 1848, and specimens collected by him in Oct. 1849 and by J. B. Wilson in Sept. 1850 served as the basis for Babington's record. In 1865 *P. trichoides* was independently reported from the same locality by Caspary (in Journ. Linn. Soc., Bot. viii. 273), who had received material from Trimmer. Caspary, influenced by the presence of muriculations on the backs of the fruiting-carpels, designated the plant as a new variety, *Trimmeri*, but after studying a large series of specimens we consider this variety untenable as the muriculations are variable in their degree of development and do not furnish a satisfactory diagnostic character. Since 1865 *P. trichoides* has been reported from a number of British stations ranging from South Devon to Mid Perth and Co. Down, but some of the records are errors arising from the fact that slender-leaved states of *P. pusillus* (*P. panormitanus*)* and *P. Berchtoldii* bear a superficial resemblance to *P. trichoides* and are sometimes mistaken for that species. At the present stage of our investigations we cannot pretend to offer a complete account of the distribution of *P. trichoides* in Britain, but having already examined much of the material upon which published records have been based we are in a position to confirm some of these and expunge others. In addition, we have seen specimens of *P. trichoides* from several vice-counties for which the species has not hitherto been recorded, and by publishing these new records we hope to stimulate further search for this comparatively rare plant so that fuller details of its distribution can eventually be given.

Before dealing with the records it may be useful in the interests of collectors to indicate the principal characters by which *P. trichoides* can be distinguished from those slender-leaved forms of *P. pusillus* and *P. Berchtoldii* which have been confused with it in the past. *P. trichoides* always has very narrow leaves which are usually under 1 mm. in breadth; the leaves of the other two species are much more variable, sometimes reaching a width of between 2 and 3 mm., but often they are very narrow as in *P. trichoides* and then confusion is liable to arise, especially when the plants are in the dried state. If,

* See the first of these notes, pp. 90–92 *supra*.

however, the material is examined with proper care little difficulty ought to be experienced in identifying the species, even when flowers or fruits are not available. *P. pusillus* is at once distinguished from the other two species by its closed (tubular) stipular sheaths. *P. Berchtoldii* and *P. trichoides* both have convolute open stipular sheaths, but they are easily separated from each other by the nervation of the leaves. In *P. Berchtoldii* the midrib is usually bordered, at least towards the base, by one or more rows of lacunae, and the two lateral nerves are evident; in *P. trichoides* the midrib is proportionally thicker and more prominent and is usually without a border of lacunae, while the two lateral nerves are so faint that they are often scarcely discernible *. When flowers or fruits are present *P. trichoides* is easily recognized by its tendency to monocarpy; the carpels in each flower are usually reduced to three, two, or one, and the fruit, when developed, consists of one carpel only. In *P. pusillus* and *P. Berchtoldii*, on the other hand, the flowers normally have the full *Potamogeton* complement of four fertile carpels, though these may not all develop in fruit. Moreover, the fruiting-carpels of *P. trichoides* are appreciably larger than in *P. pusillus* and *P. Berchtoldii*, and are usually more or less muriculate along the dorsal keel.

In Druce's 'Comital Flora' (1932), p. 317, *P. trichoides* is indicated for twelve British vice-counties (3, 14, 17, 25–29, 31, 33, 39, 88) and with doubt for Co. Down in Ireland. A record for vice-county 4 (North Devon), published by Hiern in 1906, was apparently overlooked by Druce. Since the appearance of the 'Comital Flora' the species has been reported also from vice-counties 12 (North Hants) and 6 (North Somerset) by Pearsall in Bot. Soc. & Exch. Club Brit. Is. x. 112 (1933) & 845 (1935). So far we have not seen any material named *P. trichoides* from vice-counties 12 or 39, and are thus unable to confirm these records at present. We should, therefore, specially appreciate the opportunity to examine specimens named *P. trichoides* (or suspected to represent that species) from either of these two vice-counties. The other vice-counties are dealt with in numerical order below, erroneous records being placed in square brackets and new county records distinguished by the letters N.C.R.

[(3) South Devon. *P. trichoides* var. *Trimmeri* was recorded from Bradmere Pool, Drewsteignton, by Dunn in Journ. Bot. xxxii. 23 (1894) on the authority of A. Bennett, and again in

* Because of this the species has been wrongly described as having one-nerved leaves. Babington (in Henfrey, Bot. Gaz. ii. 285) described the leaves as having "one very strong nerve", and on the following page of his paper he remarked: "On a cursory examination of Mr. Wilson's specimens I suspected the occasional presence of two faint lateral nerves, but have since had reason to believe that my eye was deceived by the edges of the leaves being recurved. No instance of the presence of more than one nerve can be detected upon the living specimens now before me."

Bot. Exch. Club Brit. Is. Rep. 1895, 497 (1897). The specimens, collected by Dunn himself in Aug. 1893 and on 28th July 1895, are *P. Berchtoldii*. Another gathering of *P. Berchtoldii* made by Dunn at Teigngrace in Aug. 1893 has been named and distributed as *P. trichoides*, and in the herbaria of Hiern (at the Royal Albert Memorial Museum, Exeter) and of the Torquay Natural History Society there are further specimens of *P. Berchtoldii* from Teigngrace and from Kingsteignton which have also been named *P. trichoides*.]

[(4) NORTH DEVON. Hiern in the 'Victoria History of Devonshire' (1906), p. 68, reported *P. trichoides* from the Barnstaple District. The record was based on plants collected at Braunton and Molland on various dates between the years 1882 and 1905, and preserved in Hiern's herbarium. All the plants are referable to *P. Berchtoldii*. We have seen no genuine *P. trichoides* from Devon.]

(5) SOUTH SOMERSET. N.C.R. Wellington, comm. *R. P. Murray*, 2nd Oct. 1884 (Herb. Brit. Mus.). The material, which is sterile, was sent by Murray to A. Bennett with the note: "It is certainly *P. pusillus*, but I never saw it before with the leaves veined in exactly the same manner." In Bennett's herbarium the plant was placed, apparently provisionally, under *P. panormitanus*.

(6) NORTH SOMERSET. *P. trichoides* was correctly recorded from this vice-county by Pearsall in Bot. Soc. & Exch. Club Brit. Is. x. 845 (1935). His material, which was received through Lady Davy, came from a locality near Weston-super-Mare.

(13) WEST SUSSEX. N.C.R. Henfield Level, July 1849, *W. Borrer* (Herb. Borrer, at Kew). This plant has lain in Borrer's herbarium for nearly ninety years under the erroneous name *P. pusillus*.

(14) EAST SUSSEX. We have seen numerous authentic specimens of *P. trichoides* from the neighbourhood of Lewes and Iford, collected by T. Hilton, C. E. Salmon, G. C. Druce, C. Bucknall, J. E. Lousley (Ref. C. 7/A), E. C. Wallace, and others. The species occurs also in the north-west of the vice-county, for fragments of it are included among a gathering of *P. pusillus* made by Salmon at Fen Place Mill Pond, near Kingscote, in July 1921.

(17) SURREY. Beeby in Journ. Bot. xxxii. 88 (1894) correctly reported *P. trichoides* from Hedge Court Mill Pond and from the Basingstoke Canal near Aldershot. He collected specimens at Hedge Court on 28th Sept. 1879 and 12th Sept. 1886 *, and

* Hagström (Crit. Res. 126) referred this gathering to his *P. franconicus* var. *spicosus*, a supposed hybrid between "*P. pusillus*" (*i. e.*, *P. Berchtoldii*) and *P. trichoides*. There is no justification for ascribing a hybrid origin to Beeby's plant, which agrees in all respects with *P. trichoides*. *P. Berchtoldii*, it may be noted, has not been reported from Hedge Court,

in the Basingstoke Canal on 31st July and 7th Aug. 1881. Apparently no one since Beeby has succeeded in finding the species in either of these localities. Beeby also found *P. trichoides* in Ewood Pond in July 1884 *, and further material of the species, mixed with *P. pusillus*, was collected at Newdigate by L. Haig in June 1932 (Herb. Kew). [In Bot. Soc. & Exch. Club Brit. Is. x. 990 (1935) specimens obtained from Hedge Court Mill Pond by J. E. Lousley (Ref. F. 30) were referred to *P. trichoides*, but these are *P. pusillus*, as also is a plant collected at Old Woking by Lady Davy and recorded as *P. trichoides* by Druce in Bot. Soc. & Exch. Club Brit. Is. viii. 702 (1929) †. Another Surrey plant, collected by F. Clarke at St. Catherine's, Guildford, and referred to *P. trichoides* by Druce, *op. cit.* vi. 751 (1923), is *P. Berchtoldii*; the material in Herb. Druce had been determined as *P. trichoides* by Hagström in 1921.]

(21) MIDDLESEX. N.C.R. Staines, 12th July 1885, *J. Fraser* (Herb. Kew), named *P. filiformis*. Hampton Court Park, 30th June 1934, *H. W. Pugsley* (Herb. Pugsley).

(25) EAST SUFFOLK. *P. trichoides* was correctly recorded by A. Bennett in Journ. Bot. xviii. 317–318 (1880) from Wortham Long Green. We have seen specimens collected in that locality by Bennett himself and dated 5th and 6th Aug. 1880.

(26) WEST SUFFOLK. We have examined authentic material of *P. trichoides* from Babington's herbarium, collected in Barton Mere and cited by Hind, Fl. Suffolk, 362 (1889).

(27) EAST NORFOLK. The first British records of *P. trichoides*, as we have already mentioned, were from Framingham Earl, in East Norfolk. We have also seen material of the species from Swardeston, Marlingford, Flordon, Alpington, Roydon, Happisburgh, Potter Heigham, Lessingham, Hempstead Marshes, and the New Cut near Palling. All these localities are represented in the British Museum Herbarium (including the Boswell Herbarium). [Specimens from a ditch near Horsey, collected by J. Groves on 10th July 1912, were referred by him to *P. trichoides* in Bot. Soc. & Exch. Club Brit. Is. iv. 166 (1915); these are *P. pusillus*.]

* This gathering (wrongly ascribed to Straker) was placed along with the Hedge Court plant under *P. franconicus* f. *spicosus* (err. *aspicosus*) by A. Bennett in Journ. Bot. lvii. 19 (1919). The same remarks apply as in the preceding footnote.

† Dr. R. W. Butcher has informed us that the plate of *P. trichoides* in Butcher & Strudwick's 'Further Illustrations of British Plants' (1930), p. 374, t. 392, was based on a plant from Old Woking. The figured plant is certainly *P. pusillus*, but some of the accompanying analyses do not agree with that species and are either inaccurate or derived from another source. Thus fig. B shows a fruiting-carpel with muriculate back, fig. C on upon stipular sheath, and fig. D the apex of a leaf which appears to have a midrib and two marginal nerves meeting at the tip.

(28) WEST NORFOLK. The localities cited for *P. trichoides* in W. A. Nicholson's 'Flora of Norfolk' (1914), p. 155, include Little Ryburgh, Shipdham, Walpole St. Peter, Terrington, and Wimbotsham, all in West Norfolk. We cannot at present comment on these records, however, as we have not yet seen material from any of the localities. [A gathering from a drain between the R. Nar and Shouldham Warren, made by J. E. Little on 25th June 1914, was referred with some doubt to *P. trichoides* var. *Trimmeri* by A. Bennett in Watson Bot. Exch. Club, ii. 511 (1915); the plant is *P. Berchtoldii*.]

(29) CAMBRIDGE. Fryer in Journ. Bot. xxxv. 446–447 (1897) correctly recorded *P. trichoides* from the parish of Mepal. His specimens were gathered in Hammond's Eau (Ref. 3077, 3102, and 3112) and in the Mepal Engine Drain (Ref. 3105 and 3142). Further material was collected at Mepal by Druce and Fryer in Aug. 1909, and in Hammond's Eau by E. W. Hunnybun on 9th Sept. 1909. We have also seen a specimen gathered in Crooked Drain, near Ely, by H. and J. Groves on 2nd June 1884.

(30) BEDFORD. N.C.R. Southill Park Lake, 26th July 1930, *J. E. Little* (Herb. Brit. Mus.; Herb. Kew), mixed with *P. pusillus* under the name *P. panormitanus*.

(31) HUNTS. We have examined specimens collected at Brocas by G. C. Druce in Aug. 1905 and at Holme Fen by E. W. Hunnybun on 9th Sept. 1909. They are correctly named *P. trichoides*.

(33) EAST GLOUCESTER. *P. trichoides* var. *Trimmeri* was reported from an old brick-pit near Gloucester by A. Bennett in Bot. Soc. & Exch. Club Brit. Is. v. 131 (1918). The plant was collected by Miss Todd and is *P. trichoides*. Specimens were also obtained near Gloucester by A. S. Montgomrey in 1916 and by Mrs. Wedgwood in 1921, while J. W. Haines collected material at Walham, just north of Gloucester, on 10th June 1915.

(52) ANGLESEY. N.C.R. Cors Ddygai, Malldraeth, *H. Davies* (Herb. Brit. Mus.). These specimens were labelled by Davies as "another rather uncommon appearance of *Pot: pusillum*", and were determined by A. Bennett as *P. pusillus* var. *tenuissimus*. They were collected by Davies about the beginning of last century, and it would be interesting to know whether the species still occurs in the region.

(54) NORTH LINCOLN. N.C.R. Drain, Wainfleet, 15th Aug. 1891, *J. Burtt Davy* (Herb. Brit. Mus.).

(86) STIRLING. N.C.R. Wood ponds, Grangemouth, 12th June 1893, *R. Kidston & J. S. Stirling* (Herb. Brit. Mus.; Herb. Univ. Glasgow), named *P. pusillus*; same locality, 26th July 1934, *A. Taylor* (Herb. Brit. Mus.), named *P. rutilus* by Pearsall. Taylor's plant formed the basis for a new county record of *P. rutilus* in Bot. Soc. & Exch. Club Brit. Is. x. 845 (1935).

[(88) MID PERTH. *P. trichoides* was recorded for the first time from Scotland by A. Bennett in Journ. Bot. li. 336 (1913), the record being repeated in Bot. Exch. Club & Soc. Brit. Is. iii. 395 (1914) and in Trans. Perth. Soc. Nat. Sci. vi. 6 (1914). Bennett's material, which is now in the British Museum Herbarium, was collected in White Moss Loch, Dunning, by J. R. Matthews on 4th Sept. 1913. It represents *P. pusillus* in a sterile condition.]

[(H 38) DOWN. A. Bennett in Journ. Bot. xix. 312 (1881) reported *P. trichoides* from Co. Down on the basis of material sent to him by D. Orr with the label "Pools, Conlig hill, Co. Down, D. Orr, 1844". The material is now in the British Museum Herbarium, and is correctly named *P. trichoides*, but the record cannot be accepted since the accuracy of Orr's labels is very much open to question. Stewart and Corry, in their 'Flora of the North-east of Ireland' (1888), p. 303, refused to credit the locality assigned to the plant by Orr, and placed *P. trichoides* among the "plants excluded".]

P. trichoides is obviously a species of very sporadic distribution in Britain, even if we assume that all the records not dealt with in the present note are correct. Most of the known British stations are in south-eastern England (especially East Anglia), the remaining ones being sparingly scattered in south-western England, the Midlands, Anglesey, and Scotland. The species may, however, be commoner than is supposed, and possibly has been overlooked in some at least of the intervening areas. We have seen gatherings of *P. trichoides* mixed with *P. pusillus* from countries as distantly separated as England, Kashmir, and Southern Rhodesia, and it is clear that these two species favour similar ecological conditions. *P. trichoides* should therefore be sought wherever *P. pusillus* occurs.

THE BRITISH BRYOLOGICAL SOCIETY.

BY ELEONORA ARMITAGE.

THE above Society held its Annual Meeting and Excursion at Bundoran, Co. Donegal, Ireland, from June 19 to 26, 1937, under the presidentship of Mr. J. B. Duncan, Berwick-on-Tweed. About twenty members and friends were present. Thirteen of the party went on to Achill Island, Co. Mayo (I. 27) for another week. In East Donegal (I. 34) the Bundoran sand-dunes were explored, and two excursions were made up the

River Erne—one from Ballyshannon and the other from Belleek; the latter included a small area of Co. Fermanagh (I. 33). But the chief interest centred in the range of the Dartry Mountains in Counties Leitrim (I. 29) and Sligo (I. 28). The excursions here included the attractive valleys of Gleniff with Annacoona Rocks, Sligo, and Glenade, Leitrim; also in Sligo was the huge bluff of Ben Bulben, facing towards the Atlantic, with very steep wet grassy slopes, and, near the summit, the great curved wall of precipitous rock, the jutting cliffs of which are deeply grooved. This walk taxed the climbing powers of the bryologists, though the cliff-top was but 1500 ft., and the grassy summit beyond was 1700 ft.

A good deal of rain impeded the walks on Achill Island (I. 27). The bog land near Dugort was interesting, and the cliffs, rocks, and Corrie of Slievemore held many bryophytes. One day the barren summit (2204 ft.) of Slievemore was reached. Croaghaun has precipices of over 1000 feet. At Keel and Dooagh were sandy stretches of beach.

The Annual Meeting took place on June 22. The following elections were made: President and Treasurer, Mr. J. B. Duncan; Vice-President, Miss E. Armitage; Secretary, Mr. A. Thompson. The next meeting is to be at Llangollen for the Berwyns in August 1938.

The *Sphagnum* list has been collated by Mr. A. Thompson; all are new v.c. records. Most of the Mosses and Hepatics are also new or interesting.

Sphagna.

S. Warnstorfii, I. 28, I. 34; *S. rubellum*, I. 29; *S. subtile*, I. 27; *S. quinquefarium*, I. 28; *S. plumulosum*, I. 29; *S. compactum* var. *imbricatum*, I. 29, I. 33; *S. squarrosum* var. *spectabile*, I. 29, I. 27, var. *subsquarrosum*, I. 29, I. 34; *S. amblyphyllum* var. *macrophyllum*, I. 27, I. 28, var. *mesophyllum*, I. 27, I. 29; *S. pulchrum*, I. 29; *S. recurvum* var. *robustum*, I. 28, var. *majus*, I. 27, I. 28, I. 29; *S. fallax* var. *robustum*, I. 29; *S. cuspidatum* var. *falcatum*, I. 28, I. 34, var. *submersum*, I. 27, I. 28, var. *plumulosum*, I. 27, var. *serratum*, I. 34; *S. molluscum*, I. 29; *S. Holtii*, I. 27; *S. obesum*, I. 29, var. *plumosum*, I. 27, var. *teretiramosum*, I. 27, I. 28, var. *canovirens*, I. 29, I. 27, var. *hemiisophyllum*, I. 27; *S. subsecundum*, I. 29; *S. inundatum* var. *robustum*, I. 28, I. 33, var. *eurycladum*, I. 33, I. 34, var. *densum*, I. 34, var. *lancifolium*, I. 29, I. 33, var. *diversifolium*, I. 29; *S. auriculatum* var. *ovatum*, I. 27, I. 33, var. *laxifolium*, I. 33, var. *submersum*, I. 27, var. *racemosum*, I. 28; *S. crassicladum* var. *diversifolium*, I. 27, I. 33. *S. Camusii*, I. 27, I. 28, I. 29. *S. platyphyllum*, I. 33. *S. imbricatum* var. *cristatum*, I. 27. *S. papillosum* var. *normale*, I. 28, I. 29, I. 33, var. *sublaeve*, I. 27. *S. magellanicum*, I. 27, I. 28, I. 29.

Irish Mosses (new county records starred.)

Swartzia montana c. fr., Gleniff, I. 28; *S. inclinata*, Gleniff, I. 28. *Seligeria pusilla*, Annacoona, I. 28*; *S. tristicha*, Annacoona, I. 28*, Glenade, I. 29*, new to Ireland; *S. recurvata*, Glenade, I. 29. *Brachyodes trichodes*, Ben Bulben, I. 28*; *Dichodontium pellucidum* var. *compactum*, Gleniff, I. 28*; *Dicranella heteromalla*, Gleniff, I. 28*; *D. cerviculata*, Cliffony, I. 28*; *Campylopus pyriformis*, Ben Bulben, I. 28*; *Dicranum Bonjeani* var. *rugifolium*, Bundoran, I. 34*. *Fissidens viridulus* var. *Lylei*, Ballyshannon, I. 34*, *F. pusillus*, Gleniff, I. 28, *F. crassipes*, River Erne, Belleek, I. 33*; *F. rufulus*, River Erne, Belleek, I. 33*; *Campylostelium saxicola*, Ben Bulben, I. 28*. *Tortula ruraliformis*, I. 34; *T. intermedia*, Ballyshannon, I. 34*. *Barbula lurida*, Bundoran, I. 34*, *B. ferruginascens*, Ben Bulben, I. 28*; *B. recurvifolia*, Bundoran, I. 34*, Glenade, I. 29; *B. recurvifolia* var. *robusta*, Glenade, I. 29* (only known before from Ben Bulben, I. 28). *Leptodontium flexifolium*, Glenade, I. 29*; *Weisia tenuis*, Ben Bulben, I. 28; *W. calcarea* c. fr. Ben Bulben, I. 28*; *W. curvirostris*, Glenade, I. 29*, *W. curvirostris* var. *insignis*, Glenade, I. 29* (only known before from Ben Bulben, I. 28); *W. curvirostris* var. *commutata*, Bundoran, I. 34*, new to Ireland; *W. verticillata*, Bundoran, I. 34. *Trichostomum crispulum* var. *elatum*, Ben Bulben, I. 28*; var. *brevifolium*, Bundoran sand-dunes, I. 34*, new to Ireland; *T. mutabile* var. *cophocarpum*, Ben Bulben, I. 28, Glenade, I. 29; *T. tortuosum* var. *fragilifolium*, Truskmore, I. 29*, Bundoran, I. 34*. *Encalypta commutata*, summit of Ben Bulben, Annacoona (c. fr.), I. 28. *Anoectangium compactum*, Gleniff, I. 28. *Ulota vittata*, Gleniff, I. 28. *Orthotrichum saxatile*, Gleniff, I. 28; *O. cupulatum* var. *nudum*, Bundoran, I. 34*; *O. tenellum* on hawthorn by R. Erne, Ballyshannon, I. 34* (also *O. pulchellum*); *Amblyodon dealbatus*, Annacoona, I. 28. *Timmia norvegica*, Gleniff, I. 28. *Catoscopium nigritum*, slack in sand-dunes, Bundoran, I. 34*; *Breutelia arcuata*, Gleniff, I. 28, Glenade, I. 29, c. fr. *Plagiobryum Zierii*, summit of Ben Bulben, I. 28. *Bryum filiforme*, Ben Bulben, I. 28, Ballyshannon, I. 34. *B. pendulum*, Bundoran, I. 34. *B. inclinatum*, Annacoona, I. 28*, Kinlough, I. 29*. *B. obconicum*, Bundoran, I. 34*. *B. murale*, Belleek, I. 33. *Mnium affine* var. *elatum*, Ben Bulben, I. 28*, *M. serratum*, Glenade, I. 29*, Belleek, I. 33*, *M. orthorrhynchum*, Truskmore, I. 29*; *M. stellare*, Gleniff, I. 28. *Neckera crispa* var. *falcata*, Ben Bulben, I. 28. *Pterygophyllum lucens*, I. 29. *Heterocladium heteropterum* var. *fallax*, R. Duff, I. 28*. *Thuidium abietinum*, I. 34, *T. delicatulum*, Ben Bulben, I. 28*, *T. Philiberti*, Bundoran, I. 34*. *Cylindrothecium concinnum*, Bundoran, I. 34. *Orthothecium rufescens*, I. 24, I. 29. *O. intricatum*, Gleniff, I. 28, in fruit, which is very rare. *Camptothecium lutescens*, I. 34. *Brachythecium salebrosum* var. *palustre*, Bundoran, I. 34*;

Eurhynchium Swartzii var. *rigidum*, R. Erne, I. 34*. *E. pumilum*, Erne Valley, I. 34*, *E. Teesdalei*, I. 28, I. 33, near R. Erne, Belleek, I. 34*. *E. tenellum*, Erne Valley and Bundoran, I. 34*. *Plagiothecium depressum*, Annacoona, I. 28*, R. Erne, I. 34*. *Hyocomium flagellare*, Glenade, I. 29*. *Amblystegium Sprucei*, Annacoona, I. 28, Glenade, I. 29*. *A. confervoides*, Gleniff, I. 28. *A. serpens* var. *salinum*, Bundoran, I. 34. *A. Kochii*, Bundoran, I. 34*. *Hypnum polygamum*, I. 34. *H. chrysophyllum*, R. Erne, I. 33; *H. falcatum* var. *gracilescens*, Annacoona, I. 28*, new to Ireland. *H. cupressiforme* var. *tectorum*, Bundoran, I. 34*, var. *elatum*, Bundoran, I. 34. *H. palustre*, Ballyshannon, I. 34*. *H. stramineum*, Ben Bulben, I. 28*, *H. cordifolium* and *H. giganteum*, Bundoran, I. 34. *Hylocomium brevirostre*, Glenade, I. 29.

Achill Island Mosses.

Campylopus Schwarzii, Croaghaun, I. 27. *Dicranum uncinatum*, Croaghaun, I. 27. *Barbula recurvifolia*, Dugort, I. 27*. *Ulota crispa*, Croaghaun, I. 27; *U. Hutchinsiae*, Slievemore, I. 27. *Splachnum ampullaceum*, Dugort, I. 27. *Funaria Templetoni*, I. 27. *Webera elongata*, Croaghaun, I. 27*. *Bryum pendulum*, I. 27*. *B. turbinatum*, The Valley, I. 27*.

Hepatics.

Aneura pinguis, Bundoran sand-dunes, I. 34*; *A. palmata*, Croaghaun and Slievemore, I. 27. *Metzgeria conjugata*, Glenade, I. 29*. *Pellia Fabbroniana*, Bundoran, I. 34*; *Fossombronia angulosa*, Dugort, I. 27. *Lophozia bantriensis*, Glenade, I. 29*; *L. excisa*, Ben Bulben, I. 28. *Plagiochila asplenioides* var. *minor*, Erne Valley, I. 34*, and forma *laxa*, Erne Valley, I. 34* (new to Ireland); var. *humilis* forma *laxa*, Erne Valley, I. 34* (new to Ireland). *P. spinulosa*, Ben Bulben, I. 28. *Leptoscyphus Taylori*, Ben Bulben, I. 28*; *L. cuneifolius*, Croaghaun, I. 27. *Cephalozia connivens*, Dugort, I. 27; *Nowellia curvifolia*, Dugort, I. 27*. *Adelanthus dugortiensis*, Dugort, I. 27, refound, but not plentifully, in its only locality. *Bazzania tricrenata*, I. 27, Glenade, I. 29*. *Blepharostoma trichophyllum*, I. 28, Glenade, I. 29*. *Herberta Hutchinsiae*, I. 27. *Mastigophora Woodsii*, Dugort, I. 27. *Trichocolea tomentella*, Glenade, I. 29. *Scapania aspera*, Bundoran sand-dunes, I. 34*. *S. dentata* var. *ambigua*, Dugort, I. 27*; *S. umbrosa*, Ben Bulben, I. 28*. *Radula aquilegia*, Croghaun, I. 27; *Pleurozia purpurea*, I. 27. *Madotheca laevigata*, lime-rocks, Erne Valley, I. 34*. *Lejeunea patens*, Ben Bulben, I. 28, I. 29. *Harpalejeunea ovata*, Croaghaun, I. 27, Glenade, I. 29. *Marchesinia Mackaii*, lime-rocks, Erne Valley, I. 34*. *Frullania germana*, Slievemore, I. 27, Ben Bulben, I. 28*. *Anthoceros punctatus*, Dugort, I. 27.

ON THE NOMENCLATURE OF THREE SPECIES OF *CAESALPINIA*.

By J. E. Dandy and A. W. Exell.

As we have had occasion to examine the nomenclature of three well-known species of *Caesalpinia* L., and find that our conclusions are not in agreement with the generally accepted names, we make this attempt to clear up the problem †.

The first species concerned is *C. Crista* L. Sp. Pl. i. 380 (1753). It has long been recognized that Linnaeus included in his protologue elements belonging to two species, the one usually known as *C. Nuga* (L.) Ait. f., the other as *C. bonducella* (L.) Fleming. Here no doubt exists about the taxonomy; the difficulty lies in typification and application of the name. The complete citation in the 'Species Plantarum' is as follows:—

> "*Crista* 2. Cæsalpinia foliis ovatis integerrimis.
> Cæsalpinia aculeis recurvis, foliolis ovatis. *Fl. zeyl.* 157.* *Hort. ups.* 102.
> Acacia gloriosa, lentisci folio, spinosa, flore spicato luteo, siliqua magna. *Pluk. alm.* 4. *t.* 2. *f.* 2.
> Christa pavonis, glycyrrhizæ folio, minor repens spinosissima, flore luteo spicato minimo, siliqua latissima echinata. *Breyn. ic.* 58. *t.* 28.
> *Habitat in* Zeylona. ħ".

There is no specimen named *C. Crista* in the Linnean Herbarium, so that in choosing the lectotype we have to consider the three syntype elements represented by Linnaeus's synonyms. These three elements are: (1) the 'Flora Zeylanica' citation (*Hort. ups. 102* merely repeats this and the other two synonyms); (2) the Plukenet figure; and (3) the Breynius plate. The citation in the 'Flora Zeylanica', p. 69, n. 157, consists of three parts: firstly the Plukenet reference quoted in the 'Species Plantarum'; secondly *Kuburuwæl. Herm. zeyl. 12*; and thirdly a description worded as follows:—*Rami lignosi, solidi, glabri. Folia duplicato-pinnata, foliolis ovatis, glabris (absque acumine setaceo), in singulo partiali folio 3 paria remota. Flores glabri, in racemis laxioribus, magis labiati. Fructus Guilandinæ.* This description was clearly drawn up from the material of *Kuburuwael* on fol. 68 of vol. i. of Hermann's Herbarium (now at the British Museum) except for the words *Fructus Guilandinæ*, which presumably were based on the cited Plukenet figure since there is no fruit

† The three species are not always included in the genus *Caesalpinia*. *Guilandina* L. is sometimes maintained for two of them, and *Ticanto* Adans. for the other. This, however, does not affect the questions of typification involved; nor does it alter the fact that all three species are (and probably will continue to be) placed in *Caesalpinia* by many authors.

with Hermann's material. The brief note about the fruit is, however, scarcely diagnostic, and it is obvious that Hermann's material must be regarded as typifying the ' Flora Zeylanica ' reference in Linnaeus's protologue of *C. Crista*. Hermann's plant belongs to the species usually known as *C. Nuga* (L.) Ait.f., and was so identified by Trimen in Journ. Linn. Soc., Bot. xxiv. 141 (1887). The Plukenet figure, which is the second syntype element of *C. Crista* to be considered, was taken from a specimen now in the Sloane Herbarium, vol. xcv. fol. 6, at the British Museum. This specimen, which Linnaeus never saw, is referable to the species commonly known as *C. bonducella* (L.) Fleming, as also is the Breynius plate which forms the third syntype element of *C. Crista*.

Linnaeus's definition of *C. Crista—Cæsalpinia foliis ovatis integerrimis*—is too short to be conclusive, but the evidence, as far as it goes, is that it was taken from the ' Flora Zeylanica '. The word *ovatis* agrees particularly well with Hermann's material, although allowance must be made for the fact that Linnaeus used the term *ovatus* in a very wide sense. Thus we see that, although the specific epithet *Crista* came from the Breynius synonym, the brief definition applies well to Hermann's specimens which are the only existing material seen by Linnaeus ; further, that the first reference quoted is based on this material, and that the geographical note *Habitat in Zeylona* certainly refers to it. The balance of evidence, therefore, seems clearly in favour of regarding Hermann's material as lectotype of *C. Crista* L., and this name should thus be applied to the species commonly known as *C. Nuga* (L.) Ait. f. and not to the one known as *C. bonducella* (L.) Fleming.

Merrill (Interpr. Rumph. Herb. Amboin. 260–262 (1917)) came to the opposite conclusion, and used the name *C. Crista* in the same sense as Urban (Symb. Antill. ii. 269 (1900)), but we consider that he did not give sufficient consideration to the facts here stressed, and especially that he did not realize that the ' Flora Zeylanica ' citation must be typified by the Hermann material (owing to the description given) and not by the Plukenet synonym.

It is interesting to follow the later history of *C. Crista* in Linnaeus's own works, for in such a controversial case any lectotype indicated either deliberately or inferentially by Linnaeus might have some influence on a decision made now. In his ' Systema Naturæ ', ed. 10, vol. ii. p. 1018 (1759), Linnaeus added to his definition of *C. Crista* the words *pinnis trijugis*, apparently referring to the number of leaflets in each pinna. The origin of this extra information was probably the phrase *in singulo partiali folio 3 paria remota* in the ' Flora Zeylanica ' description quoted in full above. Thus the Hermann material is again indicated and our view confirmed.

In the second edition of the ' Species Plantarum ', vol. i. p. 544 (1762), we find that *C. Crista* was entirely reconstituted, not emended in the ordinary sense. The Breynius reference beginning *Christa pavonis* (now corrected to *Crista pavonis*) was here (p. 545) transferred to the new species *Guilandina bonducella*, and the Plukenet synonym was placed under *G. Bonduc*, while the ' Flora Zeylanica ' element regarded by us as lectotypical of *C. Crista* was completely omitted. Linnaeus apparently abandoned his original conception of *C. Crista* and applied the name (with a new definition worded *Cæsalpinia caule aculeato, foliolis ovatis, floribus pentandris*) to a concept coinciding with *Cæsalpinia foliis duplicato-pinnatis foliolis ovatis integerrimis floribus pentandris* Mill. Gard. Dict., ed. 7 (1759), which is *C. brasiliensis* L. There is no evidence as to what Linnaeus now thought of the ' Flora Zeylanica ' plant, but it is quite definite that he no longer retained in *C. Crista* the Plukenet and Breynius elements which Urban and Merrill regarded as typifying that species.

The second species with which this paper is concerned is *Guilandina Bonduc* L. Sp. Pl. i. 381 (1753). Owing to a misapprehension by Roxburgh, who transferred *G. Bonduc* to *Cæsalpinia* while describing a different species, there has been considerable confusion. The lectotype of *G. Bonduc* L., and hence of *Caesalpinia Bonduc* (L.) Roxb. according to our interpretation, must undoubtedly be taken from the Hermann material indicated by the citation *Fl. zeyl. 156*, which includes a description drawn up from Hermann's specimens. These comprise two flowering gatherings preserved in Hermann's Herbarium, one in vol. ii. fol. 17, representing *Kuburuwael*, and one in vol. iii. fol. 35, representing *Arbor exotica spinosa foliis lentisci*. The two gatherings are, as near as can be, identical, and belong to the species commonly known as *C. bonducella* (L.) Fleming ; they both agree with the description given by Linnaeus in the ' Flora Zeylanica ', but the one in vol. iii. fol. 35 (representing *Arbor exotica* etc.) shows the characteristic foliaceous stipules and we therefore take it as the lectotype of *G. Bonduc*. There are two specimens named *G. Bonduc* in the Linnean Herbarium, and these are conspecific with Hermann's plants. Thus there is no question of the identity of *G. Bonduc*, and, in fact, this has not been a matter of controversy in recent times.

That Roxburgh (Fl. Ind. ii. 362 (1832)) in publishing the name *Caesalpinia Bonduc* referred the synonym *Guilandina Bonduc* to *Willd. 2. 534* is of no significance since in the ' Flora Indica ' he invariably cited Linnaeus's species by reference to Willdenow's edition of the ' Species Plantarum '. Hence there is no evidence that Roxburgh's intention was to transfer *Guilandina Bonduc* (non L.) Willd. to *Caesalpinia*. Actually Willdenow's account

of *G. Bonduc* was practically copied from the second edition of the 'Species Plantarum', in which Linnaeus had himself reconstituted *G. Bonduc* so that it comprised elements belonging to two species.

We are well aware that it is possible to take the contrary view of *Caesalpinia Bonduc*, i. e., that Roxburgh regarded Willdenow's *Guilandina Bonduc* as a misidentification and therefore intended *C. Bonduc* Roxb. (not *C. Bonduc* (L.) Roxb.) to be a new specific name, the epithet *Bonduc* being used over again. This would make it impossible legitimately to transfer *Guilandina Bonduc* L. to *Caesalpinia*. In our opinion there is insufficient justification for this interpretation and every probability that Roxburgh considered that he was transferring Linnaeus's *Guilandina Bonduc* to *Caesalpinia*. Thus the species usually known as *C. bonducella* (L.) Fleming or more recently, and in our view erroneously, as *C. Crista* L. becomes *C. Bonduc* (L.) Roxb. emend.

There remains for consideration the third species—the one confused by Roxburgh with *Guilandina Bonduc* and hence widely known as *Caesalpinia Bonduc* Roxb. Merrill (Interpr. Rumph. Herb. Amboin. 261 (1917)) took up for this species the name *C. Jayabo* Maza (in An. Soc. Esp. Hist. Nat. xix. 234 (1890)), but this name is illegitimate since Maza cited several legitimately published specific names as synonyms, including *Guilandina Bonduc* L., *G. bonducella* L., and *Glycyrrhiza aculeata* Forsk., the latter two under the var. *cyanosperma*. The oldest legitimate name for the species appears to be *Bonduc majus* Medic. (Theod. Specios. 43, t. 3 sup. (1786)). It is true that Medicus cited *Guilandina Bonduc* L. as a synonym of *B. majus* *, but his description and the rest of his synonymy clearly indicate that his species was the one with which we are now dealing. No doubt he interpreted *G. Bonduc* from the second edition of Linnaeus's 'Species Plantarum' and therefore referred it to *B. majus*. Thus the correct name for our third species (when placed in *Caesalpinia*) seems to be *C. major* (Medic.), comb. nov. It is worthy of note that the name *Guilandina major* (DC.) Small, used for the species in some recent works, was based on *Guilandina Bonduc* var. *majus* DC., which was founded independently of *Bonduc majus* Medic. Small's name stands if the genus *Guilandina* is retained.

The nomenclature here proposed is based on conclusions which conform with those reached by Skeels in a paper entitled "The Method of Types Applied to the Nickernut", presented to the Botanical Society of Washington in 1913 and summarized in 'Science', new ser. xxxvii. 921–922 (1913), except that he retained the second and third of our three species in *Guilandina*.

* Owing to the rule against tautonyms, *B. majus* is a legitimate name despite the inclusion of *G. Bonduc* L. by Medicus.

In the summary mentioned, however, no detailed arguments were given for the results arrived at. We appreciate the inconvenience of the nomenclature here proposed, but feel that a completely unprejudiced investigation leads to it. All the necessary materials have been available to us in the British Museum Herbarium, and we hope that the position now arrived at can be regarded as stable.

The relevant synonymy of the three species is as follows :—

1. CAESALPINIA CRISTA L. Sp. Pl. i. 380 (1753) emend., excl. syn. Pluk. et Breyn.—Skeels in Science, new ser. xxxvii. 922 (1913).
Kaka Mullu Rheede, Hort. Malabar. vi. 33, t. 19 (1686).
Kuburuwael Herm. Mus. Zeyl. 12 (1717).
Caesalpina aculeis recurvis, foliolis ovatis L. Fl. Zeyl. 69, n. 157 (1747) pro parte, excl. syn. Pluk.
Nugae silvarum Rumph. Herb. Amboin. v. 94, t. 50 (1747).
Guilandina Nuga L. Sp. Pl., ed. 2, i. 546 (1762).
Ticanto Nuga (L.) Medic. Theod. Specios. 52 (1786).
Caesalpinia Nuga (L.) Ait. f. in Ait. Hort. Kew., ed. 2, iii. 32 (1811).—Merr. Interpr. Rumph. Herb. Amboin. 261 (1917).
This is the smooth-fruited species usually known as *C. Nuga* (L.) Ait. f.

2. CAESALPINIA BONDUC (L.) Roxb. Fl. Ind. ii. 362 (1832) emend., excl. pl. descr.
Arbor exotica spinosa foliis lentisci Bauh. Pinax, 399 (1623).—Herm. Mus. Zeyl. 35 (1717).
Caretti Rheede, Hort. Malabar. ii. 35, t. 22 (1679).
Crista pavonis Glycyrrhizae folio, minor, repens, spinosissima, flore luteo spicato minimo, siliqua latissima echinata, semine rotundo cinereo, lineis circularibus cincto, majore Breyn. Prodr. ii. 38 (1689).—Breyn. f. in Breyn. *op. cit.*, ed. nov. 58, t. 28 (1739).
Lobus echinatus fructu caesio foliis longioribus Herm. Parad. Bat. Prodr. 348 (1689).—Sloane, Cat. Pl. Ins. Jam. 144 (1696); Voy. Jam. Nat. Hist. ii. 41 (1725).
Acacia gloriosa Lentisci folio spinosa flore spicato luteo, siliqua magna muricata Pluk. Phytogr. t. 2, fig. 2 (1691); Alm. Bot. 4 (1696).
Bonduc vulgare, minus, polyphyllum Plum. Nov. Pl. Amer. Gen. 25 (1703).
Kuburuwael Herm. Mus. Zeyl. 19, 57 (1717).
Acacia, qui lobus echinatus Clusii, oculus Cati Lusitanis Burm. Thes. Zeyl. 4 (1737).
Guilandina caule fructuque aculeatis α L. Hort. Cliff. 158 (1737) pro parte, quoad syn. Burm. et Rheed.
Guilandina caule fructuque aculeatis β L. *loc. cit.*
Guilandina aculeata, foliolis ovalibus cum acumine L. Fl. Zeyl. 68, n. 156 (1747).
Caesalpina aculeis recurvis, foliolis ovatis L. *op. cit.* 69, n. 157 (1747) pro parte, quoad. syn. Pluk.

Globuli majores Rumph. Herb. Amboin. v. 92, t. 49, fig. 1 (1747).

Caesalpinia Crista L. Sp. Pl. i. 380 (1753) pro parte, quoad syn. Pluk. et Breyn.—Urb. Symb. Antill. ii. 269 (1900).—Merr. Interpr. Rumph. Herb. Amboin. 260 (1917).

Guilandina Bonduc L. Sp. Pl. i. 381 (1753); *op. cit.*, ed. 2, i. 545 (1762) pro parte, quoad syn. Pluk.—Skeels in Science, new ser. xxxvii. 922 (1913).

Guilandia Spinosa, foliis bipinnatis ovatis cum acumine, seminibus cinereis Browne, Civ. & Nat. Hist. Jam. 228 (1756).

Guilandina bonducella L. Sp. Pl., ed. 2, i. 545 (1762).

Glycyrrhiza aculeata Forsk. Fl. Aegypt.-Arab. 135 (1775).

Caesalpinia bonducella (L.) Fleming in As. Research. xi. 159 (1810).

Caesalpinia Jayabo Maza in An. Soc. Esp. Hist. Nat. xix. 234 (1890), *nomen illegitimum*, pro parte, quoad var. β et syn. *Guilandina Bonduc* L.

This is the Grey Nickar, a species with aculeate fruits and leaden-grey seeds, commonly known as *C. bonducella* (L.) Fleming or more recently as *C. Crista* L.

3. **Caesalpinia major** (Medic.) Dandy & Exell, comb. nov.

Lobus echinatus fructu flavo foliis rotundioribus Herm. Parad. Bat. Prodr. 348 (1689).—Sloane, Cat. Pl. Ins. Jam. 144 (1696); Voy. Jam. Nat. Hist. ii. 40 (1725).

Bonduc vulgare, majus, polyphyllum Plum. Nov. Pl. Amer. Gen. 25 (1703).

Guilandina caule fructuque aculeatis α L. Hort. Cliff. 158 (1737) pro parte, excl. syn. Burm. et Rheed.

Frutex Globulorum Rumph. Herb. Amboin. v. 89, t. 48 (1747).

Guilandina Bonduc (non L. 1753).—L. Sp. Pl., ed. 2, i. 545 (1762) pro parte, excl. syn. Pluk.

Bonduc majus Medic. Theod. Specios. 43, t. 3 sup. (1786) excl. syn. L.

Caesalpinia Bonduc (L.) Roxb. [Hort. Bengal. 32 (1814), *nomen nudum*] Fl. Ind. ii. 362 (1832) pro parte, quoad pl. descr.—Urb. Symb. Antill. ii. 272 (1900).

Guilandina Bonduc var. *majus* DC. Prodr. ii. 480 (1825).

Caesalpinia Jayabo Maza in An. Soc. Esp. Hist. Nat. xix. 234 (1890), *nomen illegitimum*, pro parte, excl. vars. et syn. *Guilandina Bonduc* L.—Merr., Interpr. Rumph. Herb. Amboin. 261 (1917).

Guilandina major (DC.) Small, Fl. Southeast. U.S. 591, 1331 (1903).—Skeels in Science, new ser. xxxvii. 922 (1913).

Caesalpinia glabra (Mill.) Merr. in Philipp. Journ. Sci. C. v. 54 (1910) pro parte, excl. syn. Mill. quod verisimiliter est *Gymnocladi* sp.

This is the Yellow Nickar, a species with aculeate fruits and yellow or yellowish grey seeds, usually known as *C. Bonduc* Roxb.

BIBLIOGRAPHICAL NOTES.

CVIII. On the Dates of Publication of 'Choix de Plantes' by E. P. Ventenat. By A. W. Exell, M.A., F.L.S.

Ventenat's 'Choix de Plantes' is dated 1803 on the title-page, and there is nothing to indicate that it appeared in parts, so that this date is usually given for all the genera and species described in it. From internal evidence (see footnote to t. 43) it is clear that at least part of the work did not appear until 1808. I have attempted therefore to trace the dates of publication of the various parts.

J. C. Brunet ('Manuel du Libraire,' ed. 5, col. 1123 (1864)) states that it appeared in two volumes of ten parts in all, and gives the dates 1803–1808, but does not make it clear whether the publication was continuous over those years or not.

There were in all sixty plates, published in ten parts, each consisting of six plates. The fourth part (livraison 4) was noticed in the 'Journal Général de la Littérature en France' (Journ. Gén. Litt. Fr., Pluviose, XII.—*i. e.* between January 21 and February 19, 1804), and the fifth part in the same journal two months later (*loc. cit.*, Germinal, XII.—*i. e.*, between March 22 and April 20, 1804). The first four parts were thus published before February 19, 1804, and the fifth part before April 20, 1804. Allowing for a reasonable lapse of time before the notices in Journ. Gén. Litt. Fr., it appears probable that the first five parts all appeared in 1803, although the fifth part may not have been published until early in 1804. In the absence of definite evidence to the contrary it seems best to assign to it the date 1803, as has always been done in the past. This accounts for the first thirty plates in the 'Choix de Plantes' and for the citations of genera and species published in them.

Ventenat himself, in a paper entitled "Notice sur les plantes qui seront publiées dans les cinq dernières livraisons de l'ouvrage intitulé 'Choix de Plantes'" (Mém. Math. et Phys. Inst. Nat. Fr. 1807, 1: 1–20 (1807)), explains in the following sentences that there was a break in the publication:—"L'ouvrage que j'avois entrepris sous le nom de 'Choix de Plantes,' et qui faisoit suite au Jardin de Cels, est interrompu depuis quatre ans. J'avois fait paroître à cette époque cinq livraisons, et les espèces qui devoient composer l'ensemble de l'ouvrage, étoient déterminées et décrites. Les circonstances n'étant pas assez favorables pour m'engager à continuer dans ce moment une entreprise aussi dispendieuse, je demande à la classe la permission de lui présenter un extrait raisonné de mon travail, et de lui faire connoître les espèces nouvelles et les genres nouveaux que je me proposois de publier."

As this was written in 1807 it confirms the supposition that the first five parts were published in 1803 (four years previously).

In the paper quoted above Ventenat published with descriptions the new genera and species from plates 31–42 inclusive (parts six and seven) of the as yet unpublished second half of the ' Choix de Plantes.' These are thus validly published in 1807. Strangely enough two of them are cited correctly in the ' Index Kewensis,' and the others incorrectly.

In a further paper in the same journal entitled " Observations sur la famille à laquelle il faut rapporter les genres *Samyda* et *Casearia* " (Mém. Math. et Phys. Inst. Nat. Fr. 1807, 2 : 142–155 (1808)) Ventenat described the new species from plates 43–47 inclusive (making part eight with t. 48). These citations antedate those from the ' Choix de Plantes,' though probably published in the same year.

As these two papers are quoted in the ' Choix de Plantes ' we now know that plates 31–42 (parts six and seven) were published after March 16, 1807, and plates 43–48 (part eight) after January 18, 1808.

This leaves plates 49–60 (parts nine and ten). The names published in them date from the ' Choix de Plantes,' as apparently they were not published previously by Venetenat in any other work. All we know definitely about the dates of plates 49–60 (parts nine and ten) is that they were published after January 18, 1808. In an obituary of Ventenat, however (see Journ. de Bot. i. 39 (1808)), ' Choix de Plantes ' is spoken of in a way which suggests that the work was then complete, and the sentence " La mort vient d'enlever ce savant botaniste à l'âge de 51 ans, au moment où il venoit de terminer ses deux derniers ouvrages. . . " also indicates that ' Choix de Plantes ' had been completed before Ventenat's death, which took place on August 14, 1808.

Thus, unless more definite information ever becomes available, one cannot go far wrong in assigning the date 1803 to plates 1–30 and 1808 to plates 31–60.

The information obtained is summarized below, the dates which are almost certain being printed in clarendon :—

Fasc. 1 ...	Plates 1–6.	**1803.**	New names not published previously elsewhere.
Fasc. 2 ...	Plates 7–12.	**1803.**	New names not published previously elsewhere.
Fasc. 3 ...	Plates 13–18.	**1803.**	New names not published previously elsewhere.
Fasc. 4. ...	Plates 19–24.	1803.	Certainly before February 19, 1804. New names not published previously elsewhere.
Fasc. 5 ...	Plates 25–30.	1803.	Certainly before April 20, 1804. New names not published previously elsewhere.
Fasc. 6. ...	Plates 31–36.	1808.	Certainly after March 16, 1807. New names first published in Mém. Math. et Phys. Inst. Nat. Fr. 1807, 1 : 1–20 (1807).
Fasc. 7 ...	Plates 37–42.	1808.	As fasc. 6.

Fasc. 8 ...	Plates 43–48.	**1808.**	Certainly after January 18, 1808. New names of plates 43–47 first published in Mém. Math. et Phys. Inst. Nat. Fr. 1807, 2 : 142–155 (1808).
Fasc. 9 ...	Plates 49–54.	**1808.**	Certainly after January 18, 1808. New names not published previously elsewhere.
Fasc. 10 ...	Plates 55–60.	**1808.**	As fasc. 9.

I am very grateful to my colleague Mr. A. C. Townsend, Librarian of the British Museum (Natural History), for much assistance in establishing these dates.

OBITUARY.

STEPHEN TROYTE DUNN (26 Dec. 1869–18 April 1938) was the second son of the Rev. James Dunn and his wife Angelina Dyke Dunn (*née* Acland-Troyte). After a classical education and with a degree in the classics from Merton College, Oxford, he devoted himself to a study of the British Flora. He was for a time a keen member of the Botanical Exchange Club. In 1893 he published his ' Flora of South-west Surrey,' writing the preface from Chilworth, near Guildford. Then an opportunity of studying the colonization of vegetation over new railway embankments near Rugby led him to collect data on alien plants. In 1898 he became Private Secretary to Sir William Thiselton-Dyer, and in 1901 Assistant for India in the Herbarium of the Royal Botanic Gardens, Kew. As Augustine Henry's rich collections from Yunnan were under study at the time, and as the ' Flora of British India ' had been completed in the year before, and the ' Index Floræ Sinensis ' was nearing completion, Dunn's services were sought to trace the spread of the plants of Assam and Burma into China, and with the publication of descriptions of a long series of new species from China, he figuratively walked out of India into China : for he was selected in 1903 to be Superintendent, Botanical and Forestry Department, Hong Kong.

At this juncture he drew up a list of the alien plants of Britain, and with his wife's help worked it up into his ' British Alien Plants ' (1905).

He stayed in China until 1910, feeling his way for two years, and then in 1905 making an expedition into the interior of Fukien, *via* the Min River, and a couple of years later making another into the interior of Kwangtung from Swatow. The Linnean Society published the results of his Min River expedition (Journal, xxxviii. 1908), and published also monographs on *Actinidia*, *Millettia*, etc., which he wrote late in or immediately after his service in Hong Kong.

From 1913 to 1915 and from 1919 to 1928 he was employed again at Kew, for part of the time being the Assistant for India,

In this last post he wrote the first part of Gamble's 'Flora of the Presidency of Madras.' Other writings were mostly on various genera of the Leguminosae.

He was one of the gentlest of men, and some of the tenets of Christian Science which he adopted were natural to him. Beyond them he acquired outwardly a very great control of a very sensitive nature, and bore with fortitude a long illness.—I. H. B.

BOOK-NOTES, NEWS, ETC.

A PLEASANT ceremony took place in the Department of Botany on May 31st, when colleagues and friends presented the Keeper of Botany with the robes, cape, and hat of the doctorate of science of Coimbra University. Mr. A. J. Wilmott, in making the presentation, spoke of the close association of the Department with the investigation of the flora of Angola, which dated from the friendship between Welwitsch and Robert Brown, and which led to a profitable co-operation with Portuguese botanists made feasible by the enthusiasm and organizing ability of the late Professor L. Carrisso. The Portuguese Ambassador was unable to be present, but was represented by Dr. Ferreira da Silva; Dr. F. A. Mendonça represented the University of Coimbra.

MANY botanists throughout the world who know of the splendid work done by Dr. T. A. Sprague and Miss M. L. Green on the 'Index Kewensis' and on botanical nomenclature will be interested in the following announcement, which appeared in 'The Times,' May 10, and will wish to add their congratulations and good wishes:—

"Dr. T. A. Sprague and Miss M. L. Green. The engagement is announced between Thomas Archibald, sixth son of the late Dr. and Mrs. Thomas Bond Sprague, of Edinburgh, and Mary Letitia (Manna), second daughter of the late Rev. Philip William and Mrs. Green, of Llywel, Brecon."

SOUTH LONDON BOTANICAL INSTITUTE.—This Institute was founded and endowed by A. O. Hume in 1910: it is situated at 323 Norwood Road, S.E. 4. "The sole object for which the Institute is established is to promote, encourage and facilitate, among the residents of South London, the study of the science of botany exclusively." On the death of the founder in 1912 he was succeeded as President by Dr. A. B. Rendle who continued in office until January last. At a meeting of the Council of Management on February 20th, Mr. J. Ramsbottom was elected President.

CAPT. F. KINGDON-WARD has proceeded on a plant-collecting expedition to the Assam Himalaya. He will be away until early next year.

CONTRIBUTIONS TO THE STUDY OF BRITISH ELMS. I. WHAT IS GOODYER'S ELM?

BY R. MELVILLE, PH.D., F.L.S.

IN 1633 the second edition of Gerard's 'Herbal' was published. Thomas Johnson, as editor, made use of the opportunity for revising many of the descriptions of plants and inserting additions. He was aided in this work by John Goodyer, of Maple Durham, Weston, near Petersfield, Hants, an able botanist, and one responsible for adding a number of new species to the British flora as it was then known. Among the descriptions for which Goodyer was responsible are four of elms, two of which were described for the first time in this edition of the 'Herbal.' It is the second elm of this series with which we are concerned, the "Ulmus minor folio angusto scabro. The Narrow-leaved Elme." The informative account of the tree which follows the phrase name reads:—

> "2. This tree is like the other* but much lesser and lower, the leaves are usually about 2½ ins. long and an inch and a quarter broad, nikt or indented about the edges and with one side longer than the other as the first hath; and are also harsh or rough on both sides, the barke or rinde will also strip as the first doth: hitherto I have not observed either the floures or seed or blisters on the leaves, nor have I had any sight of the timber, or heard of any use thereof. This kinde I have seen growing but once, and that in the hedges by the highway as I rode between Christ Church and Limmington in the New Forrest in Hampshire about the middle of September 1624, from whence I brought some small plants of it, not a foot in length which now, 1633, are risen up ten or twelve foot high, and grow with me by the first kinde, but are easily to be discerned apart, by any that will look on both."

The illustration which accompanies this account is in the somewhat conventional style current at the time. It depicts a branch with rather narrow and acutely serrate leaves, with objects apparently intended for fruits distributed in a haphazard manner over leaf and branch. Goodyer states plainly that he saw neither flowers nor fruit, and it is evident that this picture has nothing to do with his elm, for it is an exact copy of that used earlier by Dodoens in his 'Pemptades' (1616) for a different elm, probably correctly referred to *U. nitens* Moench.

The small plants Goodyer brought back with him from his excursion were most probably rooted suckers of perhaps one year's growth. They grew to 10 or 12 feet high by 1633, and were

* The first elm is that now known as *U. procera* Salisb.

therefore about ten years old at that time. It is interesting and probably important that the date 1633 is mentioned, since it is also the date of publication of the description. Goodyer saw the tree growing in the wild but once, and it is highly probable that he compiled his description from the saplings in his garden shortly before sending it to Johnson. It follows that the plants described could not have borne a mature type of foliage, as elms of about ten years' growth normally have a juvenile type of leaf. Such juvenile leaves generally differ somewhat in shape, and are invariably much more rough and hairy than adult leaves of the same species. It is possible, also, that Goodyer's recollection of the tree in the New Forest may have been mainly of this type of foliage, which would have been common in the hedgerow growth. If this view is accepted it will account for much of the difficulty botanists have encountered in trying to fit Goodyer's description to the foliage of a mature tree.

Goodyer's descriptions of the four elms in Gerard's 'Herbal' were certainly much better than any hitherto published. For a time they became the standard copied by other writers, including Miller. In the first edition of the 'Gardeners' Dictionary' (1731) Miller gives as his third elm "Ulmus; minor, folio angusto scabro. Ger. Emac. The small-leaved or English Elm." The descriptive part of Goodyer's account is omitted, and Miller states further on that "the first four sorts are very common in divers parts of England." This statement, together with the change in the vernacular name, arouses the suspicion that Miller had misidentified Goodyer's elm.

Miller gives no further particulars of this elm in the various editions of the Dictionary until the seventh edition (1759). The phrase name is then changed to the following:—

> "3. Ulmus foliis ovatis acuminatis duplicato serratis basi inequalibus.—This is the Ulmus minor folio angusto scabro, Ger. Emac. 1480. The Small-leaved or English Elm."

In the eighth edition (1768) no change is made beyond the addition of the specific epithet "sativa" in brackets after "3. Ulmus." The seventh and later editions contain the additional statement:—

> "The third sort is commonly known in nursery gardens by the title English Elm, which is far from being a right appellation for it is not a native of England and is only found growing near London or in plantations where the young trees were procured from the neighbourhood of London. Where this tree grows naturally is not easy to determine, some persons having supposed it was brought from Germany. As this tree is well known it requires no description. Flowers purplish red, generally appear at the beginning of March, but I could never observe any seeds upon this sort."

It is apparent from Miller's account that his *Ulmus sativa* was most probably an introduced tree, possibly a hybrid, known only in cultivation in the neighbourhood of London. Perhaps at this early date the importation of bastard elm seedlings from the continent had already begun; undoubtedly it has been in full swing for at least a hundred years. But apart from this, other statements in Miller's account are irreconcilable with Goodyer's. If *U. sativa* were at all common near London in Goodyer's day, he could scarcely have failed to find it. From Druce's account of Goodyer's work (Rep. B. E. C. Suppl. 1916) we know that he had friends in London and must have been a frequent visitor. Furthermore, before the publication of the second edition of the 'Herbal' Goodyer had visited various parts of Hertfordshire, Buckinghamshire, Oxfordshire, Northamptonshire, and Essex. It is inconceivable also that he could have found an introduced tree in what was then a rather remote district of the New Forest of the same kind as any of frequent occurrence near London. Much more probable is the assumption that Goodyer's tree was a local native form and that Miller had blundered in identifying his *U. sativa* with Goodyer's elm.

Miller's misidentification of this elm has been one of the principal causes of confusion in the nomenclature of British elms. Following Miller, every writer who studied this problem up to recent times has added something to the tangle of nomenclature. There is little point in detailing this chapter of errors. Reference may be made to the paper by Gilmour and Stearn (Journ. Bot. 1932, Suppl.), where the more important works are cited under *Ulmus minor* Mill. sec. Henry. In view of what is to follow mention should be made of Druce's suggestion (*loc. cit.*) that Goodyer's tree was probably the Cornish Elm (*U. stricta* Lindl.). Druce also states that the Cornish Elm grows in the New Forest, though there are no specimens of this species or anything resembling it from that area in his herbarium. He came to the conclusion that the Cornish Elm was *U. minor* of Miller, but this is a view that cannot be maintained, for Miller states that *U. minor* is "very common in some parts of Hertfordshire and in Cambridgeshire" where *U. stricta* is found only occasionally as a planted tree. Aiton, also, cited Goodyer's description under his "*U. campestris stricta*, Cornish Elm" (Hort. Kew., 1789, i. 319), and in Hunter's edition of Evelyn's 'Silva' (1786, 115–16), under *U. sativa* Mill., appears the statement: "It is by some called the Cornish Elm." However, it is not clear from these early works whether the true Cornish Elm or the Hampshire variety is intended.

Following the study of the literature the next step in the unravelling of this problem was to visit the places mentioned by Goodyer. If the tree were native there should be a good chance of finding it in the district where Goodyer found it originally,

and a rather remote chance of its survival from suckers or seedlings at or near the site of his garden at Maple Durham. Both places were visited during August 1937. Maple Durham House is marked on old one-inch to a mile ordnance maps. It lies just west of the Portsmouth Road, near the small village of Weston, about two miles south of Petersfield, and the Southern Railway runs through a part of the grounds. There is still a derelict house with outhouses on the site and a neglected orchard partly enclosed by old walls. The only elms seen here or anywhere in the immediate neighbourhood were forms of *U. procera*. There were remains of several large dead trees, probably of this species, close to the house, but nothing recalling Goodyer's description of the Hampshire elm was found.

The country between Lymington and Christchurch was explored on 20 August, starting from Lymington. At Pennington, about a mile to the west of Lymington, the road dips into a small hollow. Here a number of elms were seen, all of an unfamiliar kind. The foliage of mature branches closely resembled that of *U. stricta*, but the habit was very different. The trunks were rather short, with several ascending branches spreading to make a dome-shaped head, the longer branches of which were generally more or less clothed with a growth of short epicormic shoots* giving rise to a "mossy" appearance. The branches of *U. stricta* growing in Cornwall in exposed places not far from the sea often have a similar epicormic growth; killing back of branches either by drying winds or salt spray appears to stimulate it. However, at Pennington and elsewhere along the coastal plain between Lymington and Christchurch this particular type of elm bore the epicormic growth on its branches when growing in sheltered situations. It may be a normal feature, therefore, and not dependent on adverse conditions. Sucker shoots and saplings of the tree had rather small, narrow leaves roughly hairy on both surfaces. The change from the juvenile to the adult type of foliage appeared to be a gradual process occupying a number of years in the life of an individual. Young trees 15–20 ft. high were not fully mature when judged on this character. The foliage of epicormic shoots was more or less intermediate in shape and indumentum between the juvenile and adult types.

Some reasons for believing that Goodyer described the shoots of an immature tree have been advanced above. The juvenile forms of the trees at Pennington agreed in every particular with Goodyer's description, and were growing in the district he mentioned. Material was collected from two mature trees about 40 ft. high, one young tree about 18 ft. high, and from hedgerow growth about 10 ft. high. The exploration was then

* Epicormic shoots are vigorous shoots arising from dormant buds on the trunk and larger branches.

continued to determine whether this kind of tree was common in the neighbourhood. Between Pennington and Milford-on-Sea several trees and much hedgerow growth with narrow rough leaves were seen. From Downton to Wootton Hill there were many more trees of the same type on the damper soils. No elms were encountered on the dry gravelly soils about Wootton Hill or elsewhere in the Forest. The tree was common between Wootton Hill, Bashley, and Hinton, and in all the area mentioned so far it was a common hedgerow tree to the exclusion of all other kinds of elm. A few *U. glabra* Huds., *U. hollandica* Mill. var. *major* Rehd., and *U. stricta* Lindl. var. *sarniensis* (Loud.) Moss were seen, but only in parks and planted copses. Passing westward to Winkton and Sopley the tree was found in company with *U. procera*, but became less frequent as the Avon Valley was traversed to Ringwood. East of Ringwood no further specimens were found once the dry gravels were reached. It is highly probable from the distribution, so far as it is known, that this is a distinct native race of elm, and possibly endemic. There is very good reason to believe that it is the tree that Goodyer described from this neighbourhood, for there is no other common elm along the coastal plain of south-west Hampshire that will fit his description.

Although the tree differs markedly in habit from typical *U. stricta*, there are so many points of similarity in the foliage and branchlets that it is considered preferable to describe this elm as a variety of *U. stricta* rather than to give it specific rank.

ULMUS STRICTA Lindl. var. **Goodyeri,** var. nov., a typo ramis ascendentibus, capite plus minusve rotundato, lateribus foliorum basi latioribus minus cuneatis, marginibus magis composite serratis recedit.

The broad crown with ascending branches is shown in the habit sketch of a tree by the roadside near Pennington, not far from Lymington (fig. 1, E). This may be contrasted with the photograph of typical specimens of *U. stricta* published as "*U. nitens* Moench. var. *stricta* Henry" in Thurston's 'Trees and shrubs in Cornwall,' tt. 33 & 34. The mature leaves are subcoriaceous and somewhat cupped on the upper surface as in the type, but are broader and differ slightly but consistently in shape, as will be noticed when adult distal and subdistal leaves of short shoots are compared. The most obvious divergence in the outline occurs near the base on the long side of such leaves. In var. *Goodyeri* this part of the leaf is broad, much as in var. *sarniensis*, but it is narrow in the type. The leaves are therefore broad-based, in contrast with the relatively narrow wedge-shaped base in the type. The serrations of the margin in the upper half of the distal and subdistal leaves of adult short shoots frequently have two or three secondary serrations, whereas those on comparable leaves of the type are simple or have one or rarely two secondary serrations.

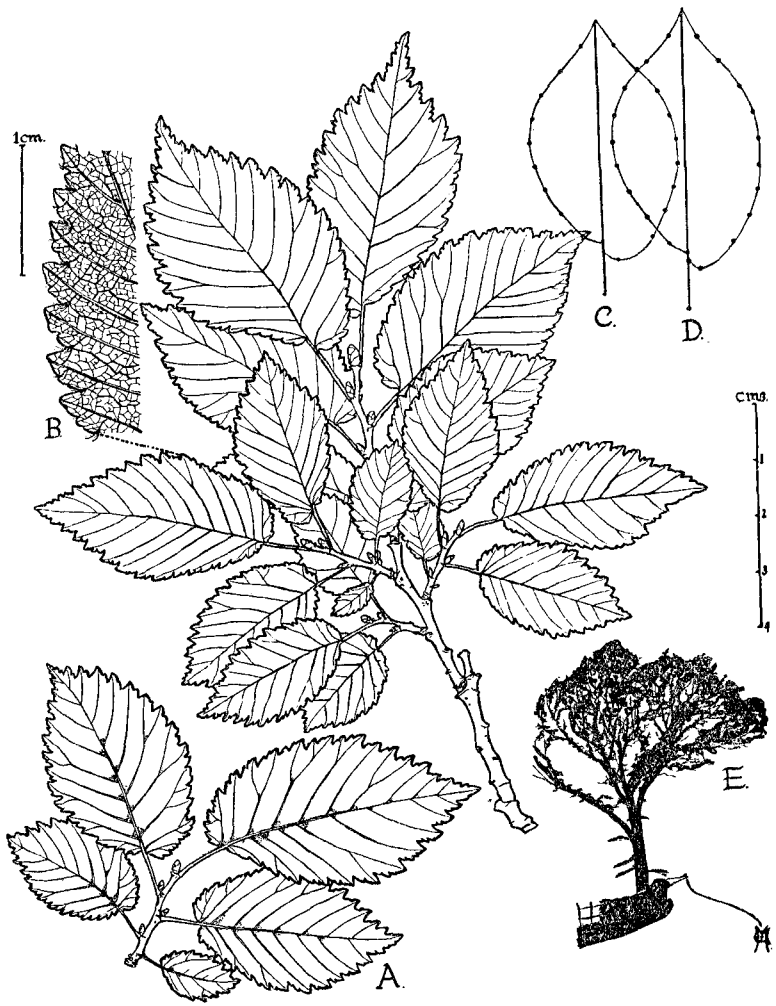


Fig. 1.—Normal adult shoot, upper surface. A. A single short shoot, lower surface. B. Portion of lower surface of the distal leaf indicated by dotted line, enlarged to left-hand scale. C. Mean outline derived from ten subdistal leaves from normal adult short shoots, drawn to scale. D. Mean outline derived from ten distal leaves from the same normal adult short shoots as C, drawn to scale. E. Habit drawing from a photograph of a tree by the Lymington–Christchurch road near Pennington. The centre shoot A, C, and D are drawn to the right-hand scale. All except E are drawn from a tree at Bashley, S. Hants. (Ref. no. 37.123.)

The indumentum of adult leaves is similar. The petiole in relation to the length of the lamina is nearly twice as long as is usual in the type, which varies to some extent in this character. The somewhat tufted arrangement of the terminal branchlets and almost complete absence of simple hairs on them, excepting the axillary tufts, are other features common to both.

It is not possible to convey in words the exact shapes of asymmetrical leaves, but their outlines can be defined with exactitude by a series of rectangular co-ordinates obtained by a method already described (Ann. Bot. n. s. i. 4, 1937). Co-ordinates are expressed as percentages of the length of the lamina; for convenience the co-ordinate of length is written as the numerator of a fraction and that of breadth measured from the midrib in each half leaf as the denominator. Outlines based on the mean co-ordinates derived from ten comparable leaves from one tree for distal and subdistal leaves of adult short shoots are shown in fig. 1, C & D. The co-ordinates for these are as follows :—

Distal leaves, short side.—6/0, 10/7, 20/15, 30/22, 40/26, 50/28, 60/26, 70/23, 80/15, 90/6, 100/0.
Distal leaves, long side.—3/0, 0/4, 10/18, 20/24, 30/27, 40/28, 50/28, 60/26, 70/21, 80/14, 90/6, 100/0.
Mean length of lamina 4·7 cm.
Subdistal leaves, short side.—8/0, 10/7, 20/17, 30/24, 40/27, 50/29, 60/28, 70/24, 80/16, 90/7, 100/0.
Subdistal leaves, long side.—4/0, 0/6, 10/21, 20/26, 30/30, 40/32, 50/32, 60/29, 70/24, 80/16, 90/7, 100/0.
Mean length of lamina 4·3 cm.

It is obvious that any of these measurements can be converted at once into absolute terms by reference to the lamina length, which is given in centimetres.

The leaves of sucker shoots and young saplings are narrow, elliptic to lanceolate, subequal at the base, and roughly hairy. They are generally narrower than in the type. The change from this juvenile foliage to the smooth, relatively broad, and asymmetric adult form is a gradual process occupying a number of years. Foliage of a 10-ft. sapling is shown in fig. 2, A, and a shoot from a sucker in B. It is evident from the arguments advanced earlier in this paper that Goodyer must have been describing shoots resembling A or B, and from the age of his plant probably similar to A.

Epicormic shoots (fig. 2, C) bear leaves intermediate in character between sucker leaves and those of adult branches. They are generally more or less roughly hairy. Proleptic shoots* from epicormic shoots (tip of fig. 2, C) or from adult branches

* Proleptic shoots are vigorous shoots continuing the axis of a branchlet, developing after normal growth for the year has ceased.

revert to the narrow juvenile form. This phenomenon of the reversion of proleptic shoots is a common feature of elms, and such leaves may be compared in different species and varieties.

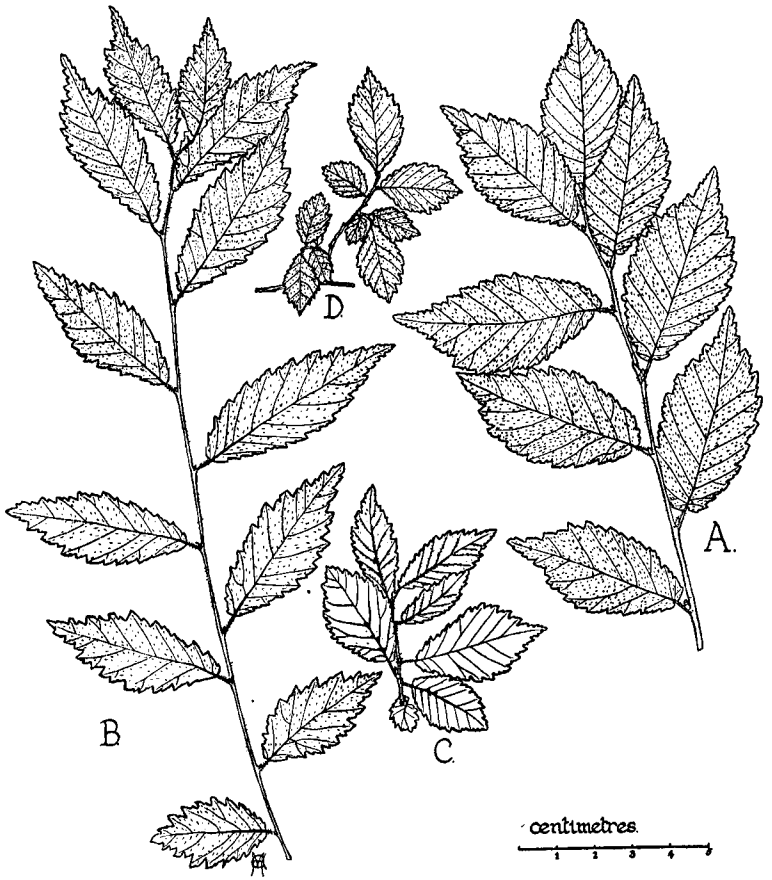


Fig. 2.—A. Shoot from a 10-ft. sapling, near Pennington, S. Hants, upper surface. (Ref. no. 37.122.) B. & D. Shoots from suckers of different ages from the tree at Bashley, S. Hants, upper surface. (Ref. no. 37.123.). C. Epicormic shoot terminated by proleptic shoot from tree at Bashley, lower surface. (Ref. no. 37.123.)

Both sucker leaves and those of proleptic shoots are narrower in var. *Goodyeri* than is usual in the type.

It is regrettable that road-widening operations during the winter 1937–8 resulted in the destruction of the tree illustrated in fig. 1, E, and the sapling Ref. no. 37.122.

SOME PRELIMINARY NOTES ON THE DRIFTWEED AROUND WORTHING.

By Lilian Lyle.

The excessive amount of seaweed cast up on the shores of Worthing and its neighbourhood has for years aroused discussion as to its origin and methods of disposal. Last July some driftweed was collected at East Preston, about six miles from Worthing. It was a slimy mass of green algæ, mostly Enteromorphas and Cladophoras, with an admixture of Ceramiums, Polysiphonias, and *Brongniartella byssoides*.

As summer progressed the rejectamenta changed in character, became more abundant, and of an offensive odour. On 6 September a gathering was obtained for examination. There were fewer green algæ and more of the red and brown species. Ceramiums, Polysiphonias, and *Brongniartella byssoides* occurred more frequently with the addition of *Chorda Filum*, *Dictyota dichotoma*, and *Cladostephus spongiosus*. As usual in autumn, the algæ were beset with epiphytes.

The amount of rotting material was enough to constitute a serious nuisance during the 1937 holiday season, and the municipal authorities followed a practice which had been in use for many years: the drift was collected from the beach, transported off-shore, and put back into the sea.

The Nature of the Substratum.

The substratum is a wide expanse of sand, pebbles, and shells. In the neighbourhood of Worthing it is comparatively flat. Shallow banks border the coast from Shoreham to Bognor about one and a half miles in width, and one and three-quarters to three and a half fathoms below the surface. Along the shores of Brighton the sea-floor slopes abruptly into five fathoms of water—a depth which continues in a line westward, outside the shallow ledges across to Selsey Bill, about two and a half miles from Worthing. Beyond, the depth increases to ten fathoms, in a line between Selsey Bill and Seaford, at a distance of five and a half miles from Worthing. Low rocks and reefs are scattered here and there: the largest occur at Bognor, including the Middleton ledge. The Kingsmere lobster grounds lie off Angmering. At Ferring, Kingston, and East Preston there are more rocks; and lastly the Brill rocks near Worthing. These conditions are fairly uniform and extend for about forty miles between Selsey Bill and Beachy Head.

The Type of Vegetation.

As is well known, certain ecological factors (such as nature of substratum, degree of exposure, climatic conditions, etc.)

modify the kind of flora that grows in their vicinity. Here, where the substratum consists of sand, pebbles, and low rocks, with moderate shelter, and fairly equable climate, the vegetation assumes a certain facies typical of these conditions. The type has been named by Cotton (1912) "The Pebble-attached Association of Quiet Bays." The association, he says, "is found on a soft bottom strewn with stones and pebbles. A very large number of species go to form it, and they are for the most part characterized by finely divided bushy fronds, though heavier and less bushy plants are found on the larger stones and on the occasional pieces of rock. . . . The association extends from just above low-water mark down into 3 or 4 fathoms." In summer *Dictyota dichotoma*, *Brongniartella byssoides*, *Ceramium* species are largely represented, while later on *Polysiphonia nigrescens* and *Ectocarpus* species appear in autumn. These details are closely applicable to the conditions along this part of the southern coast, both as regards nature of substratum and species*. Further, the eighty-four species listed do not belong to a rocky habitat, *i. e.*, they are not strictly saxicolous. The algæ in that case would be of a different character and include encrusting species, soft or calcareous; and others with long, leathery fronds, stout stalks, and strong, often branched, holdfasts, as *Rhodymenia palmata*, *Laminaria digitata*, *Halidrys siliquosa*, etc. Such vegetation forms another type growing on rocky coasts, *e. g.*, Guernsey, West Cornwall, Hebrides, etc.

In consideration of the distinctive features possessed by the species examined, it may be assumed that the driftweed in the vicinity of Worthing is a product of wide extent along the neighbouring shores. Little, if any, has travelled from a great distance. Some weathered samples were found; but the practice of repeatedly returning the drift to the sea would account for their battered appearance.

Notes on the Species.

RHODOPHYCEAE. Most of the specimens were fragmentary, especially *Ceramium rubrum*. Those with stout fronds were entire, such as *Chondrus crispus*, *Furcellaria fastigiata*, etc. Small or filamentous kinds were often intact, e.g., *Ceramium tenuissimum*, *Brongniartella byssoides*. *Rhodymenia palmata* and *Phycodrys rubens* were each represented by a small portion of a frond.

* The presence of *Chorda Filum* indicates a similarity to the Channel Vegetation noted by Cotton (1912), which, he says "resembles that of quiet bays." Warming (1925, p. 168) has pointed out how the long unbranched fronds show special adaptation in according passive resistance to the undulatory movements of water in conditions of moderate calm and shelter.

PHAEOPHYCEAE. *Chorda Filum* was remarkably abundant and often bore various epiphytes, as *Ectocarpus confervoides*, *Ceramium tenuissimum*, etc. Some propagula of *Sphacelaria cirrhosa* were observed to be germinating and producing the parenchymatous bases of the plants.

Fucus vesiculosus. One receptacle indicated this species. A fairly large plant belonging to the genus was so denuded that the species could not be determined.

Halidrys siliquosa. Two pods had probably been washed up by the tide from a distance. Fronds were entirely absent.

Laminaria saccharina. One frond was found among the driftweed examined, very filthy, and overgrown with *Ectocarpus* sp.

Taonia atomaria.—Sporelings in different stages of growth were frequent. Specimens had previously been found near a sewage outflow at Seaford—a fact suggesting the nitrophilous or ammoniacophilous character of this species.

CHLOROPHYCEAE. The preponderance of green algæ in the driftweed is remarkable only in the spring and early summer. With the advance of autumn this preponderance is lost. *Enteromorpha intestinalis* and *Cladophora sericea*, with a small amount of *Ulva latissima*, are the prevalent species. Their appearance in undue amount is connected with the presence of freshwater, and indicates brackish conditions. The Arun at Littlehampton, the Adur at Shoreham, and a stream at Ferring are responsible for much of this growth.

According to Cotton, *Cladophora sericea* (May Fog or Flannel weed) has the reputation of producing a most pungent smell on decay.

Offensive Smell.

The offensive smell arising from the driftweed is due to natural pollution of the coastal waters. The decay of a large amount of seaweed fouls the water in a similar way to that of sewage by producing albuminoidal and ammoniacal nitrogen. These compounds act as fertilizers, resulting in a luxuriant and vigorous growth. Conditions are aggravated by returning the driftweed to the sea; for the accumulating products increase in offensiveness and in manurial potency. Marine vegetation will absorb nitrogen with avidity, and, if the latter be present in some form in seawater, the result will be an intensified algal growth. Many and varied are the uses to which driftweed may be applied; but this consideration is more the concern of the manufacturing chemist than the botanist.

The simplest way of disposing of the weed is to cart it inland, there to be dried and burnt, and the ash disposed of to farmers.

In Guernsey the weed is placed on frames or racks and dried in the open. A drying machine is also used, heated by the burning weed.

Any efforts to destroy the growing algæ should be regarded with grave hesitation. It is not known to what extent such a proceeding would affect the balance of nature.

The effect of living green algæ in purifying freshwater has to be considered. Seaweeds give shelter for spawn, and food for small molluscs and crustacea, which, in their turn, serve as food for fish—so that seaweeds form the basis of animal life in the sea.

A total reorganisation of the method of sewage disposal of seaboard towns is suggested—for two reasons. In view of a probable nitrogen shortage in the near future, the practice of putting a sewage effluent, no matter how harmless or sterile, into the sea is to be deplored. Secondly, the most "harmless" effluent has a nutrient value for vegetation, owing to its abundant nitrogen, and may encourage an unwanted excessive growth of algæ.

These notes are merely tentative. Further work on the subject is needed, *e. g.*, a survey of the sea-floor. The relative positions and areas of the various plant-communities should be mapped. Analyses of the seawater at different times of the year might show whether, with the seasonal increase of population, the nitrogen content increases likewise.

My best thanks are due to Mr. A. Gepp and to Mr. Geoffrey Tandy both of the British Museum (Natural History) for suggestions, kind help, and interest in the writing of these notes.

List of Algæ thrown up at East Preston 6 *September*, 1937.

MYXOPHYCEAE.

Dermocarpa rosea Batt.
Spirulina subsalsa Oersted
Calothrix confervicola Ag.
—— *aeruginea* Thur.

CHLOROSPERMEAE.

Enteromorpha intestinalis Link
—— —— var. *bullosa* Le Jolis
—— *compressa* Grev.
Ulva lactuca v. *latissima* DC.
Bolbocoleon piliferum Pringsh.
Cladophora Hutchinsiae Harv.
—— *utriculosa* Kütz.
—— *sericea* Kütz.
—— *glaucescens* Harv.
—— *flexuosa* Harv.
—— *albida* Kütz.
—— *refracta* Aresch.

FUCOIDEAE.

Desmarestia aculeata Lamour.
Litosiphon pusillus Harv.
Asperococcus fistulosus Hooker
Ectocarpus confervoides Le Jolis
—— *fasciculatus* Harv.
—— *granulosus* Ag.
Sphacelaria cirrhosa Ag.
—— —— var. *fusca* Holm. & Batt.
Cladostephus spongiosus Ag.
—— *verticillatus* Ag.
Stypocaulon scoparium Kütz.
Myrionema strangulans and var. *punctiforme* Holm. & Batt.
Chorda filum Stackh.
Laminaria saccharina Lamour.
Fucus vesiculosus L.
—— *serratus* L.
Halidrys siliquosa Lyngb.
Achinetospora pusilla Born.
Dictyota dichotoma Lamour.
Taonia atomaria J. Ag.

FLORIDEAE.

Goniotrichum elegans Le Jolis
Erythrotrichia carnea J. Ag.

Porphyra umbilicalis Kütz.
Acrochaetium Daviesii Näg.
corymbiferum Batt.
Chondrus crispus Stackh.
Phyllophora membranifolia J. Ag.
Ahnfeltia plicata Fries
Cystoclonium purpureum Batt.
Rhodophyllis bifida Kütz.
Gracilaria confervoides Grev.
Rhodymenia palmata Grev.
Champia parvula Harv.
Plocamium coccineum Lyngb.
Nitophyllum ramosum Batt.
Phycodrys rubens Batt.
Hypoglossum Woodwardii Kylin
Halopithys incurvus Batt.
Chondria dasyphylla Ag.
—— *caerulescens* J. Ag.
Polysiphonia elongata Grev.
—— *nigrescens* Grev.
Brongniartella byssoides Bory
Griffithsia flosculosa Batt.
Ceramium tenuissimum J. Ag.
—— *rubrum* Ag.
Furcellaria fastigiata Lamour.
Lithothamnion membranaceum Fosl.
Corallina rubens Ellis & Sol.

List of Epiphytes on Algæ thrown up at East Preston.

Dermocarpa rosea Batt. on *Cladophora* sp.
Spirulina subsalsa Oersted
Calothrix confervicola Ag. on *Ceramium rubrum.*
aeruginea Thur.
Bolbocoleon piliferum Pringsh. on *Ceramium tenuissimum.*
Cladophora utriculosa Kütz. on *Cladostephus spongiosus.*
sericea Kütz.
Litosiphon pusillus Harv. on *Chorda Filum*, etc.
Ectocarpus confervoides Le Jolis on *Polysiphonia elongata*, etc.
granulosus Ag. on *Chorda Filum*, etc.
Sphacelaria cirrhosa Ag. on various algæ.
—— v. *fusca* Holm. & Batt. on various algæ.
Myrionema strangulans Grev. and var. *punctiforme* Holm. & Batt. on *Ulva lactuca* var. *latissima.*
Achinetospora pusilla Born. on various algæ.
Goniotrichum elegans Le Jolis on *Ceramium rubrum* and *Cystoclonium purpureum.*
Erythrotrichia carnea J. Ag. on *Ceramium rubrum.*
Acrochaetium Daviesii Näg. on *Ceramium rubrum.*
corymbiferum Batt. on *Ceramium rubrum.*
Lithothamnion membranaceum Fosl. on *Phyllophora membranifolia.*
Corallina rubens Ellis & Sol. on *Cladostephus spongiosus.*

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NEW GENERA IN UMBELLIFERAE.

By C. Norman, F.L.S.

The two genera described below, occurring as they do each in an area extremely remote from the other both geographically and botanically, have none the less one feature in common—the unusual development of the involucral bracts. And that they are so completely unlike each other may serve to show how great is the possible range of development of these organs.

CHLAENOSCIADIUM, gen. nov. juxta *Centellam* Linn. referendum. Calycis dentes obsoleti, petala ovata apice inflexo. Fructus didymus, ambitu sub rotundatus tuberculato-rugosus, a latere valde compressus basi cordatus; juga inconspicua (vel absentia ?). Umbellæ compositæ paucifloræ. Involucri et involucellorum phylla maxima glumacea primum flores omnino celantia (sicut species *Compositarum*) demum explicientia. Herba cæspitosa caulibus multis floriferis; folia simplicia angusta, flores albi.

Species 1, from the Coolgardie district of Western Australia.

Chlaenosciadium Gardneri, sp. nov.

Herba perennis sericeo-pubescens, cæspitosa; *caules* plurimi ±10 cm. longi tenues plerumque prostrati. *Folia basalia* linearilanceolata acuta ±5×·5 cm. versus basim manifeste attenuata, margine remote dentata vel rarius integra; *folia caulina* sessilia lanceolata integra ±1 cm. longa.

Umbellæ compositæ breviter pedunculatæ foliis caulinis oppositæ *radiis* 3 crassis, complanatis vix ·5 cm. longis; umbellulæ 5-floræ, flores omnes fertiles brevissime pedicellati. *Involucri phylla* 6, rigida conspicua ±8 mm. longa, tria late-, tria angusto-lanceolata acuminata: *involucellorum* 3 eis involucri consimilia sed minora flores multo superantia.

Fructus (immaturus) a latere valde compressus, aureus, tuberculato-rugosus; styli sat longi e disco depresso orientes.

Western Australia; between Yellowdine and Bronti, Coolgardie District *C. A. Gardner* s.n. (type; State Herb. W. Australia; Brit. Mus.).

This interesting genus belongs to the *Hydrocotyloideae–Hydrocotyleae–Hydrocotylinae* group of Drude's classification, and seems nearest to the South African genus *Centella*, some species of which have well-developed but very different involucral bracts of both kinds and somewhat similar leaves, e.g., *Centella capensis* (L.) Domin.

In *Schoenolaena* Bunge (in Drude's *Hydrocotyloideae–Hydrocotyleae–Xanthosiinae* group) the development of the involucral bracts is almost identical, but the fruit and leaf characters are widely different, so that perhaps the similarity of the bracts,

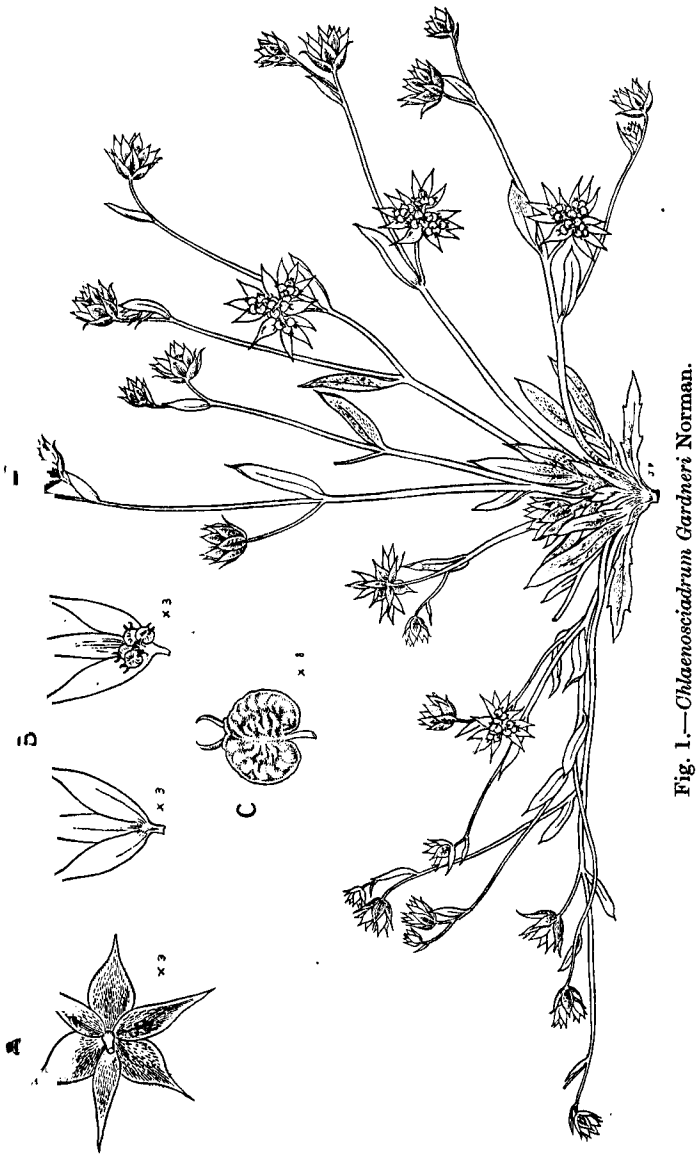

Fig. 1.—*Chlaenosciadrum Gardneri* Norman.
A. Involucral bracts seen from below.
B. Involucel attached to ray, back and front view with fruit.
C. Fruit.

admittedly a most striking feature, may be accounted for on the assumption that similar causes may produce similar effects in allied plants, rather than by assuming that such similarity necessarily indicates generic identity. In our plant the umbels are much reduced, but in addition to the flowers of the umbellules there are a few subsessile on the somewhat swollen apex of the peduncle. The fruit unfortunately not truly ripe is of a rich golden colour.

Mr. Gardner has drawn my attention to the fact that though occurring in the hot arid country round Coolgardie this plant was in full flower in December—the height of summer.

PLEUROSPERMOPSIS, gen. nov. inter *Ligusticum* et *Pleurospermum* referendum. Calycis dentes parvi triangulares acuti. Petala late oblonga integra. Fructus oblongus a latere compressus ; carpella anguste oblonga, juga primaria acuta haud alata. Commissura pro rata lata : discus amplus depressus. Semen facie interiori leviter concavum. Carpophorum ad imum basim partitum. *Umbellæ* compositæ pauciradiatæ, radii validi apice subdilatati. *Umbellulæ* multifloræ congestæ, pedicellis crassis brevissimis. *Involucri* phylla valde evoluta sæpe foliis similia ; *involucellorum* numerosa rigida imbricata late obovata apice trifida longe dentata flores involventia. Herba biennis vel perennis. Folia pinnata ambitu auguste oblonga foliolis ovatis acutis margine grosse serratis.

Species 1, from Sikkim and the Chumbi valley.

Pleurospermopsis sikkimensis (C. B. Clarke), comb. nov.

Pleurospermum sikkimense C. B. Clarke, Flor. Brit. Ind. ii. 702 (1879).

Sikkim : Kankola ; Yeumtang, *J. D. Hooker* (Kew) ; Yakla, *C. B. Clarke* 9798 (Kew) ; Jongri, *J. D. Hooker* (Kew), *C. B. Clarke* 26207 (lecto-type of *Pleurospermum sikkimense* C. B. C., Kew) ; 26164 (Kew) ; 26179 (Brit. Mus.) ; *T. Anderson* 620 (Brit. Mus.), Cheumsanthang ; *Ribu and Rhomoo* 5838 (Kew), Alukthang ; *Ribu and Rhomoo* 6621 (Edinburgh) ; Chumbi Valley : Yatung *Hobson* s.n. (Kew) ; Mee rik la *King's Collector* 638 (Kew).

In Records Bot. Survey of India, iv. 376 (1913), Sir W. W. Smith gives the following localities in Sikkim, where he collected specimens :—Changu, Tosa, Ningbil, and Gnatong. These specimens are in Calcutta and have not been seen.

I do not think that this plant is admissible as a *Pleurospermum*, even on the widest interpretation of that genus. The fruit bears but little resemblance to that of *Pleurospermum*, but is much closer to that of *Ligusticum* (*L. scoticum*), from which the remarkable involucels clearly exclude it. Nor are they the involucels of *Pleurospermum*. In that genus they are

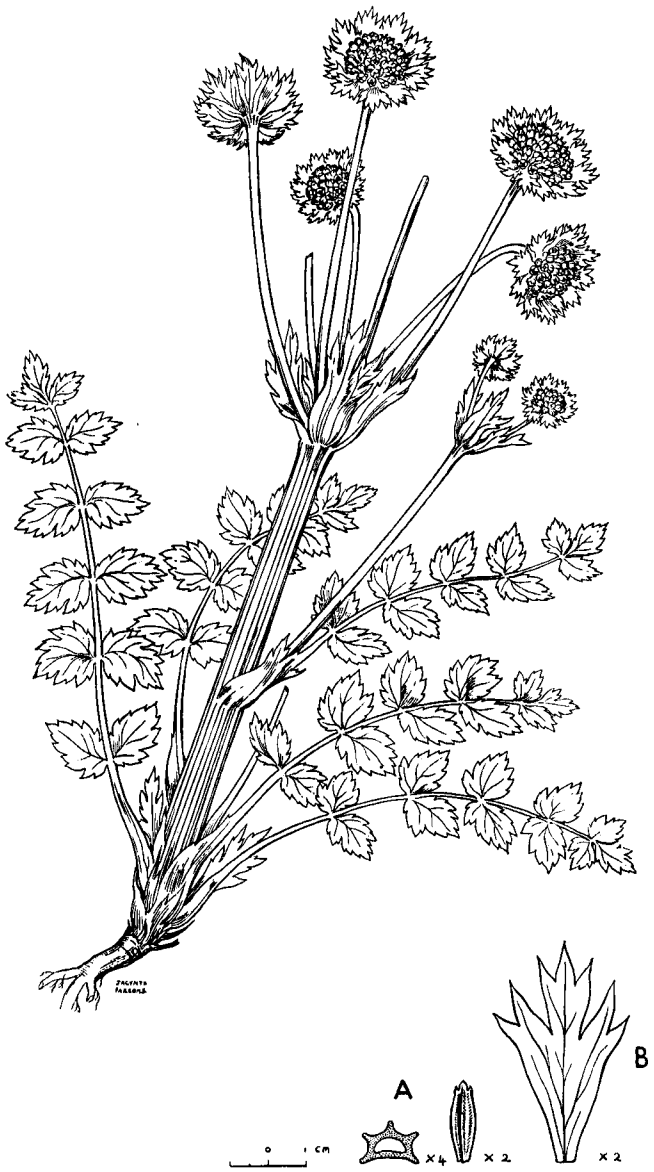

Fig. 2.—*Pleurospermopsis sikkimensis* (C. B. Clarke) Norman.
A. Carpel, entire and in section.
B. An involucel.

always flaccid, with age shrivel, and are more or less deciduous, on old plants often completely so.

In *Pleurospermopsis* they are stiff, almost prickly, strongly persistent if not accrescent and of a different form, and more numerous than is usual in *Pleurospermum*.

It is true that *Pleurospermum Candollii* (DC.) C. B. Clarke bears much outward resemblance to our plant, especially in the leaves; but it seems to me that the involucels in *P. Candollii* and the fruit so far as it is known *are* those of *Pleurospermum* in the wide sense. It is quite extraordinary how difficult it is to get specimens of this common plant with fruit that is even approximately ripe.

CREPIS FOETIDA AND FOUR CLOSELY RELATED SPECIES.

By E. B. Babcock.

Crepis foetida, the Stinking Hawksbeard, has long been recognized by European botanists as an extremely variable or polymorphic species. Numerous subspecific forms have been named and described, many of them as "species." In fact a monotypic genus (*Rodigia*) was erected by Sprengel in 1820 for the disposition of a species which I find it necessary to merge with *foetida*. As a result of extensive studies on herbarium material, examination of the chromosomes in numerous cultivated strains, and hybridization experiments involving various subspecies and strains, I have concluded that *C. foetida* sens. lat. is a Rassenkreis in the essential meaning of that term, although the present distributional areas of the subspecies of *C. foetida* overlap to a greater extent than is apparently implied in the definition of Rensch.*. A plausible explanation of the origin and present status of this Rassenkreis is suggested by the following hypothesis:—

(1) Three closely related species were involved: *C. foetida* L. (including the southern form, *C. glandulosa* Guss.), *C. rhoeadifolia* Bieb., and *Rodigia commutata* Spr.

(2) Preceding or during the period of differentiation of these species they became geographically isolated: *C. foetida* in southwestern Europe; *C. rhoeadifolia* in the Caucasus region; and *C. commutata* in Asia Minor.

(3) Eventually all three spread until they met in western Asia Minor or the Balkan Peninsula, and, through hybridization, gave rise to the intergrading forms connecting them into a Rassenkreis.

* Rensch, B., 1929, 'Das Prinzip geographischer Rassenkreise und das Problem der Artbildung.' Berlin.

(4) Meanwhile each of the original species becomes polymorphic through mutation, so that many local races exist.

(5) The combined result is an extremely variable complex of minor variations caused by gene mutations and intergrading forms resulting from hybridization.

Thus for taxonomic purposes it is necessary to treat the three original species as subspecies of a single inclusive species. There is already good precedent for doing this with respect to *C. foetida* and *C. rhoeadifolia*. The inclusion of *C. commutata* as a subspecies is supported both by the study of specimens collected in the wild and by cytologic and genetic investigation.

During the course of these studies two new, well-marked, and geographically separated species have come to light, namely, *C. eritreënsis* and *C. Thomsonii*. These species show affinity with *C. foetida* sens. str. in certain respects, and with *C. foetida commutata* in others. It can hardly be questioned that they all evolved from the same ancestral stock. The evidence from morphology, cytology, and genetics on which these conceptions are based will be presented in a later paper.

Two other species, long since described, but as yet comparatively little known, are included in this paper—*Crepis Schimperi* Sch. Bip. is closely related to *C. eritreënsis*, and *C. Bureniana* Boiss. is closest to *C. Thomsonii*.

The purpose of this paper is to place on record the present taxonomic treatment of these five species.

Key to the Species.

Involucre cylindric or campanulate; outer involucral bracts becoming lax and more or less conspicuous in fruiting heads; marginal achenes subterete or, if subcompressed, not unequally so dorsally and ventrally.

Corolla in marginal florets 12–18 mm. long or, if smaller, the inner florets without reddish purple ligule-teeth; anther-tube usually 3–4 mm. long; inner achenes 10–15-striate ..... *C. foetida.*

Corolla in marginal florets 7–10 mm. long, the ligule-teeth on all the florets reddish purple; anther-tube about 2 mm. long; inner achenes 10–20-ribbed.

Involucre cylindric or turbinate in fruit, the inner bracts becoming carinate but not strongly enclosing the marginal achenes; achenes monomorphic, long-beaked.

Plant 1–3 dm. high, the whole plant hispid with setiform hairs; inner involucral bracts 15–20; corolla-tube 5 mm. long; style-branches 1 mm. long; achenes reddish brown, coarsely beaked: endemic in Abyssinia..... *C. Schimperi.*

Plant 2·5–5·5 dm. high, the whole plant hispidulous with fine soft hairs; inner involucral bracts 12 or 13; corolla-tube 4 mm. long;

style-branches about 2 mm. long; achenes dark brown when mature, finely beaked: endemic in Eritrea ..... *C. eritreënsis.*

Involucre broadly campanulate, the inner bracts becoming prominently navicular, strongly enclosing the marginal achenes; achenes dimorphic, the marginal shortly and coarsely beaked, the inner finely beaked: endemic in north-west India, Afghanistan, and Baluchistan. *C. Thomsonii.*

Involucre globose-turbinate; outer involucral bracts inconspicuous, remaining strongly compressed between the navicular inner bracts in fruit; marginal achenes strongly and unequally compressed, the dorsal half subalate, the ventral half convex ..... *C. Bureniana.*

CREPIS FOETIDA L., Sp. Pl. ii. 807 (1753) (sens. lat.).

Annual, rarely biennial, or short-lived perennial (?) herb, 1–5 dm. high, ±hispid; caudical leaves oblanceolate, denticulate to bipinnate, petiolate; cauline leaves elliptic, ovate, lanceolate or linear, sessile, auriculate, runcinate to deeply pinnatifid with linear lobes, ±laciniate near the base; stem erect, branched above or from near base, branches strict, divaricate, decumbent or prostrate, few- or many-headed; peduncles somewhat thickened or inflated toward summit, the heads nodding or erect before anthesis; heads medium to large, many-flowered; involucre cylindric-turbinate to campanulate, the outer bracts linear to lanceolate, becoming lax, the inner bracts lanceolate, becoming strongly carinate or navicular, enclosing the marginal achenes; receptacle either densely ciliate or paleaceous with linear chartaceous paleæ; flowers yellow, the ligules usually reddish purple on outer face in marginal florets; achenes dimorphic the marginal (rarely absent in certain forms), stout, shortly and coarsely beaked or beakless, the inner longer, slender, finely beaked; pappus sordid white, 3–7 mm. long, 2-seriate, persistent.

Western, central, and southern Europe to the Caspian Sea; Asia Minor, Syria, and northern Palestine, to Transcaucasia and western Persia.

This polymorphic species includes very numerous forms which exhibit combinations of variations in several characters, such as habit, leaf-dissection, glands on stem and involucre, eglandular setæ on involucre, relative length of outer and inner involucral bracts, size of florets and flower parts, size and colour of achenes, length of pappus, and presence or absence of paleæ on the receptacle. Many of these variations are genetic in nature, but many modifications in size, habit, and degree of development of certain characters are caused by environmental factors. Most notable among these are the occasional depauperate and repressed forms, which may be difficult to classify. There exist, however, three fairly distinct subspecies with different although overlapping areas of distribution; and it is possible to identify nearly all the

specimens of this species as one or other of these three subspecies. Certain forms, however, are obviously hybrids between the subspecies.

Key to the Subspecies of Crepis foetida.

Receptacle ciliate but not paleaceous; pappus 4–7 (mostly 5–6) mm. long.

Outer involucral bracts narrower, the longest mostly half (rarely two-thirds) as long as the inner; trichomes of the involucre mostly piliform, glandular ..... subsp. *vulgaris.*

Outer involucral bracts broader, the longest about two-thirds as long as the inner; trichomes of the involucre mostly setiform, eglandular ..... subsp. *rhoeadifolia.*

Receptacle paleaceous; pappus 3–4 mm. long .. subsp. *commutata.*

CREPIS FOETIDA subsp. **vulgaris** (Bisch.), comb. nov.—*Crepis barbata* Mill., Gard. Dict. ed. 8, n. 2 (1768), non L.; *Picris foetida* Lam., Fl. Fr. ii. 108 (1778); *Barkhausia foetida* F. W. Schmidt, Samml. Phys. Aufs. i. 283 (1795); *Wibelia graveolens* Gaert. Mey. et Scherb., Fl. Wett. iii. 144 (1801); *Hostia foetida* Moench, Meth. Suppl. 221 (1802); *Barkhausia graveolens* Link, Enum. Hort. Berol. ii. 290 (1822); *Crepis foetens* Link, ex Buch., Phys. Bes. Canar. 147 (1825), non DC.; *C. graveolens* Schrad., ex Steud., Nom. ed. 2, i. 436 (1840); *Anisoderis foetida* Fisch. et Mey., Ind. Sem. Petropol. 32 (1835–42); *Wibelia foetida* Sch. Bip., Cich. n. 64 (1841); *Crepis foetida* B. *occidentalis* a. *borealis* Webb. et Berth., Phyt. Canar. iii. 458 (1836–50); *C. foetida* a. *vulgaris* Bisch., Beitr. 252 (1851); *Hieraciodes foetidum* O. Kuntze, Gen. i. 346 (1891); *C. foetida* var. *typica* Hal., Consp. Fl. Græc. ii. 216 (1902).

Western, central, and southern Europe to Crimea; and, including all the forms listed below, Ægean Archipelago, Crete, and Cyprus; Asia Minor, Syria, and south-western Persia.

C. foetida vulgaris:

f. **glandulosa** (Guss.), comb. nov.—*Crepis glandulosa* Guss., Ind. Sem. Hort. Boccad. 4 (1825); Pl. Rar. 329, t. 56 (1826), non Brot.; *Barkhausia glandulosa* Presl. Fl. Sic. 31 (1826); *C. foetida* B. *occidentalis* b. *australis* Webb. et Berth., Phyt. Canar. iii. 458 (1836–50); *C. glandulosa* var. *simplex* et var. *interrupta* Hausskn. in Mitt. Thüring. Bot. Ver. vii. 53 (1895).—Sicily, Portitxol Island (Spain), southern Greece, and north-western Syria.

f. **pinnatipartita** (DC.), comb. nov.—*Crepis glandulosa* β *pinnatipartita* DC., Prod. vii. 158 (1838).—Sicily.

f. **Candollei** (Spr.), comb. nov.—*Barkhousia Candollei* Spr., Syst. iii. 657 (1826); DC., Prod. vii. 158 (1838).—Natural habitat unknown; authentic spec. in Herb. DC. ex hort.

f. **zacinthia** (Marg. et Reut.), comb. nov.—*Barkhausia zacinthia* Marg. et Reut., ex DC., Prod. vii. 158 (1838).—Southern Greece and local in southern France.

f. **gracilis** (Lej.), comb. nov.—*Barkhausia gracilis* Lej., ex Rouy, Fl. Fr. ix. 211 (1905).—A very reduced form. Here and there in southern Spain, France, and Italy.

f. **triangularis** (C. Koch), comb. nov.—*Barkhausia triangularis* C. Koch in Linnæa, xxiii. 686 (1850).—Biennial (?). Eastern Turkey; northern Syria.

f. **interrupta** (Sibth.), comb. nov.—*Crepis interrupta* Sibth., Fl. Graec. Prod. ii. 137 (1813); Fl. Graec. ix. t. 803 (1837), non DC. —Southern Balkans, western Anatolia, northern Syria.

f. **radicata** (S. et S.), comb. nov.—*Crepis radicata* S. et S., Fl. Graec. viii. 74, t. 800 (1833), non Forsk.; *Barkhausia radicata* Godr. in Mém. Acad. sci. Montpell. sect. méd. i. 436 (1853), fide Thell., Fl. Advent. Montpell. 581 (1912); *C. foetida* var. *maritima* Boiss., Fl. Orient. iii. 581 (1875); *C. glandulosa* Guss. var. *maritima* Boiss., ex Hausskn. in Mitt. Thüring. Bot. Ver. vii. 54 (1895).—Greece, Crete, Sardinia, Corsica.

f. **insularis** (Moris. et Not.), comb. nov.—*Crepis insularis* Moris. et Not. in Mem. Acad. Torino, ii. 85, t. 3 (1) (1839).—Capraja Island, Corsica.

f. **prostrata** (Dumort.), comb. nov.—*Barkhausia prostrata* Dumort., Fl. Belg. 61 (1827); *C. foetida* var. *diffusa* Lej. et Court., Comp. iii. 110 (1836); *C. prostrata* Dumort., ex Michot, Fl. du Hain. 254 (1845), fide Wildeman et Durand, Prod. Fl. Belg. ii. 810, (1899) (ex descr.).

f. **supina** (Rouy), comb. nov.—*Barkhausia supina* Rouy, Fl. Fr. ix. 211 (1905).—Var, France.

f. **gomerea** (C. Bolle), comb. nov.—*Crepis foetida* var. *gomerea* C. Bolle in Bonpl. viii. 135 (1860).—Cult. Hort. Berol. ex germ. leg. Gomera, Canary Islands.

f. **fallax** (Boiss.), comb. nov.—*Crepis fallax* Boiss., Fl. Orient. iii. 850 (1875); *Hieraciodes fallax* O. Kuntze, Gen. i, 346 (1891).—Greece, Anatolia, Cilicia, Cyprus, Syria, south-western Persia.

CREPIS FOETIDA subsp. RHOEADIFOLIA (Bieb.) Schinz et Keller, Fl. Schweiz, ed. 3, ii. 361 (1914).—*Crepis rhoeadifolia* Bieb., Fl. Taur. Cauc. iii. 537 (1819); *Barkhausia rhoeadifolia* Rchb., ex Moess., Handb. ed. 3, ii. 1475 (1833); *Anisoderis rhoeadifolia* Fisch. et Mey., Ind. Sem. Petropol. iv. 32 (1835–42); *C. foetida* A. *orientalis* Webb et Berth., Phyt. Canar. iii. 458 (1836–50); B. *rhoeadifolia* var. *genuina* Koch in Linnæa, xxiii. 685 (1850); *C. foetida* var. *hispida* Bisch., Beitr. 252 (1851).

Asia Minor, Kurdistan, and north-west Persia; Transcaucasia, southern Russia; the Balkan Peninsula to northern Greece and Central Europe.

C. foetida rhoeadifolia:

f. **byzantina** (DC.), comb. nov.—*Barkhausia byzantina* DC., Prod. vii. 158 (1838).—Constantinople.

f. **rodigioides** (Sch. Bip.), comb. nov.—*Barkhausia rodigioides* Sch. Bip., ex Koch in Linnæa, xxiii. 687 (1850).—Syria.

f. **echioides** (Ledeb.), comb. nov.—*Crepis echioides* Ledeb., Ind. Sem. H. Dorpat. 23 (1821); Fl. Ross. ii. 819 (1844) (=? *B. foetida* var. *hirto-scabra transilvanica* Schur in Verh. Naturf. Brünn, xxxvi. 208 (1897)). Said by Ledebour to be a larger, more hirsute form of *rhoeadifolia*.

f. **hispidissima** (Koch), comb. nov.—*Barkhausia rhoeadifolia* var. *hispidissima* Koch in Linnæa, xxiii. 685 (1850).—Caucasus.

f. **subdivisa** (Schur), comb. nov.—*Barkhausia foetida* var. *subdivisa* Schur in Verh. Naturf. Brünn, xxxvi. 208 (1897).—Czeckoslovakia.

f. **Stribrnyi** (Velen.), comb. nov.—*Crepis Stribrnyi* Velen., Fl. Bulg. 333 (1891); *C. foetida* var. *Stribrnyi* Stefanoff, in litt. (Ex descr. intermediate between *rhoeadifolia* and *vulgaris* f. *fallax*.)—Bulgaria.

f. NESTMEIERI (F. Herm. et Deg.), comb. nov.—*Crepis Nestmeieri* F. Herm. et Deg. in Magyar Bot. Lapok, xxxii. 64 (1933).—Turkey.

CREPIS FOETIDA subsp. **commutata** (Spr.), comb. nov.—*Rodigia commutata* Spr., Neu Entd. i. 273 (1820); *Seriola commutata* Loss., Syn. 131 (1832); *Barkhausia hirta* Koch in Linnæa, xxiii. 687 (1850); *Crepis brachypappa* Bornm. in Beih. Bot. Centralb. xxxii. 118, t. 19 (1914).

Crete, Ægean Archipelago, eastern Greece, southern Bulgaria, Asia Minor, northern Syria, and eastward to western Persia.

C. foetida commutata:

f. **coa** (DC.), comb. nov.—*Phalacroderis coa* DC., Prod. vii. 97 (1838).—d'Urville, no. 130 *b* in Herb. Kew. Depauperate. Cos, Dodecaneso, Ægean Archipelago.

f. **bulgarica** (Vel.), comb. nov.—*Rodigia bulgarica* Vel., Fl. Bulg. 362 (1891); *R. commutata* var. *bulgarica* (Vel.) Stoj. et Stef., in herb.

f. **gracilis** (Freyn et Sint.), comb. nov.—*Rodigia gracilis* Freyn et Sint. in Oest. Bot. Zeit. xliv. 259 (1894).—North-west Asia Minor.

f. **assyriaca** (Bornm.), comb. nov.—*Crepis foetida* var. *assyriaca* Bornm. in Bull. Herb. Boiss. ser. 2, vii. 436 (1907).—Kurdistan and Persia.

Crepis eritreënsis, sp. nov.

Herba annua 2·5–5·5 dm. alta; planta tota hispidulosa; folia caudicalia oblanceolata, denticulata vel dentata, gradatim attenuata in petiolum alatum; folia caulina inferiora similia vel pinnatifida, alia sessilia lyrato-pinnatifida subauriculata; caulis erectus superne ramosus, rami elongati stricti corymbosi, vel ad basim ramosus, rami divaricati arcuati vel stricti, ramuli ultimi cum 2–3 capitulis nutanti; pedunculi 1–5 cm. longi; capitula mediocria ad maturitatem erecta circa 60-flora; involucra turbinata 7–10 mm. longa; squamæ exteriores circa 11 inæquales lineares virides ad apicem purpureæ; squamæ interiores 12–13 æquales lanceolatæ acutæ ventraliter pubescentes ad maturitatem carinatæ et spongioso-incrassatæ; receptaculum areolatum cilatum; corolla 10 mm. longa, ligula 6 mm. longa 1·25 mm. lata flava in dentibus purpurea; tubus 4 mm. longus glabrescens; antheræ 2 mm. longæ; rami styli 1·75–2 mm. longi; achænia uniformia exteriores breviores omnia ad maturitatem obscure fusca 8–11 mm. longa, corpus 3·5 mm. longa abrupte attenuata in rostrum tenuissimum circa 15-costata, costæ tenuæ dense spiculatæ pappus flavidus 4–5 mm. longus 2-seriatus tenuissimus ex involucro fructifero exserto persistens.

Southern Eritrea from 800 to 1400 metres altitude.

The type, *Schweinfurth et Riva* 2031, Mogod Valley, is in the U.S. Nat. Herb.; an isotype is in Herb. Kew. Other collections: *Schweinfurth et Riva* 1596, Mogod Valley, Herb. Barbey-Boissier; *Fiori* 1897, 1898, Hamasen (Asmara) region, Herb. Florence; ex hort. gen. Calif. no. 3005, grown from seeds collected by H. Compere near Embaralla, Herb. Univ. Calif.

Crepis eritreënsis is closely related to *C. Schimperi* Sch. Bip., of Abyssinia, but the two differ significantly in many characters. Although they occupy rather closely adjacent areas, apparently they are confined to different altitudes. Furthermore, *C. Schimperi* flowers during autumn and winter, whereas *C. eritreënsis* is a spring-flowering plant. These two species have as their nearest relatives *C. Thomsonii* and *C. foetida.*

Crepis Thomsonii, sp. nov.

Herba annua, 0·5–3·5 dm. alta; caudex brevissimus attenuatus in radicem ligneam; folia caudicalia rosulata oblanceolata runcinata vel pinnatifida petiolata parce hispida; folia caulina similia vel lanceolata sessilia subamplexicaulia laciniata ad basim; caules numerosi ascendentes vel semidecumbentes, rami pauci elongati pedunculati vel cum 2–4 capitula glanduloso-setulosi; capitula magna multiflora virginea nutantia; involucrum campanulatum, squamæ exteriores inæquales interdum 2-plo breviores, interiores oblongæ ventraliter pubescentes dorsaliter glanduloso-setosæ ad maturitatem forte naviculares induratæ flavidulæ; receptaculum alveolatum ciliatum; corolla 7–9·5 mm.

longa, ligula circa 0·8 mm. lata flava in dentibus purpurea, tubus 3–4·5 mm. longe pubescens; antheræ 2 mm. longæ; rami styli 0·75–1·25 mm. longi; achænia fusca 20-costata biformia, marginalia 5·5–7·5 mm. longa valde compressa lateraliter attenuata in rostrum crassum ventraliter valde spiculata, interiora 7·5–12 mm. longa fusiformia paululum tetragona attenuata in rostrum tenuum; pappus flavidulus 5–6 mm. longus 2-seriatus tenuis persistens.

Northern and north-western India, especially submontane Punjab; Afghanistan and Baluchistan.

The type, *Thomson* 1037 pro parte, Naini Tal (=Kumaon), is in Herb. Kew.; isotypes are in Paris, Munich, and Gray Herb. Other collections: Aitchison in 1871, Rawalpindi, Herb. Kew.; *Stocks* 1053, 1153, Baluchistan, Herb. Kew., and Dehra Dun; *Griffith* 945, Afghanistan, Herb. Kew.

Crepis Thomsonii was confused with *C. foetida* by C. B. Clarke (Comp. Ind. 252 (1876)) and J. D. Hooker (Fl. Brit. Ind. iii. 393 (1882)). But it is very distinct from *C. foetida* in both flowers and fruits; and the distributional areas of the two species are separated by a region (eastern Persia) where a related but still more distinct species, *C. Bureniana*, occurs.

Many of the available herbarium specimens of *C. Thomsonii* are depauperate forms. Only the more typical specimens are cited above.

Crepis Schimperi Sch. Bip., ex Schweinf., Fl. Æthiop. 144 (1867).

Annual herb, 1–3 dm. high, hispid with yellow setiform hairs; caudical leaves oblanceolate, dentate to pinnately partite, petiolate; cauline leaves similar or sessile; stem erect, branched above or from near base, the branches long, mostly 1-furcate, 2-headed; peduncles 1·5–10 cm. long; heads nodding before anthesis, erect in flower and fruit, about 60-flowered; involucre cylindric-turbinate, about 10 mm. high, 8 mm. wide; outer bracts 10, linear, dark green; inner bracts 15–20, lanceolate, becoming carinate and dorsally thickened, ventrally pubescent towards tip; receptacle areolate, ciliate; corolla about 10 mm. long; corolla-tube 5 mm. long; anther-tube 1·8 mm. long; style-branches 1 mm. long, yellow; achenes reddish brown, 8–10 mm. long, about 0·75 mm. wide, monomorphic but unequal in length, gradually attenuate into a rather coarse beak equal to the body, about 15-ribbed; pappus yellowish, 5–6 mm. long, completely extruded, persistent. (*Barkhausia Schimperi* Sch. Bip., ex A. Rich., Voy. Abyss. i. 466, 1847; *Hieraciodes Schimperi* O. Kuntze, Gen. i. 346 (1891).)

Central and northern Abyssinia, 1600–2200 m. alt., hills, fields, and waste places; abundant around Abba Gerima in 1862.

The type-collection is *Schimperi iter Abyss. Sect.* 1 : *plantae Adoënses*, 295. The plants are somewhat variable in size and habit as a result, no doubt, of variations in local environmental conditions. They are more robust under cultivation (*cf.* spec. in Herb. Hort. Berol.), but they retain the distinctive features of leaves, habit, and inflorescence.

Crepis Schimperi is closely related to *C. eritreënsis*, but it is clearly distinguished from it by the hispid indumentum, especially on the involucre ; by the furcate, two-headed branches and longer peduncles ; by the copious, longer, yellow pappus ; by the reddish brown achenes, which are shorter, relatively wider, and more coarsely beaked, with the beak equal to the body ; and by various characters of the flowers and leaves. Apparently the two species are isolated geographically, but even if they are not so isolated they appear to be restricted to different altitudes, *C. Schimperi* ranging from 1600 to 2200 m., whereas *C. eritreënsis* occurs between 800 and 1400 m. Furthermore, *C. Schimperi* produces its flowers during autumn and winter, whereas *C. eritreënsis* is a spring-flowering plant. All these conditions, taken together, seem to assure practically complete, if not complete, isolation of the two species. Living material of *C. Schimperi* has not been available for experimental investigation.

CREPIS BURENIANA Boiss., Fl. Orient. iii. 852 (1875).

Annual herb, 0·5–3 dm. high, more or less tomentose and gland-pubescent ; caudical leaves oblanceolate, runcinate to pinnatifid, petiolate ; cauline leaves oblong to lanceolate, sessile, auriculate-amplexicaul, dentate ; stem erect, divaricately branched from near the base or above the middle ; peduncles 2–8 cm. long, slender below, wider near the head ; heads nodding before anthesis, erect in flower and fruit, many-flowered ; involucre globose-turbinate, 10–12 mm. high and about as wide, densely pubescent with long eglandulose hairs, canescent-tomentose, shortly gland-pubescent ; outer bracts inconspicuous, sometimes very short, sometimes one-third as long as the inner, always closely appressed between the navicular inner bracts in fruit ; inner bracts about 15, lanceolate, becoming infolded, strongly navicular, enclosing the marginal achenes, ventrally pubescent ; receptacle areolate, glabrous ; corolla 8–9·5 mm. long ; corolla-tube 3·5–4 mm. long ; anther-tube about 2·4 mm. long ; style-branches less than 1 mm. long, yellow ; achenes stramineous or yellowish, dimorphic ; marginal achenes about 5 mm. long, strongly compressed, the dorsal part thin or almost alate, striate, tawny, the ventral part swollen, convex, smooth, whitish or yellow ; inner achenes 7–11 mm. long, terete, fusiform, attenuate into a slender pale beak equal to or longer than the body, 10–15-ribbed, ribs narrow, spiculate ; pappus white or sordid, 6 mm. long, completely extruded, persistent. (*Crepis Kotschyana* Boiss., Fl. Orient. iii. 852 (1875) ; *C. glanduligera* (Winkl.) B. Fedtsch., Rastit. Turkest. 765 (1915) ; *Hieraciodes Burenianum* O. Kuntze, Gen. i. 345 (1891).)

North-west India and the Pamir region westward through Turkestan, Afghanistan, Persia, and Mesopotamia, into eastern Syria ; up to 2000 m. alt. ; frequently in deserts.

This very distinct member of the group also differs from all the others with which it might come in contact by the fact that it has only eight chromosomes, the others having ten. This would doubtless cause high sterility in any hybrids that might occur. It therefore serves as a barrier between *C. Thomsonii* and *C. foetida*.

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OBITUARIES.

FREDERICK JANSON HANBURY

(1851–1938).

FREDERICK JANSON HANBURY was born at Stoke Newington on 27 May, 1851, and died at East Grinstead on 1 March. He was the eldest son of Cornelius Hanbury and grandson of the Cornelius Hanbury who in 1795 had entered into partnership with William Allen in the famous pharmaceutical business of Allen and Hanbury. F. J. Hanbury was educated at the Friends' School, Grove House, Tottenham. After serving an apprenticeship, and studying at the College of the Pharmaceutical Society (1871–2) he joined the family business and worked with his father and his cousin, Daniel Hanbury ; from 1916 he was Chairman of the firm. Quite early he become interested in flowering plants, and there is a note by him in this Journal for 1871 recording the finding of *Galium tricorne* at Stoke Newington. In the following year he was awarded the silver medal of the Pharmaceutical Society for the best herbarium of British plants ; he collected seven hundred specimens in one year. A note in the Journal for 1873 states that he had begun to gather material for a flora of Kent, apparently at the suggestion of Henry Trimen, who, four years previously, had completed (with W. T. Dyer) the scholarly 'Flora of Middlesex.' From this date, during many years, most of his leisure was spent in the personal investigation of the plants of the county, but with increasing pressure from a successful business he had eventually to seek the collaboration of the Rev. E. S. Marshall ; the 'Flora of Kent' was published in 1897, and immediately took its place as one of the best of our country floras. He contributed many notes to this Journal, principally on new Kent records, Scottish plants

(in collaboration with others), and Hieracia. He began the publication of a monograph of *Hieracium* in 1889, but unfortunately this was never completed, the last part, no. 8, appearing in 1898; it was illustrated with coloured plates, most of which were drawn by Miss Gulielma Lister, Hanbury's cousin.

Shortly before the death of Boswell-Syme in 1888, Hanbury acquired the copyright of the 'London Catalogue.' He published the eighth edition in 1886 and the twelfth in 1925; in the various editions he acknowledged the great help he received from A. W. Bennett, W. E. Clark, C. E. Salmon, and others. He left the copyright, with £100 for printing the next edition, to Messrs. A. J. Wilmott and H. W. Pugsley and the Keeper of Botany.

At Boswell-Syme's death Hanbury purchased his herbarium, and this was presented to the Department of Botany in 1932. He then wrote: "The Boswell Herbarium was, I believe, offered to both the British Museum and to Kew, and it was not until after this offer had been refused by both the National Institutions that I bought the Collection from the widow. I know some people felt at the time that the Collection ought not to have been allowed to pass into private hands, and this knowledge gives me the greater pleasure in being able now to present it to the Department of Botany . . . where it will henceforth be available to all botanists desiring to consult it." Hanbury's own herbarium and Hieracia have been bequeathed to the Department.

Before the war Mr. Hanbury was a frequent visitor to the Department of Botany and, though at that period I knew him only slightly, his name was often mentioned in a way which showed that he was *persona grata* with my seniors.

No account of him would be complete without some reference to his eminence as a horticulturist. His rock garden, cut out of the natural sandstone slope, is world famous. It was when showing off his treasures here that one likes to remember him. Keen and alert in spite of his age, with fund of anecdote about his plants, the making of his rockery, and British Botanists of a former generation, he nevertheless always maintained a courteous deference to what he considered to be authoritative opinion on general botanical matters.

C. F. M. Swynnerton (1877–1938),

B. D. Burtt (1902–1938).

A TRAGIC aeroplane crash on or about 8 June a hundred miles north-west of Dodoma, Tanganyika Territory, resulted in the death of C. F. M. Swynnerton and B. D. Burtt, together with their pilot.

Charles Francis Massey Swynnerton was born on 3 December, 1877, in India, where his father was Senior Chaplain to the Indian Army. He was educated at Lancing, and went out to Southern Rhodesia at the age of nineteen to learn farming. While there he became interested in the birds and plants of Mashonaland and also studied mimicry in insects. Later he turned his attention to tsetse flies and in 1921 pointed out the possibility of reducing this terrible scourge by controlling the particular types of vegetation in which they breed. Shortly afterwards he was appointed Game Warden of Tanganyika Territory, the main part of his work being directed to the tsetse problem; in 1928 a Tsetse Research Department was founded with Swynnerton as Director. After this he himself paid less attention to the taxonomic side of botany, as he had a botanical taxonomist on his staff, but he remained convinced that the only hope of success in controlling the tsetse was to regard the problem as an ecological one with an equilibrium which can be upset if due attention is paid to the part played by vegetation. The results obtained by Swynnerton and his staff were described in 'The Tsetse Flies of East Africa' 1936. Some of his botanical collections were enumerated in "A Contribution to our Knowledge of the Flora of Gazaland," which appeared in the 'Journal of the Linnean Society' for 1910. The genus *Swynnertonia* (Asclepiadaceae) is named in his honour.

Bernard Dearman Burtt was born at York, 14 June, 1902, the son of Dr. Arthur H. Burtt, lecturer in Botany at Reading University. He was educated at The Friends' School, Ackworth, going then to University College, Aberystwyth, and afterwards to Reading. After working for a time at Kew as a temporary botanist he assisted his relative, Dr. J. Burtt Davy, in the preparation of the 'Flora of the Transvaal.' In 1925 he was appointed a District Reclamation Officer in Tanganyika and shortly afterwards joined the staff of the Tsetse Research Department as Survey Botanist. Here he found full scope both for his energies and his interests. His whole heart was in collecting, and it was a great disappointment to him when he was unable to obtain leave to join the British Museum Expedition to Ruwenzori. He was an excellent collector, but although he always made voluminous notes he was not sufficiently interested in the literature of the subject to enjoy writing; he made an excellent collaborator. In the 'Kew Bulletin' for 1934 he wrote an account of a botanical reconnaissance of the Virunga volcanoes; he had made a collection of 453 plants from the eight volcanic peaks. The genus *Commiphora* was of importance in his tsetse work, and he wrote an account of the Tanganyika species in 1935, rectifying some of the old species and describing five novelties.

He collected many species new to science and the epithet *Burtii* will ensure the recognition of his excellent field-work. One

of the most interesting of his discoveries was a new genus of Connaraceae, named *Burttia* in his honour. It is a low shrub with flowers like cherry blossom and constitutes a portion of the great thicket area in the Singida district.

When he left England a few weeks ago he was full of schemes for immediate and for future work. He was always a welcome visitor in the Department of Botany, not perhaps more for the botanical treasures he always brought than for his hearty cheerfulness and lovable personality.—E. G. B. & J. R.

Alexander Zahlbruckner

(1860–1938).

On 8 May, 1938, the death occurred in Vienna after a short illness of Dr. Alexander Zahlbruckner, former Director of the Vienna State Museum of Natural History.

Born in 1860 in St. Georgen near Pressburg (Bratislava), he was educated there, and at the University of Vienna, where the degree of Doctor of Philosophy was conferred upon him in 1883. Three years later he entered the botanical section of the Vienna State Museum of Natural History as scientific assistant. In 1918 he was appointed Director of the Museum, retiring in 1922.

Although it is in lichenology that Zahlbruckner's name shines so brightly, from time to time he also published important contributions to phanerogamic botany, his work on the systematy of the Lobeliaceae deserving special mention. His published works, however, deal mostly with lichenology in its systematic and floristic aspects. It may safely be said that Zahlbruckner achieved an intimate acquaintance with the lichen-flora of almost every region of the world where lichens have been collected. The results of these studies are contained in about one hundred papers published between 1886 and 1936, and the classification of lichens which he framed in Engler and Prantl's 'Die Natürlichen Pflanzenfamilien' (1898–1907, 2nd ed. 1926) is likely to hold the field for many years to come. The greatest gratitude of all lichenologists is due to him for his enormous work 'Catalogus Lichenum Universalis,' a conspectus of all lichen-genera, species, varieties, and forms published since the time of Linnæus; its publication, which started in 1921, was completed in 1934 in nine volumes. Bringing, as it does, order into the previous chaos of incredibly involved synonymy, it is one of the greatest gifts ever made to the science of lichenology. Zahlbruckner also edited the second edition of Rabenhorst's 'Kryptogamen-flora von Deutschland, Oesterreich und der Schweiz,' having for this purpose obtained the co-operation of eminent European cryptogamic botanists; the work is still in progress. Mention must also be made of the important exsiccata, 'Lichenes rariores exsiccati' and 'Cryptogamæ exsiccatæ,' which he issued from 1884 onwards.

Of a kindly and retiring nature, and ever willing to place his immense knowledge at the disposal of others, Dr. Zahlbruckner left to all who had the privilege of personal acquaintance with him a vivid impression of geniality combined with an apparently unlimited capacity for arduous scientific research and organisation. Lichenologists in all parts of the world deplore the death of one of the greatest of their number, and will pay enduring homage to his memory.—I. M. L.

BOOK-NOTES, NEWS, ETC.

Linnean Society.—The 150th Anniversary of the foundation of the Linnean Society was celebrated on 24–27 May. Owing to the number attending the meetings, the sessions were held in the rooms of the Royal Institution. The opening meeting was at 3 o'clock on 24 May. A loyal message was sent to H.M. the King, and a letter was read from H.M. the Queen expressing a wish to become an honorary member of the Society. After welcoming the guests the President alluded to the fact that to mark the centenary of the Society an annual award of a Linnean Medal had been instituted; the medal for this year was handed to Professor Sir Wentworth D'Arcy Thompson.

In his Address Mr. Ramsbottom pointed out that in studying the work of Linnaeus it must not be assumed that his opinions remained unchanged throughout the whole of his career; incidental observations must be interpreted in their relation to the particular subject under discussion; and we must guard against reading into some isolated sentence the germ of a theory formulated at a later date. The Mosaic account of the creation led to the deduction by some of the doctrine of the fixity of species, but several of the early Fathers of the Church did not regard it as conveying scientific as distinguished from moral and spiritual truth. Linnaeus enunciated the doctrine in his 'Philosophia Botanica,' 1751: "Of the species of plants we reckon so many as there were different forms created in the beginning by the Infinite Being: and these forms, according to the appointed laws of generation, have always produced offspring like themselves." But 'Philosophia Botanica' was simply a collection of didactic aphorisms written for Linnaeus's pupils. When we turn to the series of dissertations of his pupils over which he presided we find that so early as 1744 he had discussed the possibility of new species of plants arising by hybridization, and this subject was constantly before him in his work on hybridization undertaken to prove the sexuality of plants. Thus in

1761 he questions if "a genus is nothing else than a number of species sprung from the same mother of different fathers." "But whether all these species be the offspring of time, whether in the beginning of all things the Creator limited the number of future species, I dare not presume to determine." In 'Species Plantarum,' 1753, there are many notes which show the trend of Linnaeus's thoughts. Thus after describing four species of *Scorpiurus* he adds: "It is beyond doubt that all these formerly arose from a single species."

Linnaeus's system of nomenclature and his sexual system of plants gave such security in the working out of the vast accumulation of collections that all attempts to introduce a natural system which Linnaeus regarded as the primum et ultimum of botany were resisted. Linnaeus's ideas and later developments were outlined up to 1858, when, in the rooms of the Society, the famous communications of Darwin and Wallace were read.

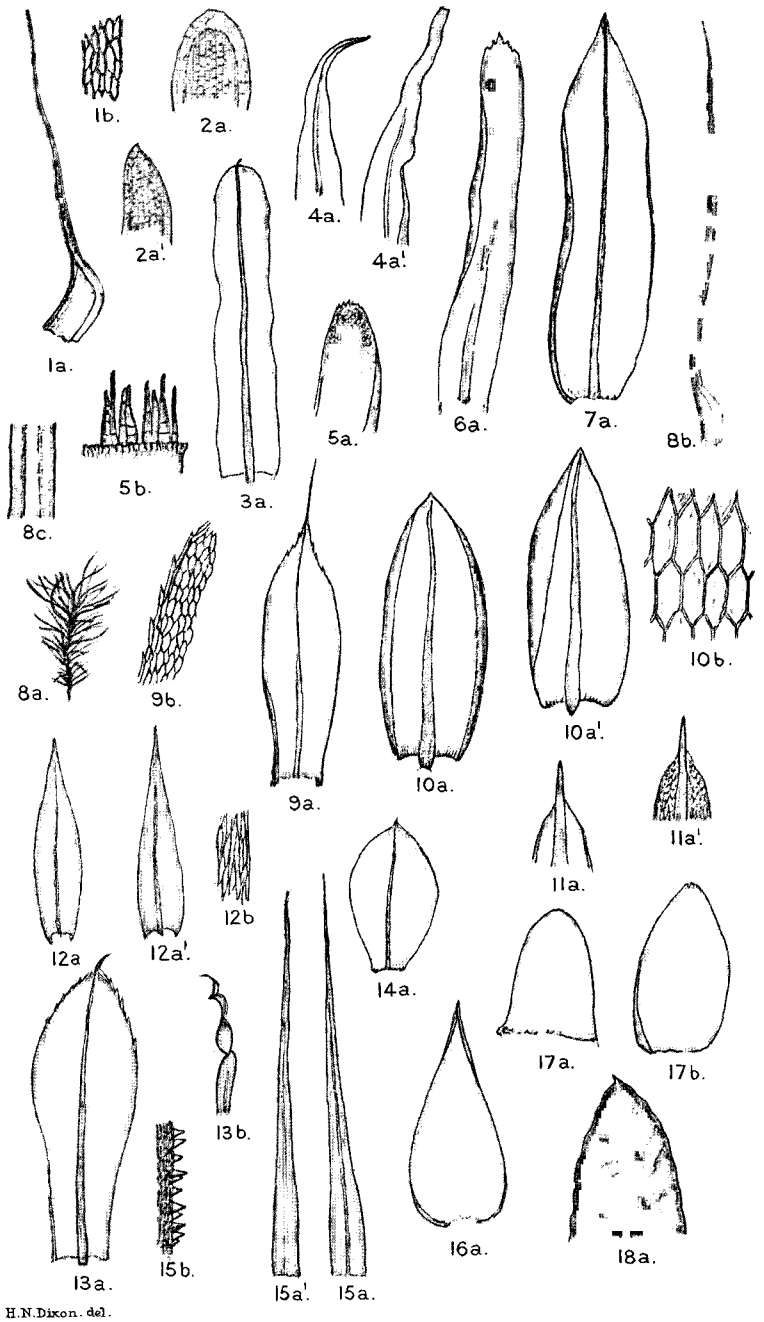
At the end of the Address the keys of two of the three cases in which the Linnaean herbarium came to England were handed to Professor R. E. Fries; the one case to go to the Swedish Linnean Society, the other to the Linnean Museum at Hammerby.

The following morning there was a symposium (to which the address on the previous day served as an introduction) on "The Concept of Species from the Time of Linnæus to the Present Day"; the principal speakers were Sir Edward Poulton, Professor E. W. MacBride, Sir Arthur Smith Woodward, Professor Ø. Winge, and Dr. K. Jordan. This was followed on Thursday morning by a symposium on "Geographical Isolation and Species Formation": here the principal speakers were Dr. Julian Huxley, Professor P. A. Buxton, Dr. E. Fischer-Piette, Dr. B. Rensch, and Professor C. Skottsberg.

A dinner was held on 25 May and a reception on 26 May. Visits and excursions occupied the afternoons and 27 May.

'MYCOPATHOLOGIA.'—This new quarterly is edited by R. Ciferri and P. Redaelli, and published by W. Junk, now of the Hague. The periodical is to be devoted entirely to fungi pathogenic to man and other animals, a branch of mycology more neglected in this country than almost anywhere else. The editors belong to the active Italian school and are both well-known authors. The first number contains 80 pages with eight papers and a Bibliographia Mycopathologica; the papers are in English, French, and Italian, and deal with many aspects of the subject, from nomenclature to allergy in *Monilia* and yeast infections. The annual subscription is 18 Dutch Florins.

ERRATUM.—The publisher of Professor G. W. Robinson's 'Mother Earth' is Thomas Murby and Co., not Thomas Murphy and Co., as given on p. 117.



TROPICAL AFRICAN MOSSES.

TROPICAL EAST AFRICAN MOSSES.—PART I. ACROCARPI.

BY H. N. DIXON, M.A., F.L.S.

(PLATE 614.)

FOR some years past I have been accumulating mosses from several parts of tropical East Africa, and it seems desirable to put on record some of the more interesting of these. In the following list I have described the unpublished species, and have recorded some of special interest or rarity, or marking an extension of distribution.

The collections include :—

(*a*) Several made by various collectors and sent from Kew for determination. The collectors include P. Chandler, W. J. Eggeling, Dr. Geilinger, P. J. Greenway, etc.

(*b*) Uganda and Kenya mosses collected by the late R. A. Dummer, mostly at high altitudes.

(*c*) Large collections made in Kenya Colony and Uganda by P. G. Balbo, and sent for determination from the Istituto Missioni Consolata at Turin, with a few collected by P. B. Favaro at Egoji, Kenya Colony.

(*d*) A collection made by Prof. J. H. Priestley and Miss L. I. Scott in 1930, in Kenya Colony.

(*e*) The mosses collected by Dr. G. Taylor during the British Museum Expedition of 1934–35.

(*f*) Mosses collected by Miss M. S. Budd in Uganda.

The types of the new species are in my herbarium ; and also, as to

(*a*) in Herb. Kew. ;
(*c*) at the Istituto Missioni Consolata, Torino ;
(*d*) in the Herbarium of Leeds University ;
(*e*) in Herb. Mus. Brit.

I have followed the taxonomic arrangement proposed in Verdoorn, ' Manual of Bryology,' pp. 406–12 (1932).

SPHAGNACEAE.

SPHAGNUM PAPPEANUM C. M. var. SPARSIFOLIUM Warnst.—Kinangop, Aberdare Mts., Kenya Colony, 4300 mm., 3 Jan. 1909 ; coll. G. Balbo (330, 334, 352). Rocks in heath forest, just above stream, Namwamba Valley, Ruwenzori, Uganda, 3200 m. ; coll. G. Taylor (2986). A very robust form, with stems a foot long, and 3 cm. across the frond, the branches 2 cm. long and more, prettily coloured with orange-brown and red.

Sphagnum macromolluscum Dix., sp. nov.

§*Cuspidata*, Ser. Ovalia. Flavescens. Ut videtur laxe cæspitosum. Epidermis caulina pallida. Ramorum fasciculi sat conferti, ramis circa 1·25–1·5 cm. longis, attenuatis, ramis pendulis caulem omnino tegentibus, conspicuis. Folia caulina circa 1·5 mm. longa, inferne circa 0·75 mm. lata, concava, *ovalia*, apice *late rotundata, cucullata, integra*, nullo modo dentata vel fimbriata. Limbus perangustus, infra vix dilatatus. Cellulæ hyalinæ fere ad basin fibrillosæ, aporosæ vel fere aporosæ.

Folia ramea 2 mm. longa, 0·75 mm. lata, sicca adpressa vel leniter patula, *ovato-lanceolata, nullo modo acuminata*, apice lato, 3–4-dentato, limbo *angustissimo*, uniseriato, integro, circumdata. Pori superficie dorsali sat numerosi, magni, ventrali perpauci. Cellulæ chlorophyllosæ superficie interiore inclusæ, exteriore liberæ.

Hab. Bog, shore of L. Nabugabo, Masak Distr., Uganda, 1150 m., Oct. 1932 ; coll. W. J. Eggeling (571) ; (946 Herb. Kew.).

A marked species, from the leaf-form clearly belonging to the *Ovalia* Group, and perhaps nearest to the Bourbon *S. ericetorum* Brid., but that has *inter alia* numerous pores on the inner face of both stem- and branch-leaves, and larger, longer, almost lingulate stem-leaves.

The specific epithet refers to the form of the branch-leaves, not to the general habit, which otherwise hardly suggests *S. molluscum*.

Sphagnum Davidii Warnst.—Morogoro, Kitundu, Tanganyika Territory, 1350 m., 29 Mar. 1935 ; coll. Miss E. M. Bruce (13).

Var. flavo-fuscescens Warnst.—I have several gatherings of this variety from Ruwenzori by different collectors. Also from Kinangop, Aberdare Mts., Kenya Colony, 3 Jan. 1909 ; coll. G. Balbo (184). A very distinct and pretty form, which I refer to f. *brachydasyclada*, was gathered on trunks of fallen trees in swamp, 2750 m., Namwamba Valley, Ruwenzori, Uganda, 5 Jan. 1935 ; G. Taylor (2886).

Sphagnum afro-crassicladum Dix. & Sherr., sp. nov.

§*Subsecunda. S. crassiclado* Warnst. affine. Differt epidermide caulina 1–2-stratosa, foliis caulinis *majoribus*, 1·75–2·25 mm. longis (raro usque 3 mm.), foliis rameis e basi late cordata sensim *acute acuminata, marginibus superioribus involutis*, apice *paucidentato*.

Hab. In marsh, 2750 m., Kinangop Forest, Naiwasha Prov., Aberdare Mts., Kenya Colony, 2 Nov. 1934 ; coll. G. Taylor (1615).

This species belongs to a small group of which only two other species are known, viz. *S. crassicladum* and *S. truncatum* Warnst., the distinguishing feature of which is that the pores of the cells

of the branch-leaves are numerous and catenulate on the *ventral* surface of the leaf. In both these species the branch-leaves are broadly ovate, little inflexed in the upper part, and broadly pointed to truncate with several apical teeth. In the present plant the upper margins are strongly involute, so that the leaf tapers to an acute narrow point.

Andreaeaceae.

Andreaea kilimandjarica Par.—This interesting and remarkable species was collected on Ruwenzori, 4500 m., by L. Hauman in 1932 ; comm. T. Herzog (890).

Polytrichaceae.

Polytrichum piliferum Hedw. (syn. *P. nano-globulus* C. M.).—Namwamba Valley, 3200 m., Ruwenzori, Toro Distr., Uganda ; coll. G. Taylor (2994).

Polytrichum subformosum Besch.—Morogoro Distr., Uluguru Mts., 1500 m., Tanganyika Territory, 22 May 1933 ; coll. B. D. Burtt (4716). Virunga Mts., near Bihungi, 2300 m., Uganda, 1933 ; coll. W. J. Eggeling (934). Limuru, Kenya Colony, 5 Jan. 1908 ; coll. G. Balbo (105). The ♂ stems with inflorescences one above the other are a conspicuous feature of the species ; one stem of 4716 has as many as six of these annual inflorescences.

Fissidentaceae.

Fissidens pseudo-rufescens C. M.—Along Kangheta, 1500 m., Karama, Giombene, Kenya Colony, 12 Nov. 1921 ; coll. G. Balbo (9, 10). Faughi Valley, 1900 m., near Falls, Mufindi, Tanganyika Territory, 1 April 1934 ; coll. G. Balbo (4, 28).

Fissidens lineari-limbatus C. M.—On ground, Matonga R., Egoji, Kenya Colony, 26 June 1934 ; coll. B. Favaro (11).

Fissidens crateris Dix., sp. nov.

§*Bryoidium*. Pusillus ; caulis 4–5 mm. altus, plumosus, 6–7-juga. Folia siccitate paullo crispo-falcata, inferne minuta, mediana oblonga, vel oblongo-lanceolata, acuta, apiculata, ubique limbata, limbidio laminæ vaginantis *valido* ; costa validiuscula, haud sinuosa, sæpius percurrens ; lamina dorsalis *anguste decurrens*. Cellulæ 7–8 μ, hexagonæ, parietibus angustis ; lævissimæ, chlorophyllosæ. Folia superiora nunc medianis similia, plerumque autem multo longiora, angustiora, anguste acuminata.

Dioicum videtur. Seta brevis, 5–7 mm., infra thecam paullo dilatata. Theca *erecta, minuta*, operculata circa 1·5 mm. longa. Exothecii cellulæ *breviter rectangulares, seriatæ*, parietibus sat crassis. Operculum breviter conico-rostellatum, rectum.

Hab. Crater of Mt. Longonot, Brit. E. Africa, in subforest, circa 2500 m., Mar. 1922 ; coll. R. A. Dummer (5049 *b*, type ; 5051 ; 5052). Sur tronc, Masisi, Congo Belge, 23 Dec. 1914 ; coll. Dr. Bequaert (3622, Herb. Potier de la Varde).

A small species, distinguished by its leaves little crisped when dry, the dorsal lamina narrowly decurrent, and especially by the minute erect capsules. *F. brachycaulon* Broth. has cells 10 μ wide, the stem shorter, 4-juga, the seta longer, and the lid aciculate. Here it is shortly rostellate only, and usually rather obtuse.

Var. nov. **sererekae** Dix.—Minor. Seta *perbrevis*, 2–3 mm., pro plantula *crassa* ; theca deoperculata 0·5 mm. longa.

Hab. Sererekа, Kenya Colony, coll. G. Balbo ; 29 Jan. 1908 (63).

Fissidens rugifolius Dix., sp. nov.

§*Bryoidium*. E robustioribus Sectionis. Caulis 1 cm. altus, regulariter plumosus, foliis versus summum caulem sensim longioribus, siccis flexuosis, crispo-falcatis, 1·25–1·5 mm. longis, *oblongis*, *haud acuminatis*, *rotundato-apiculatis*, supra *fortiter corrugatis* ; costa angustiuscula, ubique subæqualis, supra vix sinuosa, pallida, cum apiculo desinens. Lamina vaginans ultra medium folium producta, lamina dorsali ad basin *lata*, *auriculata*. Limbidium angustum sed pernotatum, in lamina vaginante circa 3-seriatum, reliquo 1–2-seriatum, laminæ dorsalis plerumque paullo supra basin soluta.

Dioicus. Flos ♂ terminalis. Seta 4 mm. alta, *tenerrima*, pallida, flexuosa ; theca minuta, erecta, sicca urceolata ; operculum aciculare, *thecæ æquilongum*. Peristomii dentes alte, pulchre, tenerrime cristati.

Hab. Primary forest, 1200 m., on ant-hill, coll. A. S. Thomas ; 30 June 1935 (1359).

Fissidens thallangae Dix., sp. nov.

§*Pycnothallia* ; Glaucissimi. *F. glaucissimo* Welw. & Duby et *F. subglaucissimo* Broth. peraffinis. Ab illo differt limbidio laminæ dorsalis ad insertionem attingente, et foliorum apice latius, brevius acuminato ; ab ambobus colore *nullo modo glaucescente*, habitu robustiore, foliis *latioribus* (usque ad 0·25 mm. latis), et lamina vaginante *multo longiore*, circa 2/3 folii longitudinem vel paullo altius æquante. Theca horizontalis.

Hab. Damp ground, R. Loboli, Thallanga Forest, Imatong Mts., Uganda, 900 m., 16 Dec. 1935 ; coll. A. S. Thomas (1576).

Obviously near *F. subglaucissimus* Broth., but apparently sufficiently distinguished by the characters italicized above.

Fissidens crispo-pachyloma Dix., sp. nov.

§*Pachylomidium*. *F. pachyloma* C. M. et *F. pachylomoides* Varde affinis ; differt foliis siccis *fortiter crispatis*, etiam madidis

sæpe falcatis, multo brevioribus et latioribus, *nullo modo acuminatis*, *late acutis vel subobtusis*, *nonnunquam obtusis*, costa *sub apice* soluta, limbidio rufo *supra multo minus valido*, *haud apicem attingente*. Lamina vaginans circa dimidiam folii longitudinem æquans.

Hab. On rocks, along Massaoia, Kenya Colony, 20 Aug. 1908 ; coll. G. Balbo (127).

A very distinct plant with broadly pointed, almost obtuse leaves, and with a much less stout border than the African species, much crisped when dry and often strongly falcate when moist. A single interrupted row of larger hyaline cells usually occurs on each side of the nerve.

FISSIDENS LONGELIMBATUS Broth.—Tusu, Gasongoro, 2300 m., Kenya Colony, 2 Aug. 1908 ; coll. G. Balbo (54).

GRIMMIACEAE.

GRIMMIA ABYSSINICA Br. & Schimp.—Macchie, Kilimanjaro, 3900 m., 9 Dec. 1932 ; coll. Dr. Geilinger (4518). Mt. Meru, on lava rocks, 4500 m., Tanganyika Territory, 29 Sept. 1932 ; coll. B. D. Burtt (4053).

Grimmia longicaulis Dix., sp. nov.

Incertæ sedis ; sterilis. Habitu et statura cum *G. abyssinica* comparabilis, sed multo laxior, elatior, *laxifolia*. Caulis usque ad 5 cm. longus, parce divisus, fuscus. Folia patentia, sicca adpressa, incurva, subcatenulata, circa 2 mm. longa, e basi ovata, decurrente, amplexicauli, sensim late lanceolata, concavo-carinata, acuta, *hyalino-apiculata*, marginibus planis, integris, ubique fere 3–4-*seriatim bistratosis*. Costa validiuscula, *profunde carinata*. Cellulæ superiores *parvæ*, perdensæ, *valde irregulares*, incrassatæ, infra paullo majores, suprabasilares quadratæ et breviter rectangulares, *parietibus sinuosis*, basilares elongatæ, juxta-costales lineares, omnes parietibus firmis, incrassatis.

Fructus ignotus.

Hab. On ground, Limuru, Kenya Colony, 5 Jan. 1908 ; coll, G. Balbo (322).

A tall lax plant, in many ways of Barbuloid habit and structure, but the hyaline points to the leaves though short are quite distinct, while the supra-basal cells with sinuose walls are quite Grimmioid. The upper are very small and dense, incrassate with minute lumen, and very irregular in outline.

RHACOMITRIUM DEFOLIATUM Dix.—Pierres du lit d'un ruisseau, sous l'eau, étage alpin, 4200 m., Ruwenzori, Congo Belge, July–Aug. 1932 ; coll. L. Hauman, comm. T. Herzog (849). Only known from Mt. Kenya otherwise.

DICRANACEAE.

DITRICHUM PALLIDUM Hampe.—On damp rocks, 3200 m., Ruwenzori, Uganda, 7 Jan. 1935 ; coll. G. Taylor (2998 *a*).

New to Africa. A very interesting new example of the disjunct distribution of palæarctic plants on the high ground of tropical Africa ; the distribution of the species as given by Brotherus is the Central European plain and montane country, Caucasus, Japan, and North America.

TREMATODON AFRICANUS Wager.—Bank of ditch, Kampala, Uganda, 1015 m., Mar. 1936 ; coll. F. Chandler (1575). I cannot separate this from the S. African and Rhodesian plant.

TREMATODON INTERMEDIUS var. NANUS Welw. & Duby (syn. *T. Pechuelii* C. M.).—Fuaghi Valley, Mufindi, Tanganyika Territory, near falls, 1700 m., 20 Mar. 1934 ; coll. G. Balbo (42). Ibidem, near falls, 1900 m., 28 Mar. 1934 (30).

T. Pechuelii is the same as this, and I think it is best considered a variety of *T. intermedius*.

DICRANELLA HETEROMALLA (Hedw.) Schimp.—Tusu, Kenya Colony, ad jugum Gasongori, 2500 m., on ground, 12 Aug. 1908 ; coll. G. Balbo (81).

Another palæarctic species new to the African continent, though known from the Atlantic Is.

DICRANELLA CAMERUNIAE (C. M.) Dus.—Crater, in subforest, Mt. Longonot, 2500 m., Kenya Colony, Mar. 1922 ; coll. R. A. Dummer (5053).

DICRANELLA NODICOMA C. M.—Tusu, Gasongori, Kenya Colony, 2400 m., 7 Aug. 1908 ; coll. G. Balbo (203). Limuru, Kenya Colony, in forest, 3 Jan. 1908 ; coll. G. Balbo (254).

I doubt whether *D. falcularia* C. M. be distinct from this.

DICRANELLA RIVALIS C. M.—Kinangop, Kenya Colony, 4300 m., 26 July 1908 ; coll. G. Balbo (295).

Dicranella kenyae Dix., sp. nov.

Gracilis, *flavescens*. Caules sat elati, comose foliosi, foliis infra sat laxis, patulis, brevibus, supra *comosis*, undique patentibus, *siccis flexuosis*. Folia caulina e basi *brevi*, *amplexicauli*, *late obovata raptim in subulam prælongam loriformem integerrimam opacam*, *apice attenuatam*, contracta. Costa valida, male delimitata, subulam fere omnino implens. Cellulæ partis vaginantis *laxæ*, anguste rectangulares, subulæ angustissime lineares. Folia superiora et perichætialia abruptius contracta.

Dioica. Flos ♂ terminalis, polyphyllus, magnus. Seta pallida (ætate fusca), circa 1 cm. alta ; theca erecta vel suberecta, parum asymmetrica, fusco-rubra, ætate paullo microstoma, leniter plicata ; operculum longe, suboblique rostratum. Peristomii dentes irregulariter fissi, striolati, dense trabeculati.

Hab. On ground, Limuru, Kenya Colony, 5 Jan. 1908 ; coll. G. Balbo (210), type. Ibidem (68, 76). Giombene, Kenya Colony, 2000 m., 8 Nov. 1921 ; coll. G. Balbo (174, 443). Ibidem, 9 Oct. 1913 (116) ; 10 Jan. 1920 (269). Ntambelne, Giombene, 1800 m., 29 April 1920 (499). Tusu, Gasongori, Kenya Colony, 2400 m., 18 Aug. 1908 (482). Ing, along Gura, Kenya Colony, 6 April, 1908 (540).

A distinct species in the yellow colour, comose leaves, with long, flexuose, solid, quite entire subula abruptly contracted from the sheathing, very distinct base. The capsules are very slightly asymmetric, with small, scarcely oblique mouth.

Dicranella grandisopra Dix., sp. nov.

Fuscescens ; stricta ; caulis æqualiter foliosus, folia rigide divaricata, e basi vaginante late oblonga sat raptim in subulam contracta ; subula sensim angustata, supra tenuis, flexuosa, sæpius minute subdenticulata ; costa lata, male definita, partem superiorem subulæ fere omnem occupans ; cellulæ partis vaginantis lineares, majusculæ, pellucidæ, subulæ partis inferioris anguste lineares, partis superioris utroque latere 1–2-seriatæ, parvæ, breviter rectangulares, pellucidæ. Seta circa 1 cm. alta, vetustate fusca ; theca (vetusta) nigrescens, suberecta, paullo asymmetrica, plicata ; peristomii dentes infra fortiter longitudinaliter striolati, supra grosse papillosi. Spori *magni*, 20–25 μ, granulosi.

Hab. Giombene, Kenya Colony, 8 Nov. 1921 ; coll. G. Balbo (205).

In some respects like *Dicranella kenyae*, described above, but darker in colour, more rigid, leaves not comose, base less distinct, with longer areolation, subula gradually tapering, not so fully occupied by the nerve, subdenticulate, often markedly denticulate at apex ; and particularly distinct in the large spores.

HOLOMITRIUM AFFINE Card. & Thér. var. OBTUSIFOLIUM (Besch.) Thér.—Epiphytic, Mulange, Uganda, 1250 m., Dec. 1911 ; coll. R. A. Dummer (5623). Ibidem, Sept. 1919 (4236 *c*).

The plants of this group have been much divided and subdivided, on perhaps rather slight grounds, but the present is a very extreme form, with broadly spathulate leaves widely rounded at apex.

DICRANOLOMA BILLARDIERI (Schwaegr.) Par.—Ruwenzori, Congo Belge, circa 3000 m. in Ericetum ; July–Aug. 1932 ; coll. L. Hauman, comm. T. Herzog (44).

DICRANUM JOHNSTONI Mitt. (syn. *D. Stuhlmannii* Broth.).—Near Mt. Kenya, 1910 ; coll. A. Y. Allan (400). Masailand, Kenya Colony, 6 Jan. 1908 ; coll. G. Balbo (115). Tusu, Gasongori, Kenya Colony, 12 Aug. 1908 ; coll. G. Balbo (122).

CAMPYLOPUS SERRICUSPIS Thér. & Varde.—On rocks in exposed places on mountain top, 1800 m., Mt. Mpapwa, Dodoma Prov., Tanganyika Territory, 20 Aug. 1930 ; coll. P. J. Greenway (2431).

This agrees well with Verdoorn, M. Sel. et Crit. 12, only being a shorter denser growth, with nerve more longly excurrent. Forming an intermediate link, both geographically and structurally, it suggests a doubt whether the species be really distinct from *C. delagoae* (C. M.) Par.

CAMPYLOPUS DICRANOIDES Thér. & Nav.—Near Kampala; Uganda, 1926 ; coll. Miss M. S. Budd (1, 2).

A marked plant, which at the time I recognized as a new species, and gave it a herbarium name equally expressing the Dicranoid appearance. Since then, however, the same plant has been described from Ruwenzori by Thériot & Naveau in Bull. Soc. Roy. Belg. lx. 15 (1927), under the above name.

Campylopus Taylori Dix., sp. nov.

§*Eucampylopus*. Atrichi. Caules dense compacti, radiculis obruti, circa 4 cm. alti, supra flavo-virides, *inferne nigrescentes* ; folia substricta, suberecta, sicca parum mutata, a basi convoluta sensim angustata, subula aut brevi, stricta, aut longior, subcapillacea, integra vel apice 1–2-denticulata. Costa *lata*, circa 3/5 folii latitudinem implens, cellulis ventralibus magnis, parietibus tenuibus, quam duces multo majores ; dorso lævis. Cellulæ basilares rectangulares, juxta-costales 2–3-seriebus laxæ, inde angustatæ, marginales angustissimæ, limbum pernotatum instruentes ; alares *paucæ vel nullæ*, superiores minutæ. Theca æqualis vel subæqualis ; calyptra haud visa.

Hab. In burnt thicket, 3200 m., Kinangop, Nawasha, Aberdare Mts., Kenya Colony, 30 Oct. 1934 ; coll. G. Taylor (1630).

Distinguished by its slender, very compact, neat habit, the wide nerve, markedly bordered leaves, and almost total absence of distinct alar cells. *C. Lavardei* Thér. has slightly developed auricles and is without the marginal band of narrow cells. *C. paludicola* Broth. has a narrower nerve, small but developed auricles, the subula denticulate at margin, and the border of narrow cells much less or scarcely developed: (the description says that the cells are narrowed towards margin, but the figure does not depict them thus).

In Dr. Taylor's gathering two forms are shown, one fruiting, with longer, much more finely subulate leaves, the other sterile, with the subula much shorter and more rigid ; but structurally the two seem identical.

Atractylocarpus flexifolius Dix., sp. nov.

A congeneribus africanis differt habitu, *caulibus mollibus flexuosis*, cæspites molles, sericeos, virides, sat humiles instruentibus ; foliis *valde flexuosis, sæpe falcatis*, undique divaricatis, nullo modo strictis vel erectis ; *prælongis*, 1 cm. vel usque ad 1·25 cm. longis, e basi convoluta nitida capillaceis, apice denticulato, aliunde aut integris aut sæpius longe infra apicem minute sed distincte sat distanter denticulatis. Costa lata, tenuis, sectione cellulas bistratosas homogeneas exhibens.

Seta 2–2·5 cm., pallide rubra. Theca elliptica, brevis, deoperculata macrostoma, nigrescens, striata ; operculum æquilongum ; peristomium generis, pulchre rubrum, valde irregulare sed bene evolutum. Spori *parvi*, 12–14 μ.

Hab. On damp rocks, 3200 m., Namwamba Valley, Ruwenzori, Uganda, 7 Jan. 1935 ; coll. G. Taylor (2998 *b*, 3000).

As in most of the species of this genus there is little structural difference in the leaves from those of the allied species, but the habit and foliation are entirely different. In the other African species they are either comparatively shortly subulate, erect, and appressed, or if longer rather strictly falcate. Here they are soft, flexuose, and widely spreading when dry, or (in no. 3000) strongly falcate-circinate, but still soft and very flexuose in the subula. This too is frequently, perhaps normally, finely and distantly denticulate for some distance downwards.

Atractylocarpus capillifolius Dix., sp. nov.

Dense cæspitosus, *nigrescens*, nitidus ; caules condensati, erecti, *perdensifolii*, supra divisi, apice *penicillati*. Folia e basi convoluta sat cito capillacea, stricta, usque ad 1 cm. longa, apice pluridenticulata, infra plerumque integra, rarius parcissime distanter denticulata. Costa sat angusta, apud basin circa 1/7 folii latitudinem æquans. Seta *breviuscula*, circa 1·5 cm., raro 2 cm. Theca vetusta angusta, atro-fusca.

Hab. Mt. Kenya, 1924 ; coll. A. Y. Allan (1028).

Near to *Metzleria alticaulis* Broth. and *M. Naveauana* Thér., but with much longer, finer subula than the former, and very different from the latter in habit and colour, the tips of the branches being very conspicuously penicillate, and all the leaves more or less erect and appressed.

LEUCOBRYACEAE.

Ochrobryum obtusissimum Dix., sp. nov.

Ab omnibus congeneribus differt foliis *apice late rotundatis*, aut omnino obtusis aut, sæpius, minute apiculatis. Apex *cucullatus*. Cellulæ chlorophyllosæ sectione apud basin hypercentricæ, superne centricæ.

Fructus ignotus.

Hab. Mufindi, Tanganyika Territory, 1900 m., 1 April 1934 ; coll. G. Balbo (96), type. Near Bandowe, Chinteche, Nyasaland, 1935 ; coll. Miss A. Lillie (2539). Nchese Mt., Nyasaland, on tree-trunks in rain forest, 1500 m., 5 Sept., 1929 ; coll. J. Burtt Davy (1312).

The different gatherings vary somewhat in form of leaf, no. 2539 having shorter broader leaves than the others, but all agree in the widely rounded cucullate apex, much more obtuse than the S. American *O. obtusifolium* (C. M.) Mitt.

LEUCOBRYUM MAYOTTENSE Card.—Giombene, Kenya Colony, 2000 m., 8 Nov. 1921 ; coll. G. Balbo (146). Tusu, Gasongori, Kenya Colony, 13 Sept. 1908 ; coll. G. Balbo (300).

New to the African continent. A small species, with habit of *Ochrobryum*.

CALYMPERACEAE.

CALYMPERES OBTUSATUM Thér. & Nav.—On *Phoenix reclinata*, edge of forest patch, Entebbe Road, Uganda, circa 1200 m., June 1937 ; coll. P. Chandler (1699). Magi, 800 m., Usambara, 10 Aug. 1922 ; coll. Dr. Geilinger (1281).

POTTIACEAE.

HYMENOSTOMUM BRACHYPELMA (C. M.) Par.—Kenya Colony, coll. G. Balbo ; Karama, Giombene, along Kanghata, 12 Nov. 1921 (9). Associated with *F. pseudorufescens* C. M. Rather curiously, these two species were associated when originally described. Mogina, 1350 m., on rocks, 23 May 1911 (28). Forest, Giombene, 10 Jan. 1920 (145). Giombene, 2000 m., 8 Nov. 1921 (195). Nyeri Hill, 29 July 1929 (310).

HYMENOSTYLIUM CRASSINERVIUM Broth. & Dix.—Chania Falls, near Thika, Kenya Colony, practically in waterfall, 26 Aug. 1929 ; coll. Prof. Priestley and Miss Scott (46), probably from the original station. Kilimanjaro, coll. Bishop Hannington ; Herb. Mitten, as *H. xanthocarpum*. On ground, Karema Hill, Kenya Colony, 14 Feb., Jan. 1908 ; coll. G. Balbo (109). On rocks near fall, Seka River, Kenya Colony, Jan. 1908 ; coll. G. Balbo (447, 496).

HYMENOSTYLIUM CONGOANUM Dix. & Nav.—Along Seka, Kenya Colony, 23 Jan. 1908 ; coll. G. Balbo (455). A narrow-leaved form.

TRICHOSTOMUM RUWENZORENSE (Broth.) Broth.—Rocks along Seka, Kenya Colony, 23 Jan. 1908 ; coll. G. Balbo (316). Mufindi, Tanganyika Territory, coll. G. Balbo ; Fuaghi Valley, near falls, 1900 m., 1 April 1934 (4 *b*) ; ibidem, 1700 m., 3 April 1934 (73) ; ad cortices arborum 1900 m., 16 April 1934 (63) ; 1900 m., 3 Sept. 1933 (11). Nos 11 and 73 are in fruit, which I believe has not been described. Seta circa 5 mm., very thin, pale. Capsule small, cylindric, 2 mm. long or rather more, lid rostrate, about half the length of the capsule ; orifice red, with persistent annulus. Teeth orange-colour, in length about one-third the width of the orifice, filiform, rigid, irregularly connected, not papillose.

Trichostomum decurvifolium Dix., sp. nov.

Humile, sordido-viride ; caulis pauca mm. altus ; folia patula, sicca *arcuato-decurva* ; 3–4 mm. longa, *late oblongo-lingulata*, *ubique fere æquilata*, apice *rotundato*, *subobtuso*, cum *costa excurrente robuste longe apiculata*. Costa valida, fusca, excurrens. Cellulæ superiores *minutæ*, *perobscuræ*, parietibus tenuibus, *per totum folium* fere similes, *paucæ* tantum basilares majores, rectangulares, pellucidæ.

Cetera ignota.

Hab. Oni, near Leikipia, Kenya Colony, 23 April 1910 ; coll. G. Blabo (273).

A small plant, with leaves arcuate in a semicircle when dry, so that the upper part is usually pointing downwards. The leaves are somewhat like those of *T. brachydontium* Bruch, but more lingulate, almost obtuse with a strong apiculus or cusp at the apex ; they are specially marked by the absence of any distinct leaf-base, the leaf being neither widened nor narrowed at the basal part, and the basal cells while distinct occupying only a small part (one-tenth to one-eighth) of the length of the leaf.

Timmiella brevidens Dix., sp. nov.

Caulis brevissimus. Folia generis, sed apice *parce*, *leniter tantum denticulato*.

Inflorescentia *synoica* (seu paroica ? Antheridia infra archegonia ad basin floris feminei). Seta circa 1·25 cm., pallida. Theca e collo brevi cylindrica, leniter curvata, submicrostoma, exannulata ; operculum rostratum. Peristomium breve, circa latitudinem orificii æquans, rubrum ; dentes *recti*, nullo modo torquati, *inæqualiter*, *irregulariter fissi*, infra sublæves, supra papillosi. Spori 10–12 μ, læves.

Hab. Musandrama, Uganda, 1926 ; coll. Miss M. S. Budd (10).

Nearest, perhaps, in the peristome, to *T. flexiseta*, but distinct in the exannulate capsule, which, with the inflorescence, separates it from all the other species of the genus. The teeth are quite distinct from those of all the other species of the genus, not being filiform, but flattened below, and divided into two unequal crura, which are more or less united in all the lower part, without any visible basal cylinder. They are, in fact not at all the normal teeth of *Timmiella*, but rather of *Trichostomum* or *Didymodon* ; but the leaf-structure is exactly that of *Timmiella*.

TORTELLA THERIOTII Broth. & Varde.—Nyeri Hill, Kenya Colony, 29 July 1929 ; coll. G. Balbo (332).

Var. nov. **angustata** Dix. & Varde. Folia apice angustiore, subacuto ; cellulæ paullo minores.

Epiphytic in forest, 1200 m., Mulange, Uganda, Sept. 1919; coll. R. A. Dummer (4240).

This differs markedly from the type in having the leaves narrowed above, and the smaller cells, which in the type are 6–9 μ in diameter, but here 6 μ, while the basal cells there are 15 μ wide, here 12 μ.

Tortella syrrhopodontoides Dix., sp. nov.

Humilis, sordide viridis, cæspitosa. Caulis 1 cm. altus vel paullo ultra, tenuis, sublaxifolius. Folia patentia, subsquarrosa, sicca valde cirrato-torquata, 5–7 mm. longa, e basi *perbrevi*, late oblonga, subvaginante suberecta cito in subulam contracta *longissimam*, *loriformem*, *fragillimam*, canaliculatam, margine minute papilloso, apice sensim angustissime acuminatam, costa excurrente *longe cuspidatam*. Costa perlata, ad basin male delimitata, supra *circa* 1/3 *latitudinem laminæ* occupans, subconcolor, longe, pungenter excurrens. Cellulæ superiores (et laminæ et superficies ventralis costæ) quadratæ et subquadratæ, *longitudinaliter seriatæ*, sat distinctæ sed opacæ, parietibus tenuibus; partis vaginantis hyalinæ, anguste lineares, teneræ, supra sensim breviores, magis chlorophyllosæ, externæ ad summum partis vaginantis paucis seriebus oblique ad marginem adscendentes.

Fructus ignotus.

Hab. Chania Falls, Thika, Kenya, 26 Aug. 1929; coll. Prof. Priestley and Miss Scott (34 *a*).

A very striking delicate species, with very fragile, extremely long and narrow, loriform leaves, the lamina flattened out with the nerve occupying often a third of its width throughout. The basal hyaline cells ascend for a short distance only along the margins, often not quite so conspicuously as usual in the genus, but often quite markedly. The pale wide bases and much contorted laminæ when dry give the plant much the appearance of a *Syrrhopodon*.

LEPTODONTIUM PUMILUM (C. M.) Broth.—Entre les Alchemilles, étage alpin, 4450 m., Ruwenzori, Congo Belge, July–Aug. 1932; coll. L. Hauman, comm. T. Herzog (850).

LEPTODONTIUM GAMBARAGARAE Negri.—Kinangop, 4000 m., Kenya Colony, 20 Feb. 1910; coll. G. Balbo (570). E descr. this must certainly be Negri's plant. It is rather close to *L. pungens* (Mitt.) Par.

(To be continued.)

THE GENUS *TRACHYDIUM*.

BY CECIL NORMAN, F.L.S.

THOSE who have attempted to name plants which they suppose may belong to the genus *Trachydium* Lindl. will have realized before getting very far that it has fallen into utter confusion.

This paper is an attempt to introduce some measure of logical cohesion into our conceptions of the genus, and to show that most—probably all—of the plants that have been assigned to *Trachydium* since Lindley's day really belong to other genera. And here it may be as well to state at once that, since my primary aim is to show that the generic position of the plants concerned is at fault, I have usually assumed that the specific position is as described unless I have good evidence to the contrary.

Fig. 1.—Carpel of *Trachydium Roylei* Lindl.

The type-species is *Trachydium Roylei* Lindl.* (Royle Illustr. 232 (1835)), based on a plant collected by Royle in the Pir Panjal Pass in Kashmir. It is usually seen as a stemless plant with what appear to be a number of simple umbels arising from the crown. This appearance, however, is deceptive; the plant is not really stemless, though frequently the stem hardly emerges above the ground, and what appear to be simple umbels are the very long rays of a large compound umbel. This stemless habit is not at all uncommon in the alpine umbellifers of the Himalaya and neighbouring ranges, but has no taxonomic significance.

* I have taken the specimen in the Lindley Herbarium, Cambridge, as the type.

It may be due to the severe climatic conditions of the very high altitudes at which alone the plants that adopt it are found. Usually specimens with well developed stems will be met with—the result perhaps of less arduous conditions.

The fruit of *Trachydium* is very remarkable and will be best understood from the figure.

The plant is confined to the Western Himalayas, so far being known only from Kashmir and Kumuan. It is possible that it may occur also in the ranges to the north and north-west of Kashmir, but it is not known from the Eastern Himalaya nor from China.

From the first the genus was completely misunderstood, the authors of the 'Genera Plantarum' (i. 884 (1867)) most

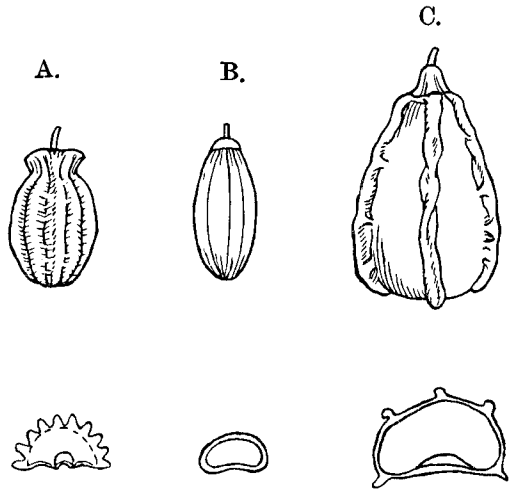


Fig. 2.—A, carpel of *Trachydium novem-jugum* C. B. Clarke; B, carpel of *T. dissectum* C. B. Clarke; C, carpel of *T. obtusiusculum* (DC.) C. B. Clarke (=*T. hirsutulum* C. B. Clarke).

surprisingly including *Haplosciadum* Hochst. and *Eremodaucus* Bunge in *Trachydium*. Boissier, in 'Flora Orientalis' (ii. 929 (1872)), apparently influenced by the 'Genera Plantarum' (though he very rightly retained *Eremodaucus* as distinct), transferred to *Trachydium* three species which he had originally referred to *Rumia*, viz., *T. depressum*, *T. Kotschyi*, and *T. elbrusense*. Of these (I have not seen the last) all that may be confidently stated is that they do not belong to *Trachydium* sensu Lindley, though the fruit is not unlike. They probably represent an undescribed genus.

Clarke, in the 'Flora of British India' (ii. 671 (1879)), dealt with five species, *T. Roylei* and his four new ones, viz.:—*T. novem-jugum*, *T. dissectum*, *T. hirsutulum*, and *T. obtusiusculum*. As will

be seen from the figures of fruits, all differ widely from that of the type-species, and all four must be transferred to other genera.

Thus:

T. novem-jugum C. B. Clarke=**Chamaesium novem-jugum**, comb. nov.

T. dissectum C. B. Clarke=**Schultzia dissecta,** comb. nov. (see note at end).

T. hirsutulum C. B. Clarke. This I believe to be only a burnt-up and stunted specimen of *T. obtusiusculum**.

T. obtusiusculum (DC.) C. B. Clarke=**Physospermopsis obtusiuscula,** comb. nov.

Of the many species described since Clarke's account was published the following belong to *Chamaesium* and *Physospermopsis* respectively:—

CHAMAESIUM Wolff (Notizbl. Bot. Gart. Berlin, ix. 275 (1925)).

T. Delavayi Franch. in Bull. Soc. Philom. sér. viii. vi. 110 (1894)=*Chamaesium novem-jugum* (C. B. Clarke) Norm.

T. spatuliferum W. W. Smith in Notes Bot. Gard. Edinb. viii. 210 (1914)=**Chamaesium spatuliferum,** comb. nov.

T. viridiflorum Franch. *loc. cit.* 111=*T. affine* W. W. Sm. in Bot. Survey India, iv. 374 (1913)=**Chamaesium viridiflorum,** comb. nov.

T. Markgrafianum Fedde ex Wolff in Fedde, Rep. xxvii. 304 (1930)=**Chamaesium Markgrafianum,** comb. nov.

PHYSOSPERMOPSIS Wolff (Notizbl. Bot. Gart. Berlin, ix. 276 (1925)).

T. rubrinerve Franch. *loc. cit.* 112=**Physospermopsis rubrinervis,** comb. nov.

T. Forrestii Diels in Notes Bot. Gard. Edinb. v. 291 (1912)=**Physospermopsis Forrestii,** comb. nov.

T. Kingdon-Wardii Wolff in Fedde, Rep. xxvii. 124 (1929)=**Physospermopsis Kingdon-Wardii,** comb. nov.

The remaining species not referred to above are listed below. Wherever possible the amended generic position is indicated, but new combinations are made only where this is reasonably certain.

In doubtful cases the genus (sometimes with an alternative) only is suggested. Nevertheless I do not doubt that even these plants should be excluded from *Trachydium*. It is generally easy to say what a plant is *not*; it does not follow that one can

* The type-sheet, in addition to specimens of *T. obtusiusculum*, comprises three specimens of *Potentilla coriandrifolia* Don.

say what it is. Especially is this true of Umbellifers, which are so often collected without fruit adequate for exact determination. The following species are imperfectly known :—

T. Dielsianum Wolff in Acta Hort. Gothob. ii. 300 (1926).

T. hispidum Wolff in Fedde, Rep. xxvii. 329 (1930). Franchet used this name in 1894.

T. Popovii Korovin in Nat. Syst. Herb. Hort. Petrop. v. 78 (1924).

T. simplicifolium W. W. Smith in Notes Bot. Gard. Edinb. viii. 346 (1915). A very distinct plant, but the genus must remain doubtful because the fruit is unknown.

T. tibetanicum Wolff in Fedde, Rep. xxvii. 122 (1929) : based on *Forrest* 1906. The specimen of this in British Museum is quite immature, but a plant collected by Ludlow at Gyantse which I think is conspecific has fruits which, though far from ripe, suggest that it might be a *Trachydium*.

T. trifoliatum Wolff, *loc. cit.* 125.

T. Wolffianum Fedde ex Wolff, *loc. cit.* 122.

The following species are excluded :—

T. astrantioideum de Boiss. in Bull. Soc. Bot. France, liii. 422 (1906)=*Pleurospermum Pulszkii* Kanitz.

T. chloroleucum Diels in Notes Bot. Gard. Ebinb. v. 290 (1912)= *Pleurospermum Hookeri* C. B. Clarke (sens. lat.).

T. daucoides Fr. in Nouv. Arch. Mus. Paris, sér. ii. viii. 245 (1885–6) =*Ligusticum daucoides* Fr.

T. fuscopurpureum Hand.-Mzzt. Symb. Sin. vii. 711 (1933), said to be doubtfully distinct from *T. purpurascens*, q. v.

T. garhwalicum Wolff, *loc. cit.* 124=**Chamaesciadium garhwalicum,** comb. nov.

T. hispidum Fr. in Bull. Soc. Philom Paris, sér. viii. vi. 113 (1894) =*Chamaesciadium* or *Ligusticum*. (This very common plant is never collected with ripe fruit. Why ?)

T. napiferum Wolff in Acta Hort. Gothob. ii. 300 (1906). Wolff himself thought this might belong to *Tongoloa* !

T. pimpinelloides (Hochst.) Norman in Journ. Linn. Soc. xlvii. 593 (1927)=*Gymnosciadium pimpinelloides* Hochst.

T. purpurascens Fr. *loc. cit.* p. 112=*Pleurospermum nanum* Fr. ? (Neither a *Trachydium* nor a *Pleurospermum* : genus doubtful.)

T. Rockii Wolff in Fedde, Rep. xxvii. 123 (1929)=? *Ligusticum*, see Fedde's note.

T. Souliei de Boiss. in Bull. Soc. Bot. France, liii. 422 (1906) ; " voisin du *T. purpurascens* "—the description of the fruit excludes *Trachydium*.

T. subnudum Clarke ex Wolff, *loc. cit.* 125=**Chamaesciadium subnudum,** comb. nov.

T. szechuanense Wolff in Acta Hort. Gothob. ii. 299 (1926) (see *T. variabile*).

T. tianshanicum Korovin in Bull. Univ. As. Cent. vii. suppl. 23 (1924)=**Aulacospermum tianshanicum,** comb. nov.

T. turkestanicum Lipsky ex O. et B. Fedtsch. Conspect. Flor. Turkest. iii. 123 (1909)=*Pleurospermum turkestanicum* Fr.

T. variabile Wolff in Acta Hort. Gothob. ii. 298 (1926)=*Carum* sensu Franchet.

Thus, if the foregoing account be accepted as substantially correct, the conclusion is reached that *Trachydium* remains a monotypic genus. The following specimens having more or less ripe fruits may be cited as typical ; all are in Herb. Kew. :—

Kashmir : *Falconer* 494, 495 ; Tragbol, *C. B. Clarke* 29267 ; Tilail, *C. B. Clarke* 30668.

Kumaun : Milam Glacier, *Strachey and Winterbottom* 6.

NOTE.—*Schultzia dissecta* (C. B. Clarke) Norman.

This differs from *Schultzia crinita* (Pall.) Spreng., to which it is very close, in having fewer and much less finely divided involucels and fewer involucres, which appear to have a tendency to fall. The following specimens must be referred to *S. dissecta*.

Baltistan : Chatpani nala, *Duthie* 13892 ; Karpuchu Valley, *Duthie* 11956 (both Herb. Brit. Mus.), also the specimen in Herb. Wallich from Kumaun to which a reference was made in *Journal of Botany* lxxv. 96 (1937).

I take this opportunity of thanking the authorities at the Cambridge Botany School and at Kew for the loan of many specimens, and of expressing my indebtedness to my friend Mr. A. H. G. Alston for his help and encouragement.

TWO QUEENSLAND IXORAS.

BY F. RAYMOND FOSBERG.

DURING work on the Rubiaceae collected by the Mangarevan Expedition of the Bishop Museum (see Fosberg, Bishop Mus. Occ. Pap. xiii. no. 19, 1937) the question arose of which of the two species named *Ixora triflora* had priority. Both were said to have been published in 1866. The fascicle of Seemann's ' Flora Vitiensis ' in which *Ixora triflora* (Forst.) Seem. was published is dated April 2, 1866. Inquiry at Kew resulted in the information that volume iii. of Bentham's ' Flora Australiensis,' in which

Ixora triflora R. Br. was published, though dated 1866, really did not appear until January 5, 1867, giving Seemann's species clear priority.

Since *Ixora triflora* R. Br. is closely related to other species of *Ixora* sect. *Phyleilema* I thought it best, before renaming it, to examine any available material to make certain that it is distinct. Several sheets were borrowed from the herbaria of the Botanic Garden, Brisbane, the Arnold Arboretum, and the Bishop Museum, Honolulu. Thanks are here expressed to Dr. C. T. White, Dr. E. D. Merrill, and Mr. E. H. Bryan, in charge of these collections respectively, for the privilege of examining this material. In all, three collections were examined, with several sheets of two of them, which had been credited to this species.

These specimens were found to represent two entirely distinct species, the *I. triflora* of R. Brown, here renamed *I. queenslandica*, and another species so different that it is a matter of some doubt whether it is correctly placed in the genus *Ixora*. Original descriptions of both are presented below to facilitate comparison.

Ixora queenslandica Fosberg, nom. nov.

Ixora triflora R. Br. in Benth. Fl. Austr. iii. 416, Jan. 5, 1867 (in part).

Non *Ixora triflora* (Forst.) Seem. Fl. Vit. 133, April 2, 1866.

Small tree, branchlets glabrous, slender, internodes up to 2·5 cm. long; leaves obovate to elliptic, blunt-obtuse at apex, cuneate at base, up to 7 cm. long and 3·5 cm. wide, thin-coriaceous, glabrous, petiole 4–6 mm. long; stipules only slightly connate, ovate, firm but with a noticeable thin wing at each side, strongly carinate toward the apex, not so near the base, beak very strong and slightly incurved, sharp or blunt, the whole stipule up to 4 mm. long, caducous; cyme of 3 sessile or subsessile flowers, the central one with a pedicel about 1 mm. long, peduncles up to 22 mm. long; bracts almost orbicular, cordate, apex rounded, petiole less than 1 mm. long, but lower 5 mm. of mid-rib thickened (as in *I. Setchellii*), bracts up to 2 cm. long and wide; hypanthium glabrous, 1·5 mm. long; calyx about 1 mm. long, rather sharply but remotely denticulate, slightly ciliate; corolla-tube 10–13 mm. long, or less in stunted cymes, 0·8 mm. thick, the four lobes up to 8 mm. long, 2 mm. wide, oblong-lanceolate, acute, somewhat contorted in bud; anthers up to 4 mm. long, linear-lanceolate, acuminate, sagittate at base, attached in the sinuses of the corolla, filament less than 1·5 mm. long; style filiform, up to 18 mm. long, exserted 4–5 mm., upper 1·5–2 mm. thickened and bifid.

Moore (Journ. Bot. lxiv. 216, 1926) gives the following information not available on the specimens before me: "corolla white; fruit subglobular, 6×5 mm."

Specimens seen: Queensland, Percy Is., Pine Island, scrub, March 1906, *Tryon* (Brisbane Herb.; Arn. Arb.); another specimen, fragmentary and without data, determined in F. M. Bailey's writing (sec. C. T. White) (Brisbane Herb.).

Although I was unable to borrow the type material of Brown's species I think there is little doubt that the Tryon specimens are identical with it, as they were compared by Moore (see Journ. Bot. lxiv. 216) and considered identical.

As originally described *I. triflora* R. Br. represented a confusion of the *Ixora* material with specimens of *Diplospora lorioides*. This confusion was pointed out by Spencer Moore (*loc. cit.*), and the species as here renamed includes only *I. triflora* R. Br. as limited by him, not in the original sense as published by Bentham.

It is difficult with the present lack of material of most of the species of *Ixora* sect. *Phyleilema* to make any suggestion as to the relationship of *I. queenslandica* with any of the other species. Certain similarities with *I. Setchellii* Fosberg are probably merely the result of parallel development. When more complete collections are available from Melanesia and the Papuan area relationships in this section of *Ixora* may become more obvious.

Among collections distributed by the Arnold Arboretum is a plant collected by L. J. Brass in Queensland, labelled "*Ixora triflora* R. Br." Dr. C. T. White suggested that this plant might represent a different variety. Open flowers and fruits are not present on the specimens, but careful dissection and examination of the flower parts shows features possessed by no other *Ixora* known to me. There is some doubt that it even belongs in this genus, but in the absence of fruit it would be unwise to set up a new genus for it, and the aspect and most other characters are those of an *Ixora*.

Ixora biflora Fosberg, sp. nov.

Frutex, folia elliptica vel oblonga vel obovata acuminata, cyma terminalis bracteata reducta ad flores solitarias vel geminates, hypanthium glabrum tarde hirtellum, corolla glabra 4-loba, antheres lata oblonga 1·2 mm. longa in alabastris dehiscentes.

"Shrub about 4 ft. tall," branchlets cylindrical, glabrous, woody almost to the tips, internodes up to 3·5 cm. long, frequently under 1 cm. on branchlets; leaves oblong to elliptical or slightly obovate, acuminate, "thin and soft, paler on under surface," up to 9 cm. long and 4 cm. wide, glabrous, base contracted, petiole 6 mm. long; stipules broadly ovate, not carinate except at apex which is prolonged into a sharp beak, the whole 4 mm. long; ultimate branchlets much condensed with imbricate bracts and their stipules, producing an appearance of terminal leafy buds, from which the corollas project singly or in pairs between a pair of leaf-like bracts, ovate, acuminate at apex, 1 1·5 cm. long, up to 8 mm. wide, obtuse at base, with a slight winged petiole less than 1 mm. long, the imbricate bracts sur-

rounding the flowers thin, pale green, elliptical, sharply acuminate, about 1 cm. long, 5 mm. wide ; flowers terminal, single or paired, sessile ; hypanthium about 1·5 mm long, glabrous at first, but after shedding of corolla becoming woolly-hirtellous ; calyx about 1·5 mm. long, membranous, cup-shaped, irregularly lobed, minutely fimbriate-ciliate, otherwise glabrous ; corolla white, glabrous, not known except from buds almost ready to open, typically *Ixora*-like but not or only slightly twisted, evidently nodding in bud, tube up to 14 mm. long, enlarged slightly at base and slightly funnel-form at throat, 0·8 mm. thick, lobes 6 mm. long, imbricate in bud, but not or only slightly contorted ; anthers broadly oblong, 1·2 mm. long, attached in the sinuses of the corolla, dehiscing, evidently introrsely, while the bud is still closed, showering the inside with pollen ; style completely undeveloped in the buds at this stage, represented only by a small conical prominence on the disk, but evidently deciduous, as it is represented only by a circular scar on an ovary which had just shed its corolla, the disk on this a raised somewhat irregular ring ; ovary of buds too young to make out anything with certainty, even with thin sections, the older ones attacked and destroyed internally by insects ; fruits unknown.

Specimens seen : North Queensland, slopes of Mt. Demi, rain-forests, alt. 2000 ft., Feb. 6, 1932, *L. J. Brass* 80 (type in Brisbane Herb., duplicates in Arnold Arb. and Bishop Mus.).

The unusual feature of the ovary becoming woolly after the shedding of the corolla is evident from the presence of glabrous young ovaries and woolly older ones on the Bishop Museum specimen.

The only plant that I can find mentioned which could be related at all closely to this is a little-known species from New Guinea, *Ixora coffeoides* Valeton, of which only the fruit and very young buds are known. It is excluded from *Ixora* by Bremekamp (Bull. Jard. Bot. Buitenz. ser. iii. xiv. 348, 1937), who suggests that it may come nearer to *Diplospora*. The latter genus, however so far as I know, never has a sclerified endocarp, which *Ixora coffeoides* has, in common with other species of *Ixora*. The lack of a concavity on the inner side of the pyrene is the most obvious difference which would exclude it from *Ixora*. Features of *Ixora biflora* different from other *Ixora* species are the short and broad anthers and the extreme retardation of development of the style. A delayed opening of the style-lobes to expose the stigmatic surfaces is a feature of the whole tribe Ixoreae. Also there is a vague suggestion in the sections of the very young ovaries available of more than one ovule in a cell, but the material is too young for the point to be determined with certainty. It would seem best to retain these two species in *Ixora* until flowers of *I. coffeoides* and fruits of *I. biflora* are available. Then their relationship and generic affinities may be determined more satisfactorily. At present neither can be placed in any of Bremekamp's subgenera.

The sheet of *I. biflora* in the Brisbane herbarium is designated the type, as it has the most flowers, though the more mature ovaries are on that in the Bishop Museum. The sheets in the Bishop Museum and the Arnold Arboretum may be considered isotypes.

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NOTES FROM THE BRITISH MUSEUM HERBARIUM.

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

Hibiscus shirensis Sprague & Hutch. subsp. nov. **bocarangaonsis**. *Suffrutex ramosus* usque ad 1·5 m. alt. *Rami* brunneo-pubescentes. *Folia* ovata vel rhomboideo-ovata brunneo-tomentosa, margine serrata, 20–40 mm. longa, 12–35 mm. lata ; petiolis 3–10 mm. longis. *Flores* rubri axillares. *Bracteolæ* lineari-lanceolatæ 4–5·5 mm. longæ 1·3–1·8 mm. latæ. *Calyx* 8–10 mm. longus, dentibus acutis. *Capsula* 10–11 mm. alta ; seminibus gossypinis.

Hab. Oubangui-Chari : Reg. Bocaranga, *Jean Eckendoff* 58 (type, Herb. G. Le Testu ; Herb. Brit. Mus.).

" Près du Rocher Noliri sur un rocher de granit haut de 15–20 m. et nu dans une fente du rocher. Hauteur 1·50 m. Fleurs couleur saumon."

This plant differs from the typical *H. shirensis* by the bracteoles, which are distinctly broader, and by the calyx-lobes.

Albizzia (Eualbizzia) **Eggelingii,** sp. nov. *Arbor* circ. 40-pedalis ad *A. glabrescentem* Oliver et *A. Warneckei* Harms accedens differt primo intuitu foliolis diversis. *Pinnæ* 3–4 jugæ ; foliolis 6–7 jugis glabris oblique rhomboideis apice acutis, basi late cuneatis, membranaceis, nervo medio subcentrali, 2–5 cm. longis, 1·2–2·2 cm. latis ; petiolulis brevibus ±2 mm. longis. *Inflorescentia* 5–10 cm. longa. *Pedunculi* axillares paniculati. *Flores* pedicellati. *Calyx* ±3 mm. longus dentibus brevibus. *Petala* superne lanceolata, 4–5 mm. longa. *Legumen* ±21 cm. longum, ±4 cm. latum, 10–12 spermum, stipitatum.

Hab. Uganda : Chua, *W. J. Eggeling* E. 3512 (type in Herb. Mus. Brit.) E. 3615 ; Budama, *W. J. Eggeling* E. 3511 ; on the banks of the Ora River Vula Forest, Rogen, W. Nile, E. 1935.

" Small leaved *Albizzia*. Young leaves yellowish pink. An umbrella-shaped tree 40 ft. high."

The leaflets of this plant are in 4–7 pairs ; they are obliquely rhomboid, pointed, base cuneate, 2–5 cm. long, 1–2·2 cm. broad. The central nerve is subcentral with 10–12 lateral nerves. The flowers are pedicellate, the calyx is ±3 mm. long, teeth triangular, acute, ±0·5 mm. long ; the petals are 4–5 mm. long. It differs from *A. glabrescens* Oliver by the pointed leaflet etc.

Pinnæ 1–2 jugate. Leaflets 4–6 pairs obliquely oblong rhomboid, obtuse	*A. glabrescens Oliv.*
Pinnæ 3–4 jugate. Leaflets 4–7 pairs, obliquely rhomboid, pointed	*A. Eggelingii*, sp. nov.

Erythrina Eggelingii, sp. nov. *Arbor* ad *E. tomentosam* R. Br. accedens usque ad 40 ped. alt. *Folia* trifoliolata, petiolis armatis, foliolis terminalibus rhomboideis 6–7 cm. longis, 6–7 cm. latis, subtus cinereo-tomentosis foliolis lateralibus inæquilateraliter ovatis 5–7 cm. longis 5–6 cm. latis, petiolis in specimine nostro 8–9 cm. longis. *Flores* in spicas pedunculatas dispositi. *Pedunculis* cinereo-tomentosi 11–16 cm. longi. *Calyx* cum laciniis 30–35 mm. longus, linearibus ±20 mm. longis. Petala ignota.

Hab. UGANDA : Lamogi, Keyo Gulu, *W. J. Eggeling* E. 1645 (type in Herb. Mus. Brit.) " Savannah tree to 40 ft. Flowers coral-red. Leaves tomentose, the petiole armed."

This species is allied to *E. tomentosa* R. Br. of which the type is at South Kensington. It differs in several important particulars. The tomentum is of a different colour, cinereous, not reddish brown. The petiole is strongly armed and the terminal leaflet is of a different shape. The laciniæ of the calyx are longer, ±20 mm.

In some respects it is allied to *E. sudanica* Bak. fil., but is at once distinguished by the long lobes to the calyx.

ERYTHRINA CAFFRA Thunb. var. nov. **mossambicensis.** *Arbuscula. Folia* trifoliolata foliolis terminalibus triangulari-ovatis glabris, 5–11 cm. longis, 6–8 cm. latis. *Calyx* bilabiatus 6–10 mm. longus. *Vexillum* 40–50 mm. longum. *Legumen* moniliforme, longe stipitatum, 3–6-spermum cum stipite 7–11 cm. longum, ±10 mm. latum.

Hab. PORTUGUESE EAST AFRICA : Niassa, Maniamba, *A. R. Torre* 523 (type in Herb. Coimbra).

" Arbusto simples na base e forte de 2 a 3 m. de alt. Flores côr de salmão. Planta medicinal indigena. Da casca fazem uma maceração contra dôres de ventre. Floresta aberta. Rara."

This differs from typical *E. caffra* Thunberg by the rather different shape of the terminal leaflets and by the pod, which is more longly stipitate and 3–6-seeded, stipes 35–50 mm.

STUDIES OF BRITISH POTAMOGETONS.—III.

BY J. E. DANDY, M.A., AND G. TAYLOR, D.Sc.

III. *POTAMOGETON RUTILUS* IN BRITAIN.

POTAMOGETON RUTILUS Wolfg. is an ally of *P. Friesii* and *P. pusillus* (*P. panormitanus*) * in the series *Pusilli connati*, characterized by closed (tubular) stipular sheaths. It is easily separated from *P. Friesii* by the more slender habit with narrower leaves which are gradually attenuate to a fine-pointed apex and are usually only three-nerved. From *P. pusillus* it is most conveniently distinguished by the stipular sheaths, which are firmer in texture, stronger-nerved, and more persistent than in Linnaeus's species, with a tendency to become fibrous in age ; they are tubular only towards the base. Judged from the available records over its area of distribution, *P. rutilus* is rare and local in its occurrence. Hagström (Crit. Res. 93–94), who did not then recognize it as a British plant, recorded it from Sweden, Denmark, Finland, Germany, Poland (then part of Russia) †, central Asia (Pamir), and North America. Fernald, however, in Mem. Gray Herb. iii. 14 (1932) pointed out that Hagström had confused an endemic American plant with the European *P. rutilus*, and in the same work (p. 59) gave the distribution of Wolfgang's species as " northern Britain, Holland, France and Scandinavia eastward to the Pamir ".

The first published record of *P. rutilus* from Britain was by Lees, who, in his ' Flora of West Yorkshire ' (1888), p. 418, reduced Wolfgang's species to a variety of *P. pusillus* and referred to it a plant collected at Dringhouses, Mid-west York. We have examined the specimen upon which this record was based and find that it is referable to the common *P. Berchtoldii* (" *P. pusillus* " Auct.), a species with open stipular sheaths. It is clear that Lees completely misunderstood *P. rutilus*.

The next mention of *P. rutilus* as a possible British plant was made by A. Bennett in Journ. Bot. xxxiii. 24 (1895). He remarked that in the Berne Herbarium was a sheet of specimens, labelled " *Potamogeton pusillum*. Ely, Cambridgeshire, 25 July, 1825 (*Henslow*, 1825) ", part of which were " true *pusillus* " (probably meaning *P. Berchtoldii* ‡) and part *P. rutilus*. The specimens were not mixed, and Bennett therefore suggested that a label might have been lost. We have not seen this sheet and are thus unable to confirm Bennett's determinations, but if genuine *P. rutilus* is really on the sheet there can be no doubt that his suggestion about a missing label is correct, for there is no other evidence that *P. rutilus* has been collected in Cambridgeshire,

* See the first of these notes (*supra*, pp. 90–92).

† The type of the species came from the vicinity of Vilna, now in Poland.

‡ We have seen material of *P. Berchtoldii* from Ely.

although the county has been thoroughly explored for Potamogetons by Fryer and others. In the same note Bennett referred sceptically to the record from West Yorkshire, remarking that the description given by Lees " will apply to several forms of *pusillus* " ; his scepticism, as we have seen, was justified.

In 1900 Bennett (in Journ. Bot. xxxviii. 65, t. 407) claimed to have established the certain occurrence of *P. rutilus* in Britain. The plate which was published to illustrate his paper was drawn from specimens mounted on a sheet presented by J. A. Power to the Holmesdale Natural History Club and subsequently bequeathed to the British Museum with C. E. Salmon's Herbarium in 1930. This sheet bears specimens of *P. pusillus* (named *P. rutilus* in Bennett's hand *) mixed with *P. pectinatus*, and the localities " Coventry Canal Atherstone " (Warwick) and " Marl Pits Fradley Staffordshire " are written in the right-hand bottom corner. At the end of the same paper (p. 67) Bennett also recorded *P. rutilus* from Anglesey (Llyn Coron, 1892, *J. E. Griffith*) and East Sussex (ditch near Rye, July 1898, *T. Hilton*), and added that he had other specimens from the Orkneys which might belong to the species but were insufficient for determination. We have examined all the plants concerned in these records and find that, like Power's specimens, they are referable to *P. pusillus*.

By 1915 it had been recognized that the plants from Sussex and the Midlands were not *P. rutilus*, for when Bennett dealt with that species in the last part of Fryer & Bennett's ' Potamogetons of the British Isles ' (pp. 82–83, t. 54†) he restricted its distribution in the British Islands to " England : Anglesea. Scotland : Orkney ? " The Anglesey locality, Llyn Coron, came to be regarded by British botanists as the *locus classicus* for *P. rutilus* in this country, and they visited the lake year after year in search of a species which apparently was never there. The plant which they gathered, *i. e.*, *P. pusillus*, could have been obtained with much less trouble in many other parts of the country ‡. Meanwhile the Orkneys continued to be regarded

* An annotation added by Pearsall in 1929 reads : " In my judgment this is a narrow-leaved form of *Pot. rutilus* Wolfgang."

† It is worthy of note that this plate was drawn from Swedish specimens of the true *P. rutilus*. Fig. 2, however, gives a very misleading impression of the stipular sheath, which should be tubular towards the base, not open as shown. The figure was drawn before Hagström placed *P. rutilus* among the species with tubular sheaths.

‡ We have been informed by Dr. R. W. Butcher that the plate published to illustrate *P. rutilus* in Butcher & Strudwick's ' Further Illustrations of British Plants ' (1930), p. 371, t. 389, was based on material from Llyn Coron. The plate appears, however, to represent at least two different species, for while the flowering branch shown in the left-hand top corner is *P. pusillus* the sterile plant forming the main part of the plate suggests *P. pectinatus*, as also does the " stipule " in fig. C. Fig. D shows the apex of a leaf with no midrib ; such a leaf is unknown in *Potamogeton*.

as a doubtful station for *P. rutilus*, until in 1924 Druce (in Bot. Soc. & Exch. Club Brit. Is. vii. 217) definitely recorded the species from Loch of Ayre, Holm, Mainland, on the basis of specimens collected by H. H. Johnston (Ref. 1997) in 1922. Again, however, the plant is merely *P. pusillus*. Johnston's specimens are identical with another Orkney plant, collected by J. W. H. Trail in Loch of Stenness, Mainland, on which Bennett based his *P. pusillus* var. *rigidus* in Scot. Naturalist, vii. 25 (1883).

In 1921 Druce (*op. cit.* vi. 152) recorded *P. rutilus* from the Shetlands with the remark : " New to Scotland, unless indeed Bennett's *P. pusillus*, var. *rigidus* is the same thing." Bennett's variety, as we have already pointed out, is referable to *P. pusillus*, but Druce's own specimens from the Shetlands (Bardister and Tingwall Lochs) are the genuine *P. rutilus* and thus his record of the species from the Shetlands is authentic. Druce, however, was not the first to collect *P. rutilus* in the Shetlands. The credit belongs to Beeby, who gathered specimens in Bardister Loch in 1890 and recorded them in Scot. Naturalist, xi. 30 (1891) as *P. pusillus* var. *rigidus* on the authority of Bennett, who evidently took a wide view of this variety. Beeby's specimens were collected nearly half a century ago, but their true identity has not hitherto been recognized. Druce (*tom. cit.* 528) in his ' Flora Zetlandica ' merely included Beeby's plant in parentheses under the name *P. pusillus* var. *rigidus*, with the remark that it required confirmation as it might be either *P. panormitanus* or *P. rutilus*.

Druce's ' Comital Flora ' (1932), p. 317, gave *P. rutilus* as occurring in four vice-counties : Anglesey (52), Caithness (109). Orkneys (111), and Shetlands (112). We have already dealt with the plants from Anglesey, the Orkneys, and the Shetlands. The record from Caithness was based, we are informed by Dr. R. W. Butcher, on material collected by him in July 1928. By his courtesy specimens have been sent to the British Museum ; they are referable to *P. pectinatus*.

More recently, in Bot. Soc. & Exch. Club Brit. Is. x. 845 (1935), *P. rutilus* has been recorded from Stirling and Lanark on the authority of determinations made by Pearsall. The Stirling plant (Grangemouth, 1934, *G. Taylor*) is *P. trichoides*, as pointed out in the second of these notes, pp. 170–171 *supra*. The Lanark plant (Glenbuck Reservoir, 1934, *G. Taylor*) is *P. pusillus*.

To summarize, *P. rutilus* as a British plant is known only from the Shetlands. The British records from counties outside the Shetlands are erroneous and refer to four different species : *P. pusillus* (Sussex, Warwick, Stafford, Anglesey, Lanark, Orkneys), *P. Berchtoldii* (York), *P. trichoides* (Stirling), and *P. pectinatus* (Caithness).

REVIEWS.

The Flora of Westmorland. By ALBERT WILSON. 8vo, pp. 413, 37 plates, map. T. Buncle & Co. : Arbroath. Price 25*s*.

ADDITIONS to our existing County Floras are always welcome, and especially, as in this instance, the first for a county. Part of Westmorland has been previously dealt with in J. G. Baker's ' Flora of the English Lake District,' but that appeared half a century ago. The present work is clearly set out, and is ornamented by beautiful photographs of scenery and plants.

The introductory part is well done. The topography and geology of the river basins—taken as the districts into which the county is here subdivided—are described, their noteworthy plants being listed. After an account of the climate, the botanical features are analysed, Watson's distribution-types being adopted. The section which follows, dealing with Early Pioneers in the county, is limited to two pages, and ends with Hudson (1730–1793), and no other biographical account of Westmorland botanists is given. This is regrettable, for there must be much useful matter thus omitted, and one of the duties of a County Flora is to supply information concerning the botanists as well as the plants. The Bryophyta and Lichens are included, but no Fungi or Algæ, and occupy more than one-third of the pages of records. One has the feeling that the whole work has been over-condensed and over-cut to make room for these Cryptogams. The good County Floras which deal only with Flowering Plants and Vascular Cryptogams make volumes sufficiently large, and the inclusion of Cryptogams in the same volume must tend either to unwieldiness or to undue excision of useful matter. That this excision has been made in some instances I happen to know, but there must be others unknown to me. For example, there is no mention under *Carum verticillatum* that Herb. W. M. Rogers has been searched (with some difficulty) for a voucher specimen. This was done, and the fact should have been mentioned in order to prevent others from wasting their time in similar effort. The fact that unavailing attempts have been made by present-day botanists to verify or bring up to date certain old records is also not always mentioned, and such information should certainly be given.

It is unfortunately easy to be critical of this type of work, for no matter how hard the author tries, he cannot make it complete. But it is generally possible to obtain assistance in certain necessary matters from those competent to give it, such as specialists in various genera, curators of the great collections, and someone with knowledge of the Rules of modern nomenclature. This seems not to have been done systematically here, and unless it is done such works suffer seriously, which is a special pity since County Floras can appear only at long intervals.

No attempt has been made to obtain up-to-date information concerning certain critical genera. This should have been seriously collected for a few years and the results sent to specialists, so that at least the broad lines of the modern position could be given. But *Rhinanthus* has a mere seven lines under *R. minor*, whereas I collected a *Rhinanthus* at Meathop this June, and found it to be *R. stenophyllus* (Schur) Druce. Similarly, no attempt has been made to deal with *Thymus*, *Taraxacum*, *Centaurea nigra*, and *Chenopodium album* forms, etc. The great Herbaria have not been properly consulted, *e. g.*, the specimen of *Cypripedium* in Herb. Mus. Brit. is not dealt with, and certainly that rarity requires better treatment than it gets.

Many records are given for *Orchis praetermissa* Druce, some as "type," but from my experience I suspect that they will all prove to be the var. *pulchella*, which is best placed, as Mr. Pugsley has done, under *O. purpurella*. Is there any *O. praetermissa* in the County ? Has the material been verified by any expert ? Have the specimens of *Fumaria muralis* been seen by Mr. Pugsley ? In view of the rarity of that species (most records being erroneous) they cannot otherwise be accepted, and if they have been verified by Mr. Pugsley the fact should have been stated. Is the *Hieracium aurantiacum* really *H. brunneocroceum* Pugsl. or not ? Why is *Saxifraga platypetala* Sm. "Incognit." ; and what exactly does this "Incognit." signify ? One of the objects of such a Flora should be to get all such doubtful or even questionable records properly verified and checked.

Certain definite errors exist. The *Senecio* is not *S. integrifolius* (L.) Clairv., but *S. spathulaefolius* (Gmel.) DC. [really subsp. *maritima* (Syme), comb. nov., and not the typical plant]. The nomenclature is sometimes peculiar, the earlier name being given as a synonym of the later, e. g., *Carex filiformis* L. under *C. lasiocarpa* Ehrh., *Claytonia sibirica* L. as a synonym (which it is not) of *C. alsinoides* Sims. Other names are quite contrary to present day Rules of Nomenclature, e. g., *Juncus sylvaticus* Reichard, which is a homonym of *J. sylvaticus* Huds.=*Luzula sylvatica* (Huds.) Gaud.

I make these criticisms as examples because it would have been better had they been prevented before publication by proper consultation of experts, who are generally willing to give assistance. Had this been done in MSS. stage errors and slips would be mostly eliminated. It is not that the work has been careless. It is good (except for the map, which is poor and even lacks the subdivisions used),so far as it goes. It is a generally sound compilation and a useful addition to the botanical library, but after such a great amount of labour has been put into it a little wider co-operation could have made it much better.—A. J. W.

Wild Flowers in Britain. By ROBERT GATHORN-HARDY. 8vo, pp. viii, 120, endpieces, 100 photographs, 4 colour lithographs and text-figs. B. T. Batsford, Ltd.: London, 1938. Price 8*s.* 6*d.*

POPULAR books on botany are not attractive as a rule, usually because either they are written in a sloppy manner or with a disdain for academic botany both old and new. The present book is certainly attractive if only on account of the hundred photographs, many of them magnificent, as is to be expected from Messrs. R. M. Adam and E. J. Bedford, who are responsible for most of them. There are also over twenty line-drawings, which, though mostly good, are not of the same standard as the majority of the photographs; and four colour lithographs which, though decorative, are disappointing.

The text is such as can be read as an arm-chair essay. There is a good deal of sound botanical observation written in a personal style likely to appeal to those with little or no previous botanical knowledge, giving the joy of the search for the more attractive rarer plants and the botanical pleasures to be derived from the hedge-row, the riverside, the woodland, the sea-shore, and the mountains.

The book is said to be written by an amateur for amateurs, and it should appeal to a wide public.

The author states that " In the early 1850's a piece of *Elodea* from the Oxford Botanical Gardens fell into the Cherwell " and so accounts for the beginning of what became for some time a scourge of navigable water-ways. A conflicting story is that it escaped from the Cambridge Botanic Garden into Vicar's Brook and thence to the Cam, and, causing trouble to the bargemen, was named by them *Babingtonia damnalis.* The first reliable record is from near Market Harborough, October 1847, but equally interesting as its spread and gradual subsidence would be to learn the method of its arrival in this country.

One or two other problems arise from what the author writes which suggests that his matter is stimulating; there are very few slips. The general get-up is excellent, except that when the brightly coloured jacket is worn the cover is too light for reasonable handling.

Kryptogamenflora der Mark Brandenburg. Band vii. Lief. 3. *Ascomycetes.* By W. KIRSCHSTEIN. 8vo, pp. 305–448, 10 text-figs. Gebrüder Borntraeger: Berlin. Price R.M.12.

MYCOLOGISTS will greet with pleasure the signs of renewed vitality in the 'Kryptogamenflora der Mark Brandenburg.' The first and second parts of the Ascomycetes appeared in 1907 and 1911 respectively. Part 3 deals with the Sphaerellaceae, and is by W. Kirschstein. It is to be hoped that the remaining parts of the volume will now be pressed forward, for we are sadly in need of an up-to-date treatment of most groups of Pyrenomycetes. So far as one is able to judge from descriptions alone, the work appears to be well done. It follows the usual scheme with a key to the genera and keys to the species. Fourteen genera are treated—four are new. *Plectosphaerella* is a new name for *Ascospora*; *Batschiella* a new genus differing from *Guignardia* in having coloured spores; *Mycotodea* a new genus with eleven species formerly mostly placed in *Leptosphaeria,* but distinguished from *Saccothecium* by coloured spores; *Thyrospora* a new genus (monotypic) distinguished from *Pleosphaerulina* by coloured spores, and *Jaapia* (monotypic) differing by multisporous asci. The main part of the work is the treatment of *Sphaerella* with 111 species, ten of which are new. The name *Sphaerella* is used instead of *Mycosphaerella* under the impression that *Sphaerella* is a conserved name by the International Rules. None of the names in the lists of fungi have yet been voted on and the result of *Sphaerella* v. *Mycosphaerella* is still in abeyance. The name *Jaapia* has been applied to one of the new genera to commemorate the well-known Mark collector Otto Jaap—an unfortunate *lapsus* for the name has been used by Bresadola for a well-characterised resupinate Basidiomycete.

Manual of Pteridology. By FR. VERDOORN and others. Pp. xx, 640, 121 illustrations. Martinus Nijhoff: The Hague, 1938. Price 24 Guilders.

DR. VERDOORN has followed his excellent 'Manual of Bryology' with a similar work on the Ferns. Aided by twenty-one collaborators he deals with the group from many different aspects. The book has sections on morphology, anatomy, mycorrhiza, galls, cytology, ecology, classification, etc., each by a different author. It is quite the most comprehensive work on the subject and forms an indispensable work of reference for every botanical library.

In a short review like the present it is impossible to mention every section, but it is worth noting that Dr. Christensen here propounds his views on a new classification, a great improvement on the current one of Prantl, as he takes up many of the ideas put forward by Bower and other morphologists and reduces them to a system.—A. H. G. A.

Compendium van de Terminologie, Nomenclatuur en Systematiek der Zaadplanten. By A. A. PULLE. Pp. 338, 1 plate, text-figs. N. V. Oosthoek : Utrecht. Price 4.50 Guilders.

THE best praise that can be given to this book is to say that it is a pity it is in Dutch. It will be invaluable to the students for whom it is written, but some such work would be useful in this country both for those beginning the study of systematics and for amateurs. As the title indicates the book is in three parts. The first (pp. 15–70) deals with terminology, and is based on J. W. Moll's 'Handbook'; it gives the Latin equivalents of the terms defined. The part on nomenclature (pp. 73–127) is a valuable summary of the International Rules with explanatory examples. The third part is a synopsis of the classification of flowering plants (Spermatophyta) with descriptions of the families illustrated by floral diagrams. In this part there are some modifications of existing systems, and these are explained in an introduction to the section. Dr. Pulle, who is Director of the famous Utrecht Herbarium, is well qualified to have opinions on the subject, and fortunately he has issued an English translation of the introduction which can be obtained from the publisher.

Four subdivisions of the Spermatophyta are distinguished: Pteridospermae, Gymnospermae, Chlamydospermae [=Gnetales], and Angiospermae. In Gymnospermae the Coniferae are divided into four orders: Araucariales, Podocarpales, Pinales, Cupressales (Cupressaceae, Taxodiaceae), and Taxales (Cephalotaxaceae, Taxaceae).

The orders of Angiospermae agree more or less with Wettstein's classification. The author's ideas of relationship here are summarized in a figure with circles of different size and colour, arranged in eight series; it is a phylogenetic tree "on the crown of which we look from above, but whose dense foliage does not allow us to see the structure of its branches." Like several other eminent systematists Dr. Pulle expects that the system of classification will undergo many changes in the future: "but it does not seem to me that the time for a revolution of the present system has arrived yet. We can only progress by small steps and that is the reason why the arrangement given here is mainly conservative."

An Introduction to Laboratory Technique. By A. J. ANSLEY. 8vo, pp. xiii+313, 121 text-figs. Macmillan: London. Price 12*s.* 6*d.*

THOUGH this book is written primarily for those engaged in teaching physics, there is a mass of information in it which will make it a useful *vade-mecum* for a botanical laboratory. Thus, for example, the first chapter—the care of laboratory

equipment—is one of general applicability. Of the fourteen chapters those on Cements, lutes, and solvents, Glass-blowing and glass-working, Optical projection of lantern-slides, and Soldering of metals, contain much which botanists will find helpful: the other chapters deal mainly with physical apparatus. There are several useful tables.

The book is written in a clear style with sufficient theory to make the practice intelligible. The index provides a necessary short-cut to the information needed.

The British Mycological Society Transactions, xxi. parts iii. and iv., contains several important papers. F. K. Sparrow describes some Chytrideaceous fungi from North Africa and Borneo, Miss D. Lloyd records two years' continuous observation on *Blastocladia Pringsheimii*, C. G. Dobbs gives a valuable account of the life-history and morphology of *Dicranophora fulva*, H. D. Gordon has determined that the beetle *Cartodere filum* is responsible for eating the spores of dry fungi in the laboratory and herbarium, Y. S. Sabet describes the growth of *Penicillium egypticum* a perithecium-forming species from soil, S. P. Wiltshire treats with thoroughness the original and modern conceptions of the genus *Stemphylium*, B. B. Mundkar records *Ustilago sorosporoides* from India, and T. Petch provides a welcome monograph of the British Hypocreales.

Lebensgeschichte der Blütenpflanzen Mitteleuropas, III. ii. Lief. 58–59, pp. 1–176, 101 figs. Stuttgart: E. Ulmer. Price 11 R.M.

THE parts of this valuable work are appearing at present with refreshing speed. The most recent number begins the treatment of Leguminosae by Willi Christiansen. The genera treated are *Lupinus* (3 spp.), *Agyrolobium*, *Laburnum* (3 spp.) *Cytisus* (9 spp.), *Sarothamnus*, *Ulex*, *Cytisanthus*, *Genistella*, *Genista* (7 spp.), *Ononis* (7 spp.), *Trigonella* (3 spp.), *Melilotus* (5 spp.), *Medicago* (8 spp.), and *Trifolium* (29 spp.). The fact that so many Leguminous plants are of economic importance makes the present part of particular value.

BOOK-NOTES, NEWS, ETC.

MIDLAND NATURALISTS' UNION.—Representatives of Natural History Societies in the Midlands, meeting in the rooms of the Birmingham Natural History and Philosophical Society on June 18th, unanimously decided to form a Midland Naturalists' Union, membership of which is open to Natural History, Archæological, and similar Societies in the counties of Monmouth, Hereford, Worcester, Warwick, Leicester, Rutland, Nottingham, and Lincoln.

It is intended to organise an Annual Congress, several Field Meetings, and in the larger towns a number of lectures during the winter months. A list of lecturers willing to visit Societies, a panel of referees for specimens, and information in the various groups of plants and animals and other branches of Natural History and Archæology, and a system of lantern-slide exchange among members, are also being organised. It is felt that the Union will facilitate co-operative work among the Societies as well as bringing workers into touch with others in their own branches of the subject. Further information may be obtained from the Hon. Secretary, G. BRIAN HINDLE, 55 Newhall Street, Birmingham.

DR. ALEXANDER EIG, lecturer in Applied Botany at the Hebrew University in Jerusalem, has recently died at the age of 43. Dr. Eig was born at Minsk, Russia, and went to Palestine before the war, and when the British army advanced through the country he joined the 41st Royal Fusiliers. He wrote many papers on the flora of Palestine and compiled a Hebrew botanical dictionary.

THE Sociedad Mexicana de Historia Natural intend to celebrate "the centenary of the cellular theory which was founded by" M. J. Schleiden and T. Schwann by publishing a special volume containing "papers relating to problems of the cellular theory and kindred subjects." Biologists of all countries are invited to contribute. Schleiden-Schwann Medals will be awarded to the two most meritorious contributions, one of them being reserved for a resident of the Mexican Republic. January 31, 1939, is the final date for the acceptance of papers.

L'ABBÉ BOURDOT.—Subscriptions are asked towards the cost of placing a commemorative plaque and medallion of this eminent mycologist in the church of Saint-Priest-en-Murat (Allier), where he was priest for thirty-nine years. The treasurer is M. R. d'Astis, 79, boulevard Saint-Marcel, Paris (13e).

ERRATUM.—*Journal of Botany*, lxix. (1931) 312, l. 24. For *C. tuberosus* × *arvensis* read *C. tuberosus* × *acaulis*. I have never seen the former hybrid. [With regard to the latter, I took from Silbury Hill a root of apparent *Cnicus acaulis* and grew it on in my garden, and it developed a strong resemblance to *C. tuberosus* × *acaulis*; but the root was destroyed when I left Bloxham. It might be worth while following up the clue.] It is doubtful if pure *C. tuberosus* now grows at Avebury; cultivation has shown that the apparently pure plant I gathered there was really the hybrid with *acaulis*.—H. J. RIDDELSDELL.

ERRATUM.—For *Chlaenosciadrum* in legend to fig. 1, p. 199 of this volume, read *Chlaenosciadium*.

TROPICAL EAST AFRICAN MOSSES.—PART I. ACROCARPI.

BY H. N. DIXON, M.A., F.L.S.

(Concluded from p. 228.)

Leptodontium filicaule Dix., sp. nov.

Caules *filiformes*, flexuosi, inter alios muscos intertexti, 2–3 cm. alti, parce iterum ramosi, *propter folia remota, sicca incurvo-adpressa, catenulati*. Folia minuta, 0·5–0·75 mm. longa, erecta, adpressa, rarius apice patulo, sicca incurvo-adpressa; late oblongo-lanceolata vel ovato-lanceolata, decurrentia, acuta, marginibus planis, parte superiore argute, fortiuscule inæqualiter dentatis. Cellulæ *distinctæ, haud incrassatæ*, hexagonæ, 10–12 μ latæ, papillosæ, per totum fere folium æquales, ad infimam basin tantum paullo elongatæ. Costa sat valida, fusca, dorso sparse papillosa, infra apicem desinens.

Cetera ignota.

Hab. In burnt thicket, 3200 m., Kinangop, Naivasha, Aberdare Mts., Kenya, 30 Oct. 1934; coll. G. Taylor (1630 *b*).

A very distinct species in the habit, filiform stems, minute, erect leaves, etc. *L. tenerascens* Broth. is more robust, with denser foliation and lax basal cells. *L. subfilescens* Nav. & Thér., which appears to resemble it in habit, has also the lower margins revolute and the basal cells rectangular and pellucid.

Leptodontium rhynchophorum Dix., sp. nov.

Gracilescens. Caulis 3 cm. altus vel ultra. *L. sublævifolio* Broth. affine; differt caule interrupte folioso, nodoso; foliis *longissime angustissime decurrentibus*, marginibus *planis*, plerumque *integerrimis*, raro apice denticulatis, costa *longe infra apicem desinente*, foliis plerumque in subulam *longam recurvatam, canaliculatam, proboscoideam, fragilem*, prolongatis; cellularum lumine *haud angulato*, rotundato vel elliptico, incrassato; cellulis basilaribus haud papillosis, parietibus *haud sinuatis, omnibus perincrassatis*.

Hab. Kinangop, Aberdare Mts., Kenya, 3 Jan. 1909; coll. G. Balbo (104 *b*).

Distinct, I think, from *L. sublaevifolium* Broth. in the characters italicized, and remarkable for the long, canaliculate, fragile, proboscis-like prolongation of the leaf.

PLEUROCHAETE SQUARROSA (Brid.) Lindb.—Crater, in subforest, 2500 m., Mt. Longonot, Kenya Colony, Mar. 1922; coll. R. A. Dummer (5040). New to Central Africa. This may be *P. Beccarii* Vent., but if so, I cannot think it specifically distinct from *P. squarrosa*.

DIDYMODON PAUCIDENTATUS (C. M.) Broth.—Kampala, Uganda, 1926; coll. Miss M. S. Budd (47). On rocks in forest, 2250 m., along Massioia, Tusu, Kenya Colony, 7 Aug. 1908; coll. G. Balbo (396). Ibidem, Limuru, 5 Jan. 1908 (58). Giombene forest, 2000 m., Kenya Colony, 9 Oct. 1913; coll. G. Balbo (349), f. *subintegra*.

Didymodon (*Erythrophyllum*) **sublingulatus** Dix., sp. nov.

Dense cæspitosus, terrestris, 1 cm. altus vel paullo ultra, supra sordide viridis, infra rufescens. Folia laxiuscule disposita, madida patula, sicca crispata, 2 mm. longa, 0·3–0·35 mm. lata; e basi *haud vel* vix latiore *oblongo-lingulata*, carinata, late acutata, marginibus *omnino planis*, ad apicem *argute*, *subspinulose denticulatis*, *apiculo longo hyalino* coronatis. Costa sat valida, dorso carinata, *supra obscura*, sub apice desinens. Cellulæ superiores 6–7 μ, obscuræ, papillosæ, subquadratæ, infra medium folium minus obscuræ, sensim majores, suprabasilares magnæ, subquadratæ, subpellucidæ, parietibus subincrassatis; basilares laxæ, hyalinæ, longe rectangulares, parietibus tenuibus.

Fructus ignotus.

Hab. Bamboo forest, Musandama, Uganda, 1926; coll. Miss M. S. Budd (5).

A well-marked species in the broad leaves, scarcely widened at base, plane margins, acutely toothed apex with pellucid teeth and long hyaline apiculus. The basal areolation also is distinct, the lax hyaline median cells rising much higher in the leaf than the short, subquadrate, more or less chlorophyllose marginal cells of the lamina, which descend at margins to near the insertion.

The hyaline bases and white glossy back of the nerve in the lower part give an almost Calymperoid appearance to the stems when dry.

The specific epithet is given from the form of the leaves, not from any relation to another species.

Didymodon rigidifolius Dix., sp. nov.

Cæspitosus, circa 2 cm. altus, atro-viridis, infra fuscus. Folia laxiuscula, madida *rigide patentia*, sicca *erecta*, *appressa*, *stricta*; 1–1·25 mm. longa, e basi ovato-triangulari lanceolata, sensim late acutata, apice *hyalino-apiculata*, marginibus inferne fortiter revolutis, supra planis, integris; costa validissima, ad basin longe decurrens, *supra dense alte papillosa*, cum apice dissoluta. Cellulæ superiores parvæ, obscuræ, humiliter papillosæ, parietibus tenuibus, versus basin paullo majores, longiores, basilares vix inanes.

Fructus ignotus.

Hab. On rocks by river, 1950 m., Buliganya, Uganda, 1928; coll. Miss M. S. Budd (29).

Rather like *D. strictifolius* Dix. & Varde, of S. India, but with more distant smaller leaves and a marked hyaline apiculus.

It is very distinct from all the other African species. It may, of course, possibly be a *Barbula*; but it is very unlikely.

TORTULA LONGIROSTRIS (Hampe) Par.—On rocks, 4100 m., Mt. Elgon, Nyanza Prov., Kenya Colony, 22 Feb. 1935; coll. G. Taylor (3582).

The geographical interest of this plant is equalled only by the complexity of its synonymy! It was collected by Schimper in Abyssinia, "in alpe Deggen altitud. 12,000', 3 Mart. 1840," and described by C. Müller in the 'Synopsis' as *Pottia longirostris* Hampe. (It was issued in the 'Musc. Abyssin.' as *Gymnostomum longirostre*, and Hampe had probably written to C. Müller criticizing this and suggesting *Pottia* as its generic position.) *P. longirostris* has not been recorded elsewhere. The Mt. Elgon plant agrees exactly with Schimper's specimen. But it also agrees exactly with the South American *Tortula limbata* Mitt., collected by Jameson "in summo monte Pichincha," and not found since. It is therefore known from three summits, one in the Andes, one in Central Africa, and one in Abyssinia, all at altitudes of over 3500 m. I do not know if there is any parallel to this remarkable case of geographical distribution among flowering plants; it is only paralleled among mosses, I think, by *Aongstroemia julacea* (Hook.) Mitt., recorded only from Mt. Everest, at just above 6000 m. (the highest known station for any moss), from four stations in Natal, ranging from 2000 m. to 3000 m., and from one or two of the highest Andes.

As to the correct name for the plant—the true position is in *Tortula* §*Zygotrichia*; but this was not recognized at first owing to its having the most unusual character, for the genus, of being entirely without peristome. It was on this account placed in *Gymnostomum* by Bruch and Schimper, and Taylor, and in *Pottia* by Hampe.

The South American plant was named *Gymnostomum Jamesoni* by Taylor in 1848, but this was invalidated under *Tortula* by the earlier homonym *T. Jamesoni* Mitt. Mitten therefore altered it to *Barbula limbata* in 1851, and to *Tortula limbata* in 1869.

The Abyssinian plant was described as *Pottia longirostris* in the 'Synopsis' in 1849, and this gives the earliest valid specific epithet. Paris (Index Ed. ii. v. 47) credits Brotherus with the combination *Tortula longirostris*, but this is an error; Brotherus only writes "Wahrscheinlich gehort auch *Pottia longirostris* Hamp. aus Abyssinia hierher," and this cannot be considered the creation of a new combination, which must be attributed to Paris. The synonymy will therefore stand thus:—

TORTULA LONGIROSTRIS (Hampe) Par. Ind. ed. ii. v. 47 (1906).

Syn. *Pottia longirostris* Hampe e C. M., Syn. i. 552 (1849).
Gymnostomum Jamesoni Tayl. in Lond. Journ. of Bot. 1848, p. 279.

Barbula limbata Mitt. in Kew Journ. of Bot. iii. 154 (1851).
Tortula limbata Mitt. in Journ. Linn. Soc., Bot. xii. 168 (1869).

Tortula tanganyikae Dix., sp. nov.

§*Syntrichia*. Sat robustus, humilis, atro-rufescens. Caulis brevis, simplex, *comoso-foliosus*, folia *subpatentia*, sicca *fortiter incurvo-torquata*, *nervo dorso nitente*, 3–4 mm. longa, e basi vix latiore, ad insertionem contracta, *late oblongo-spathulata*, inde *raptim breviter late acuminata*, acuta vel subacuta. Margines infra revoluti, superne plani, ad summum apicem sæpius indistincte subdenticulati. Costa pervalida, fusca, superne sensim angustata, subpercurrens. Cellulæ basilares juxtacostales per partem breviusculam folii hyalinæ, laxæ, late rectangulares, marginales seriebus pluribus minores chlorophyllosæ, ad basin attingentes. Cellulæ superiores magnæ, 12–16 μ, rotundatæ vel ellipticæ, *collenchymaticæ*, *perdistinctæ*, papillis humilibus latis præditæ; marginales haud mutatæ. *Propagula pernumerosa subclavata*, chlorophyllosa, vix pedicillata, pluricellularia, ad costam et folii apicem inveniuntur.

Fructus ignotus.

Hab. Mufindi, Tanganyika Territory, 2 May 1934; coll. G. Balbo (41).

A very marked species in the rather unusual form of the leaves, shortly and widely, rather abruptly acuminate from a broad oblong or subspathulate lamina. *T. Cardoti* Thér. & Nav. from the Belgian Congo is perhaps the nearest, but has leaves not acuminate and scarcely acute, with the nerve excurrent in an abrupt apiculus, margins plane, leaves bordered with narrow cells, and is a much smaller plant.

CINCLIDOTUS FONTINALOIDES (Hedw.) P. Beauv.—Tusu, Gasongori, 2280 m., Kenya Colony, 2 Aug. 1908; coll. G. Balbo (301). In Africa known only from Algiers.

ORTHOTRICHACEAE.

LEPTODONTIOPSIS FRAGILIFOLIA Broth. Mayopa, Ighembe, 1800 m., Kenya Colony, 28 April 1920; coll. G. Balbo (409).

Leptodontiopsis macrocarpa Dix., sp. nov.

Stirps *robusta*, elata, caulibus 5–6 cm. altis, rigidis, parce ramosis, cæspites magnos, altos, instruentibus. Folia confertissima, haud fragilia, e basi suberecta leniter squarrosa, sicca subtorquata, divaricata; circa 4 mm. longa, e basi erecta pallida *obcuneata*, superne 0·8 mm. lata, longe lanceolata, sensim angusto acuminata, acutissima. Margines plani, apud apicem irregulariter eroso-denticulati. Costa angustiuscula, *in cuspidem peracutum* excurrens. Cellulæ ellipticæ vel subrotundæ, perincrassatæ, distinctæ, dense papillosæ, basilares omnes angustissime lineares, pellucidæ, læves.

Seta nonnunquam lateralis, 2–2·5 cm. alta; theca *magna*, cleoperculata 4 mm. longa, e collo distincto elliptico-cylindrica, microstoma, orificio plicato, gymnostoma. Calyptra longa. Spori 22–25 μ, muriculati.

Hab. Epiphytic on tree, 2750 m., Kinangop Forest, Naiwasha, Aberdare Mts., Kenya, 31 Oct. 1934; coll. G. Taylor (1633).

Much more robust than *L. fragilifolia* Broth., with larger sporophyte etc. Differs from *L. elata* Dix. in the broad leaf-base, widening upwards, and very narrow acumen.

ZYGODON MICROTHECA Dix.—Limuru, Kenya Colony, 5 Jan. 1908; coll. G. Balbo (57).

Zygodon micro-gemmaceus Dix., sp. nov.

§*Euzygodon*. Gracilis; sordide pallide viridis, cæspitosus. Species distincta foliis integerrimis, sensim breviter acuminatis, margine uno latere late recurvo, cellulis distinctis, incrassatis, papillosis, 8–11 μ latis; propagulis pernumerosis, *minutis*, *paucicellularibus*, subellipticis vel subrotundis, obtusis, 35–40 μ longis, raro 50–55 μ. Inflorescentia dioica videtur. Seta pallida, circa 5 mm., theca obovata vel elliptica, majuscula, plicata; operculum rostratum, curvatum, peristomium *nullum*. Spori 18–24 μ; annulus vix evolutus.

Hab. Summit of Observation Point, Namwamba Valley, Ruwenzori, Uganda, 4300 m., 10 Jan. 1935; coll. G. Taylor (3085), type. Ibidem, epiphytic in heath zone, 3200 m. (3091).

Especially distinct in the minute subrotund gemmæ, perhaps the smallest of any species, of the type of *Z. erosus*. I have found no trace of peristome, in a capsule from which I removed the operculum, and I think there is no doubt that it is truly gymnostomous.

MACROMITRIUM PERUNDULATUM Broth.—Kenya colony, coll. G. Balbo, varr. locc. Tusu (162). Ibidem, along Massioia, 2280 m. (299, 422). Giombene, in forest, 2000 m. (381). Nyeri Hill (436). Mostly sterile. The leaves vary considerably in the degree of undulation.

MACROMITRIUM MEGALOSPORUM Thér. & Nav.—Kinangop, Aberdare Mts., 4000 m., on *Erica*, 20 Feb. 1910; coll. G. Balbo (263).

FUNARIACEAE.

PHYSCOMITRIUM SPATHULATUM C. M.—Crater, 2500 m., in subforest, Mt. Longonot, Kenya Colony, Mar. 1922; coll. R. A. Dummer (5046 *b*).

Exactly the same as the South African plant.

SPLACHNACEAE.

TAYLORIA CAMERUNIAE (C. M.) Broth.—Nyeri Hill, Kenya Colony, 29 July 1929; coll. G. Balbo (191). Tusu, Gasongori, 2500 m., on trees, 12 Aug. 1908; coll. G. Balbo (125).

Tayloria limbata Dix., sp. nov.

Gracilis, mollis, circa 2 cm. alta. Folia laxiuscula, sicca valde contracta, mollia, 3·5–4·5 mm. longa, e basi decurrente paullo angustiore late longe oblongo-lanceolata, *longe teneriter acuminata*, marginibus inferne angustissime recurvis, supra planis, *valde irregulariter, distanter, argute, sæpe fortiter* denticulatis. Costa sat angusta, *longissime excurrens*. Cellulæ laxæ, 22–25 μ irregulares, elongato-hexagonæ, hexagono-rhomboideæ, rectangulares, etc., infra sensim majores, laxiores, rectangulares, marginalibus circa 2-seriebus *perangustæ, lineares, limbum angustissimum, bene evolutum*, supra medium folium productum instruentes. Cetera iguota.

Hab. On trees, Tusu, Kenya Colony, 18 Aug. 1908; coll. G. Balbo (298).

Only a single stem was found, mixed with other mosses, but so distinct in the bordered leaves that it seems worth while to describe it. The only hesitation I have had is whether it might possibly be a *Brachymenium* of the *Orthocarpus* type, in which the leaves are somewhat similarly bordered; but the upper areolation, not rhomboid but irregularly hexagono-rectangular, and often actually widely rectangular, seems clearly to show it is not a Bryoid moss. The leaves are much contracted, but not spirally contorted when dry.

BRYACEAE.

MIELICHHOFERIA MILDBRAEDII Broth.—In burnt thicket, 3200 m., Kinangop, Aberdare Mts., Naiwasha Distr., Kenya Colony, 30 Oct. 1934; coll. G. Taylor (1632).

MIELICHHOFERIA CRATERICOLA Broth.—Damp rocks near summit, 3400 m. Mgahinga, Virunya Mts., Uganda, 22 Nov. 1934; coll. G. Taylor (197).

Webera kenyae Dix., sp. nov.

Gracilis, terrestris, inter alios muscos crescens; caulis breviusculus, subrigidus. Folia patula, oblongo-lanceolata, paullo decurrentia, marginibus *planis*, apice subdenticulatis; costa *latiuscula, tenuis, ubique male definita, sub apice dissoluta*. Cellulæ anguste rhomboideo-lineares. Dioica. Seta 2–2·5 cm. alta, flexuosa. Theca nutans, e collo perbrevi *turgide ovalis*, leptodermica, cellulis exothecii *valde mamillose protuberantibus*, irregulariter isodiametricis, parietibus crassis, valde flexuosis. Operculum conicum. Annulus angustus. Peristomium pallidum; dentes flavi, ubique *dense papillosi*, paullo irregulares, leniter trabeculati; endostomii membrana circa 1/3 altitudinem dentium æquans; processus dentibus æquilongi, *papillosi*, flavidi, *lineares, haud perforati*, irregulares; cilia 0. Spori 18 μ, aurantiaci.

Hab. Tusu, Gasongori, Kenya Colony, 2300 m., 7 Aug. 1908; coll. G. Balbo (493).

The structure of the fruit, the plane margins, etc., separate this from all the African species. *W. decurrens* Ren. & Card. has strongly decurrent leaves, a differently formed capsule, etc. *W. grammophylla* (C. M.) differs in the autoicous inflorescence, smooth outer teeth, and carinate rimose processes. *W. Heribaudii* (Ren. & Card.) has quite different fruit, as in *W. chrysoblasta* Thér. & Nav.

BRACHYMENIUM SPEIROCLADUM C. M., forma.—Disused ant-hill, Lake Nabugabo, Uganda, circa 1200 m., July 1937; coll. P. Chandler (1723). Ibidem, on root of tree in forest (1728).

I name this with some doubt, as the border is extremely narrow and the leaves are almost entire. In other characters, however, including the fruit, it agrees.

BRACHYMENIUM VARIABILE Dix.—Karema Hill, 1800 m., Kenya Colony, 8 Nov. 1908; coll. G. Balbo (255).

ANOMOBRYUM SULCATUM Thér. & Nav.—Rocks, 2000 m., Bulago, Bugishu, Uganda, 28 Aug. 1932; coll. Botanist, Dept. of Agriculture, Uganda (351). A beautiful, highly glossy, pale green plant, forming cushions 20 cm. across.

ANOMOBRYUM COMPRESSULUM (C. M.) Broth.—Rocks on road to Butandika, near stream, Uganda, 1928; coll. Miss M. S. Budd (21). Trees along the Karamayo Road, circa 2000 m., Sabei, Uganda, 1928; coll. Miss M. S. Budd (23 *a*). Chania Falls, Thika, Kenya Colony, 26 Aug. 1929; coll. Prof. Priestley and Miss Scott (36).

ANOMOBRYUM FILIFORME (Dicks.) Husn.—Kenya Colony, coll. G. Balbo; viz. along Kagongoine, 12 Feb. 1915 (40); along Massioia, 20 Aug. 1908 (64).

Anomobryum latirete Dix., sp. nov.

Robustum, elatum, *rufescens*, subnitidum. Caules 2–3 cm., densifolii; folia erecto-patula, sicca *appressa, contracta, valde carinata*, 1·5 mm. longa, latissime oblongo-ovata, *cochleariformia*, apice *cucullato-inflexa, acuta*. Costa *infra pervalida*, pulchre rubra, superne sensim attenuata, sat longe sub apice soluta. Cellulæ superiores *breves, parvæ*, regulariter rhomboideæ, circa 3×1, 12–15 μ latæ, parietibus firmis; inferne paullo elongatæ, parum latiores, *haud laxæ*, infimæ tantum anguste rectangulares, parietibus rubris, incrassatis.

Cetera ignota.

Hab. Tusu, Kenya Colony, on rocks, 2280 m., 20 Aug. 1908; coll. G. Balbo (375).

Very distinct from all the African species, in habit coming near to some robust Himalayan forms. When moist the habit is not particularly Anomobryoid, but in the dry state the appressed, often incurved leaves, strongly carinate with the broad reddish nerve, but narrowed by the incurving of the margins, are very remarkable. It is one of the most robust of the African species.

BRYUM PLANO-MARGINATUM Dix.—Nyeri, Kenya Colony, 20 April 1908; coll. G. Balbo (494). Singhiro Valley, near Mogoro, 1300 m., Kenya Colony, 12 May 1915; coll. G. Balbo (16). Keja, 1200 m., Kenya Colony, 8 Sept. 1912; coll. G. Balbo (34). Egoji, Kenya Colony, 1934; coll. B. Favaro (7, 25). Etage alpin, 4650 m., Ruwenzori, Congo Belge, July–Aug. 1932; coll. L. Hauman, comm. T. Herzog (885).

This has turned up in numerous localities, and seems to keep its characters well, but has not yet, I believe, been found fruiting.

Bryum subintegridens Dix., sp. nov.

§*Caespitibryum* (veresimiliter). Humilis. Caulis sat laxifolius, folia sicca leniter contorta (haud spiraliter torquata), vix decurrentia, basi rubra, ovato-lanceolata, breviuscule acuminata; margines recurvi, *valide limbati*, integri. Costa *ubique valida*, rubro-fusca, in cuspidem crassiusculum breviter excurrens. Cellulæ sat laxæ, minusculæ, marginalis seriebus pluribus lineares, incrassatæ.

Synoicum. Seta 3–4 cm. alta. Theca horizontalis vel nutans, fusca, e collo longo distincto clavata, sub ore haud contracta; operculum hemisphærico-apiculatum. Peristomium sat pallidum; dentes intus fortiter lamellati; endostomii membrana altiuscula, processus triangulari-lanceolata, *anguste tantum rimosi*, *nonnunquam subintegri*. Cilia prælonge appendiculata. Spori parvi.

Hab. Tsangui, Kenya Colony, 22 Oct. 1915; coll. G. Balbo (185), type. Ibidem, forest, on rocks, 2000 m. (416).

The only nearly allied African species appears to be *B. rhomboidale* Thér. This is placed in *Trichophora*, to which section the present plant may possibly belong. The inflorescence is, however, dioicous in that species, the processes are widely gaping, and the nerve and border are considerably weaker. *B. inclusum* C. M. has ovate or subglobose capsules.

Bryum stenophyllum Dix., sp. nov.

§*Erythrocarpa*. Gracile, humile, *rufescens*, *nitidum*, *habitu B. erythrocarpi*. Caules perradiculosi. Folia parva, decurrentia, *anguste lanceolata*, acuminata, marginibus *planis*, superne denticulatis; costa sat tenuis, nunc percurrens, nunc sub apice soluta. Cellulæ pellucidæ, parietibus tenuibus, in medio folio laxiusculo

rhomboideæ, margines versus *sensim angustatæ*, *illic lineares*, *limbum latum sed male definitum* instruentes. Cellulæ basilares perlaxæ.

Seta circa 1·5 cm. alta, ad apicem abrupte arcuata. Theca nutans, *longa et angusta*, 4 mm. longa, pulchre badia, e collo *longo* defluente saturatius colorato anguste clavata, sub ore leniter contracta, operculo alte conico, apiculato, nitido. Peristomium aurantiacum; dentes *inter se remoti*, infra oblongo-lineares, pallide marginati, dorso pulchre regulariter papillosi; endostomium membrana alta, flavida, sparse papillosa, processus superne tantum *anguste rimosi*; cilia 2–3, appendiculata. Spori 16 μ.

Epiphytic in tree heath zone, 3200 m., Namwamba Valley, Ruwenzori, Uganda, 10 Jan. 1935; coll. G. Taylor (3092).

A pretty little species with leaves in form and structure quite Weberoid.

B. usambaricum Broth. has a short turgid capsule and revolute margin. The capsule here is remarkably narrow and elongate.

BRYUM LEPTO-TORQUESCENS C. M.—Buliganya, on rocks by river, 1900 m., 1928; coll. Miss M. S. Budd (24 *b*).

Agrees well with Dusen, no. 208.

BRYUM AREOBLASTUM C. M.—Mogina, Kenya Colony, 23 May 1915; coll. G. Balbo (267).

The St. Thomé plant has more acute and cuspidate leaves, but the Cameroons plant (234, Herb. Besch.) agrees quite well.

Bryum rectitheca Dix., sp. nov.

§*Alpiniformia*. Habitus et color *B. alpini* robustioris. Folia angusta, e basi *sensim leniter angustata*, *ad apicem latiuscula*, *inde cito brevissime angustata et longiuscule cum costa crassa excurrente cuspidata*. Margines ubique fere revoluti; cellulæ *breviter* rhomboideæ; costa *pervalida*, rubro-fusca, versus apicem *parum angustata*, longe crasse excurrens.

Seta circa 2 cm. alta; theca saturate purpureo-fusca, *siccitate erecta vel suberecta*, Brachymenioidea; e collo longiusculo pernotato clavato-elliptica, circa 4 mm. longa, *microstoma*, operculo conico, acuto, nitido. Peristomii dentes inter se remoti, opaci, lanceolati, aurantiaci, late marginati, dense lamellati, linea media valde angulata. Endostomium plus minusve adhærens, male evolutum; processus *lineares*, *irregulares*, vix pertusi. Exothecii cellulæ parvæ, valde irregulares, parietibus *crassissimis*.

Hab. On boulders, 3000 m., Mt. Debasien, Uganda, 1936; coll. W. J. Eggeling (2697).

Leaves much more robust and less concave than in *B. convolutifolium* Dix. It is very near to the South African *B. Wilmsianum* C. M., but that appears always to have broader leaves,

rather laxer cells, and a shorter and wider capsule. Sim unites it with *B. subconcavifolium* Par., which he says is recorded from Mt. Elgon, but that, whatever it is, is an unpublished species. The leaves here are rather marked in their apical form. They are scarcely lanceolate, generally tapering gradually from the base to a rather wide apex, which is then abruptly and very shortly contracted and forms with the excurrent nerve a stout, often long, cuspidate point.

Bryum microdontum Dix., sp. nov.

§*Rosulata*. A congeneribus facile distinctum foliis haud rosulatis, per caulem *æqualiter dispositis* ; folia sat parva, 3–4 mm. longa, superne 1 mm. lata, e basi multo angustiore obovato-spathulata, marginibus inferne revolutis, superne *anguste* limbatis, dentibus *parvis, haud argutis* præditis. Costa ad basin valida, supra multo attenuata, in cuspidem integram *brevem sæpius erectam* excurrens. Cellulæ parvæ, parietibus tenuibus, marginales 2–3-seriebus lineares, incrassatæ, limbum angustum distinctum formantes.

Cetera ignota.

Hab. On ground, Egoji, Kenya Colony, 15 Aug. 1934 ; coll. B. Favaro (1), type, Motonga R., Egoji, 26 July 1934 (24). Oubangui, W. Tropical Africa, coll. Eckendorff, 7 Sept. 1934 (*cf.* Rev. Bryol. et Lichen. ix. 204 ; as var. *compactum* P. de la V.).

Sufficiently distinct in the leaves arranged equally along the stem, not rosulate, with rather narrow border and small, not very acute teeth.

Bryum spiralifolium Dix., sp. nov.

§*Rosulata*. *B. microdonto* supra descripto *habitu et foliorum dispositione* simillimum, sed foliis longioribus, laxioribus, marginibus peranguste revolutis, limbo *validiore*, dentibus *longioribus, acutioribus, subspinulosis*. Folia sicca in se *fortiter spiraliter torquata*, et circum caulem leniter contorta.

Fructus ignotus.

Hab. Chania Falls, Thika, Kenya Colony, 26 Aug. 1929 ; coll. Prof. Priestley and Miss Scott (43).

The resemblance of this and the last species in the non-rosulate, equally distributed leaves is curious, and rather disconcerting. The toothing of the leaves, however, is so different that they cannot be united. The border here, too, is much stronger, not only by the more numerous rows of cells but by their being much more incrassate. It is rather notable, too, in that it seems constantly narrow at the extreme apex of the leaf, then much stronger (circa 4-seriate or more), just above the widest part of the leaf, then narrowed again towards the base.

The leaves of *B. microdontum* show an approach to the remarkable cork-screw-like twisting in the dry state as shown here, but not nearly so markedly.

Rhodobryum Preussii (Broth.) Par.—Damp rocks among herbage, 3200 m., Namwamba Valley, Ruwenzori, Uganda, 7 Jan. 1935 ; coll. G. Taylor (2961).

Rhodobryum minutirosatum (C. M.) Broth.—Kenya Colony ; coll. G. Balbo ; viz., near Mogoro, 1300 m., on ground, 8 Nov. 1921 (286) ; Giombene, forest, 1850 m., near Koghio, 8 Feb. 1921 (356) ; Ighembe, 8 Nov. 1921 (615). Mufindi, Tanganyika Territory, 1800–1900 m., 1934 ; coll. G. Balbo (34, 59, 74).

Rhodobryum plano-roseum Dix., sp. nov.

Habitu *R. rosei* sed paullo minus ; *pallide* viride. Folia comalia *latissime obovato-spathulata*, 7–8 mm. longa, superne 4 mm. lata, apice rotundato-acuta, cum costa excurrente cuspide acutissima denticulata terminata ; margines *omnino plani*, e medio folio conferte, argute, mediocriter spinuloso-dentati. Costa ad insertionem validissima, cito attenuata, breviter excurrens. Cellulæ sat parvæ, late hexagono-rhomboideæ, marginibus 2–3-seriebus angustissimæ, limbum angustum, sæpe male definitum instruentes. Cetera ignota.

Hab. Forest thicket near L. Nabugabo, Uganda, circa 1000 m., July 1937 ; coll. P. Chandler (1722).

Well marked in the rather short, small, very widely spathulate leaves, with quite plane margins. An undescribed species from Nyasaland has leaves with a similar outline, but with revolute margins.

Bartramiaceae.

Bartramia angustissima Dix., sp. nov.

§*Vaginella*. Humilis, densifolia, viridi-aurantiaca. Folia sicca atque madida *stricta, suberecta*, 5 mm. longa vel paullo ultra, e basi oblonga, *albescente, nitida, sensim* angustata, *angustissime longissime ligulato-subulata*, acutissima, marginibus ubique planis, superne conferte denticulatis ; costa sat angusta, ubique distincta, plerumque breviter excurrens. Cellulæ superiores opacæ, sed haud obscuræ, breviter lineares, parietibus pellucidis, quæque *papilla spiculosa* prælta ad apicem superiorem prædita ; cellulæ basilares omnes lineares, pellucidæ, læves, juxta-costales sat latæ, marginales seriebus pluribus angustiores, limbum latum male notatum instruentes.

Fructus ignotus.

Hab. On tree ferns, 2500 m., Kampala, Uganda, 1928 ; coll. Miss M. S. Budd (30).

Although certainly belonging to the Section *Vaginella*, this differs from all species known to me in the very narrow base, little wider than the lower part of the lamina, into which it tapers quite gradually—the form of the leaf is in fact almost that of *B. pomiformis*, but the structure is quite different. The

plane margins, very long and narrow leaves, and the high spiculose papillæ are also marked characters.

PHILONOTIS MARANGENSIS Broth.—Numerous localities in Kenya Colony and Uganda. On rocks in stream, Amami, Lukongo R., 800 m., S. Usambaras, Tanganyika Territory, 13 Nov. 1935; coll. P. J. Greenway (4153). A highly variable plant. A very striking form, possibly worthy of specific rank, was collected by Prof. Priestley and Miss Scott at Nanyuki, Mt. Kenya, in Cedar forest (6), with very rigid stems, densely matted with tomentum, the leaves rather distant, rigidly appressed and incurved when dry, so as to be somewhat spirally catenulate.

PHILONOTIS MICROTHAMNIA Broth.—On road cutting, 1375 m., Kilembe, Ruwenzori, Uganda, 19 Dec. 1934; coll. G. Taylor (2610).

PHILONOTIS MAURITIANA Aongstr.—Kampala, Uganda, 1200 m., Mar. 1936; coll. P. Chandler (1585).

BREUTELIA STUHLMANNII Broth. (syn. *B. auronitens* Negri).—Kinangop, Aberdare Mts., on ground, Kenya Colony, 26 July 1908; coll. G. Balbo (446). Ibidem, 4000 m., 20 Feb. 1910 (470). Ibidem, 4300 m., 3 Jan. 1909 (469). In damp turf, Muhavura, Uganda, 2900 m., 1933; coll. W. J. Eggeling (998), a slender form with deflexed leaves. In *Podocarpus-Erica* forest above 3000 m., southern slope of Kilimanjaro between Umbwe and Weru Weru Rivers, 30 Aug. 1932; coll. P. J. Greenway (3158).

In Smithsonian Miscell. Colls. 69, no. 2, p. 20, I have expressed a doubt whether *B. auronitens* is really specifically different from *B. Stuhlmannii*. I have no hesitation now in uniting them. Negri, it may be recalled, himself speaks of their close relationship, distinguishing *B. auronitens* by the larger size, scarcity of tomentum, and fewer marginal cells in the alar region. From an examination of numerous specimens I am convinced that these characters are in no way correlated; the tomentose stems, for example, are by no means always associated with the more robust habit, and the basal marginal cells may vary very considerably and irregularly.

Correction: On p. 223 *for* **grandisopra** *read* **grandispora.**

EXPLANATION OF PLATE 614.

Fig. 1. *Dicranella kenyae*. *a*, leaf, × 8; *b*, cells of sheathing part, × 50.
Fig. 2. *Ochrobryum obtusissimum*. *a*, *a'*, leaf-apex, × 40.
Fig. 3. *Trichostomum decurvifolium*. *a*, leaf, × 10.
Fig. 4. *Leptodontium rhynchophorum*. *a*, *a'*, leaf-apices, × 20 (*a*, normal leaf, *a'* proboscid form).
Fig. 5. *Timmiella brevidens*. *a*, leaf-apex, × 40. *b*, part of peristome, × 40.
Fig. 6. *Didymodon subligulatus*. *a*, leaf, × 20.

Fig. 7. *Tortula tanganyikae*. *a*, leaf, × 10.
Fig. 8. *Tortella syrrhopodontoides*. *a*, stem, × 1; *b*, leaf, × 10; *c*, part of lamina, × 25.
Fig. 9. *Tayloria limbata*. *a*, leaf, × 10; *b*, upper cells, × 50.
Fig. 10. *Anomobryum latirete*. *a*, *a'*, leaf, × 20; *b*, cells, × 200.
Fig. 11. *Bryum rectitheca*. *a*, *a'*, leaf-apex, × 40.
Fig. 12. *Bryum stenophyllum*. *a*, *a'*, leaf, × 20; *b*, upper cells, × 40.
Fig. 13. *Bryum spiralifolium*. *a*, leaf, × 10; *b*, leaf, dry, × 4.
Fig. 14. *Rhodobryum plano-roseum*. *a*, leaf, × 3.
Fig. 15. *Bartramia angustissima*. *a*, *a'*, leaf, × 10; *b*, cells in profile, × 200.
Fig. 16. *Sphagnum afro-crassicladum*. *a*, leaf, × 10.
Fig. 17. *Sphagnum macro-molluscum*. *a*, stem-leaf, × 10; *b*, branch-leaf, × 10.
Fig. 18. *Fissidens rugifolius*. *a*, upper part of leaf, × 40.

IS *ULMUS CAMPESTRIS* L. A NOMEN AMBIGUUM?

BY R. MELVILLE, PH.D., F.L.S.

THE problem of the identity of *Ulmus campestris* L. is one that has never been satisfactorily settled, though various points of view have been expressed by different writers, and the name has been applied to several species of elm at different times and in different countries. The solution of this problem can follow only from a careful examination of the evidence provided by the synonymy given by Linnaeus in his works, and of existing specimens named by him.

In the 'Species Plantarum' (1753) Linnaeus described three elms—*U. campestris*, *U. americana*, and *U. pumila*. As the last two are both of extra-European origin, this fact alone suggests that he intended to include all the European forms under the one species, *U. campestris*. The diagnosis of the 'Species Plantarum' is too brief to be of any value in settling the question, but the following bibliography, here numbered for reference, is given:—

(1) U. fructu-membranaceo Hort. Cliff. 83.
(2) Fl. Suec. 219.
(3) Mat. Med. 105.
(4) Roy. Lugdb. 223.
(5) Dalib. Paris. 82.
(6) U. campestris et Theophrasti Bauh. Pin. 426.
(7) Ulmus, Dod. Pempt. 837.

In the 'Hortus Cliffortianus' (1737) references 6 and 7 and four others are given, and the following varieties are distinguished:—

(α) Ulmus folio latissimo scabro. Tournef.
(β) Ulmus minor folio angusto scabro. Tournef.
(γ) Ulmus folio glabro. Tournef.

Linnaeus here appears to have collected together all the references to elms he could find, and united them under the name

" Ulmus fructu membranaceo." By reference to Tournefort's ' History of Plants,' ii. (1732) 357, the three varieties can be identified as follows, since they are taken from Goodyer's descriptions in Gerard's ' Herbal,' ed. ii. (1633) :—

α is *U. glabra* Huds. (non Mill.), *U. montana* Bauh. Pin. 427.
β is Goodyer's Hampshire Elm, *U. stricta* Lindl. var. *Goodyeri* Melville.
γ is *U. nitens* Moench.

Tournefort mentioned two other elms, one of which is the *U. campestris et Theophrasti* Bauh. Pin.

Of the other references in the ' Species Plantarum,' the ' Flora Suecica ' (1745) merely repeats references 1, 6, and 7, the ' Materia Medica ' (1749) gives reference 1 only, while Royen's ' Flora ' (1740) gives references 1 and 6, and in addition Boerh. Lugdb. 2, p. 220. The latter refers to " U. folio latissimo scabro Ger. Emac.," which is *U. glabra* Huds. Royen it appears considered this synonymous with *U. campestris et Theophrasti* of Bauhin. Dalibard's ' Floræ Parisiensis Prodromus ' (1749) repeats references 1, 4, 2, and 6, and gives four varieties. The first three of these can be identified as follows :—

(*a*) *U. stricta* Lindl. var. *Goodyeri* Melville, Goodyer's Hampshire Elm.
(*b*) *U. nitens* Moench.
(*c*) *U. glabra* Huds. (non Mill.).

The fourth variety, " d. U. pumila, cortici fungoso. Pluk. Almag. 393," remains obscure, as the only additional information given by Plukenet is " foliis parvis glabra."

The reference to Bauhin's ' Pinax ' (1623) appears to refer to *U. nitens* Moench. on the general evidence of Bauhin's own bibliography and the fact that he mentions a second species, *Ulmus montana*. An examination of the bibliography given under the latter species considered in relation to that of the first species strongly supports the view that *U. glabra* Huds. is intended. Theophrastus also mentioned two elms, one of low-lying country, the *U. campestris* of Latin editions of his works, and the other of hilly country, the *U. montana*, which appears to correspond to Bauhin's *U. montana*. There is nothing in the description of *U. campestris* of Theophrastus against its identification as *U. nitens* Moench. or some closely related form. Some of the other authors referred to under Bauhin's first species appear to rely on Theophrastus for their information, but where any conclusion at all can be drawn from such indefinite descriptions it is favourable to the view that *U. nitens* Moench. or some closely related form was intended. In the final reference of the ' Species Plantarum,' Dodoens (7) gives a figure and a description that suggest *U. nitens* Moench. rather than *U. glabra* Huds. or any other species.

To sum up this examination of the references of the ' Species Plantarum,' nos. 1, 2, 3, 4, 5 confuse *U. nitens* Moench. and *U. glabra* Huds., and sometimes other elms as well. If the cross reference to the ' Hortus Cliffortianus ' were eliminated from nos. 2, 3, and 5 the evidence is mainly in favour of *U. nitens*, and references 6 and 7 appear to refer to this species only.

Another Linnaean publication that must be taken into account is the ' Flora Anglica ' (1754), compiled by one of Linnaeus's pupils, I. O. Grufberg. The reference " 468–1 " on p. 13, under " Ulmus campestris," is to Ray's ' Synopsis Stirpium,' ed. iii. (1724), which was used as a basis for this work. Ray's first elm is the " Ulmus vulgatissima folio lato scabro. Ger. Emac.," and Goodyer's description in Gerard's ' Herbal,' ed. ii., is repeated unchanged. There can be no doubt, therefore, that the ' Flora Anglica ' refers to *Ulmus procera* Salisb. It is uncertain whether Linnaeus ever saw a specimen of this species, but even had he done so it is probable that he would have included it with the equally distinct species *U. nitens* Moench. and *U. glabra* Huds. under his *U. campestris*.

The specimen of *U. campestris* in the Linnaean Herbarium has been examined, and there is no doubt that it is a form of *U. glabra* Huds. It consists of a small branch bearing young expanded leaves and full-grown fruits. The indumentum of the leaves and shoot, the very short petioles, the well-developed auricle at the base of the lamina, and the shape of the fruit all agree very well with *U. glabra* Huds. var. *scabra* Lindquist. The leaf-shape and serrature also are very similar on the lateral short shoot, but the terminal more elongated shoot has some leaves with a single larger tooth (" cornicle ") on the shoulder on either side of the mid-rib, as in the var. *cornuta* Rehd. Though such cornicles are common on juvenile and epicormic shoots of several varieties of this species, the presence of fruits shows that the branch is adult, and therefore it may represent the latter variety.

The ' Hortus Cliffortianus ' at the British Museum (Natural History) has been consulted also, but *U. campestris* L. is not now represented in it. The only Linnaean specimen seen is therefore unquestionably a form of *U. glabra* Huds.

Linnaeus often made manuscript notes in personal copies of his books, and these sometimes throw extra light on the species concerned. In his copy of the ' Species Plantarum,' ed. i., he wrote against *U. campestris* " Norland " and " a Lapponia," both of which were crossed out, and also " ab Uplandia " and " ad Gades." All of these appear to be localities where he saw elms. In ed. ii. of the ' Species Plantarum ' he printed " ad Gades in Gestricia." Norland, Upland, and Gaestrickland are all districts in Sweden where, as in Lapland, the species he saw was probably *U. glabra* Huds. From Cadiz in Spain he may have seen either this or *U. nitens* Moench.

Although the specimen in the Linnaean Herbarium is a form of *U. glabra* Huds., this evidence of Linnaeus's views cannot stand alone, but must be considered in relation to his published writings on the subject. The above examination has shown by the bibliography cited that he refers to the following elms :— *U. glabra* Huds., *U. nitens* Moench., *U. stricta* Lindl. var. *Goodyeri* Melville, and *U. procera* Salisb. In his treatment of the elms Linnæus was far less critical than several of his predecessors, notably Goodyer. By failing to distinguish more than one European species of elm he was directly responsible for later confusion in the application of the name *U. campestris*. In the circumstances it was natural that botanists in each country should interpret as the Linnaean species their own common species of elm. Thus over the greater part of Europe *U. nitens* Moench. or some variety or hybrid of it came to be regarded as *U. campestris* L. This is obvious from the following representative bibliography in which the name is used in this sense :—

Coste, Fl. France, iii. 251 (1906).
Grenier & Godron, Fl. France, iii. 105 (1855).
Ascherson & Graebner, Syn. Mitteleurop. Fl. iv. 552 (1911).
Schinz & Keller, Fl. Schweiz, i. 153 (1905).
Archangeli, Fl. Ital. ed. 2, 186 (1894).
Borg, Fl. Malta, 102 (1927).
Delogne, Fl. Belgique, 423 (1888).
Heukels, Fl. Nederland, ii. 59 (1909).
Ibiza, Fl. Espanola, ii. 16 (1907).

Comparatively few botanists have interpreted *U. campestris* L. in the sense of *U. glabra* Huds., among them the following :—

Pallas, Fl. Rossica, i. 75 (1784).
Kerner, Sched. Fl. Exsicc. Austro-Hung. i. 98 (1881).
Liljeblad, Fl. Svenska, ed. 3, 154 (1816).

British botanists differ from their colleagues on the continent in not using the name *U. campestris* for *U. nitens*, the great majority applying it to *U. procera* Salisb. In this they follow the usage of the 'Flora Anglica.' The following may be cited :—

Woodville, Med. Bot. iii. 540, t. 197 (1793).
Elwes & Henry, Trees Gt. Brit. vii. 1850 (1903).
Moss, Cambr. Brit. Fl. ii. 94, tt. 102, 103 (1914).
Jackson, New Fl. & Silva, ii. 221, t. 80 (1930).
Butcher & Strudwick, Further Ill. Brit. Plants, 310, fig. 328 (1930).
Carter, Catk. Bear. Plants, 48, t. 13 (1930).

A few early British botanists, confused apparently by Miller's treatment of the elms in the 'Gardeners' Dictionary' (1768), interpreted *U. campestris* in the sense of *U. minor* Mill. sec. Henry ; of these the following are the more important :—

Sowerby & Smith, Engl. Bot. xxvii. t. 1886 (1808).
Smith, Engl. Fl. ii. 21 (1824).

The evidence from the works of Linnaeus is too confused to enable any decision to be drawn as to which species he intended for *U. campestris*, if indeed he did not intend to include all European elms under this name. There can be little doubt that he was most familiar with *U. glabra* Huds. in his native Sweden, and this is the tree represented in his herbarium. Among the references cited in his works there is a preponderance in favour of *U. nitens* Moench., and this fact is reflected by the interpretation of *U. campestris* L. as *U. nitens* by the majority of continental botanists. This use of the name, coupled with its other applications detailed above, provides a permanent source of confusion and error.

The case for considering *U. campestris* L. a *nomen ambiguum* has already been stated briefly by Stearn and Gilmour (Kew Bull. 1933, 503). The more extended examination of the evidence given here endorses the view expressed by them. The name *U. campestris* L., owing to its use with different meanings for more than a century, has become a permanent source of confusion and error. It is urged, therefore, that it should be rejected as a *nomen ambiguum*, under Article 62 of the International Rules of Botanical Nomenclature.

CATENELLA NIPAE USED AS FOOD IN BURMA.

By F. Boergesen.

A short time ago I received for determination from Professor L. P. Khanna, University College, Rangoon, a parcel containing algæ about which he wrote : "This plant is very common along the Kuoy coast. The plant is eaten by the natives—either raw or boiled." The sample consisted of a dark grey, almost black, material composed of grains more or less connected in short or long chains. When examined with a lens it was easily recognizable as *Catenella*, and by a more thorough examination was found to be *C. Nipae*. The sample consisted mainly of this plant ; other mangrove algæ were in so small quantities that they must be considered nothing but contaminations. As it seemed to me most interesting to know not only the exact locality, but also how it was collected and prepared, I wrote to Professor Khanna asking for detailed information and, if possible, a fresh sample which had not been cleaned. Professor Khanna has been so kind as to send me this interesting information :—"I bought the parcels from Amherst, Martaban, from a shop which was selling prepared dishes. Each packet costs a little over one penny. I was informed that it grows on rocks along Martaban coast. It is not cultivated. The dried

specimens are soaked in water overnight—in the next morning it is well washed."

About the way it is used Professor Khanna writes as follows :—" Some like it raw mixed with the oil of *Sesamum indicum* L., salt, powdered fruit of *Capsicum annuum* L., fried rhizome of ginger (*Zingiber officinale* Rosc.), onion (*Allium Cepa* L.), and garlic (*Allium ursinum* L.). Some boil it for an hour and then mix it with above ingredients."

It is a well-known fact that in the East many algæ are eaten or used as medicine (*cf.* von Martens, 1866, p. 137, Suringar, 1872, and Kjellman, 1897, p. 22). In the recent paper by C. K. Tseng (1935) there is a fairly long list of species, used either as food or as medicine ; but in none of these is there any mention of *Catenella* or other mangrove algæ. Sauvageau, in his well-known book ' Utilisation des Algues marines,' has gathered much information about the uses of algæ ; but *Catenella* is not mentioned among those which serve as food.

It appears that the algæ of Professor Khanna's sample were gathered in the large estuary of the Salwin River, where mangrove algæ may be supposed to grow in especially favourable conditions. These gatherings are also interesting because we know so little from that locality. At any rate I have not found it among the many mentioned in Miss Erika Post's paper on the *Bostrychia-Caloglossa* Association (1937).

List of Species found in the Collection.

CATENELLA Grev.

1. CATENELLA NIPAE Zanard. 1872, p. 143 ; Post 1937, p. 68.

As mentioned in the introduction, it is this alga (fig. 1) which is the real object of the gatherings, which the natives try to get free of other algæ and pollutions.

To judge from its dark violet colour and vigorous growth it must be presumed to have been living in favourable conditions. Joints with tetrasporangia occur now and then. By means of the characteristic haptera described by Miss Post (1937, p. 69) it is now fairly easy to distinguish this species from the related *C. impudica*, the haptera in *C. Nipae* being the ends of the joints, while in *C. impudica* these are independent organs developed at the constrictions between the joints.

CALOGLOSSA (Harv.) J. Ag.

1. CALOGLOSSA ADNATA (Zanard.) De Toni 1900, p. 730 ; Post 1937, p. 47.—*Delesseria adnata* Zanard. 1872, p. 141.

Only small pieces were found of this plant, which seems to be rare, but easily recognizable. It fixes itself by means of rhizoids growing out everywhere from epidermal cells on the underside, either in small groups or placed singly. They are free, not coherent, and end in a small disc. In one of the pieces tetrasporangia were present. They occur in dense groups on both sides of the mid-rib and are developed in proliferations from the edge of the thallus.

2. CALOGLOSSA LEPRIEURII (Mont.) J. Ag. 1876, p. 499 ; Post, 1937, p. 49.—*Delesseria Leprieurii* Mont. 1840, p. 196 ; J. Ag. 1852, p. 682.

f. *typica* Post 1937, pp. 47 & 51.

A few small pieces were found. In one of them tetrasporangia were present. The broad parts of the thallus reach a breadth of little more than 1 mm. One piece was not much constricted and approaches f. *continua* Okam.

var. *Hookeri* (Harv.) Post 1937, p. 53.—*Caloglossa Hookeri* Hook. f. & Harv. 1845, p. 270 [nomen nudum]. *Delesseria* (*Caloglossa*) *mnioides* Harv. 1857, no. 33 [nomen nudum]. *Caloglossa Mnioides* (Harv.) J. Ag. 1876, p. 500. *Hypoglossum Vieillardi* Kütz. 1866, p. 4. *Caloglossa Vieillardi* (Kütz.) Setch., 1924, p. 161.

Of this interesting variety I found two quite small pieces ; fig. 2 shows one of them. The stem is not yet much developed. Compared with Kützing's figure the shape of the segments is not so ellipsoidal, but more oblong-rectangular with broadly rounded corners. The breadth of the segments is rather variable, the broadest I have seen was a little more than 1 mm.

BOSTRYCHIA Mont.

1. BOSTRYCHIA RADICANS (Mont.) Mont. 1850, p. 286 ; J. Ag. 1863, p. 856 ; Falkenb. 1901, p. 513 ; Post, 1937, p. 13.—*Rhodomela radicans* Mont. 1840, p. 198.

Of the species found mingled with *Catenella Nipae* fragments of *Bostrychia radicans* were most often met with, either loose or fastened by its numerous haptera to *Catenella*. The haptera are not only present on the decumbent creeping filaments but are also often developed from nearly every apex of the filaments (f. *hapteromanica* Post). The haptera consist of a bundle of rhizoids at the ends of the branchlets. The plant seems to be able to form haptera whenever an apex of a branch comes near to a suitable substratum.

The ramification is distichous, but often poor with long distances between the branches.

The thallus has no cortical layer, and is of variable thickness ; the thicker branches are about 110–120 μ thick, the filaments decreasing slowly upwards to about 40 μ in the uppermost ends. Cross-sections of the thallus show a variable number of pericentral cells. I have met with six to nine. A longitudinal section shows that the central cell is about double as long as the pericentral cells.

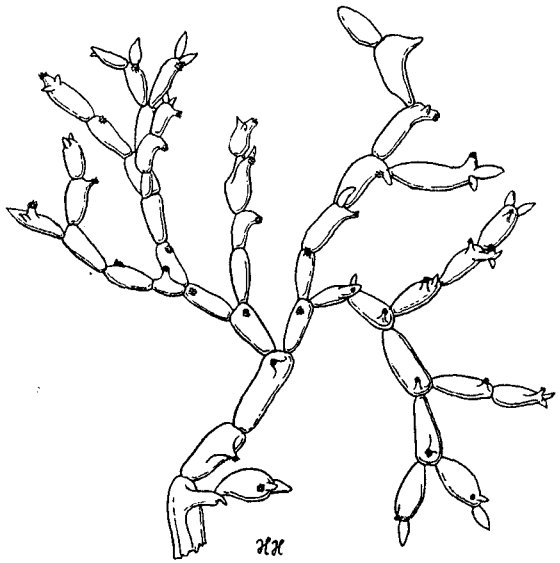

Fig. 1.—*Catenella Nipae* Zanard. Habit of a plant. ×3.

Fig. 2.—*Caloglossa Leprieurii* (Mont.) J. Ag. var. *Hookeri* (Harv.) Post. Outlines of a small plant. ×12.

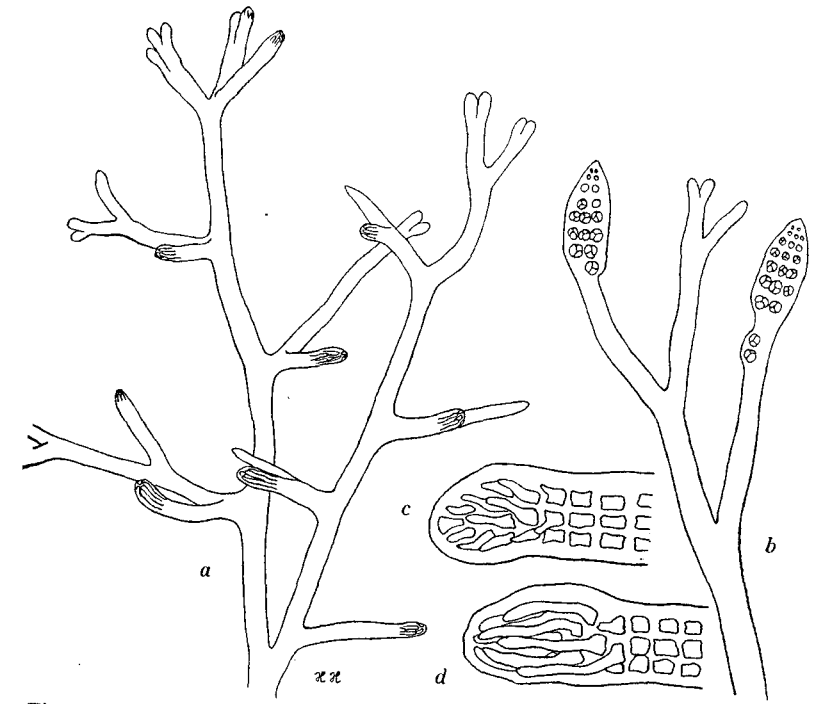

Fig. 3.—*Bostrychia radicans* (Mont.) Mont. *a*, part of the thallus; *b*, filament with stichidia; *c*, *d*, apices of branchlets growing out to haptera. *a*, *b*, ×33; *c*, *d*, ×225.

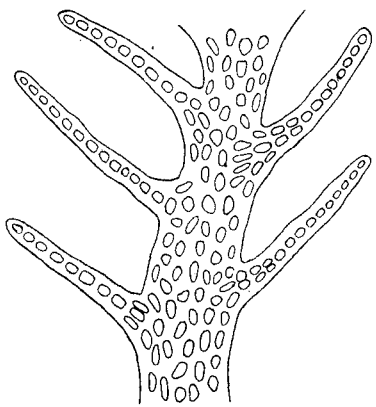

Fig. 4.—*Bostrychia tenella* (Vahl) J. Ag. Part of a branch with branchlets. ×200.

The few stichidia that I have met with are terminal on rather elongated branchlets; their shape was obovate-elongated, tapering abruptly upwards. They have five to six tetrasporangia in each tier. The largest stichidium found was 165 μ broad and 400 μ long.

2. BOSTRYCHIA TENELLA (Vahl) J. Ag. 1863, p. 869; Boergesen 1918, p. 300; 1937, p. 351.—*Fucus tenellus* Vahl 1802, p. 45.

Of this species (fig. 4) I found only two small bits. According to her definition of this species and that of *Bostrychia Binderi* Harv. I suppose that Miss Post might refer the specimens to the last-mentioned species (*cf.* Harv., 1847, p. 68, pl. 28) as the branches of last order are short; but there is this peculiar feature in the specimens, that although several of the branchlets are short and polysiphonous right up to their summits, most of them are more or less monosiphonous, several of them quite monosiphonous, composed of a single row of as many as twelve to fourteen cells (fig. 4). As stated above, the branches are rather short (about 100 μ long or a little more). It is on old parts of a plant that these observations are based.

For my reasons for referring these specimens to *B. tenella* see Boergesen, 1937, p. 351.

Besides the above-mentioned Rhodophyceae some filaments of a *Chaetomorpha* (most probably *C. tortuosa*) were found. The filaments were about 44μ broad, and the length of the cells about 60μ. A small piece of an *Enteromorpha* and a few filaments of Cyanophyceae were also seen.

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CONTRIBUTIONS TO OUR KNOWLEDGE OF BRITISH ALGÆ *.

BY J. W. G. LUND, M.Sc.

VII. SOME NEW BRITISH ALGAL RECORDS.—II. EUGLENINEAE.

IN a previous contribution (1) a number of algæ new to Britain were described from ponds in Richmond Park, Surrey. The present paper deals with new records of Euglenineae from the same locality.

EUGLENA PISCIFORMIS Klebs (fig. 1, A–C). The spindle-shaped cells (26–32·5 by 7–12 μ) are somewhat metabolic, and narrow posteriorly to a more or less sharp point. The periplast shows delicate spiral striations. The flagellum is approximately the length of the cell. The two lateral chloroplasts have the shape of irregular lobed bands, and each possesses a single pyrenoid sheathed on each side with paramylon. The chloroplasts either lie in close contact with the periplast (fig. 1, C) or are a little removed from it (fig. 1, A) when they are connected with it by cytoplasmic strands. Oblong paramylon granules are almost always present and commonly distributed throughout the cell. The oval nucleus lies in the posterior half, and the eye-spot near the anterior end.

This species, already recorded from other parts of Europe (2) and America (3), was found in a small stagnant pond. It is occasionally present in the littoral region of the Pen Ponds.

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Var. *minor* Hansg. is widespread in the ponds examined. It differs from the type not only in its much smaller size, but also in its more marked metaboly.

EUGLENA MUTABILIS Schmitz (fig. 1, D–H). This little-known species has elongate cells (68–100 by 7–8·5μ) with the posterior end drawn out into a long blunt process. The vast majority of the cells observed were highly metabolic and lacked a flagellum. However, about a dozen specimens possessing flagella were observed on one occasion in the Leg-of-Mutton Pond; these showed no metaboly *. When creeping over the substratum the individuals frequently attach themselves by

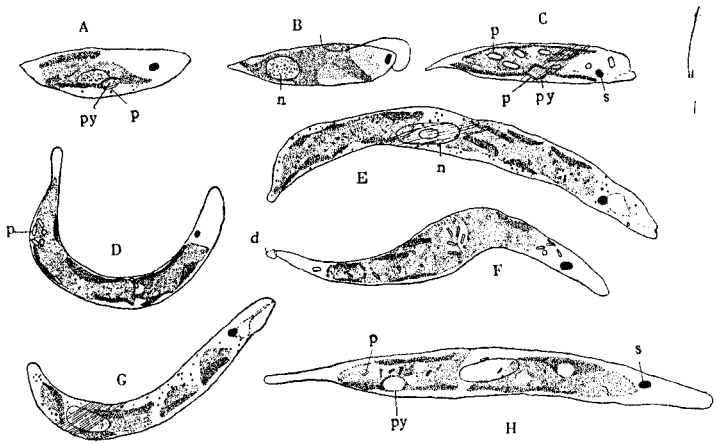

FIG. 1.—A–C. *Euglena pisciformis* Klebs. A, C. One of the two chloroplasts in side view, showing the pyrenoid. B. Surface view of chloroplasts. In C a few of the periplast striations are shown. D–H. *Euglena mutabilis* Schmitz. A few of the periplast striations are shown in E and G. *d*, detritus; *n*, nucleus; *p*, paramylon; *py*, pyrenoid; *s*, stigma. (All ×650.)

their posterior ends for longer or shorter periods. The periplast shows very delicate spiral striations which may appear almost longitudinal in much elongated specimens (fig. 1, E, G). The oblong nucleus is usually situated in the posterior half (fig. 1, E), while the stigma lies near the base of the reservoir of the vacuolar system. The numerous paramylon granules are often very small; the larger ones are distinctly rod-shaped (fig. 1, D, H). There are two to four chloroplasts (sometimes more) which are usually devoid of pyrenoids and have the shape of elongate

* These specimens were observed after this paper had been written. It is hoped to figure them in a later paper.

ribbons with more or less lobed, and sometimes incised, margins.

The individuals I have examined resemble those described by Schmitz (4) except that pyrenoids are usually absent and there is a spirally striated periplast. The striation, however, is very delicate and easily overlooked. Moreover, in mud containing this species which was placed in a 0·05 per cent. Benecke solution there appeared specimens with clearly marked naked pyrenoids (fig. 1, H). There can, therefore, be little doubt that the alga found is identical with *E. mutabilis* Schmitz. Skuja (5), who was uncertain whether his specimens were *E. mutabilis* Schmitz, and Huzel (7) were likewise unable to find pyrenoids in their specimens, but noted the delicate spiral striation of the periplast.

Mainx (6) established a species, *Euglena Klebsii*, which was founded on *E. intermedia* (Klebs) Schmitz var. *Klebsii* Lemm. (see 2, p. 129). The variety differs from *E. intermedia* in its smaller dimensions and in the possession of small paramylon granules. *E. intermedia* has numerous discoid chloroplasts without pyrenoids and possesses a flagellum.

E. Klebsii Mainx agrees with *E. mutabilis* in almost every respect, the flagellum being occasionally present, especially in young cultures. Schmitz was doubtful about the occurrence of a flagellum in *E. mutabilis*, nor did Skuja or Huzel observe one in their specimens. *E. Klebsii*, on the other hand, differs from *E. intermedia* var. *Klebsii*, and agrees with *E. mutabilis* in having only a few ribbon-shaped chloroplasts which sometimes possess naked pyrenoids. Other points of agreement are the small, apparently rod-shaped * paramylon granules, the pronounced metaboly, the general lack of a flagellum, and the fact that it occurs in highly acid waters. It therefore appears probable that *E. Klebsii* is identical with *E. mutabilis*. The presence of pyrenoids or a flagellum seem to be variable features in *E. mutabilis*. While *E. Klebsii* is probably identical with *E. mutabilis*, there is no evident justification for regarding *E. intermedia* var. *Klebsii* as synonymous with either †. I have observed specimens which appear to be identical with *E. intermedia* var. *Klebsii*.

E. mutabilis (including *E. Klebsii* Mainx) has been recorded from Germany (4, 6, 7), Latvia (5), and the Belgian Congo (8), and is probably a frequent form in moorland and other acid waters. Mr. Scourfield has shown me his drawings of a species of *Euglena* found in Epping Forest which appears to be *E. mutabilis*. The

* Mainx's description of these as " seifenstückförmig " gives no accurate idea of their shape, but his figure points to their being rod-shaped.

† It is to be noted that the nomenclatural type of *E. Klebsii* is *E. intermedia* var. *Klebsii*. The fact that Mainz misidentified his species leads to confusion, which, however, is lessened by his failure to recognize that he was dealing in all probability with *E. mutabilis*.

specimens here described were found in temporary pools among the bracken, on drying mud at the edge of the Pen Ponds, and in the Leg-of-Mutton Pond. Where the alga was present in quantity the pH of the water was always less than 5 and acid humus was abundant. I have also observed the alga in small pools in *Sphagnum*-moors at Fox House, near Sheffield, and near High Wray, Westmorland.

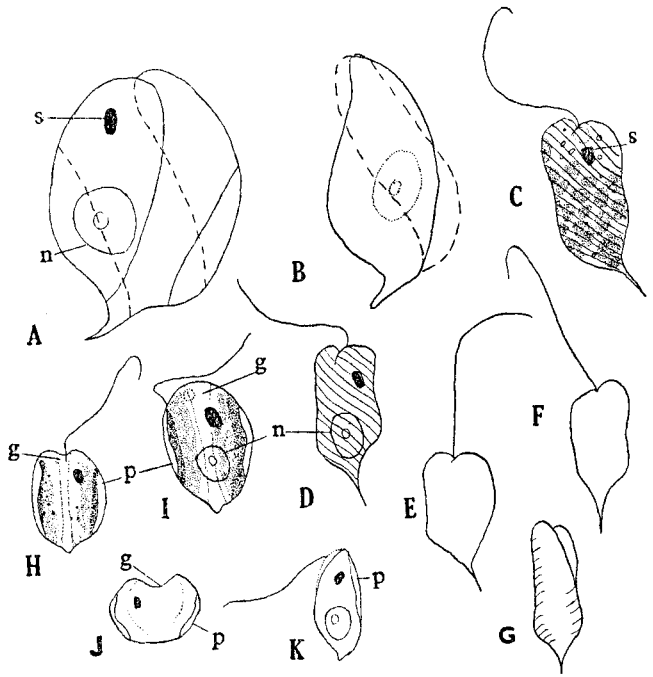

FIG. 2.—A, B. *Phacus alata* Klebs var. *latviensis* Skvortzow. A. Surface view. B. Lateral view. C–G. *Phacus aenigmatica* Drezèpolski, D–F. Surface views. G. Lateral view. H–K. *Phacus agilis* Skuja. H. Ventral view. I. Dorsal view. J. Viewed from anterior end (optical transverse section). K. Lateral view. *g*, groove; *n*, nucleus; *p*, paramylon; *s*, stigma. (I × 1250, rest × 1000.)

PHACUS ALATA Klebs var. LATVIENSIS Skvortzow (fig. 2, A & B). This species is characterized by the two flat wing-like expansions of the cell (34–37·5 by 29–31·5 μ) which form an angle with one another (fig. 2, B). In other respects the structure is similar to that of *P. pleuronectes* (O. F. Müll.) Duj. There is a short oblique posterior spine and the surface of the periplast shows longitudinal striations. There are commonly, but not always, two large paramylon grains, one apposed to each "wing." My specimens are much larger than those recorded by Klebs (2), and approach those found by Skuja (9) which were referred to a var. *latviensis* by Skvortzow (10).

Specimens of this alga occurred in all the ponds.

PHACUS AENIGMATICA Drezèpolski (fig. 2, C–G). The flattened cells (19–25·5 by 8·5–10 μ) are irregularly subrectangular, with the posterior end prolonged into an oblique spine. The firm periplast is spirally striated and the flagellum is approximately the length of the cell. The eye-spot, situated near the anterior end, often shows a lens-shaped outer region. The oval nucleus is usually located posteriorly. There are numerous discoid chloroplasts which assume a polygonal form when closely packed together. According to Drezèpolski (11) three large paramylon granules are characteristic of the species, but in the individuals I have studied this was very rare; usually a number of small ones were present.

The species occurred sparsely in the Pen Ponds and a small stagnant pond. I have observed it in a small lily pond in Kew Gardens. It has been previously recorded from Poland (11), Latvia (5), France (12), and Germany (7), and is probably of widespread occurrence, especially in the littoral regions of lakes and ponds.

PHACUS AGILIS Skuja (fig. 2, H–K). This, the smallest known species of the genus, has hitherto been recorded only from the littoral plankton of Latvia (9) and from France (12).

The cell (13–17 by 8·5–11 μ) has roughly the shape of a coffee-bean with a longitudinal groove traversing the whole length of the ventral surface. The posterior end terminates in a short blunt point. I have been unable to observe the fine striations of the periplast described by Skuja (9). The flagellum is as long as, or somewhat longer than, the cell, which, during movement, rotates about its long axis. The prominent eye-spot lies to the side of the point of insertion of the flagellum. The two parietal chloroplasts are placed one on each side of the groove. There are usually two large paramylon grains shaped like watch-glasses and apposed to the lateral margins of the cell, but smaller ones may occur also.

This organism was found occasionally in the Leg-of-Mutton Pond, the Pen Ponds, and a small stagnant pond. It was also observed in a pond near Rivelin Dams, Sheffield, in November 1936 and in a small pond in Kew Gardens. It is probably widespread in ponds containing much vegetable detritus.

The author's grateful thanks are due to Professor F. E. Fritsch, F.R.S., for advice and criticism.

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ADDITIONAL NOTE ON QUEENSLAND IXORAS.

BY L. FOSBERG.

AFTER the manuscript of the article on " Two Queensland Ixoras " (Journ. Bot. lxxvi. 233–237, 1938) was submitted for publication, Mr. C. T. White was kind enough to send for my examination two additional recent collections of *Ixora biflora* with the suggestion that one of them might represent a new variety. This turned out to be so, and the variety *Fleckeri* is described below and also a varietal name is given to the typical form.

One of the collections, Mossman Gorge, Queensland, June 20, 1937, *Flecker* 3509 seems identical with the type of the species, and, fortunately, bears a mature fruit, from which the following may be added to the description of the species: fruit " bright scarlet," somewhat flattened, slightly grooved on the flat sides, bearing a large calyx scar at apex, subsessile, 11 mm. high, 13 mm. wide, 6–7 mm. thick when dry, surface when dry rugulose-papillose, subtended by two or more persistent bracts, these not, or only slightly, accrescent.

IXORA BIFLORA Fosberg var. **typica** Fosberg, nom. nov.

This is the typical form of the species as described on p. 235.

IXORA BIFLORA Fosberg var. **Fleckeri** Fosberg, var. nov.

Folia oblongo-lanceolata acuminata, hypanthium persistens glabra, calix valde 4-dentatus.

Differing from var. *typica* in having oblong-lanceolate acuminate leaves up to 9 cm. long and 2·5 cm. wide; hypanthium not becoming hirtellous, but remaining glabrous, calyx margin not fimbriate-ciliate, but glabrous and prominently 4-dentate; fruit maturing later, those on specimen young and green, about the size of small peas.

Specimen seen: Queensland, Mossman Gorge, jungle at intake, June 20, 1937, *Flecker* 3521 (type, Brisbane Herb.).

THE TYPIFICATION OF *ASPLENIUM FONTANUM* (L.) BERNH.

BY T. M. C. TAYLOR, B.A., M.Sc., PH.D.

A recent examination of the specimens of *Polypodium fontanum* in the Linnaean herbarium revealed that they do not represent *Asplenium fontanum* in the sense of modern authors, nor is the latter covered by the diagnosis of *P. fontanum* in 'Species Plantarum' (ed. 1). In view of these facts it is felt desirable to bring forward reasons that justify the continued use of the epithet *fontanum* for designating this species of *Asplenium*, and it also becomes necessary to select a proper type.

The following is quoted from 'Species Plantarum,' ed. 1, 1089 (1753) :—

" fontanum 33. Polypodium fronde sub-bipinnata lanceolata foliolis subrotundis, stipite lævi.
Filicula fontana minor *Bauh. pin.* 358.
Habitat in Siberia, Galloprovincia.
Habitus P. fragilis, et Foliola arctiora, minus profunde subdivisa, punctis floriferis majoribus, prodeuntibus non ex squama subrotunda, sed ex rima s. valvula lineari, oblonga, alba."

From the above it is apparent that the *Polypodium fontanum* of Linnæus consisted of two elements :—

(1) A. Synonyms :

Filicula fontana minor C. Bauh. Pin. 358 B (1623).

Filicula fontana foemina Ger. Herball, p. 980 (1597), *ic. cum descr.*—Cited by Bauhin.

Filicula fontana Tab. Neuw Kreuterb. ii. 471 D (1591), *ic. eadem, sine descr.*—Cited by Bauhin.

B. Specimens :

Filicula fontana minor CB. in Herb. Burser—*vide* Savage, Caroli Linnaei, Determinationes in Hortum Siccum Joachimi Burseri, p. 67, n. 38 (1937). (Cat. Manuscr. Libr. Linn. Soc. Lond. part 2.)

(2) Specimens :

Two fully developed, but unlocalized plants marked " 33 fontanum " in Linnaeus's handwriting (in Herb. Linn. propr.).

Of these two elements 1 A probably represents *Asplenium fontanum* as reference to 'Tabernaemontanus' will show ; that 1 B also represents this same species is stated on the authority of Juel, Symb. Bot. Upsal. ii. 134 (1936), who writes : " XX 38 ' Filicula fontana minor Bauh. In Gallo Provincia ' *Asplenium fontanum* (L.) Bernh."

A careful examination of the specimens preserved in the Linnaean herbarium makes it quite clear that element 2 is *Woodsia glabella*. In fact, the sheet is annotated " W. hyperborea ? " in the handwriting of Sir J. E. Smith.

The arguments in favour of selecting one of these elements, instead of the other, as typifying the epithet *fontanum* are itemized below :—

1. Reasons for selecting element 1 (*A. fontanum*).

(*a*) The epithet *fontanum* was taken from 'Tabernaemontanus.'

(*b*) The only figure cited (although indirectly) is also from ' Tabernaemontanus.'

(*c*) Linnaeus had identified as *Polypodium fontanum* the specimen named *Filicula fontana minor* in Burser's herbarium.

(*d*) The description of the sorus, quoted above in the note following the geographic distribution, applies only to *A. fontanum*.

2. Reasons for selecting element 2 (*W. glabella*).

(*a*) The specimens in the Linnaean herbarium written up by him in 1753 (*vide* Jackson, ' Index to the Linnaean Herbarium,' 120, 1912) represent *W. glabella*.

(*b*) The diagnosis applies in part to *W. glabella* alone, namely the words " fronde sub-bipinnata " and " foliolis subrotundis."

From the foregoing facts the rationalization of the situation appears to be (*a*) that Linnaeus was familiar with the *Filicula fontana minor* of Bauhin and with its various synonyms ; (*b*) that he identified correctly as his own *Polypodium fontanum* a specimen in the Burser herbarium named *Filicula fontana minor* ; (*c*) that he misidentified his own specimens and based his diagnosis upon them: The note, quoted above, indicates an attempt to reconcile the two elements, while the somewhat detailed description of the indusium shows that he had certain features of the *Asplenium* element clearly in mind.

That he, himself, was aware of the inadequacy of the diagnosis is emphasized by the insertion, in the second edition of his ' Species Plantarum,' p. 1550 (1763), of the words " argute incisis " in the description of the pinnae, so that the diagnosis now covers both elements. In this same edition he also added a reference to *Adiantum filicinum durium crispum minimum* Barrel. Ic. t. 432, fig. 1 (1714), which represents *Asplenium fontanum*.

In consequence, when the arguments pro and con are considered, there appears ample justification for the continued use of the epithet *fontanum* in its long-accepted sense as designating a species of *Asplenium*, and the logical lectotype is the specimen in the Burser herbarium identified by Linnaeus as his *Polypodium fontanum*. This species is therefore correctly cited as *Asplenium fontanum* (L.) Bernh. in Schrad. Jour. 1799, p. 314—*Polypodium fontanum* L. Sp. Pl. p. 1089 (1753), quoad partem typicam. Lectotypus : *Filicula fontana minor* CB., n. 38 in vol. xx. Herb. Burser.

The writer wishes to express his appreciation to Dr. T. A. Sprague for advice and suggestions in connexion with the foregoing discussion.

BOOK-NOTES, NEWS, ETC.

BOTANISTS, especially, will wish to congratulate Sir Albert Seward, V.-P.R.S. on his election as President of the British Association for the meeting to be held next year at Dundee.

HORTI sicci of pre-Linnaean age are still fairly numerous in Britain, but ancient collections of the bulkier parts of plants that were used by pharmacists in the compounding of their medicinal remedies are now of great rarity.

At the exhibition of Scientific Objects arranged for the British Association by the Philosophical Society of Cambridge, three considerable collections of Materia Medica were on view. The best-documented of these collections is associated with John Francis Vigani, the first Professor of Chemistry in Cambridge. It includes about 290 botanical specimens, classified as Flowers and Fruits, Seeds, Nuts, Woods, Barks, Roots, Juices, and Balsams, mostly obtained in 1704 for a London apothecary, Francis Porter, whose contemporary bills are still extant in Queens' College. Other specimens came from Henry Colchester of the Maiden's Head in Cheapside.

A few of the labels give further information. " Flores Stoechadoes " were derived *e horto Chel*, obviously the Apothecaries' Garden at Chelsea. Two or three specimens are noted as being contributed by Richard Bradley, who was elected to the Professorship of Botany in 1724. A number of seeds of garden

vegetables in one of the drawers probably also came from Professor Bradley, a great horticulturist in his day.

Still older is a second collection in a finely designed cabinet that belonged to Dr. Addenbrooke and is now in St. Catharine's College. An included bill is dated 1645 and the greater number of the plants may in all probability be referred to the third quarter of the seventeenth century. This collection of about 140 specimens has recently been rearranged.

The third collection is on a larger scale. It was obtained by Dr. William Heberden to illustrate his lectures on Materia Medica. It comprises some 300 vegetable specimens, listed in a catalogue written in 1751. Dated additions to the collection were made in 1742, three years after Heberden took his Doctor's degree from St. John's College.

The specimens included in such collections supply clues, indeed the only clues, to the identity of the plants whence contemporary herbalists derived their remedies. They have therefore great historic value.

Full lists of the plants have been published in Gunther's 'Early Science in Cambridge,' pp. 472–94.—R. T. GUNTHER.

OBITUARY.—E. M. Nelson, one of the foremost workers in microscopy, died on July 20 at the age of 87. For many years he was closely associated with the Royal Microscopical Society and the Quekett Microscopical Club and was the recognized British authority on the theory of the microscope; many improvements in construction which he suggested were patented by others, with the consequence that his name was not so prominent as it would otherwise have been. He added much to our knowledge of the structural details of diatoms.

THE numerous vegetable poisons of Africa have been referred to by travellers from earliest times. Scientific information on the subject is very scattered, and G. Cufodontes has therefore done a most useful service in gathering it together in a review in 'Scientia,' ser. 3, xxxii. (1938), 1–5.

N. B. BAGENAL has written a short account of "Thomas Andrew Knight, 1759–1838" in the Journ. Roy. Hort. Soc. lxiii. (1938) 319–324. No general aspect of the growth of plants seems to have been without interest to this eminent horticulturist and botanist. He is best known for his wheel with which he began the study of the "phenomena observable during the conversion of a seed into a plant", but he also did valuable work in raising new hybrids of fruits and vegetables, and experimented on the connexion between the rust of wheat and that of barberry. "In the domain of practical horticulture the originality and range of his investigations are positively staggering." A full biography of this remarkable man might well be sponsored by the Royal Horticultural Society, of which he was president from 1811 to 1838.

PLANTÆ NOVÆ TIBETICÆ ET BHUTANICÆ IN HERBARIO MUSEI BRITANNICI.

By HEINRICH HANDEL-MAZZETTI.

Androsace rhizomatosa Hand.-Mzt., sp. nov.

In rhizomate crasso et longo, interdum pluricipite, petiolis mortuis griseis cincto singularis vel fasciculata (necnon cespitosa ?). Folia rosulata numerosa, ambitu orbicularia, profunde cordata, fere ad tertium vel quartum inferum 5-partita, partibus late cuneato-obovatis ad medium c. lobatis, herbacea, saturate viridia, utrinque breviter strigilloso-pilosa; petioli laminis 2–4-plo longiores, evaginati. Scapus e rosula singulus, folia superans. Umbella densa, bracteis herbaceis, purpureis, basi paulum saccato-productis. Calyx obconicus, c. 3 mm. longus, ad medium vel paulo profundius in lobos ovatos, obtusos fissus, enervius. Corolla pallide et centro intensius rosea, viridiflavo-oculata (e collectoribus), c. 8 mm. diametro, lobis obovatis, rotundatis vel levissime emarginatis, annulo humili 10-crenato. Antheræ vix apicibus emersæ. Stylus inclusus. (Capsula ignota.)

Typus.—Folia 5–10 mm. diametientia, versus quartum inferum 5-partita, partibus extimis 2-, mediis 3–7-lobatis, lobis lanceolatis et ellipticis acutis; petioli pilis tenuibus articulatis patulis mox brunnescentibus hirti. Scapus 4–10 cm. longus, folia pluries superans, inferne ut petioli, superne brevissime et accumbenter pilosus. Umbella 2–5-flora, bracteis ovato-lanceolatis, ut pedicelli iis c. duplo longiores ad 5 mm. longi calycesque purpurei brevissime strigilloso-pilosis.

BHUTAN CENTR.: Ritang, Tang Chu, 4300–4600 m., common where found, growing in open rocky grass slopes, in large clumps, 7. vi. 1937 (*Ludlow et Sherriff* no. 3208).

Var. **maior** Hand.-Mzt., var. nov.

Multo maior, foliis 1½–4 cm. diametientibus, sæpe vix ad tertium inferum partitis, partibus ad medium trilobis, lobis iterum sæpe irregulariter 2–5-lobulatis lobulis ovatis. Indumentum totius plantæ brevissimum, crispulum et in inflorescentia hirtellum. Scapus foliis sesqui- usque duplo longior. Umbella usque ad 20-flora, pedicellis usque ad 14 mm. longis, ad 5-plo longioribus quam bracteæ lanceolatæ. Calyx fere glaber, viridis.

BHUTAN CENTR.: Tang Chu, 3850 m., common in clearings in bamboo and *Abies* forest, 4. vii. 1937 (*Ludlow et Sherriff* no. 3375, typus). Tang Chu, Ritang, 4000–4330 m., on steep open grassy slopes and banks, 6. vi. 1937 (*Ludlow et Sherriff* no. 3195).

Species affinis *A. geraniifoliae* Watt, quæ differt rhizomate nullo, foliis minus profunde partitis partibusque multo minus lobatis. No. 3375 a typo speciei distinctissimus, no. 3195 autem ei paulo propior.

ANDROSACE BRAHMAPUTRAE Hand.-Mzt. in Not. Bot. Gard. Edinb. xvi. 164 : 1931.

Syn. : *A. bisulca* Hand.-Mzt., *l. c.* xv. (1927) 267, 280, et apud Marquand in Journ. Linn. Soc., Bot. xlviii. (1929) 201. Non Bur. et Franch.

Diagnosis *l. c.* 267 et 280 sub nomine *A. bisulcae* data descriptione sequente supplenda. In radice palari surculis permultis denique crassis fuscis sæpeque denudatis pulvinos usque ad 10 cm. latos et altos formans. Folia paulum dimorpha, anguste linearia, ±acuta, basi non dilatata, crassiuscula, viridia, denique costa subtus late prominua, marginibus angustissime incrassatis et recurvis, mortua sæpe diu persistentia præter bases brunneas albida mox autem fusca ; exteriora superne dense albo penicillato-hirsuta, interiora iis paulo longiora, 4–12 mm. longa, remote et longe ciliata, denique ciliis partim delapsis denticulata. Scapus e rosula singulus, folia non vel pluries superans, tenuis, usque ad 3½ cm. longus, ut bracteæ lineares herbaceæ pedicellique iis breviores vel raro usque plus duplo longiores calycesque longe et tenuiter albo-hirsutus. Flores 2–5. Calyx obconicus, 2½–3 mm. longus, herbaceus, viridis, vittis membranaceis albis e sinubus decurrentibus, ad medium in lobos ovato-lanceolatos obtusos fissus, enervius. Corolla roseo-purpurea, centro atrior vel aurantiaca (e collectoribus), 5–7 mm. diametro, lobis sæpe anguste vel cochleato-obovatis, rotundatis, annulo plano. Antheræ stylusque inclusi. Capsula calyce vix longior.

TIBET AUSTR. : Tsangpo Valley, 3050–3950 m. (*K. Ward* no. 5654, typus). Karta, dotted about the dry rocky slopes, and on cliffs in the arid valley above, 4250 m., 15. vi. 1935 (*K. Ward* no. 11709). Cha La N. of Sanga Choling, very little seen, on dry grassy banks, 3950 m., 14. v. 1936 (*Ludlow et Sherriff* no. 1585). Takar La, W. Tsari, on open grassy hillside, 4250 m., 28. vi. 1936 (*Ludlow et Sherriff* no. 2245). Bung, Char Chu, on open stony dry hillside, 3950 m., 7. vi. 1936 (*Ludlow et Sherriff* no. 1969). Karutra, Chayul Chu, on open rather dry, steep hillsides, 4100 m., 16. x. 1936 (*Ludlow et Sherriff* no. 2737). Sumbatse, Kyimdong Chu, on dry southward-facing hill slopes, 3950 m., 14. vi. 1936 (*Ludlow et Sherriff* no. 1816). Item, on open dry grassy hillsides, 20. x. 1936 (*Ludlow et Sherriff* no. 2699).

Foliorum costæ marginesque multo minus incrassati quam in *A. bisulca* Bur. et Franch. nuper iterum recepta nomenque suum re vera meritante.

Androsace zayulensis Hand.-Mzt., sp. nov.

Surculis nunc foliorum mortuorum fuscorum rosulis contiguis columnaribus, nunc tenuibus rigidis usque ad 2½ cm. longis dissite parcifoliis castaneis glabris apice tantum rosuliferis pulvinos compactos vel intus cavos usque ultra 10 cm. altos latosque formans. Folia paulum dimorpha, exteriora lingulata margine paulo longius ciliata, mortua mox brunnea, interiora iis subduplo maiora, magis rhombea, ad 6 mm. longa, omnia obtusa, basi paulum dilatata sessilia, crassa, cæsia, utrinque densissime et brevissime hirtella, costa lata subtus paulum prominua. Scapi foliis breviores, 2–4-flori, ut pedicelli sub fructu arcuato-patuli 3–5 mm. longi bracteæque oblongæ iis duplo breviores usque æquilongæ densissime et breviter hirti. Calyx ad 3 mm. longus, infra medium in lobos ovato-oblongos obtusos fissus, enervius. Corolla (marcida tantum adest) purpurea (?), c. 4 mm. diametro, carnosula, lobis subrectangulo-obovatis leviter emarginatis, annulo orali protruso. Capsula calyce paulo longior.

TIBET AUSTR. : Sangachu Dzong, Zayul, growing on sunny limestone cliffs, 3650–3950 m., 11. ix. 1933 (*K. Ward* no. 10852).

Proxima *A. euryanthae* Hand.-Mzt., quæ differt surculis hirtellis, foliis mollibus scapisque partim longe ciliatis et glandulosis, bracteis longioribus, corollis maioribus. Partibus vegetativis quasi inter *A. coronatam* (Watt) Hand.-Mzt. et *A. Wardii* W. W. Sm., ab utraque autem scapis brevissimis distincta.

Androsace Ludlowiana Hand.-Mzt., sp. nov.

Surculis erectis vel magis diffusis rigidulis spadiceis tenuiter albo-hirtellis sero glabrescentibus, internodiis nudis c. 5–30 mm. longis, cespites pulvinatos ±densos ad 10 cm. altos latosque formans. Folia sessilia, vix vaginata, herbacea, saturate viridia, annotina spadicea, dimorpha ; exteriora lineari-lingulata, obtusa, utrinque parce brevipilosa et antice longe penicillato-albipilosa ; interiora iis c. duplo longiora, spathulata, 4–8 mm. longa, acutiuscula, utrinque dense et breviter albo-hirta, costa denique dorso versus basin prominula. Scapi pro rosula singuli, tenues, 8–30 mm. longi, uni- vel umbellato 2–3-flori, tunc ebracteati vel unibracteati, nunc bracteis totidem ac pedicelli scapo paulo vel sesquibreviores eocumque albo-hirtelli, lanceolatis, c. 3 mm. longis, obtusis, herbaceis, hirtellis. Calyx campanulato-turbinatus, 2½–3 mm. longus, herbaceus, vix nervatus, vix ad medium in lobos ovatos rotundatos fissus, parce hirtus et breviter glandulosopilosus, apice longius et dense ciliatus. Corolla 6–9 mm. diametro, rosea, lobis obovatis rotundatis, ore viridis vel flavoviridis (e collectore), annulo humili. Antheræ sub ore subsessiles. Stylus ½ mm. longus. Capsula calycem paulo excedens.

BHUTAN CENTR. : Riuchen Chu, growing in large cushions on cliff ledges and very steep open hillside, 4700 m., 13. vii. 1937 (*Ludlow et Sherriff* no. 3430).

Habitu similis *A. molli* Hand.-Mzt., quæ differt foliis exterioribus cochleatis, interioribus obovatis, ciliatis tantum vel dorso sparse sed æquilonge pilosis, scapis glandulosis, pedicellis brevioribus. *A. Wardii* W. W. Sm. habitu erecto, indumento multo breviore et densiore, pedicellis brevioribus, floribus enim non vel vix longioribus distat.

Aster albescens Wall. var. **glandulosus** Hand.-Mzt., var. nov.

Folia ovato-lanceolata, supra alutacea et setuloso-aspera, denique interdum versus margines tantum, subtus glabra, sed dense sessili-glandulosa. Inflorescentia dense glanduloso-furfuracea. Involucri phylla lanceolata, acuta, glabra vel antice ciliata.

TIBET AUSTR.: Rong Tö Valley, above Migu, Zayul, forming clumps on boulder screes, fl. violet, 3050 m., 23. xi. 1933 (*K. Ward* no. 11006). Karta, on rocky or stony slopes, 3950 m., fl. mauve, 16. vi. 1935 (*K. Ward* no. 11723). Chamdo distr., Gorge of the Salwin, growing on cliffs, widely distributed, 3950 m., fl. mauve, 6. viii. 1933 (*K. Ward* no. 10752, typus).

Ab omnibus formis indicis mihi visis et sinensibus (vide Act. Hort. Gothob. xii. (1938) 205) diversa. Forma extrema (maxime xeromorpha) no. 11723, specimina optima autem no. 10752 typus designata.

Aster Ramsbottomi Hand.-Mzt., sp. nov.

Suffrutex rhizomate longissimo crassissimo, truncis numerosis lignosis, crassis, 4–8 cm. longis, caules plures fasciculatos edentibus cespites usque fere 1 m. latos (e collectore) formans. Caules ad 15 cm. longi, tenues, rigidi, multicostulati, virides, herbacei, dense foliati, superne subcymoso-ramosi, ramis sub 45° patentibus, usque ad 2½ cm. longis, foliis decrescentibus æquicrebris obsitis, monocephalis, inferioribus brevibus sterilibus raris. Folia suberecta, oblongo-oblanceolata, usque ad 12×3 mm., obtusa et minute mucronulata, basi angustata sessilia, crassiuscula, margine vix recurva integra, intense viridia, utrinque densissime et brevissime ut caulis velutino-hirtella prætereaque sparse et minute sessili-glandulosa, costa subtus prominula, infima haud rosulata. Involucri late calathiformis ore c. 1 cm. lati phylla imbricata c. 5-seriata, ab extimis ovato-lanceolatis subpatentibus c. 1½ mm. longis ad intima lineari-lanceolata c. 6 mm. longa accrescentia, omnia c. ⅔ mm. lata, acutissima, stramenticia apice costaque tenuissima exteriora fusco-viridia, interiora purpurascentia, margine angustissime membranaceo molliter brevissimoque ciliolata. Flores radii c. 20 ♀, uniseriati, ligulis oblongis ad 6 mm. longis et 2 mm. latis, acutiusculis, minute tridenticulatis, albis vel roseo-violaceis. Flores disci ☿ involucrum superantes, flavi, tubo puberulo breviore quam limbus cylindricus, cuius lobi parvi, ovati. Pappus uniseriatus, creber, corolla æquilongus, levissime rubescens. Achænia (nondum maturissima) compresso oblongo-obovoidea, ecostata, dense pilosa.

TIBET AUSTR.: Salwin Gorge, Chamdo distr. On the dry gravel or earth slopes, on cliffs, abundant throughout the arid region, 2750–3350 m. Attains a considerable age. 3. viii. 1933 (*K. Ward* no. 10675).

Aster poliothamnus Diels indumento foliorumque forma congruens differt caulibus valde lignescentibus haud viridibus, podicellis longis, tenuissimis, nudis, phyllorum exteriorum apicibus sublingulatis viridibus. Habitus speciminum parvorum *A. alysoidis* Turcz., qui differt foliis multo angustioribus indumento valde diversis, calathiis angustioribus, in var. *achnolepi* Hand.-Mzt. autem æquilatis sed indumento diversis.

Aster hypoleucus Hand.-Mzt., sp. nov.

Fruticulus cespitosus, e rhizomate crasso verticali truncos lignosos multos mox decumbentes et multiramosos edens. Ramuli hornotini simplices vel furcati, erecti, ad 10 cm. longi, tenuissimi, rigidi, primum angulati, densiuscule foliati. Folia oblanceolata, usque ad 13×3 et 15×2 mm., acuta vel obtusiuscula, longe mucronata, basi subpetiolato-angustata, integra vel cum dente uno alterove sinuato mucronato, coriacea, margine revoluta, supra atroviridia subglabra, subtus ut rami albo-tomentosa, suberecta, inferiora minora patula. Pedunculi singuli (usque terni), ad 3 cm. longi, glabriusculi, foliis ad subulas reductis perpaucis obsiti, monocephali, annotini lignescentes toti persistentes haud incrassati. Involucri calathiformis ore c. 8 mm. lati phylla haud numerosa, imbricata, c. 4-seriata, extima ovato-lanceolata intimis lineari-lanceolatis ad 5 mm. longis 4–5-plo breviora, omnia c. ⅔ mm. lata, stramenticia, nervo tenui et exteriora toto fere apice spadicea, margine anguste membranaceo hic illis fimbriato-ciliata. Flores radii c. 13, ligulis linearioblongis c. 4 mm. longis ¾ mm. latis obtusis minute tricrenatis, e sicco albis. Flores disci involucrum vix superantes, tubo subduplo breviore quam limbus anguste infundibularis basi pilosulus ultra ⅓ in lobos lanceolatos fissus. Pappus creber, corolla fere longior, uniseriatus, albus. Achænia (nondum maturissima) compresse oblongo-obovoidea, ecostata, dense pilosa.

TIBET AUSTR.: Kyrindong Dzong, hot cliffs, 3350–3650 m., 14. vii. 1935 (*K. Ward* no. 11993).

Species fruticosa teneritate et pedicellis persistentibus insignis. Proximus *A. lavandulifolius* Hand.-Mzt. in Notizbl. Bot. Gart. Berl. xiii. (1937) 609, differt habitu multo altiore, foliis supra papillosis, inflorescentiis dense corymbosis, calathiis multo angustioribus, ligulis disco æquilongis, pappo brunnescenti-stramineo.

Aster Sherriffianus Hand.-Mzt., sp. nov.

Caulis usque ad 1·20 m. altus (e collectoribus), cuius pars superior tantum adest, validus, elevato-multistriatus, dense foliatus, ut inflorescentia dense et brevissime fulvide glanduloso-velutinus et hic illic pilis patulis longioribus albis instructus, superne corymboso-multiramosus, ramis erectopatulis, inferiori-

bus dense, summis apice tantum foliatis, omnibus apice cymoso oligocephalis. Folia patentia, lanceolata, ad 8 cm. longa et 1 cm. lata, acuta, basi rotundata sessilia, antice remote paucidenticulata, herbacea, intense viridia, inferiora supra strigoso-brevipilosa, subtus magis hirta pilis hic illic fasciculatis et minute sessili-glandulosa, summa etiam brevissime glanduloso-pilosa; costa subtus prominua, nervi pauci, obliqui, tenuissimi. Pedicelli 1–3 cm. longi, tenues, ebracteolati. Calathia in corymbum densum 25 cm. latum composita. Involucri late calathiformis ore c. 1 cm. lati phylla haud numerosa, lanceolata, vix 1 mm. lata, intima ad 7 mm. longa, cetera paulo breviora, accumbentia, omnia acutissima, substramenticia, dimidio anteriore et nervo tenui purpureo-fusca, margine indistincte membranaceo, parce glanduloso-brevipilosa. Flores radii ad 30, ligulis linearibus ad 12 mm. longis apice subdilatatis ad 1½ mm. latis obtusis vix crenulatis, pallide lavandulaceis vel pallide cœruleo-violaceis (e collectoribus). Flores disci involucro paulo longiores, e sicco lutei, glabri, tubo duplo breviore quam limbus cylindricus, cuius lobi parvi, ovati. Pappus simplex, creber, albus, corolla æquilongus, tenuis. Achænia compresse ellipsoidea, ecostata, breviter sericea.

BHUTAN CENTR.: Chendeki, on open grassy hillside, or in open oak forest, 2450 m., 5. viii. 1937 (*Ludlow et Sherriff* no. 3522).

Proximus *A. vestito* Franch., qui pilis incurvis adpressis vestitus, involucri phyllis herbaceis.

Anaphalis acutifolia Hand.-Mzt., sp. nov.

In rhizomate crasso repente pluricaulis, laxiuscule cespitosa, caulibus mortuis cum foliis sæpe persistentibus. Caules 23 cm. longi, vix basi lignescentes, simplices, dense cinereo-araneosi, basi cataphyllis persistentibus parvis membranaceis late ovatis rotundatis brunneis perulati, toti æqualiter densifolii, foliis infimis sub anthesi moribundis. Folia lineari-lanceolata, 30×4–35×6 mm., acuta, basi brevissime attenuata sessili non decurrentia, herbacea, suberecta, plana, utrinque cinereo- et juniora vix flavescenti-tomentosa, subenervia. Calathia c. 5–10 in corymbum densissimum conferta folia bracteantia pauca apice sphacelata subulata excedunt, fere 10 mm. longa et 15 mm. lata. Involucri phylla numerosa, glabra, fere æquilonga, ex unguibus brevibus viridibus apice brunneis late lanceolata, acutissima, scariosa, candida, nitida, plana, tenuiter multinervosa, exteriora pauca iis subduplo breviora spadicea. Corollæ ♀ tantum notæ involucro æquilongæ, pappi pilis filiformibus.

TIBET AUSTR.: Gyamda Valley, on cliffs, sheltered side of the valley, 3650 m., 29. viii. 1935 (*K. Ward* no. 12276).

Calathia *A. nepalensis* (Spreng.) Hand.-Mzt. (*A. nubigenae* [Wall.] DC.); crescendi modo *A. Larium* Hand.-Mzt. haud dissimilis; utraque ceterum valde diversa nec alia comparabilis.

Senecio drukensis Marq. et Shaw var. **nodiflorus** (Chang) Hand.-Mzt., comb. nov.

Syn.: *S. nodiflorus* Chang in Bull. Fan Inst. Biol. vi. (1935) 54.

Varietas (cuius nomen ex anglico "nodding" emptum?) in *K. Ward* no. 10855 folia inferiora quoque in nonnullis speciminibus habet linearia, in aliis late elliptico-obovata. Eius no. 10909 speciminibus abbreviatis calathiis ±cymose compositis constat. Specimina ad speciei typum pertinentia *K. Ward* no. 12258 multo maiora quam describitur, versus 50 cm. alta, panicula stricta composita calathiis ultra 30, ramis inferioribus 10 cm. longis. Nullum dubium est, quin omnes ad unam eandemque speciem pertineant.

Senecio Ramsbottomi Hand.-Mzt., sp. nov.

Radix ignota. Caulis erectus, 60 cm. altus, validus, tenuiter striatus, purpurascens, vix araneosus, æqualiter dissitifolius, apice in corymbum densissimum 10 cm. latum dense et brevissime brunneo glanduloso-velutinum ramosus. Folia lyrato-pinnata, pinna terminali ovato-triangulari, ad 8×6 cm., breviter acuminata, basi leviter cordata angulis breviacuminatis interdum bifidis, ceterum irregulariter eroso-dentata dentibus mucronatis, pinnis lateralibus minutis irregularibus falcato-triangularibus vel angulatis contiguis vel in foliis infimis in petiolis tenuibus pinnis terminalibus æquilongis remotis, infimis in auriculas magnas amplexicaules rotundatas productis; folia summa sensim lanceolata lyrato-pinnatifida tantum; omnia herbacea, intense viridia, vix asperello-puberula, costa nervisque c. 5-paribus irregularibus ramosis venarumque reti densiusculo utrinque conspicuis. Bracteæ superiores sensim filiformes, longæ, herbaceæ. Pedicelli vix 1–3 mm. longi, tenues. Bracteolæ paucæ, calathiis contiguæ, lineares, obtusæ, carnosulæ, fuscæ, involucro plus quadruplo breviores. Involucri cylindrico-campanulati 5 mm. longi phylla 5–6, linearia, glabra, crassiuscula, brunnescentia, ad tertiam partem contigua, dein marginibus et circa apices obtusissimos nigro-scariosa. Flores pallide lutei (e collectore), ligulati 1–2, ligulis lineari-filiformibus disco brevioribus; flores disci c. 4, involucro paulo longiores, glabri, tubo subduplo breviore quam limbus anguste ovoideus, cuius lobi anguste lanceolati. Pappus creber, tenuis, albus, corolla brevior.

TIBET AUSTR.: Tsari Valley, on earth-banks and turf-slopes, 4250 m., 11. ix. 1935 (*K. Ward* no. 12328).

Affinis *S. Kaschkarowi* C. Winkl., cuius folia pinnis lateralibus elongatis, pinna terminali hastata eorum longitudine angustiore instructa et calathia subturbinata involucri phyllis 7 et ultra, ligulis, si adsunt, bene evolutis prædita. *S. biligulatus* W. W. Sm. differt e descr. foliis runcinatis, lobis lateralibus igitur et e comparatione cum *S. gracilifloro* (Wall.) DC. multo maioribus, bracteolis involucro longioribus, ligulis 3 mm. longis.

Ligularia petiolaris Hand.-Mzt., sp. nov.

Caulis (cuius pars inferior deest) ultra 30 cm. altus, crassus, fistulosus, parcissime et brevissime araneosus, dense foliatus. Folia anguste cordato-ovata, usque ad 16×12 cm., acuta, angulis basalibus rotundatis, ubique, apicem versus sinuato- tantum, dentata, herbacea, atroviridia, supra in costa subtiliter, subtus præsertim in nervis brunneo furfuraceo-pilosa et juniora parce albo-araneosa, venarum reti densiusculo subtus tenuiter prominuo, petiolis inferiorum laminis æquilongis exalatis basi in vaginas inconspicuas triangulares dilatatis, summa pauca sensim diminuta, lamina transverse elliptica dentata et cauda ea longiore integra constantia, brevipetiolata. Racemus simplex, polycephalus, junior densissimus 8 cm. longus, furfuraceo-puberulus, bracteis minutis lanceolatis, pedicellis nunc nutantibus c. 2 mm. longis. Bracteolæ filiformes paucæ, calathio approximatæ eoque multo breviores. Involucri campanulati phylla 5, oblongo-lanceolata, 8 mm. longa, acutissima, herbacea, fusciviridia, partim late sed indistincte membranaceo-marginata, facie sparse et margine præsertim apice dense fusco articulato-pilosula. Flores ♀ corollis carentes, stylum nudum tantum gerentes pro calathio 1–2 ; ☿ c. 5, nunc virides. Pappus corolla multo brevior, creber, albus, setis validiusculis asperis.

TIBET AUSTR. : Bimbi La, under *Rhododendron* bushes, in small colonies, or scattered, uncommon, 3960 m., 12. vii. 1935 (*K. Ward* no. 11967).

Foliorum superiorum etsi petiolatorum forma *L. lankongensi* (Franch.) Hand.-Mzt. similis, cui forsitan etiam affinis. Ob statum juvenilem caute tantum judicandum. Flores ♀ nudi, ovario et pappo et stylo tantum constantes, mihi adhuc in toto genere non obvii fuere. Quamvis specimen juvenile sit nec totum perscrutari possit, in calathio uno unum talem florem, in alio duos inveni.

Ligularia tongkyukensis Hand.-Mzt., sp. nov.

Folia late reniformia, maximum quod adest 10 cm. longum, 17 cm. latum, rotundata, basi aperte cordata lobis rotundatis, præter sinum ubique argute dentata, herbacea, atro et subtus pallidius viridia, pedatim ad 9-nervia, in nervis subtus tenuiter reticulatis sparse et subtilissime brunneo-furfuracea, petiolis tenuibus exalatis laminis c. duplo longioribus (decerpto). Caulis 60–90 cm. altus (e collectore), tenuis, superne late corymboso-ramosus, fusco furfuraceo-pilosulus, foliis superioribus quidem 7 cm. latis in petiolis laminis brevioribus in vaginas lanceolatas herbaceas ±sensim dilatatis, summis ramos bracteantibus sensim spathulatis limbis integris tenuiter petiolatis. Corymbi plures, densissimi, ad 5 cm. lati, polycephali. Bracteæ longæ, filiformes. Pedicelli ad 5 mm. longi, pilis minutis clavatis glandulosis fusco-violaceis velutini. Bracteolæ 2, filiformes, calathio contiguæ

eoque ±duplo breviores. Involucri cylindrici 1 cm. longi phylla 3, linearia, obtusa, fusca, tenuia, brunneo et partim purpureoviolaceo membranaceo-marginata, apice minute fimbriato-ciliolata. Flores 3, tubulosi, involucro 2 mm. longiores, e sicco fulvi (?), tubo æquilongo quam limbus campanulato-cylindricus, cuius lobi breves lanceolati. Antheræ 4 mm. longæ, apicibus lanceolatis. Styli rami antice velutini, apice triangulari-subtruncati. Pappus creber, rufus, corolla paulo brevior.

TIBET AUSTR. : Tongkyuk. Pome Snow range, in Conifer–*Rhododendron* forest, scattered, 3350–3950 m., 1. viii. 1935 (*K. Ward* no. 12112).

Inflorescentia eiusque partes eadem ac in *L. Mortoni* (C. B. Cl.) Hand.-Mzt., comb. nova (*Senecio Mortoni* C. B. Cl., Comp. Ind. (1876) 208) foliis diversissima. *Ligularia Kingiana* (W. W. Sm.) Hand.-Mzt., comb. nov. (*Senecio Kingianus* W. W. Sm. in Journ. As. Soc. Beng., n. ser. vii. (1911) 71, non S. *Kingii* Rydb. 1910) e descriptione differt caule crasso, foliis basalibus anguste cordatis, minutius dentatis (?), nervis subtus velutinis, vaginis foliorum caulinorum eodem modo denticulatorum valde dilatatis, calathiis radiatis 5–7-floris, pappo saltem initio albo.

Saussurea Kingii J. R. Drumm. ined.

In radice palari unicaulis, probabiliter biennis. Caulis crassus, succosus, jam supra basin et totus diffuse longiramosus, 3–c.10 cm. altus, ramis inferioribus eo longioribus foliis bracteatis, foliis rosularibus hornotinis sub anthesi vivis, ceterum aphyllus, ramis tantum mediis folio singulo concaulescente omnibusque foliis paucis calathia bracteantibus præditis, illiscum cinereo araneoso-tomentosus. Folia ambitu lincari-lanceolata, usque ad 10 cm. longa et 2 cm. lata, obtusa, basi petiolato-angustata, tota irregulariter et remote pinnatipartita, partibus patulis ovatis rhachi æquilatis sinuato angulato-dentatis, dentibus crasse mucronato-apiculatis, lobulis parvis interjectis, crassa, marginibus partim reflexis crispa, supra saturate viridia floccosa, subtus præter costam latiusculam cinereo-tomentosa. Calathia in caulis ramorumque apicibus pauca glomerata paucaque singula, late campanulata, involucris c. 8–10 mm. longis et æquilatis vel angustioribus, basi rotundatis. Phylla pauca, subæquilonga, exteriora late ovata cum appendicibus stipitatis herbaceis spathulatis mucronato-dentatis, cinereo-araneosa, interiora sensim ovato-lanceolata integra, acutissima, partim purpurea, sericea. Paleæ nullæ. Flores numerosi, purpurei, involucro sesquilongiores. Corollæ limbus tubo tenui æquilongus ; lobi illius parte anguste campanulata duplo longiores. Antherarum caudæ in lanam albidam lacerátæ. Pappi setæ exteriores paucæ caducæ albæ subleves setis interioribus albis plumosis basi brunneis plus duplo breviores. Achænia araneosa, transverse irregulariter et parce rugosa et superne gibbosa.

TIBET AUSTR.: Tsela Dzong. Growing in almost pure sand, on dunes, with silver-leafed *Astragalus*, *Sophora*, and Grasses, 3050–3350 m., 26. vii. 1935 (*K. Ward* no. 12052). Kyi Chu Valley, 8 km. E. of Lhasa, ix. 1904 (*Walton* sine nr.: Mus. Vindob., typus).

Species et habitu et characteribus involucri valde peculiaris.

Saussurea tunicata Hand.-Mzt., sp. nov.

Foliorum fasciculis sterilibus multis caulibusque floriferis pluribus, omnibus vaginis mortuis permultis late linearibus c. 2–3 cm. longis scariosis brunneis nitidis cinctis dense pulvinata, præter has tota dense albo-sericea et superne magis hirsuta. Folia linearia, erecta, 4–6 cm. longa, 3–5 mm. lata, obtusissima, basi sensim angustata et in vaginas supra descriptas vivas purpureas dilatata, marginibus anguste revolutis vel undulatis, herbacea, utrinque æqualiter sericea, costa crassa subtus prominua. Caulis 5–8 cm. longus, c. 3 mm. crassus, densifolius, foliis in bracteas anguste ovatas usque ad 8 mm. latas purpureas subtus partim glabriores venosas involucro æquilongas transeuntibus. Calathium singulum, globosum. Involucri ore 2½–3 cm. lati phylla permulta, subæquilonga, lanceolata, fusca, apicibus plerisque subulatis flaccis præsertim plumoso-hirsuta, intima angustiora, obtusa, inferne coriacea. Paleæ parcæ, breves. Flores permulti, e collectore dilute purpurei, involucro longiores. Corollæ tubus tenuis, limbo paulo longior; huius lobi lineares parte campanulata duplo longiores. Antherarum caudæ in fasciculos sericeos laceratæ. Pappi albi setæ exteriores numerosæ inæquilongæ setis interioribus tenuibus plumosis plus duplo breviores. Achænia matura ignota.

TIBET AUSTR.: Salwin–Tsangpo Divide. Ascending to nearly the limit of flowering plants, forming big clumps between granite boulders and stones on gravelly soil, 5180–5500 m., 30. ix. 1933 (*K. Ward* no. 10882).

Proxima *S. Hookeri* C. B. Cl., quæ differt tunica nulla, foliis sericeo-ciliatis tantum, involucro sericeo, paleis longioribus. Tunica fere eadem ac in *S. velutina* W. W. Sm., specie multo minus xeromorpha, qua de causa nostra pro *Saussureae Hookeri* forma extreme xeromorpha haberi non potest.

Jurinea Wardii Hand.-Mzt., sp. nov.

In radice palari tenuiore vel crassiore rosulata, acaulis, polycephala. Folia numerosa, expansa, ambitu oblongo-oblanceolata, 10– ad 20 cm. longa incl. petiolis c. 3 cm. longis basi dilatatis, c. 3 cm. lata, ad mediam c. laminam vel præsertim basin versus usque ad costam 4–6-pari lyratipartita, lobo terminali ceteris c. triplo longiore ovato, lobis lateralibus patulis subquadratis basi lata sessilibus sæpe lobis pluries brevioribus intersitis, omnibus rotundatis irregulariter eroso-dentatis et -denticulatis

apiculis cartilagineis marginibus inter eos anguste revolutis, crassa, supra viridia minute sessili-glandulosa et hic illic furfuraceo-aspera necnon interdum parce araneosa, subtus albo-tomentosa, costa lata supra purpurea, subtus cum nervis numerosis tenuibus glabrioribus prominua. Calathia disco carnoso 2–4 cm. lato insidentia. Involucri obovoidei ad 2½ cm. longi phylla haud numerosa, imbricata, c. 4-seriata, adpressa, extima intimis duplo breviora, oblongo-spathulata, superne araneosa, hæc lanceolata glabra, omnia levia, coriacea, enervia, partibus expositis purpurea, apicibus minute spinosa. Paleæ numerosæ, setaceæ, leves, obtusæ, achæniis paulo longiores. Flores numerosi, involucro paulo longiores, purpurei. Pappus corollam æquans, setis tenuibus liberis multiseriatis præter basin flavidam albis et breviter plumosis, acutis constans. Corollæ tubus limbo æquilongus; huius pars late cylindrica lobis anguste linearibus æquilonga. Antherarum caudæ in penicillos brunnescentes laceratæ. Achænia immatura levia.

TIBET AUSTR.: Sanga Chöling. Abundant on dry stony scrub-clad slopes, 3350–3650 m., 1935 (*K. Ward* no. 12356).

Jurinea Dolomiaea Boiss. (*Dolomiaea macrocephala* DC.—*Jurinea m.* Benth., non DC.), quæ proxima, differt foliorum lobis acutis, calathiis sesquilongioribus, involucri phyllis multo longius acuminatis, margine et partim dorso serrulato-asperis eorumque nervo mediano inferne argute prominuo etsi tenui, pappo fulvo.

BOLOCEPHALUS Hand.-Mzt., gen. novum.
(*Compositæ—Cynareæ—Carduinæ.*)

Radix perennis, palaris (?), crassa, monocephala (semper ?), collo vaginis atrobrunneis marcescentibus cincta et foliorum multorum fasciculo et caule centrali terminata. Folia ambitu oblanceolata, 12–20 cm. longa et c. 5–7-plo angustiora, acuta usque obtusissima, basi longe petiolato-angustata petiolis in vaginas angustas sensim dilatatis, ad mediam laminam, raro fere ad costam runcinato-pinnatiloba, lobis oblique et late triangularibus obtusis usque retrofalcato-ovatis acutis basiscope integris acroscope paucidenticulatis usque angulatis, sinubus late rotundatis, herbacea, pallide viridia, supra parce furfuraceo-puberula prætereaque interdum araneosa, subtus minute sessili-glandulosa tantum vel insuper cinereo-tomentosa; costa nervique patentes ramosi subtus prominui. Caulis sub anthesi 10– ad 30 cm. longus, erectus, fistulosus, 4–6 mm. crassus, multistriolatus, ±araneosus, monocephalus, inferne dense, superne remote foliatus, foliis inferioribus iisdem ac basalia, evaginatis autem, summis sensim angustissimis integris sæpe fere subulatis. Calathium cernuum, ante anthesin globosum, 5–6 cm. diametro. Involucrum phyllis innumeris imbricatis linearibus vix ad 2 mm. latis longissime subulato-acuminatis herbaceis autem et extus sæpe glabris constans, lana longissima alba eorum marginum

facierumque interiorum involutum; phylla intima nonnulla sequentibus breviora, extima interdum glabriora et patula (?), 1½ cm. autem longa. Paleæ nullæ. Flores numerosi (colore ?). Corolla angusta, lobis linearibus, 2½ mm. longis. Pappi setæ multæ, uniseriatæ, validæ, basi paulum dilatatæ, liberæ, antice rubellæ et setulis pronis vix ¼ mm. longis subplumoso-asperæ, flore juvenili æquilongæ, serius probabiliter cum eo accrescentes, nonnullæ breviores et acutiores et leviores. Filamenta libera; antheræ 7 mm. longæ, basi in caudas integras lanceolatas filiformi-acuminatas liberas productæ, connectivis in appendices lineari-lanceolatas 2 mm. longas protractis. Stylus crassus, cruribus late ligulatis, 1½ mm. longis, æquicrassis, retusis, cœrulescentibus, ad bifurcationem paulum incrassatus et brevipilosus; stigmata crurum margines totaque dorsa occupant (?). Achænia ignota.

Bolocephalus saussureoides Hand.-Mzt., sp. nov.

Characteres generis.

TIBET AUSTR.: Tsari. Lapu, growing in moss on top of rocks, 4575 m., 16. vi. 1936 (*Ludlow et Sherriff* no. 2158, typus). Tsari Valley, on wooded cliffs, under Rhododendrons and other bushes, 3950–4250 m. Also in alpine region, on cliffs and turf slopes, up to 4575 m., 2. vii. 1935 (*K. Ward* no. 11865). Targa La, on steep alpine slopes. Nowhere abundant, but occurs in small colonies of 6–12 plants, 4575 m. Seen only in Tsari. 13. ix. 1935 (*K. Ward* no. 12347).

Genus partibus vegetativis *Saussureas* quasdam referens, a quo genere præsertim involucri indole et antherarum caudis simplicibus (an denique carnosis ?) distat. Quoad involucrum *Tricholepidi* generi simile, quod differt imprimis antherarum appendicibus basalibus latis submembranaceis et filamentis furfuraceis. Dolendum, quod specimina omnia tam juvenilia sint nec $KMnO_4$ quidem adhibito distributio stigmatum eluceat.

THE FLOWERING OF *CORYLUS AVELLANA* LINN.

BY F. RILSTONE, A.L.S.

IT is a well-known fact that the earliest yellow catkins of the hazel are conspicuous for some time before the first pistillate flowers can be found. Very noticeable, too, is the great disparity that exists between the flowering times of individual bushes. The earliest may be yellow with catkins early in January (or even in December of the previous year), and produce their crimson pistils by the end of January or early in February, while on other bushes the catkins remain entirely undeveloped until March.

At first sight this looks as if it may be a natural arrangement to secure cross-fertilization, each succeeding batch of catkins

pollinating the stigmas of somewhat earlier-flowering bushes. The following records of observations carefully made over a three months' period in 1938 show that the explanation is not quite so simple.

Attention was especially directed to four bushes, "*A*," "*B*," "*C*," and "*D*," which grew along a stretch of about a hundred yards by a stream in a sheltered valley two miles inland from the north coast of Cornwall and at about 150 feet elevation.

The bush labelled "*A*" was chosen because it was the first in the neighbourhood to display its crimson stigmas. My sister, Miss M. J. Rilstone, has kept watch on the flowering of hazel bushes in the neighbourhood for several years past, and this particular bush has always been the first to open its pistillate flowers, usually during the first few days of February. This year the first were seen on January 31. The bush was then, and had been for some time, covered with masses of fully extended yellow catkins. But, though fully extended, these catkins were still immature. Not an anther was open and not a grain of pollen had been shed. The same thing had been noticed in previous years; always the first pistillate flowers of the year were open before the catkins began to produce pollen.

By February 12, this bush had numerous pistillate flowers, and pollen was being shed freely. Ten days later the catkins were shrivelling and turning brown, and the early pistillate flowers were discoloured, but throughout late February and March fair numbers of fresh pistillate flowers could be found, especially in the topmost branches, and small quantities of pollen were produced by a very few late-developing catkins lower down the bush.

Bush "*B*," with slender rather pendulous twigs, behaved peculiarly. On January 31 it presented as great a display of extended catkins as bush "*A*" but, as in that, the anthers were still unopened and no pollen had been shed. In a few days, however, pollen was being produced, but no pistillate flowers could be found. When, at the end of February, all the catkins had ceased pollen-production and had turned brown, and still no trace of a stigma could be seen, it looked as if the bush must be barren. March, however, brought the pistillate flowers, which were produced plentifully during the first half of the month.

Bush "*C*," about 30 feet from "*A*," will serve as an example of the prevalent late-flowering type of plant. On January 31, like the majority of the bushes in the neighbourhood, it was still in the winter state with all its catkins small and rigid. Not until February 22 were a few, perhaps half a dozen, partly extended catkins found. The first pollen was seen on March 3, when no pistillate flowers could be found, but a week later pollen was abundant and stigmas fairly numerous. By the end of the month both pistillate flowers and catkins were over.

Bush "*D*" was still entirely undeveloped on January 31. On February 12 it showed abundance of fully developed pistillate flowers, while the catkins were only partially extended and no pollen was being shed. Plenty of pollen was seen on February 22, and by March 11 the pollen was all shed, the catkins were becoming brown, and the stigmas were all blackened and past.

Examination of a great number of bushes on March 11 showed that a fair proportion were still in the early stages of catkin flowering, having some partially extended and others in the closed winter state, but all these bushes were by then well furnished with pistillate flowers. In a survey of the same area on April 1 I found almost all the pollen shed. Only an occasional catkin still produced pollen, but almost all the bushes still had fair numbers of pistillate flowers.

From these observations it seems probable that individual bushes flower at approximately the same time each year. The fact that all early flowering bushes seen were in sheltered positions suggests that shelter may have some influence on earliness of flowering. This may merely mean that early flowering types are more tender and do not persist in exposed situations, for the fact that many bushes in sheltered spots were as backward as those in fullest exposure indicates that the main cause of retardation is an individual characteristic. In the area observed, early-flowering bushes—that is, those well in flower before the end of February—formed only a small proportion of the total. The majority were March flowering. Very likely the flowering period of these late bushes was this year speeded up and shortened by the abnormally warm weather of March, and in a normal year would extend well into April. It would seem, too, that the season of pistillate flowering is slightly longer, both earlier and later, than that of pollen production.

British Floras vary considerably in the flowering period they assign to the hazel. Hooker ('Student's Flora') gives February to March; Babington ('Manual') March to April; and Druce ('Hayward's Botanist's Pocket Book') February to May. Exact information as to first dates of pistillate flowering is now available in the Reports of the Phenological Committee of the Royal Meteorological Society. Average first-flowering dates, based on observations for thirty-five years, show a difference of about three weeks between the southern and northern parts of the British Isles, February 1 being the mean date for S.E. England and February 24 for E. Scotland.

The variation from year to year, however, may be considerable. The annual tables for the last fifteen years give a seasonal average for S.E. England varying from January 29 in 1923, 1924, and 1926, to February 9 in 1931, and even, exceptionally, to February 16 in 1929. January and February of 1929 were very cold with severe and prolonged frosts. The

means for S.W. England range from January 29 in 1926 and 1934 to February 12 in 1930, and in the exceptional year 1929 to February 22. The extreme dates for S. Ireland are January 24 in 1934 and February 14 in 1936.

Apart from the exceptional date of February 1 in 1934, the means for N. Scotland vary from February 18 to March 10, and those for E. Scotland from February 10 to March 11, while those for N.E. England, omitting the exceptional date of January 30 in 1923, range from February 8 to March 3.

THE CHAROPHYTE COLLECTING TOURS OF THOMAS BATES BLOW.

By G. O. Allen.

Finding the opening lines of a proposed paper by the late Mr. James Groves on "Charophyta collected by Mr. T. B. Blow in Southern Europe and Tunis" has suggested to me that a brief sketch of the many tours all over the world made by this energetic botanist, mainly in quest of Charophytes, would be of considerable interest.

Systematic accounts by Groves have appeared in the pages of the Linnean Society's Journal on the Charophytes Mr. Blow collected in the West Indies, Ceylon, and Madagascar (Bot. xxxiii. 1898; xlvi. 1922; and xlviii. 1928), but they by no means cover all his remarkable activities in this line.

In his obituary notice on his brother Henry, James Groves has recorded that 1874 was an important year for them. It was then that through the medium of the exchange columns of 'Science Gossip' the brothers got into correspondence with a number of British botanists, including Mr. Blow. As long ago as that he was styled "one of the most ardent of field botanists," and it was his enthusiasm that led them to extend their botanical horizon. If the Groves brothers had good reason to be grateful to Blow, it was they in turn who aroused his deep and lasting fondness for the Characeæ, the study of which group they started in 1877.

The first time T. B. Blow began collecting far afield for the brothers was on the occasion of his visit to British Guiana and the West Indies in the winter of 1894–5. British Guiana itself, though a promising-looking spot, and several of the islands, produced no Charophytes at that season, but in Antigua and Trinidad several were forthcoming, including one then considered new, *Nitella dictyosperma*, of which there is an illustration by Henry Groves described subsequently by James as "among the best representations of this genus which have been produced." There is little doubt that James Groves influenced

by some later determinations by Nordstedt from that region eventually came to regard this plant as best referred to *N. oligospira* Br.

The next Charophyte expedition was a brief visit to Ceylon in the autumn of 1895. This was productive of a particularly delicate new species, *Nitella leptodactyla*, which was beautifully depicted by Miss Mary Groves. It was on specimens collected then that Groves decided to elevate Nordstedt's *N. pseudoflabellata* Br. forma *mucosa* to specific rank as *N. mucosa*. No less than thirteen species were gathered in under three weeks' hunting then with a subsequent fortnight in January 1898.

Mr. Blow then moved on in December to Western Australia and also visited South Australia, New South Wales, Victoria, and the Northern Territory. Including a short visit to New Zealand in March 1896, over one hundred and twenty gatherings of Charophytes were made in this area, eighty of these being in Western Australia.

The collection comprised over twenty-five species, the most noteworthy being *Nitella gloeostachys* Br., *N. microphylla* Br., *N. myriotricha* Br., *N. leptostachys* Br., *N. Lhotzkyi* Br., *N. congesta* Br., *N. Stuartii* Br., and a fine range of *N. gelatinosa* Br. ; *Chara macropogon* Br., *C. australis* R. Br., *C. leptopitys* Br., *C. Preissii* Br., and *C. Drummondii* Br.

Early in May of that year Blow moved on to Japan, where, by the third week of June, some forty more gatherings were made, which included *Nitella laxa* Allen, *N. batrachosperma* Br., *N. pulchella* Allen, and *N. Stuartii* Br. Some plants were also collected on the way home at Singapore and Penang.

In November of the following year (1897) his pioneer work on Bee-keeping took Mr. Blow a month's visit to Tunis, where a small but important collection of Charophytes was made, the most interesting amongst them being *Tolypella hispanica* Nordst., *Chara squamosa* Desf. (*C. gymnophylla* Br.), and *C. galioides* DC.

1898 saw another visit to the far East, collections being made for a fortnight in Ceylon, and continued in Japan during a stay there from February to December. In January 1899 for a month Blow made his first gatherings in India, continuing them on a further visit in 1908, though this latter was primarily a photographic trip.

January 1914 found him in Spain, when he was successful in finding amongst others *Tolypella hispanica* Nordst., *Chara galioides* DC., and *C. Rabenshorstii* Br.

Strenuous hospital work in France made Charophyte hunting out of the question during the War years.

Between 1920 and 1923 numerous visits were paid to the Continent, for the most part to countries bordering on the Mediterranean, where close on a hundred gatherings were made, which, as Groves has remarked in MS., " represented notable

extensions of the known distribution of several species." The countries included France, 1920–1 ; Portugal, 1921 ; Majorca, 1922 ; Spain, 1922 ; and Italy, 1922–3. About twenty-two species were obtained including *Nitella capillaris* Gr. & B.-W., *N. hyalina* Ag., *Tolypella hispanica* Nordst., *Lamprothamnium papulosum* Gr., *Chara canescens* Lois., *C. rudis* Br., *C. imperfecta* Br., *C. galioides* DC., *C. tomentosa* L. and *C. fragifera* Dur.

Early in 1924 Blow started off on perhaps the most venturesome of all his trips, viz., to Madagascar, a country where very few Charophytes had been collected before—a fact which is hardly surprising seeing the hitherto inaccessible nature of most of the island. He was, however, fortunate in having obtained from the French Colonial authorities through Sir John Pilter, a prominent Englishman in Paris, very special introductions which rendered his travels much easier and were in fact invaluable.

When after several days' journey by slow trains he reached the capital and was showing his papers, he was informed that, though they knew he had arrived at Tamatave, they had been searching for him for a week, and that the Governor-General, Mons. M. Olivier, wished to see him. Mr. Blow accordingly paid him a visit and was told that on stating his itinerary he would be helped everywhere. A dearth of porters on one occasion was remedied by the temporary release of some prisoners from the local jail.

The principal object of this visit was to investigate the theory that the presence of Charophytes was inimical to Mosquito larvæ. A very large collection was made, 384 specimens in 104 gatherings. This local enquiry, combined with subsequent thorough laboratory investigations on his return, led him to conclude that without doubt there was no substance in the theory.

From among the seventeen species collected, Groves described five as new—and also three new varieties—all of *Nitella*, the species being *N. inaequalis*, *N. graciliformis*, *N. sphaerocephala*, *N. vermiculata*, and *N. Blowiana*. The last-named, as Mr. Blow has described to me, was a most remarkable plant from its being so heavily enveloped in mucus, one specimen which would be but a few grains when dried, weighing two to three ounces when fresh. The fact that the dried plants were supplemented by a considerable amount of material in formalin, was a great help in the satisfactory study of these specimens. Without such material much time has often to be spent in detaching and preparing portions which in the end may not prove suitable for determining the species.

Blow also collected a few Charophytes in Istria in 1928, and in Corfu in 1929. Amongst the latter were two gatherings of a particularly large plant with the habit of *Chara hispida* L.,

to which Groves had assigned the MS. name of *C. corfuensis*; from this I gather that probably he intended to describe it as new. It tends towards *C. papillosa* Kütz. var. *ornata*. I sent a scrap of it to Dr. Filarszky, of Budapest, an old correspondent of Groves, meaning to discuss the status of the plant with him, but understanding it was being referred to him he published it as *C. corfuensis* in 'Determinatio Characearum Exoticarum' ("Math. und Nat. Anz. der Ungar. Akad. der Wiss. lv. 477, Budapest, 1937).

As Groves has remarked in the Madagascar paper: "Mr. Blow's experience as a hunter of these plants far away exceeds that of any other man." His "specimens were all carefully floated out and, wherever possible, fruiting examples were obtained," whereas earlier specimens from remote parts of the world being collected casually were often poor and badly preserved.

It is difficult for anyone who has not done a certain amount of collecting of these plants to appreciate the labour and skill that the production of these well-mounted specimens must have entailed. They constituted an immensely important accession to the Groves Charophyte herbarium which was bequeathed to the British Museum in 1933.

A NEW CARIBBEAN SPECIES OF *CROTALARIA* *.

By Harold A. Senn, M.A., Ph.D.

While examining a collection of species of *Crotalaria* from Colombia, in conjunction with Mr. E. P. Killip of the United States National Herbarium, attention was directed especially to a specimen collected by Purdie in 1844. This proved to be a new species closely allied to the West Indian *Crotalaria lotifolia* L. Since this species was established on a specimen from the mainland of South America, which region is not treated in my forthcoming revision of the *Crotalaria* species of North America, Central America, and the West Indies, it may be well to record it here. The species may be characterized as follows:—

Crotalaria Purdiana, sp. nov.

Frutex vel suffrutex, erectus, accedens ad *C. lotifoliam*; caulibus teretibus dense fulvo-pilosis; stipulis subnullis; foliis trifoliatis, supra hirtellis, subtus adpresso-pilosis, foliolis ellipticis

* Contribution No. 599, "Botany and Plant Pathology," Science Service, Department of Agriculture, Ottawa, Canada. (Continuing the Series of the former Division of Botany.) This species was studied during the tenure of a United States National Research Council Fellowship in Botany at Harvard University.

obtusis vel mucronulatis, foliolo terminali 4·2–8·2 cm. longo, 2·2–3·8 cm. lato, lateralibus 3·6–5·0 cm. longis, 1·8–2·9 cm. latis, petiolo angulato, 5·5–9·1 cm. longo; racemis sessilibus axillaribus, 4–8-floribus, pedicellis brevibus, circa 4 mm. longis; bracteis minutis setaceis, bracteolis obsoletis; calyce campanulato, dense piloso, tubo circa 4 mm. longo, laciniis lanceolatis 5 mm. longis; vexillo dorso glabrato praeter pilosam costam, circa 1·4 cm. longo; carinato subrotundato brevi attenuato; leguminibus immaturis oblongis, basi attenuatis, dense sericeo-pilosis.

Colombia: Santa Marta Manocapa, *Purdie* s. n., Sept. 1844, type in the Gray Herbarium, Harvard University, isotype in the Herbarium of the Royal Botanic Gardens, Kew.

Cuba: Habana Prov., Batabanó, *Ekman* 12621, in palm savannas behind the manglares (Herbarium of Field Museum of Natural History, Chicago).

This species and the closely related *Crotalaria lotifolia* L. are American representatives of the subsection Oliganthae Baker f., Section Eucrotalaria Baker f. (Journ. Linn. Soc. xlii. 241–452, 1914) of this large pantropic genus. Both *Crotalaria lotifolia* L. and *C. Purdiana* Senn are characterized by short axillary racemes and basally attenuated legumes. In *C. Purdiana* there is a definite common peduncle bearing 4–8 flowers, whereas in *C. lotifolia* the common peduncle is very short or almost lacking and only 1–3 flowers are borne in each axil. The former species has definitely larger leaves than has *C. lotifolia* and the leaves are pilose above as well as below, whereas in *C. lotifolia* the upper surface is glabrous. The type-specimen on which the above description was based bore only immature legumes. The other specimen cited had mature glabrate legumes similar to those of *C. lotifolia*.

I am grateful to those in charge of the Herbaria cited above for the loan of specimens and to Mr. Killip for the opportunity of examining his assembled Colombian material.

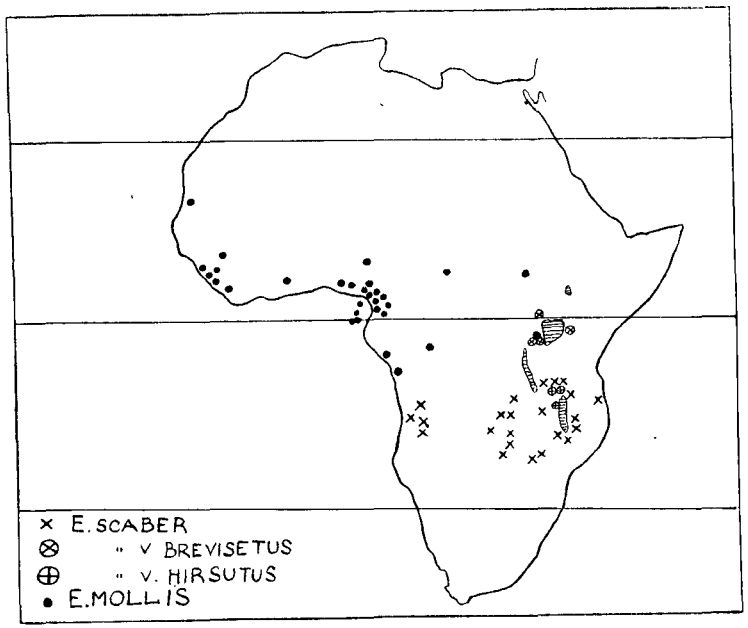
AN ENUMERATION OF THE AFRICAN SPECIES OF *ELEPHANTOPUS* L.

By W. R. Philipson, B.A.

The discovery that *Elephantopus mollis* Kunth was frequent in collections from Africa and that it had previously been confused with *E. scaber* L. lead to the examination of all the material of this genus from Africa in the herbaria at the British Museum and Kew. The distributions of these two species, which scarcely overlap, are shown in the map. All the African material of *E. scaber* was found to fall under Hoffmann's variety *plurisetus*,

which is here treated as a subspecies, since it differs constantly, though only slightly, from the Asiatic material. Within the subspecies two well-defined varieties, each with a limited distribution, are recognized. Plants collected by Kassner on the shores of Lake Mweru and by Carson south of Lake Tanganyika probably represent undescribed species related to *E. scaber*, but the material is too incomplete to base new species upon.

Two species previously described (namely, *E. Gossweileri* S. Moore and *E. vernonioides* S. Moore) are regarded as synonymous with *E. senegalensis* Oliv. & Hiern and *E. multisetus* O. Hoffm. respectively.



Map showing distribution of *Elephantopus scaber* and *E. mollis*.

The sub-tribe *Elephantopeae* was first proposed by Cassini and was maintained by Lessing and De Candolle. Bentham, in his revision of the Compositae in 'Genera Plantarum,' divided his Vernoniaceae primarily into *Euvernonieae* and *Lychnophoreae*, and included in the latter sub-tribe not only genera clearly related to *Lychnophora*, but also the *Elephantopeae* and the *Rolandreae*. The older arrangement seems preferable, for when the *Rolandreae* and especially the *Elephantopeae* are removed from the *Lychnophoreae*, a group of genera remains which is extremely closely related to the *Stilpnopappeae* and to *Vernonia* itself.

The *Elephantopeae* deserve the distinction of a sub-tribe because of their characteristic glomus of small heads and also the corolla which is asymmetric in all the species, being deeply cleft between the lobes nearest to the centre of the receptacle, a structure which is all but unique in the tribe. This character is found elsewhere in the tribe in the extremely isolated genus *Stokesia*. I have also found asymmetry of the corolla in the African monotypic genus *Paurolepis*, which on the sum total of its characters is nearly related to *Erlangea*, but is further exceptional in the tribe in having a sub-two-seriate involucre. Both these genera have many-flowered and discrete heads, but the recent genus *Hystrichophora* Mildbr. resembles *Elephantopus* not only in the asymmetric corolla, but in having rather few-flowered heads aggregated into glomera, and also in its habit. This genus certainly seems to belong to the *Elephantopeae*.

Several genera have been proposed in the sub-tribe, but most are superfluous. The only species with a two-seriate pappus is placed in *Elephantosis* (South America). Two species with a characteristic habit and inflorescence, and with two of the pappus-setae elongated and variously twisted form the genus *Pseudo-Elephantopus** (one, **Pseudo-Elephantopus Funckii** (Turcz.), comb. nov.†, previously placed in a separate genus *Spirochaeta*). *Elephantopus angustifolius* Sw., in which the pappus is of numerous bristles, has usually been removed to the genus *Orthopappus*, but a study of the African species reveals such diversity in the pappus that it is best to retain it in *Elephantopus*.

ELEPHANTOPUS L. Sp. Pl. 814 (1753), et Gen. Pl. 355 (1754).

Perennial pilose *herbs*, with leafy or scapiform stems. *Leaves* sessile, pinnately nerved, with entire or dentate margins. *Glomera* solitary or disposed on stiff peduncles in a corymb, and surrounded by leaf-like bracts. *Heads* few-flowered, with few and narrow involucral scales. *Corolla* 5-cleft, asymmetric, being more deeply cleft on the inner side. *Anthers* auriculate, auricles of adjacent anthers fused. *Style* branches filiform, pilose, especially below their union. *Achenes* cylindrical, 10-ribbed, pilose, often glandular between the ribs. *Pappus* uniseriate, setae 5-∞, usually long with wider bases, rarely short, and in one (South American) species forming a crown. Receptacle small, naked.

* *Pseudo-Elephantopus* Rohr in Nat-Selsk. Kjøb. ii. 214 (1792) (later misspelt *Pseudelephantopus*). Rohr did not make a specific combination and Vahl, *l. c.* 216, who described the species of Rohr's genera in this paper, identifies the genus with *Elephatopus spicatus* Aubl. The combination *Pseudelephantopus spicatus* was first made by Gleason in North Amer. Fl. xxxiii. 109 (1922), which is here corrected to *Pseudo-Elephantopus spicatus* (Aubl.) Gleason.

† *Pseudo-Elephantopus Funckii* (Turcz.), comb. nov.—*Spirochaeta Funckii* Turcz. in Bull. Soc. Imp. Nat. Mosc. xxiv. 167 (1851).

Distribution.—Tropical Asia; Tropical Australia; Tropical Africa; Madagascar; America from the southern United States to north-temperate South America.

Type-species, *E. scaber* L. Species in Africa 7.

Key to the African Species.

A. Pappus of 5–15 bristles or scales, inflorescence a branched corymb or spicate (rarely small plants with a single glomus).
  B. Inflorescence a branched corymb.
    C. Pappus of bristles dilated below, tips of corolla lobes glabrous.
      D. Lower leaves crowded to form a rosette, pappus bristles gradually dilated below; low scapiform herb with the involucral bracts appressed-pilose ..... 1. *E. scaber.*
      DD. Lower leaves separated by short internodes, pappus of fine bristles abruptly dilated at the base; usually tall branched and leafy herb with the involucral bracts glabrous and shining or puberulous .... 2. *E. mollis.*
    CC. Pappus of about 10–12 narrow scales, tips of the corolla lobes hairy.
      E. Involucral bracts uniformly tomentose... 3. *E. Welwitschii.*
      EE. Involucral bracts with tufts of hairs at their apices, glabrous and shining below ..... 4. *E. angolensis.*
  BB. Inflorescence spicate ..... 5. *E. Mendoncae.*
AA. Pappus of about 40–50 bristles, glomera terminal solitary, subtended by numerous involucrating bracts which are several times longer than the heads and resemble the foliage leaves.
  F. Leaf-sheaths inconspicuous ..... 6. *E. senegalensis.*
  FF. Leaf-sheaths dilated ..... 7. *E. multisetus.*

1. E. SCABER L. Sp. Pl. 814 (1753), emend.

I have examined the specimen of this species in the Linnaean Herbarium. As it was in Linnaeus's possession when he wrote the 'Species Plantarum,' and since his description is original, this specimen must be taken as the type. It is an Old World plant, for he has written "*Ind. or.*" on the sheet. The specimen has a rosette of leaves and a scapiform inflorescence. The citations following the description refer not only to this species but also to the New World species *E. carolinianus* Willd. and *E. tomentosus* L.

The material of this species, which I have examined from Asia, has achenes with a pappus of five or rarely six setæ. The African material equally constantly has achenes with more than five setæ, most frequently with from seven to ten. I regard the Asiatic material as *E. scaber* subsp. *typicus* (Koster), stat. nov. (*E. scaber* var. *typicus* Koster in Blumea, i. 458 (1935)). The African material falls under Hoffmann's variety *plurisetus*, which I regard as a subspecies.

Subsp. **plurisetus** (O. Hoffm.), stat. nov.

E. scaber var. *plurisetus* O. Hoffm. in Engl. Jahrb. xxx. 426 (1902).

BELGIAN CONGO: Katanga; Elisabethville, *Rogers* 10136 (BM, Kew); Elisabethville, *Hirschberg* 74 (Kew); Kipaila, *Kassner* 2528 (BM, Kew).

TANGANYIKA: Lindi Province; Lindi, *Schlieben* 6294 (BM). Iringa Province; Mbeya District, *Thompson* 780; *Davies* 170 (Kew); Iringa, *Emson* 550 (Kew); Uhehe, *Goetze* 772 (BM).

NYASALAND: Blantyre; Shire Highlands, *Buchanan* 53 (Kew). Without precise locality, *Buchanan* 475 (BM).

NORTHERN RHODESIA: Batoka District; Pemba, *Rogers* 8577 (Kew). Luangwa District; Broken Hill, *Rogers* 8116; Mumbwa, *Macaulay* 634 (Kew). Solwezi District; *Milne-Redhead* 551 (Kew).

SOUTHERN RHODESIA: Mazoe District; *Eyles* 256 (BM), Salisbury; *Dept. of Agriculture* 2479 (Kew).

ANGOLA: Huila; *Welwitsch* 3389 (BM, Kew). Cuanza Norte; Pungo Adongo, *Welwitsch* 3387 (Kew). Benguela; Caconda, *Gossweiler* 4259 (BM). Bié; Ganguela, *Gossweiler* 3345 (BM, Kew). Lunda; Dala, *Exell and Mendonça* 1420 (BM).

PORTUGUESE EAST AFRICA: Niassa District; *Torre* 53 (BM); *Gomes e Sousa* 1353 (Kew).

Var. **hirsutus** var. nov. a subsp. *pluriseto* tantum differt ramis dense erectis tomentosis, et squamis involucri pilis densis appressis obtectis.

TANGANYIKA: Rungwe District; *Davies* 473 (type, Kew); Kyimbila; *Stolz* 1282 (Kew).

NYASALAND: North Nyassa District; Kondowe to Kawuga, *Johnston* 359.

Var. **brevisetus** var. nov. a subsp. *pluriseto* tantum differt pappi setis brevioribus, 1·5–2·5 mm. longis.

UGANDA: Western Province; Masaka–Mbarara road, *Maitland* 827 (type, Kew).

KENYA: Nyansa Province; Kisii, *Coryndon Museum* 5390 (Kew).

TANGANYIKA: Bukoba District; Kamachumu road, *Haarer* 2178; Bugufi, at 6000 ft., *Chambers* 61 (Kew).

2. E. MOLLIS Kunth, Nov. Gen. et Sp. Plant. iv. 26 (1820).

FRENCH WEST AFRICA: Senegal, *Heudelot* 674 (Kew). Upper Senegal and Niger, *Chevalier* 2817 (Kew). French Guinea, *Pobéguin* 572 (Kew).

SIERRA LEONE: *Scott Elliot* 3880 (BM; Kew); *Thomas* 3056, 5821 (Kew); *Deighton* 292 (Kew).

LIBERIA : *Linder* 1196 (Kew).
GOLD COAST COLONY : Ashanti, *Kitson* s. n. (BM).
NORTHERN NIGERIA : Bauchi, *Lely* 837 (Kew).
SOUTHERN NIGERIA : Calabar ; Oban, *Talbot* s. n. ; Okuni, *Holland* 169 (Kew). Without precise locality, *Thomas* 2301 (Kew) ; *Kitson* s. n. (BM).
BRITISH CAMEROONS : Cameroons Mt., *Dunlap* 106 (Kew). Buea and Victoria, *Maitland* 61, 128, 249 (Kew). Victoria, *Winkler* 676 (BM, Kew). Buea, *Deistel* 138 (BM).
BIAFRAN ISLANDS : Fernando Po ; *Barter* s. n. (Kew) ; *Mann* 225 (Kew). Principe ; *Exell* 509 (BM) ; *Mann* s. n. (Kew) ; *Welwitsch* 3388 (BM). S. Tomé ; *Watt* 7054, 7086 (BM) ; *Exell* 159 (BM) ; *Moller* 78, 112, 307, 697 (BM) ; *Quintas* 1138 (BM) ; *Don* s. n. (BM) ; *Menyhart* 21 (Kew) ; *Chevalier* 13496 (Kew).
FRENCH EQUATORIAL AFRICA : Cameroons ; Bipinde, *Zenker* 4238 (BM, Kew). Without precise locality, *Preuss* 1150 (BM ; Kew). Oubangui-Chari ; Haute-Kotto *Le Testu* 3403 (Herb. Le Testu). Gabon ; Munda, *Soyaux* 407 (Kew).
ANGLO-EGYPTIAN SUDAN : Equatorial Province ; Djurland, *Schweinfurth* 2597 (BM, Kew).
BELGIAN CONGO : Middle Congo ; Kisantu, *Vanderyst* 4770 (BM).
TANGANYIKA : Lake Province ; Bukoba District, Karangwe, *Speke and Grant* 444 (Kew).
ANGOLA : Cabinda ; Mayumbe, *Gossweiler* 7125 (BM).

3. E. WELWITSCHII Hiern, Cat. Afr. Pl. Welw. i. 3, 540 (1898).

ANGOLA : Cuanza Norte ; Pungo Andongo (Pedras Negras), between Quibinde and Quitage, *Welwitsch* 3387 (type, BM). Malange ; N'Bongo, near Malange, *Gossweiler* 1219 (BM, Kew). Benguela ; between Ganda and Caconda, *Hundt* 473 (BM). Bié ; between Coemba and River Cuanza, *Exell and Mendonça* 1736 (BM).

4. E. ANGOLENSIS O. Hoffm. in Bol. Soc. Brot. x. 172 (1893).

ANGOLA : Huila ; between Lopolo and Jau, *Welwitsch* 3390 (co-type, BM, Kew) ; Ferrão da Sola, *Welwitsch* 3391 (BM, Kew).
I have not seen the specimen collected by Antunes (also from Huila) cited in the original description. It is said to have the leaves less rugose.

5. **Elephantopus Mendoncae,** sp. nov. Herba perennis, caule 1 m. alto simplici sericeo-tomentoso. Folia radicalia rosulata cum petiolo alato basi vaginato ; lamina lanceolata, 15× 2·3 cm., margine sub-crenata, utrinque scabrido-pubescenti, costa nervisque subtus prominentibus. Folia caulina pauca, radicalibus similia, superiora parva sessilia. Inflorescentia spicata, glomeris sessilibus. Glomera usque 20×12 mm. quam bracteæ longiora. Capitula 10×3 mm. tenuia ; involucri squamæ circa 8, ad apicem pubescentes lanceolatæ. Flosculi 4 ; corollæ tubus 10 mm. longus ; limbus 4 mm. longus glaber. Achenia 3 mm. longa sericeo-tomentosa ; pappus 1-seriatus, squamis 10·6×0·5 mm. lanceolatis, margine minute serratis.

ANGOLA : Bié ; between Coemba and River Cuanza, at c. 1,300 m., 7. 8. 1937, *Exell and Mendonça* 1734 (type, BM ; Coimbra).

This is distinct from all the other African species because of the spicate inflorescence, in which character it resembles certain South American species. Like *E. scaber* it has a radical rosette of leaves, but has a pappus similar to *E. Welwitschii* and *E. angolensis*.

6. E. SENEGALENSIS (Klatt) Oliv. & Hiern in Oliv. Fl. Trop. Afr. iii. 299 (1877).

Synchodium senegalense Klatt in Ann. Sci. Nat. sér. 3, xviii. 364 (1873).
Elephantopus Gossweileri S. Moore in Journ. Linn. Soc. Lond., Bot. xlvii. 267 (1925).
FRENCH WEST AFRICA : Senegal ; *Heudelot* 646 (type, Kew).
SIERRA LEONE : Musaia, *Thomas* 2659 (Kew).
SOUTHERN NIGERIA : Lagos, *MacGregor* 158 (Kew).
FRENCH EQUATORIAL AFRICA : Oubangui-Chari ; Haute-Kotto, Zalinga, *Le Testu* 3332 (Herb. Le Testu).
UGANDA : Eastern Province ; Serere, *Chandler* 940 (Kew).
ANGOLA : Cuanza Norte ; Samba Caju, *Gossweiler* 8478 (BM).

7. E. MULTISETUS O. Hoffm. in Bull. Soc. Roy. Bot. Belge, xxxix. 31 (1900).

E. vernonioides S. Moore in Journ. Linn. Soc. Lond., Bot. xlvii. 267 (1925).
BELGIAN CONGO : Lusambo, *Laurent* s. n. (type, Bruxelles).
ANGOLA : Cuanza Norte ; Capijongo, *Gossweiler* 7461 (BM).
These last two species are very distinct within the genus, having not only a distinctive pappus but a very striking habit quite unlike that of any other species.

I wish to express my gratitude to the Director of the Jardin Botanique de l'Etat, Bruxelles, for the loan of the type-specimen of *Elephantopus multisetus* O. Hoffm.

ON THE OCCURRENCE OF A HERMAPHRODITE PLANT OF *EMPETRUM NIGRUM* L.

By Kathleen B. Blackburn.

It has been known for a long time that hermaphrodite forms of the normally dicœcious Crowberry occur, and such plants are so common in Greenland that Lange referred to them as ' forma *hermaphrodita* ' *.

In 1927 Hagerup† investigated these plants from northern areas and came to the conclusion that they were sufficiently differentiated from the dicœcious *Empetrum nigrum* L., by chromosome number as well as morphological characters, to be considered as a separate species under the name *Empetrum hermaphroditum* (Lange) Hagerup.

Since this time there has been a tendency to assign all the hermaphrodite individuals found sporadically in Britain to Hagerup's new species. The discovery of another example on the hills near Edmondbyers, Co. Durham, has made it possible to test whether this is always justifiable.

Careful examination showed that in vegetative features this plant was indistinguishable from the neighbouring male and female individuals, whereas *E. hermaphroditum* is more robust and upright in habit. It also showed rooting procumbent branches which *E. hermaphroditum* is definitely stated not to do. The flowers had three stamens, as in the male, instead of the six figured by Hagerup, but this may not be significant since he also gives a diagram of a dimerous flower with only two. Again, my specimen showed more scales on the flowering shoot than the two bracteoles in his floral diagrams. The elongated style, both drawn and described, was certainly not present, but, as the few flowers examined were young ones opened precociously in autumn, this difference does not necessarily carry much weight. As described for *E. hermaphroditum* the withered stamens persisted beneath the ripening fruit, but even in the male plant they can still be seen in the autumn, so this must be considered as a descriptive rather than a diagnostic feature.

The last remaining and most important character to be tested was the chromosome number. Hagerup reported the gametic number of *E. nigrum* to be 13 and that of *E. hermaphroditum* 26, and he correlated the change in sex-conditions with the change in number of chromosomes—in other words, he thought that the new species, with its different characters, arose as the result of the chromosome doubling. In my material the anthers of both male and hermaphrodite plants were examined during meiosis and both showed a reduced figure of 13. It is thus clear that in this case the hermaphrodite condition is due to some agency other than a duplication of the chromosomes.

From the above facts it seems safe to state that the hermaphrodite plant under investigation is a form of *E. nigrum* and not *E. hermaphroditum*. The question whether the latter occurs at all in Britain will now require careful investigation.

* Lange, Joh. (1880): "Conspectus floræ Groenlandicæ," Meddelelser om Grønland, Hf. 3, p. 18.

† Hagerup, O. (1927): "*Empetrum hermaphroditum* (Lge.) Hagerup, a New Tetraploid Bisexual Species," Dansk Bot. Arkiv, v. Nr. 2.

OBITUARY.

John Frederick Bailey.

The late Mr. J. F. Bailey, a son of the famous F. Manson Bailey, was born at Brisbane on 5th August, 1866, and died at his home at Buranda, Brisbane, on the 19th May, 1938.

He was one of the most prominent figures in Australian horticulture. In 1889 he was appointed assistant to his father, then styled Colonial Botanist, and remained with him until 1905, when he was appointed Director of the Botanic Gardens, Brisbane, in succession to Mr. Phillip MacMahon. In 1915, on the death of F. M. Bailey, he was appointed Government Botanist in addition to his other post. He retained these positions until 1917, when he was appointed Director of the Botanic Gardens, Adelaide, South Australia.

On his retirement, he conducted the gardening page of the ' Brisbane Telegraph.' He was an active member of many Australian horticultural societies, and frequently acted as judge at the larger metropolitan flower shows.

In his earlier days, as Assistant to Colonial Botanist, Brisbane, he wrote several articles on economic botany in the ' Queensland Agricultural Journal,' and during his brief regime as Government Botanist (1915–1917) wrote several contributions to the Queensland Flora, mainly in conjunction with the present writer. During his term as assistant to his father he made several extensive collecting trips to different parts of Queensland. The results of two of these he published: the one called " Plants of the Rabbit-infested Country, Bulloo River, South Queensland," in the Report of the Seventh Meeting of the Australasian Association for the Advancement of Science, Sydney, 1898; the other a " Report on the Timber Trees of the Herberton District, North Queensland," published in the ' Queensland Agricultural Journal ' for October 1899. This latter is an exceptionally good report, and is the basis of our knowledge of the botany of the timber trees of this forest-rich area. C. T. White.

REVIEW.

Flora of Sussex. Edited by Lieut.-Colonel A. H. WOLLEY-DOD. 8vo, pp. lxxiii+557, with 2 maps and 6 plates. Kenneth Saville: Hastings, 1937. Price 15*s*.

THE absence of a Flora of Sussex, comparable with the existing Floras of the adjacent counties, was brought to the notice of the South-Eastern Union of Scientific Societies in 1927 by the late Dr. A. B. Rendle, and after some preliminary work had been done, Lt.-Col. Wolley-Dod in 1930 undertook to produce a new Flora in consultation with a committee of the Botanical Section of the Union. The best of our County Floras, such as White's 'Flora of Bristol,' have been written spontaneously by men who combined a good general knowledge of systematic botany with the zeal and patience which the investigation of the innumerable and often tedious details of such works entails; and in this light the committee was fortunate in securing the services of Lt.-Col. Wolley-Dod, whose botanical knowledge was not confined to the British Flora and who was already resident in the county. After seven years' labour, which has been necessarily heavier than for previous similar Floras owing to the elaboration of further critical groups and the recent changes in nomenclature, a satisfactory and comprehensive work has been published.

The introduction is adequate and of much interest. There is a full account of the seven sections into which the county is divided, with lists of their most notable species. The divisions are constructed to coincide with the natural topography, but it may be found inconvenient that three of these should overlap the boundary between Watson's two vice-counties 13 and 14. Mr. H. B. Milner contributes a chapter on the geology of the county, which is carefully and thoroughly done. The accompanying geological sketch-map, however, is hardly satisfactory, and a map with the different formations printed in colours, such as appears in the Floras of Kent and Surrey, would apparently have warranted a little extra expenditure. The Botanologia or Historical Summary is concise but comprehensive, and there is evidence here, as throughout the book, that literature and herbaria have been adequately consulted. The comparison of the flora with those of the adjacent counties shows a rather remarkable equality in the total numbers of species. A special small chapter is wisely introduced for casual aliens, but a large number of species of almost similar status appears in the Flora proper.

On turning to the body of the book the thoroughness of Lt.-Col. Wolley-Dod's work is quickly seen. The nature of the habitats of every species is stated with unusual accuracy, and

very few can be questioned. *Lithospermum arvense*, said to grow in similar places to *L. officinale* rather than in corn-fields, is almost a solitary example. A special feature that has been introduced, not found in any other Flora, we believe, is the "first notice" in addition to the "first record" of each species. In the investigation of literature and herbaria it was discovered that evidence of the occurrence of very many species existed of earlier date than the first published record, the majority of these first notices (over 300) appearing in the manuscripts of William Markwick (1739–1813), now in the Hastings Museum. An account of these manuscripts was printed in this Journal in 1933 (pp. 348 sq.). Interspersed throughout the text are frequent extracts from pre-Linnaean and other early works, often of much interest, as are also the occasional paragraphs wherein the editor expresses his own opinion on points of taxonomy. The latest accounts of critical genera are usually followed. In *Rosa* the editor is in his own domain; *Rubus* is written chiefly by Rev. H. J. Riddelsdell; *Hieracium* is less satisfactory owing to the group having been less intelligently treated by former experts. The Pansies are placed under two unnumbered aggregate species, *Viola tricolor* L. and *V. arvensis* Murr., subordinate to which are twelve numbered segregate species. One wonders whether all of these are worthy of specific rank. The two Valerians, *V. Mikanii* (Syme) and *V. sambucifolia* Mikan, are treated as three species, as proposed by Drabble in B. E. C. Report, pp. 249 etc. (1933). No stations are given, however, for two of them, and further work on the Sussex forms is clearly required. The same might also be said of the Thymes, which follow Ronniger's arrangement, but with few localities under the segregate species. In several genera some of the varieties admitted seem rather trivial. It is curious that *Valerianella carinata* is recorded in the Flora for the first time.

In spite of the general excellence of the work it is inevitable that a few points should be open to criticism. The period of flowering of *Stellaria neglecta* is given as 4–9, but surely this plant, unlike *S. media*, produces only one generation annually and is normally dried up before midsummer. The editor has doubts about his records of *Gentiana campestris* and *G. baltica*, which are certainly critical forms that have not been satisfactorily separated in Britain. The latest name for *G. lingulata* Agardh var. *praecox* Towns., i. e. *G. anglica* Pugsl., has not been adopted, owing, it is understood, to an oversight. The status given for several species might be disputed. Are *Chrysanthemum segetum* and *Artemisia Absinthium* naturalised aliens, while *Anthemis Cotula* and *Artemisia vulgaris* are natives? The status of *Asparagus* in Sussex is another problem. One or two errors appear due to lack of co-ordination between the editor and the committee. Such is "*Orchis incarnata* L." for "*O. latifolia* L." on page 430,

although " *O. latifolia* " is correctly printed in the hybrid combination below. And the attribution of *Cirsium* to Linnæus (p. 249) is presumably unintentional. " *E*[*uphrasia*] *confusa* Pugsl. *E. albida* Pugsl." for " *E. confusa* Pugsl. f. *albida* Pugsl." (p. 330) is one of the few misprints. It is regrettable that the six plates, reproduced from Mr. E. J. Bedford's photographs, should have been placed at the end of the volume after the index instead of facing the letterpress to which they refer. The " format " and printing of the book are otherwise excellent.

These are minor criticisms, which are probably inseparable from any work of this detail and magnitude, and Lt.-Col. Wolley-Dod deserves the thanks and congratulations of British botanists on his completion of a new County Flora of the first rank.

H. W. Pugsley.

BOOK-NOTES, NEWS, etc.

Linnaeus's Collections.—The Council and Officers of the Linnean Society have had under careful and anxious consideration the safety of the Linnaean Collections in view of war risks, and had completed a plan for the packing and removal of Linnæus's specimens, books, and manuscripts to Woburn Abbey, where the Duke of Bedford had agreed to store them. Indeed, everything was ready for their removal from Burlington House on the morning of Friday, September 30.

An Emergency Fund has been formed to cover the considerable expense entailed.

Third International Congress for Microbiology, New York City, September 2–9, 1939.—Would all who contemplate attending this congress kindly send their names to Dr. R. St. John Brooks, Secretary of the British National Committee (Lister Institute, Chelsea Gardens, London, S.W. 1) ?

Some knowledge of the numbers likely to make the journey will greatly facilitate arrangements for securing advantageous terms of transport from shipping companies.

At the Annual General Meeting and Fungus Foray of the British Mycological Society held at Aviemore, September 5 to 10, Miss Kathleen Sampson delivered a Presidential Address on " Life-cycles of Smut Fungi." In it she examined the evidence for various assumptions which underlie ideas on this interesting group of parasites: (1) Nuclear fusion occurs in the young chlamydospore and the single nucleus of the mature spore is diploid; (2) Meiosis occurs at the first or second (perhaps third) division of the chlamydospore nucleus; (3) Nuclear association is brought about either by hyphal or sporidial fusion with the formation of a dikaryophytic mycelium (*i. e.*, the male and female nuclei are paired, not fused); (4) Gametophytic, *i. e.*, haploid mycelium, cannot cause infection, parasitic mycelium is always dikaryophytic; (5) Saprophytic mycelium is usually haploid, dikaryophytic mycelium tends in culture to revert to the haploid condition.

Rubus echinatus Lindl.—The only specimen which is to be found under this name in Lindley's herbarium has been kindly lent me by the Professor of Botany, Cambridge. It is quite unmistakably the *R. echinatus* of Rogers, and the name antedates Mueller's *discerptus*. In Lindley's writing, at the bottom of the sheet, occur at the left-hand corner the words " 43. Hale end Forster. R. rhamnifolius "; and at the right corner " R. echinatus." Lindley's description of *R. echinatus* is very poor when compared with good modern work; but the specimen settles conclusively the identity of Lindley's species, as the Curator of the Cambridge University Herbarium tells me that there is no competing specimen. Mueller's name therefore does not replace Lindley's for this plant.—H. J. Riddelsdell.

Mr. A. H. G. Alston, Assistant-Keeper in the Department of Botany, left England on September 24th. He is to attend the First South American Botanical Assembly which is to be held at Rio de Janeiro Oct. 12–19 and will then go by way of Trinidad to La Guaira. From thence he will cross Venezuela and pass via Bogota through Colombia to Buenaventura on a botanical expedition. Mr. Alston will pay particular attention to Ferns, and hopes to obtain data to trace out the relation between the fern flora of Trinidad and that of the mainland. He will be away from the Museum about eight months.

The British Mycological Society Transactions, vol. xxii. parts 1 & 2, has accounts of the Spring foray held at Tunbridge Wells and the Autumn foray at Killarney (1936), with full lists of the species; descriptions of two new records of Agarics from Killarney by A. A. Pearson; " Mycetozoa found during the Killarney Foray " by G. Lister; the Presidential Address by F. G. Gould on " The Æsthetic Appeal of the Larger Fungi," which is a popular account of attractive species; "Agarics. New Records and Observations," by A. A. Pearson, which contains descriptions of many of the species of *Russula* recently distinguished on the continent, and other agarics including two new species, *Tricholoma Inocybeoides* and *Mycena uracea*, illustrated by a coloured plate; " Studies in the Genus *Ustulina* with special reference to Parasitism.—III. Spores—Germination and Infection," by W. H. Wilkins; " Some Fungi on the Yew," by E. O. Callen, describing *Sphaerulina Taxi* (Cooke) Massee,

Physalospora gregaria var. *foliorum* Sacc., and *Anthostomella Taxi* Grove ; " *Tremella translucens*, a new Species on dead Pine Needles," by H. D. Gordon ; " Notes on *Fusarium avenaceum* attacking the Leaves of Tulips in Glasshouses," by A. Beaumont and W. Buddin ; " Studies on British Pyrenomycetes.—II. A Comparative Study of *Melanomma Pulvis-pyrius* (Pers.) Fuckel, *Melanomma fuscidulum* Sacc., and *Thyridaria rubronotata* (B. & Br.) Sacc.," by C. G. C. Chesters ; " Contribution to the Biology of *Collybia radicata* (Relh.) Berk.," by A. H. Campbell ; " Observations of the Aquatic Fungi of the Aberystwyth district," by E. M. Brown ; " Note on the supposed Connexion between *Mastigosporium album* Riess and *Dilophospora Alopecuri* (Fr.) Fr.," by K. Sampson and J. H. Weston ; " The Taxonomy of Fungi of Blue-veined Cheese," by S. Dattilo-Rubbo ; " On the Classification, Nomenclature, Hosts, and Geographical Range of *Trametes Pini* (Thore) Fr.," by W. R. Haddow ; " *Cladosarum olivaceum*. A new Hyphomycete," by E. & J. L. Yuill, and " *Sclerotinia Polyblastis* n. sp., on Narcissus the perfect Stage of *Botrytis Polyblastis* Dowson," by P. H. Gregory.

NOMENCLATURE.—The Committee of the Taxonomy and Nomenclature section of the Seventh Botanical Congress to be held at Stockholm, 1940, have appointed Dr. T. A. Sprague, Royal Botanic Gardens, Kew, to act as " Rapporteur général " for the discussions on nomenclature. Motions dealing with nomenclature for consideration at the congress should be sent to Dr. Sprague before July 1, 1939. Motions must be presented in the form of additional articles or amendments to the International Rules, and should be drafted as briefly as possible. At least 100 printed copies must be presented.

According to Art. 74 of the International Rules, any additions or modifications made at the Amsterdam Congress will come up for confirmation at Stockholm. The Article reads :—

" These Rules can be modified only by competent persons at an International Botanical Congress convened for the express purpose. 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."

The wording is not satisfactory, but it is to be noted that the only method to obtain reconsideration of any modification accepted at Amsterdam is by bringing objections to the notice of the executive committee. It would be best, therefore, for notice of these to be sent to Dr. Sprague with suggestions for amendment, preferably in the form of a definite motion,

THREE NEW SPECIES OF TULIPS.

By A. D. Hall, K.C.B., F.R.S.

THE species of tulips here to be described have been observed before, and specimens of them may be found in herbaria, but they have not been identified or separated from the general mass of related material. They afford interesting examples of the help to taxonomy that is afforded by cytological examination.

Tulipa Aitchesonii, sp. nov.

One of the earliest species of *Tulipa* to be recognised was *T. Clusiana*, which was described by Clusius ('Curæ posteriores, Rariorum plantarum,' Antwerp, 1611) under the name of *T. persica* ; as the name indicates, he had received bulbs from some eastern source. A native of Persia, Irak, etc., it was early taken into cultivation and has become naturalised in the south of France and other Mediterranean countries. Its spread has doubtless been assisted by its marked habit of putting out stolons, which leave offset bulbs a foot or more away from the parent. Newton (1927) found this species to be pentaploid, the only example in *Tulipa* of so high a degree of polyploidy. A little later some bulbs which had been collected on the Chitral Relief Expedition proved to belong to a tetraploid form of *T. Clusiana*, and though they almost disappeared from cultivation they were found again in some material sent home by Colonel J. W. Thomson Glover from Chitral and the Swat Valley. Morphologically the tetraploid species *T. chitralensis* is barely to be distinguished from *T. Clusiana*, but in this new material, and especially in some further bulbs collected by Colonel R. Schomberg in Dardistan, specimens occurred which approximated *T. chitralensis* to the well-known *T. stellata*, also a tetraploid, described by Hooker from the Himalayas in 1827. In *T. Clusiana* and the typical *T. chitralensis* the flower possesses a deep purple basal blotch with filaments, anthers, and pollen of the same colour ; in *T. stellata* the corresponding features are all yellow. In the new material alluded to, various intermediates occur—*e. g.*, blotches of all degrees of indefiniteness, or a yellow blotch and filaments associated with purple anthers and pollen, all the other features of the plant being identical. Now *T. stellata* is accompanied by a well-known variant with a yellow ground-colour instead of white, usually known as *T. chrysantha*—not, however, the *T. chrysantha* of Boissier. These appear to be the commonest tulips of the hill country from Afghanistan and the Hindu Kush to Kashmir. Aitcheson (J. Linn. Soc., Bot. xviii. (1880), 103) writes of the yellow form, as seen on his journeys with the

Afghan Delimitation Commission "I doubt this being very distinct from *T. stellata* Hooker; there are intermediate forms. There is a high altitude form; the higher the plant goes the more yellow and dwarf it becomes. I have seen bulbs as woolly on the plains of the Punjaub as any of these at 9000 feet, where the species is common." But though the pentaploid and one or more variable tetraploid species were thus recognised, the diploid species from which they must have originated remained unknown, except for a single bulb which had come into the possession of the John Innes Horticultural Institution. It had been presented by W. R. Dykes a little before his death, but without any record of its provenance. This dwarf species, carrying a relatively large flower coloured like *T. Clusiana*, proved to be diploid, but for many years it remained the unique specimen of its kind. However, among some bulbs sent by Colonel R. Schomberg, collected from the Rambur Valley, S.W. Chitral, at an elevation of 8,000 feet, were some which produced flowers like miniature examples of the *chrysantha* variety of *T. stellata*, yellow with red on the backs of the outer segments. Other examples possessed the white ground of *T. stellata* with the purple anthers and pollen of *T. Clusiana* proper; an approach to the purple blotch occurred in others. In fact, the material represented a variable species which contained the elements characteristic of the tetraploid *stellata*, *chrysantha*, and *chitralensis*, variously combined. Since the plants were diploid, it evidently represented a species from which all the tetraploid forms could have been derived. Nor did this material stand alone. Similar diploid forms occurred in bulbs from Suru in Zanskar, Ladakh, Kashmir, distributed by Mr. T. Hay, and in others received by Messrs. Barr from another Kashmir source. Examination of the herbarium specimens at Kew showed under the name *chrysantha* various examples which appear to belong to this species (above Draz, at 10,400 ft., Astor to Dozen, Gilgit at 11,000 ft., Kurram Valley), and there is also a specimen from Daish, Chitral, at 4500 feet (Toppin no. 33), which fairly corresponds to the unique specimen described above.

It may be concluded that in the mountain regions of Upper India (the Hindu Kush and Kashmir) a diploid species of tulip occurs showing such variations as enable one to regard it as the source of the tetraploids *T. chitralensis*, *T. stellata*, and *T. stellata* var. *chrysantha*, and of the pentaploid *T. Clusiana*. Its relationship with the polyploids is demonstrated by the fact that they all possess morphological features in common, *e. g.*, a tuft of wool protruding from the apex of the somewhat tough tunic, a characteristic habit of growth and stripes of red on the back of the outer segments of the perianth, as well as certain chromosomes (2, 4, and 5 respectively) unlike those of any other species of tulip. To the tulip thus identified I have given the specific epithet of *Aitchesonii*. A species from Wazaristan described

by Blatter (J. Bombay Nat. Hist. Soc. xxxvii. (1934), 420) as *T. porphyreo-chrysantha* may be identical, but, as neither the character of the bulb nor the chromosomes were stated, the identification is uncertain. It is noteworthy that the diploids have all been derived from great elevations, the polyploids are abundant in lower and generally cultivated localities. Similarly, in southern Europe the diploid *T. australis* is a plant of the hill ranges, the corresponding tetraploid *T. silvestris* is a weed of the vineyards.

Diploid. *Bulb* nearly spherical, 1–1·5 cm. diameter. Tough brown tunic, from the apex of which a tuft of wool protrudes. *Leaves* 2–4, closely set on stem, half erect or flat on ground, 8–10 cm. long by 0·5–0·8 cm. broad, glabrous, purple on edge, sometimes very undulate. *Stem*, short slender pedicels above ground, 3–5 cm. long. *Flowers* usually 1 or 2, opening widely to a star, perianth segments equal, 3–4 cm. long, 1·5–2 cm. broad, bluntly pointed; backs of outer segments coloured with red; ground-colour yellow with no basal blotch. *Filaments*, *anthers*, and *pollen* yellow. *Ovary* greenish with a small yellow stigmatic surface. The ground-colour may be white, with a purple basal blotch of more or less intensity and purple filaments and anthers. *Capsule* nearly cylindrical, blunt end.

Chitral. Kashmir.

Species diploidea.

Bulbus fere globosus, 1–1·5 cm. diametro; tunica exteriora brunnea, dura, apice lanata. *Folia* 2–4, approximata, suberecta vel prostrata, 8–10 cm. longa, 0·5–0·8 cm. lata, glabra, interdum undulatissima, margine purpurea. *Caulis* brevis, gracilis, supra terram 3–5 cm. longus. *Flores* plerumque 1–2, stellato-patentes. *Tepala* aequalia, 3–4 cm. longa, 1·5–2 cm. lata, obtusa, lutea, emaculata, exteriora dorso rubra. *Filamenta antherae pollen* flava. *Ovarium* viride, stigmate parvo flavo. In floribus aliis tepala alba ad basim purpureo-maculata, filamenta antheræque purpurea. *Capsula* fere cylindrica, obtusa.

Habitat: Chitral. Kashmir.

Typus: Herbarium, Kew.

α. Subspecies **cashmeriana**, subsp. nov.

A form from Kashmir characterised by upright glaucous leaves and a central stem up to 15 cm. carrying two or three flowers on short pedicels, the terminal flower often coloured as it emeges from the ground. No red colour on the backs of the outer segments, all parts of the flower pure yellow.

Foliis erectis glaucis, caule usque 15 cm. alto flores duos vel tres pedicelles brevibus gerente, floribus luteis concoloribus, flore terminali e terra emergente luteo, insignis.

Habitat: Kashmir.

Typus: Herbarium, Kew.

Tulipa Bakeri, sp. nov.

The second tulip is again one that has long been in cultivation. *T. saxatilis* Sieber ex Spreng. was known to the early herbalists as the Cretan tulip and Parkinson (' Paradisus,' 1629) writes of " the Tulip of Candia " as rarely flowering in this country. In the wild state it is confined to Crete, though it is evidently related to a group of tulips which range from Persia through Asia Minor to the Palestine mountains. When Newton began his examination of the chromosomes in *Tulipa* he found this species to be triploid. This finding is in harmony with the behaviour of the species—its stoloniferous habit, its sterility, and its larger size than the other members of the same group. For a triploid one must presume a diploid origin, but the only other tulip then known that might be the source was the diploid *T. cretica*, a very small tulip belonging to the same group of Eriostemones and found in the highlands of Crete. Recently, however, among some bulbs collected by Mr. G. P. Baker, V.M.H., in Crete and grown by him as *T. saxatilis*, flowers were observed that were evidently not the typical *saxatilis*. Mr. Baker presented one of these bulbs to the John Innes Horticultural Institution, where it has now flowered for two years and can be compared with the flowers originally exhibited by Mr. Baker and with others grown at Kew. It has proved to be diploid, and there can be no hesitation in associating it with *T. saxatilis*. The colour of the corresponding parts—perianth, filaments, anthers, pollen—in the two species is alike, though in the diploid a little intenser. In the few examples that have been seen, some variation has been noted, such as is very general in diploid tulip species. None has been seen in the triploid *T. saxatilis*, as is understandable seeing that the individuals are only part of a clonal population. *T. cretica* as the immediate source of *T. saxatilis* may be dismissed, its flower is almost devoid of colour. I have given the new diploid the specific epithet of *Bakeri* to mark Mr. G. P. Baker's recognition of its specific distinctness, one only of the many interesting plants he has brought from Crete. The locality in which he found it was Asomatus, 25 km. South of Retino, on the north coast, province of Amari. In the Kew herbarium there is a specimen collected by Dorfler from Crete, " Viano propo Christos," which appears to be this species, though there named *T. Hageri*—an untenable attribution.

Diploid. *Bulb* about 1·5 cm. diameter; tunic brown, leathery, with a few hairs at the base and near the apex. *Leaves* 2–4, about 12–15 cm. long, the lower relatively broad, up to 2·5 cm.; glabrous and somewhat shining. *Stem* a pedicel about 15 cm. high. *Bud* erect. *Flower*: perianth segments 4–5 cm. long, incurved, forming a bell-shaped flower with the constriction near the base common to the Eriostemones; outer segments a little stained on the backs; backs of the inner segments with a well-defined broad rib, hirsute on the edges near the base; inner colour a soft reddish purple, a deeper shade of the colour of *T. saxatilis*, with a sharply defined basal blotch of orange, extending one-third of the length of the segment. *Filaments* tapering, alternately long and short, orange, hirsute boss at base. *Anthers* orange. *Pollen* orange. *Ovary* tapering, green, a little stained, with a yellow stigmatic surface. Capsule cylindrical with three well-marked angles, bluntly rounded at end.

Species diploidea.

Bulbus circiter 1·5 cm. diametro; tunica exteriora brunnea, coriacea, ad apicem basimque pilis paucis instructa.

Folia 2–4, 12–15 cm. longa, infimum pro rata amplum usque 2·5 cm. latum, glabra, nitidiuscula. *Caulis* supra folia circiter 15 cm. altus. *Alabastrum* erectum. *Flos* campanulatus, juxta basim constrictus. *Tepala* 4–5 cm. longa, incurva, intus lente rubro-purpurea (color *T. saxitalis* sed saturatior), triente infimo aurantiaca; tepala exteriora margine dorso tincta; tepala interiora dorso conspicue costata ad basim hirsuta. *Filamenta* altera longa altera brevia, sensim attenuata, aurantiaca, supra basim inflata et hirsuta; antheræ pollenque aurantiaca. *Ovarium* viride, leviter tinctum; stigma flavum. *Capsula* cylindrica, trigona, apice obtusa.

Habitat: Asomatus, Province Amari, Crete.

Typus: Herbarium, Kew.

Tulipa Veneris, sp. nov.

The third new species to be described is a triploid. It is a member of that large confused section of the Leiostemones named by Baker Eriobulbi, tulips which possess within the tunic a thick felt of wool round the bulb proper. They constitute the typical scarlet tulips of the Near East—Asia Minor, Syria, Palestine, Irak, Persia; two species have for a long time been naturalised in Italy and the south of France.

A large number of species have been described, but they shade off so insensibly one into another, and exhibit so much variation, even in the specimens collected in the same locality, that they may be regarded *sensu lato* as a single species for which the name *T. oculus-solis* St. Amans is the earliest. While the differentiation of species within the group is almost a matter of judgment and convenience, certain forms may be definitely picked out because they are triploids. Newton ascertained the triploid nature of *T. praecox* Tenore, a species morphologically quite distinct and exactly characterised by Tenore's diagnosis, though the subject of much confusion in Floras and Herbaria. A second triploid occurs in Syria, common on the mulberry terraces near Beyrout; this again is morphologically distinct

and unmistakable, though my identification of it with *T. aleppensis* cannot be otherwise than conventional, so imperfect are herbarium specimens of *Tulipa* for purposes of diagnosis.

Some years ago Mr. M. T. Dawe, then Director of Agriculture in Cyprus, sent to the John Innes Institution several collections of Tulip bulbs from that island. Among them was a diploid of the *oculus-solis* group which was afterwards described by Dr. Stapf as *T. cypria*, with a distinct wine-purple perianth. Another form for several years did not flower but multiplied very rapidly, continually putting out stolons and producing more small bulbs instead of growing to flowering size. They have flowered and, as was expected from the stoloniferous habit, are triploid; they are quite distinct from both *T. praecox* and *T. aleppensis*. I have called the species *T. Veneris*. It must remain a question whether it is legitimate to assign specific names to the various triploids which may arise from the same diploid species, differing from one another because of the variation in the diploid individuals from which they have started. The justification is that the triploid species is an unmistakable and invariable individual. The instructed eye will never hesitate to pick out a specimen of *T. praecox* or *T. aleppensis* or the newly recognised species here described, but a chance diploid member of this *oculus-solis* group collected in Palestine or Persia may leave the systematist in continued doubt as to which species or subspecies it belongs.

Triploid. *Bulb* up to 3 cm. in diameter, with a papery brown tunic, within which a thick coat of felted wool encloses the bulb. *Stem* about 20 cm. above ground, glabrous, carrying four leaves, the lowest of which starts 2–3 cm. above ground-level. *Leaves* lanceolate, the lowest about 16 cm.×3 cm., successively narrower and more pointed, glaucous, with a few short hairs on edges. *Bud* upright, green. *Flower* campanulate, opening widely. Perianth segments about 8×4 cm., the outer ones pointed and somewhat longer and narrower than the inner ones, which are rounded; colour a light scarlet inclined to orange, the inner segments showing a faint median stripe; the basal blotches are deep olive, almost black, pointed, extending to about one-half the length of the segment and broadly margined with yellow; the blotch shows through on the backs of the segments. The *filaments* are black, the anthers black and a little shorter than the filaments. *Pollen* yellow. *Ovary* green, marked with red on the three angles, tapering to a small red stigmatic surface. *Capsule* rarely if ever formed. Flowers in early April.

Cyprus.

Species triploidea.

Bulbus usque 3 cm. diametro; tunica exteriora brunnea, papyracea, intus dense lanata. *Caulis* supra terram circiter 20 cm. altus, glaber, 4-foliatus, folio infimo 2–3 cm. supra terram edito. *Folia* lanceolata, infimum circiter 16 cm. longum et 3 cm. latum, reliqua seriatim angustiora et acutiora, marginibus sparse ciliolatis. *Alabastrum* erectum, viride. *Flos* campanulatus, patens. *Tepala* circiter 8 cm. longa et 4 cm. lata, exteriora acuta, interioribus angustiora, interiora rotundata, omnia leviter coccinea, colore aurantiaco vergente, tepale interiora linea media levi instructa, omnia ad basim maculata; macula intense olivacea fere nigra marginibus flavis, acuta, dimidio tepali aequans, dorso tepali perspicua. *Filamenta* nigra; antheræ nigræ filamento breviores; pollen flavum. *Ovarium* viride in angulis rubris, ad stigma parvum rubrum angustatum.

Capsula perrara si unquam producta.

Floret ad initium mensæ Aprilis.

Habitat: Myrtou, Cyprus.

Typus: Herbarium, Kew.

I have to thank Mr. A. D. Cotton of the Kew Herbarium for the Latin versions of the diagnoses.

THE REV. WILLIAM CRAN AND HIS SCIENTIFIC WORK.

By G. Lister.

The contributions of the late William Cran, B.D., to our knowledge of Mycetozoa are so valuable that it is well that some account of his work should be put on record, together with a brief notice of the man himself. He was born at Lesmoir, near Rhynie, Aberdeen, in 1854. After taking the degree of M.A. at Aberdeen University in 1880, and later that of Bachelor of Divinity in Edinburgh, he went in 1883 as instructor to the Wesleyan seminary, Coke College, in the island of Antigua, West Indies, and there he remained for fifteen years. With his keen love of nature, he delighted in examining through the microscope many kinds of animal and vegetable life, and thus became interested in the study of Mycetozoa, or Myxomycetes, the beauty of whose sporangia and whose remarkable life-history greatly attracted him. In 1896 he sent a small collection of Mycetozoa to the Botanical Department of the British Museum, which was forwarded to my father for identification. In this way a correspondence started which was carried on at first with my father, and later with myself, which lasted for over thirty years; it not only proved of much interest scientifically but led to the establishment of a real friendship between us. An account of the fifty-two species collected in the West Indies by Mr. Cran was published by my father in a paper entitled "Mycetozoa of Antigua and Dominica" (*Journal of Botany*,

April 1898, pp. 113–122, Tab. 385); all the species enumerated were new records for those two islands.

In 1898 Mr. and Mrs. Cran returned to Scotland. Two years later he was appointed Congregational Minister to West Hill, Skene, Aberdeen, a position he held until he retired from active duty in 1930. Most faithfully did he fulfil his professional duties. With his wide sympathies and genial disposition, he carried on a fine educational work among the members of his congregation. To some of his young people he taught book-keeping and shorthand. His knowledge of Greek and Latin enabled him to read the classics for the sheer joy of the literature. He was always ready to share the pleasure of his varied interests with others, whether as an archeologist, as a musician (he was an excellent violinist) or as an ardent student of nature.

For many years his chief hobby was the study of Mycetozoa, with which, as he once wrote to me, " most of the purple patches of my life have been associated." So effectively did he search for these organisms that he was able to record 119 species in the county of Aberdeen and just over the border into Kincardine. Most of them were obtained in the neighbourhood of Skene and near his old home at Rhynie, though many other parts of the county were explored on his holidays. In the " Mycetozoa Journals," which he kept from 1913 to 1922, he describes his experiences and gives lists of the species found in each locality. In reading them one realizes with what zest and perseverance he pursued his studies. On returning home, his finds, many of them very minute species, would be carefully examined and beautiful permanent microscopic preparations, in glycerine jelly or Canada balsam, made of the most interesting. Of the species found (a list of which is appended below), four were new to science, eleven were new to Britain, and twenty five others had not, so far as I know, been recorded previously for Scotland. He did not publish any scientific papers; all specimens about which he was doubtful were sent to my father or to me for identification, accompanied by delightful descriptive letters, often touched with quiet humour.

I had the privilege of meeting Mr. Cran and his gracious wife in the autumn of 1912, and of being hospitably entertained by them in their manse at Westhill. He conducted me to one of his " hunting grounds," which consisted partly of an avenue of sheltered trees, partly of scattered limes, wych-elms, ashes, and sycamores, planted along the edge of an exposed upland field. To me it seemed an unpromising situation in which to search for Mycetozoa, and it was a revelation to learn what a wealth of sporangia could be found on the moss and lichens, as well as on the bark itself, on these trunks, at a height of five or more feet from the ground. Being short sighted, Mr. Cran had only to push up his convex spectacles to see well at a range of a few

inches, when he could point out minute and inconspicuous species which, for anyone with normal vision, would have needed a strong lens to detect. Such were the dark-stalked sporangia of *Orcadella operculata*, the tiny flesh-coloured clusters of *Badhamia versicolor*, the scattered grey sporangia of *Physarum Crateriachea* and *Diderma Chondrioderma*, all species which he had been the first to record for Scotland. Possibly the moist climate of the county of Aberdeen favours the growth of arboreal Mycetozoa *, but his remarkable success in finding twenty-four species on living trees, a habitat which has been little investigated elsewhere, was no doubt largely due to his perseverance, enthusiasm, and unsual powers of sight.

From 1918 onwards Mr. Cran devoted much time, with valuable results, to the study of the minute creatures wonderfully preserved in the Rhynie Chert, an ancient deposit of Middle Devonian age, the results of which have been incorporated in papers published by specialists. In 1925 he suffered a grievous loss in the death of his devoted wife, a loss which he bore with Christian fortitude. The following year an accident which he made little of at the time limited his activities. He wrote in September 1926, " I have not been on the warpath once all this year; a slight accident to my knee resulted in considerable disability in walking, so I had to confine myself to necessary duties; but I am improving; the work is however going forward." In 1931 he left Westhill and moved to the little village of Findhorn near Forres. I continued to receive cheerful letters from him, but he felt his powers were failing. He died June 28, 1933, leaving to his friends the remembrance of a beautiful and strong character and of a delightful comrade.

I am indebted to the Rev. C. T. Rae, who knew Mr. Cran well, for the notes he has kindly sent me on his friend's influence in his parish and on his classical attainments.

List of Mycetozoa found by the Rev. W. Cran in the Counties of Aberdeen and Kincardine.

(" New " denotes that the species or variety was first found by Mr. Cran. NB. denotes a new record for Britain, NS. a new record for Scotland.)

Ceratiomyxa fruticulosa (Muell.) Macbr. Abundant, summer and autumn.

Badhamia capsulifera (Bull.) Berk. Kirkville, Skene, Nov. 1916.
Var. *arborea* G. Lister. New. Westhill, Skene, Jan. 1904, Mar. 1906, Sept. 1912.

* See "Haunts of the Mycetozoa," by G. Lister, in 'Essex Naturalist,' xviii. pp. 307, 319, 320 (1918).

B. versicolor Lister. New. Arboreal. Found first at Rhynie, Aug. 1899, and occurring both there and near Skene frequently from July to December most years up to 1924. Widely distributed throughout the northern hemisphere.
B. utricularis (Bull.) Berk. Lesmoir, autumn 1916; Westhill, Sept. 1910.
B. foliicola Lister. NS. Around Lesmoir, on straw and old thatch, summer and autumn, 1913, 1915.
B. affinis Rost. NB. Arboreal: found frequently near Westhill and Lesmoir, in summer, autumn, and winter from 1899 to 1920.
B. decipiens (Curtis) Berk. NS. Kirkville, Skene, Aug. 1912, on a living tree.
B. macrocarpa (Ces.) Rost. NS. Lesmoir, Sept. 1917.
B. lilacina (Fries) Rost. Tilliefourie, Sept. 1917.
B. panicea (Fries) Rost. Near Westhill and Lesmoir, Aug. to Sept., not uncommon.
Physarum citrinum Schum. Near Rhynie, Huntly, Hazelhead, and Skene, not uncommon.
P. globuliferum (Bull.) Pers. NS. Ballogie, Oct. 1913.
P. murinum Lister. Closely allied to the preceding. Monymusk, July 1914.
P. viride (Bull.) Pers. Rhynie, Ballogie, etc.; frequent.
Var. *aurantium* Lister. Midmar, Sept. 1921.
Var. *incanum* Lister. Hazelhead and Westhill, Aug. 1916 and 1918.
P. auriscalpium Cooke. NB. Westhill, Lesmoir, and Huntly, Aug. 1912, 1916, 1923.
P. penetrale Rex. Durris, Kincardine, Sept. 1920.
P. straminipes Lister. NS. Lesmoir, summer, 1914, 1915, 1922; Westhill, Oct. 1916 and 1923.
P. nutans Pers. Frequent: var. *leucophaeum* Lister. Frequent.
P. crateriforme Petch. NB. Arboreal: frequent in summer and autumn about Rhynie and Westhill.
P. compressum Alb. & Schwein. Huntly, Lesmoir (arboreal), and Westhill, summer to winter.
P. cinereum Pers. Lesmoir, Sept. 1916, and Westhill, July 1920.
P. confertum Macbr. NB. Durris, Sept. 1920; near Skene, 1925, not well developed.
P. vernum Sommerf. Westhill, Aug. 1915; Hazelhead, Aug. 1916.
P. sinuosum (Bull.) Weinm. Near Durris, Sept. 1920; Lesmoir, 1923.
P. bitectum Lister. NS. Westhill, Oct. 1920 and 1923. Not seen by G. Lister.
P. contextum Pers. Lesmoir, Oct. 1900; Huntly, Sept. 1915.
P. virescens Ditm. Hazelhead, Aug. 1916.

Var. *nitens* Lister. Near Skene, July 1913, Oct. 1916 (weathered).
Var. *obscurum* Lister. Loch of Skene, Oct. 1916.
Fuligo septica (L.) Gmel. Frequent in late summer.
Var. *candida* R. E. Fries. Durris, Sept. 1920.
F. muscorum Alb. & Schwein. Ballogie, Sept. 1915; Durris, Sept. 1920.
Cienkowskia reticulata (Alb. & Schwein.) Rost. NS. Lesmoir, 1923.
Craterium minutum (Leers) Fries. Abundant in autumn.
C. leucocephalum (Pers.) Ditm. Not unfrequent in autumn.
C. aureum (Schum.) Rost. Lesmoir, Aug. 1915 on grass stalks; Tilliefourie, Aug. 1917.
Leocarpus fragilis (Dicks.) Rost. Not unfrequent in autumn.
Diderma hemisphericum (Bull.) Hornem. NS. Lesmoir, July to November.
D. effusum (Schwein.) Morg. Craig, Sept. 1913; Westhill, Aug. 1915.
D. Chondrioderma (de Bary & Rost.) G. Lister (syn. *D. arboreum* G. Lister & Petch). NB. Arboreal, frequent in late summer and autumn, Westhill and Lesmoir.
D. spumarioides Fries. Craig and Lesmoir, autumn.
D. ochraceum G. F. Hoffm. Durris, Sept. 1920, on moss.
D. Trevelyani Fries. Near Lesmoir, not unfrequent in summer and autumn.
D. radiatum (L.) Morgan.
Var. *umbilicatum* Meylan. Westhill, Nov. 1913; Craig, Nov. 1910 and Sept. 1915; Loch of Skene, Oct. 1916; Durris, Sept. 1920.
Didymium difforme (Pers.) Duby. Frequent in autumn Westhill and Lesmoir.
Var. *comatum* Lister. NS. Westhill, Jan. 1921.
D. trachysporum G. Lister. NS. Lesmoir, May and Aug. 1913, on old thatch.
D. Clavus (Bull.) Rabenh. Frequent and widely distributed in summer and autumn.
D. melanospermum (Pers.) Macbr. Frequent.
Var. *minus* Lister. Lesmoir, 1923.
D. nigripes (Link) Fries. Frequent.
Var. *xanthopus* Lister. Lesmoir, July 1923.
D. squamulosum (Alb. & Schwein.) Fries. Frequent.
Mucilago spongiosa (Leyss.) Morgan. Lesmoir, July 1899; Westhill, July 1920, a large growth on garden rubbish; Finzean by Aboyne, Sept. 1922.
Lepidoderma tigrinum (Schrad.) Rost. By Loch of Skene, Oct. 1912
Leptoderma iridescens G. Lister. Durris, Oct. 1920.
Colloderma oculatum (Lippert) G. Lister. NB. Arboreal. First found near Westhill, Oct. 1910, since obtained from Kildrumnay, Aug. 1914, from Ballogie near Aboyne, from near

the Loch of Skene, and at Durris in September and October. Before the Scotch gatherings made by Mr. Cran, this inconspicuous species was known only from sporangia which appeared on cultures of dead fir wood brought from Hallstadt, Upper Austria, by the late Christian Lippert ; it was described by him as *Didymium oculatum*, sp. n., in 1894 : it has since been obtained from many parts of England, from Wales, Norway, Germany, Switzerland, Portugal, New South Wales, Japan, and New England.

Stemonitis fusca Roth. Abundant.

Var. *rufescens* Lister. Westhill, August 1915.

Var. *flaccida* Lister. Westhill, August 1915, July 1916.

Var. *trechispora* Torrend. Loch of Skene, August 1920.

S. herbatica Peck. A single gathering at Finzean by Aboyne, September 1922.

S. hyperopta Meylan. Abundant.

S. splendens Rost. var. *flaccida* Lister. NS. Lesmoir, July 1915; Tilliefourie, September 1917; Finzean, Sept. 1922.

S. confluens Cooke & Ellis. Lesmoir, Aug. 1915, 1917, July 1916.

S. flavogenita Jahn. Abundant.

S. ferruginea Ehrenb. Lesmoir, Sept. 1915, July 1916, 1923.

Comatricha nigra (Pers.) Schroet. Abundant.

Var. *alta* Lister. Lesmoir ; Kirkville, May 1911.

C. laxa Rost. NS. Not uncommon.

C. elegans (Racib.) Lister. Monymusk, July 1914; Finzean, Sept. 1922; Castle Fraser, Sept. 1921.

C. fimbriata G. Lister & Cran. NS. At Westhill and Hazelhead Woods, July 1916. This species was first found in Wanstead Park, Essex, by Mr. R. Finlayson in November 1913.

C. cornea G. Lister & Cran. New. Arboreal. Westhill, June and Aug. 1913, March 1914, Aug. 1916 ; Lesmoir, July 1918, Oct. 1920. Obtained also by M. Ch. Meylan in June 1917 in Switzerland, and in Germany by Herr Chorin in Sept. 1921.

C. lurida Lister. Castle Fraser, March 1922.

C. typhoides (Bull.) Rost. Frequent.

C. pulchella (Church. Bab.) Rost. Lesmoir, Aug. 1917.

Var. *fusca* Lister, Hazelhead, Sept. 1915 ; Ballogie ; Sept. 1915 ; Tilliefourie, Sept. 1917 ; Lesmoir, 1923 ; Bennachie, Aug. 1919.

C. tenerrima (Curtis) G. Lister. NS. Westhill, August 1912 ; Lesmoir, frequent in autumn.

C. rubens Lister. Tilliefourie, Sept. 1917.

Enerthenema papillatum (Pers.) Rost. Frequent.

Lamproderma scintillans (Berk. & Br.) Morg. NS. Not uncommon.

L. columbinum (Pers.) Rost. By Loch of Skene, Oct. 1916 ; Tilliefourie, Oct. 1917.

Var. *brevipes* G. Lister. Durris, Sept. 1920.

Var. *iridescens* G. Lister. Lesmoir, Nov. 1898.

L. violaceum (Fries) Rost. Lesmoir, July and Aug. 1916 and 1917 : Tilliefourie, Sept. 1917.

L. Gulielmae Meylan. NB. Den of Craig, Sept. 1913.

Echinostelium minutum de Bary. Westhill, July 1913, on cultures of bark.

Amaurochaete cribrosa (Fries) Sturgis. NS. Castle Fraser, Sept. 1921, on stumps.

Cribraria argillacea Pers. Abundant from July to September.

C. rufa (Roth) Rost. Not uncommon from July to October.

C. vulgaris Schrader. Both the typical form and var. *aurantiaca* Pers. frequent.

C. violacea Rex. NS. Lesmoir, Nov. 1898 ; on dead wood.

Dictydium cancellatum (Batsch) Macbr. Abundant.

Var. *fuscum* Lister. Monymusk, July 1914; Westhill, Aug. 1917.

Var. *anomalum* Jahn. Monymusk, July 1914.

Licea minima Fries. NB. Not uncommon.

L. castanea G. Lister. New. Arboreal. First found at Den of Craig near Lesmoir in Nov. 1910 ; since obtained repeatedly, generally in winter, both there and near Westhill, Skene. This minute species has also been found fairly often on living trunks in the Jura by M. Ch. Meylan in late autumn since 1912.

L. pusilla Schrad. Not unfrequent in summer and autumn.

L. flexuosa Pers. Frequent on dead coniferous wood.

Hymenobolina parasitica Zukal. NB. Arboreal, on moss and lichen, found repeatedly in summer, both near Rhynie and Skene, since Mr. Cran's first finding the minute lumps of rosy plasmodium in June 1904. He describes the plasmodium as climbing " quite a giddy height " up the leaf of a moss, away from the lichen and bark on which it had been feeding.

Orcadella operculata Wing. NS. Arboreal. Westhill, Jan. 1911, Sept. 1912, July and Aug. 1916, Jan. 1921, Oct. 1922 ; Lesmoir, July 1918.

Tubifera ferruginosa (Batsch) Gmelin. Frequent from July to September.

Dictydiaethalium plumbeum (Schum.) Rost. Rhynie, Oct. 1899.

Enteridium olivaceum Ehrenb. Not unfrequent from late summer to autumn.

E. liceoides G. Lister. Rhynie, Oct. 1899 ; Westhill, Mar. 1912 ; Cairnton, 1923.

Reticularia Lycoperdon Bull. Ballogie, Sept. 1915 ; Huntly, Sept. 1915.

Lycogala epidendrum (L.) Fries. Frequent.

Trichia affinis de Bary. Huntly, Sept. 1915.

T. persimilis Karsten. Lesmoir, Aug., Sept., Nov. 1916, 1917; Craig, Nov. 1916.
T. varia Pers. Huntly, Sept. 1915; Lesmoir, Sept. and Nov. 1916.
T. contorta (Ditm.) Rost. Frequent.
Var. *inconspicua* (Rost.) Lister. Westhill, Aug. 1921.
T. lutescens Lister. NS. Craig, Nov. 1916, on living elm bark.
T. decipiens (Pers.) Macbr. Abundant in summer and autumn.
T. Botrytis Pers. Abundant.
Var. *munda* Lister. Craig, Nov. 1911; Lesmoir, Sept. 1916; Westhill, April 1912.
Var. *flavicoma* Lister. Lesmoir, May 1913; Westhill, Feb. 1913, April 1914.
Hemitrichia Vesparium (Batsch) Macbr. Finzean, Sept. 1922.
H. Karstenii Rost. NS. Often arboreal. Westhill, Oct. 1910, Jan. 1911, Oct. 1916; Lesmoir, Aug. 1899.
H. leiotricha Lister. NS. Ballogie, Oct. 1913; Craig, Sept. 1915; Tilliefourie, June 1917.
H. minor G. Lister. NS. Arboreal. Lesmoir, July 1912, Sept. 1916.
Arcyria ferruginea Saut. Ballogie, Sept. 1915; Durris, Sept. 1920; Westhill, 1923.
A. cinerea (Bull.) Pers. Abundant, summer and autumn.
A. pomiformis (Leers) Rost. Balmoral, Oct. 1913.
A. denudata (L.) Wettst. Not uncommon in summer and autumn.
A. incarnata Pers. Abundant in summer and autumn.
A. nutans (Bull.) Grev. Not uncommon, July to September.
Perichaena chrysosperma (Currey) Lister. Often arboreal. Not uncommon.
P. pedata G. Lister. NS. On a living trunk, Westhill, Jan. 1915.
P. corticalis (Batsch) Rost. Frequent.
P. vermicularis (Schwein.) Rost. NS. Lesmoir, Aug. 1917, July 1918; Westhill, 1923.
Margarita metallica (Berk. & Br.) Lister. NS. Often arboreal. Lesmoir, May 1898, Sept. 1916; Huntly, Sept. 1915; Westhill, Mar. and July 1916; Kirkville, Nov. 1916; Keith Hall, Aug. 1916. Most of these gatherings are the var. *plasmodiocarpa* R. E. Fries.
Dianema Harveyi Rex. NS. Westhill, Dec. 1907, 1910, Jan. 1911.
D. corticatum Lister. NB. Not uncommon; the first British gathering was from Rhynie in Oct. 1899.
D. repens G. Lister & Cran. New. Aboreal. Lesmoir, Nov. 1912, Sept. 1916. The only other known gathering is from Porlock, Somerset, by Mr. N. G. Hadden in Dec. 1920.
D. nivale (Meylan) G. Lister (syn. *Lamprodermopsis nivalis* Meylan). NB. On an ash twig, Kirkville, March 1912. M. Ch. Meylan's type found in the Jura Mountains in May 1909 and the repeated gatherings he has made since were all on turf near melting snow. He does not consider that the species should be regarded as a *Dianema*, on account of its having the threads of the capillitium somewhat thicker near the base, and more slender and anastomosing upwards.
Prototrichia metallica (Berk.) Mass. NS. Not unfrequent from autumn to spring; sometimes arboreal.

A CENTRAL REPOSITORY FOR TYPE-SPECIMENS.

By F. R. Fosberg.

Type-specimens are the basis of stability in botanical nomenclature and one of the main factors in taxonomic interpretation. This fact has come to be recognized in the International Rules and is realized, I think, by all taxonomists of any experience whatever. It must also have occurred to many what a catastrophe to the science of botany it would be if one of the major herbaria, or, for that matter, some of the smaller ones, were to be destroyed or seriously damaged in any way. Modern militarism has thoroughly demonstrated its irresponsibility and utter disregard for the welfare of humanity, and its willingness to destroy anything in its path to gain a military objective. The current war in Spain should be given careful consideration by scientists as well as war-experts as a rehearsal for future wars. It has shown conclusively that educational institutions and botanical gardens, in spite of their international character and peaceful inclinations, will receive no special consideration whatever. The state of war is an emergency and all sense of human values is lost.

With world politics in its present unsettled condition and armaments piling up in all of the major nations, it seems time for systematic botanists and others interested in the science to give some thought to the safeguarding of the precious type-specimens on which our nomenclature rests.

A plan calculated to accomplish this end is here presented for the consideration of the botanical public. It is not claimed that this is the best possible plan. It is expected that this or any similar plan will be bitterly opposed by all who place the prestige of their own institutions above the welfare of the science of botany. The suggestion is merely made to stimulate thought and discussion, and with the idea that if it is considered of sufficient importance it may be brought up for discussion at the 1940 international congress at Stockholm. Perhaps by this means something practical and acceptable to all botanists may be evolved and put into operation.

Briefly, my suggestion is this. That a modern central herbarium be established for the housing of all types in a locality sufficiently remote from densely populated centres, industrial areas, or points of stragetic importance, to be reasonably safe from destruction in case of any war whatever. This herbarium should be administered by a director and board of regents appointed by the international botanical congress.

If there were a reasonable degree of unanimity among botanists as to the desirability of such an institution, a fund for establishing and endowing it could doubtless be built up by requests to the various research foundations, national research councils, and even to the governments of the important nations. Institutions with a large number of types to be cared for would likely be willing to contribute certain sums for annual running expenses. Gifts from private individuals with an interest in botany would probably not be entirely lacking. An international association of systematic botanists might be organized to promote the welfare of the central herbarium, with small dues to go to maintenance and service.

The administration of this herbarium should, I think, be placed in the hands of a salaried director, appointed by the international congress for a term of five years, subject to renewal at the discretion of the congress. He should be assisted and advised by a council or board of regents of six members, also appointed by the congress, who would have the power, by a two-thirds majority vote, to veto any action of the director that they considered detrimental to the welfare of the institution or the collections housed there.

Facilities should be provided for working and for inexpensive living for visiting botanists who wished to work on the collections housed in the herbarium. Loans of types to accredited institutions would naturally be permitted. Photographs of types would be made at the request of institutions or individuals and distributed at as small a cost as possible. A working collection of specimens other than types and historically important specimens should be maintained, the specimens in so far as possible compared with the types, both for use of resident and visiting botanists and for loan to those interested in special groups. This would prevent shipping damage to more important specimens in all cases where a carefully compared specimen would serve in place of a type. This collection might be built up by the distribution, by exchange, of specimens checked against types, to institutions in all parts of the world. In this way a great service to botany would result at the same time that the central collection was being built up.

The library, necessary in connection with any herbarium, would, in time, naturally become a repository for rare and important works, as well as a very complete collection of all

documents of interest to systematic botanists. A self-supporting photostating or microfilm copying service could be established in connection with the library. Also, a natural outgrowth of this would be a universal bibliographic and abstracting service for systematic botany. A probable result of the maintenance of such a library would be that many of the extensive private libraries (and also herbaria) might be kept together by bequest of the owners, rather than dispersed at their deaths.

Choice of a location for such an institution should only be made after careful deliberation and study of all factors involved, and perhaps only after consultation with military men of several different nations. The place must be remote from any possible military route or battle-ground. Yet it must be reasonably accessible to botanists, without entailing too much travel expense. The climate must not be so extreme in either cold or heat as to discourage botanists from visiting the institution and working there. The region should, if possible, be interesting botanically. Needless to say, deliberation on this subject should be carried on in an atmosphere free as possible from all national or regional feeling. Switzerland, with its record of hundreds of years of peace, would be a logical choice as a location for such a herbarium if it were not situated in the midst of potentially antagonistic powers. Certain localities in Scandinavia, or perhaps Iceland, would seem likely to remain peaceable, though perhaps the winter climate might be a deterring factor. Sparsely inhabited areas in the southern Rocky Mountain region of the United States might give reasonable safety combined with a moderate climate.

Perhaps the most important question of all, after that of finance, would be that of the status of the types and other historical specimens housed in this herbarium. Of course, some institutions might be willing to give their specimens outright, in the interests of botany, but the majority would probably want to see how the plan worked, before losing control of their specimens. This very reasonable desire might be satisfied in either of two ways. The specimens might be deposited on permanent loan. Or an institution might endow or provide a table and herbarium cases sufficient to house the number of specimens of historical importance in its possession, and make this unit a department of its own herbarium. Its collection would not, however, be maintained in these cases as a unit, as this would be a source of confusion and extra labour for everyone. This would make possible the participation of institutions where the loaning of specimens or of types is forbidden.

Needless to say, the construction and maintenance of such a herbarium could profit by the hundreds of years' experience and the mistakes and successes of all other herbaria combined. Working out of details could be left to the first director and his

advisory council, who would, naturally, welcome suggestions from experienced persons the world over.

This plan is not presented under any illusion that it is perfect. It seems workable. The benefits that would result to the science of botany would seem to outweigh, by far, any conceivable detriments. If worked out properly it should insure reasonable safety for type-material as long as civilization itself will last, or at least as long as types are necessary to the stability of botanical nomenclature.

University of Pennsylvania.

Since the above was written definite news has been received of the deliberate and total destruction of at least two of the largest universities in China, and of some damage by bombs to a third. What happened to their botanical collections, or, for that matter, to the botanists, is not known. Certainly the promising start that the Chinese have made in systematic botany is seriously retarded.

In Europe the most serious crisis since the world war has just been passed. The days during which war seemed practically inevitable must have made many botanists wonder why some such scheme as that presented above was not put into effect long ago. The settlement reached, though peaceable, seems little more than a truce that will enable the powers to build up their military strength still further. No thinking person should be deceived into thinking that a permanent peace has been achieved.

The history of the past year has demonstrated beyond a doubt the desirability of taking some action similar to that outlined above, also the danger entailed by delay and procrastination. By good fortune the herbaria of Great Britain, Prague, Vienna, Paris, and the various German institutions, rich in type-material, escaped exposure to war for the present, but who can predict what may happen next time international politics reaches a boiling point?

THE *IXORA* SPECIES OF BURMA AND THE ANDAMAN ISLANDS.—ADDITIONS AND EMENDATIONS.

By C. E. B. Bremekamp.

Since the appearance of my paper on "The *Ixora* Species of Burma and the Andaman Islands" (this Journal, 1937, pp. 108-111, 169-175, 260-266, 295-298, and 318-326) the Herbaria of Dehra Dun and Maymyo have sent me, by the intermediary of Mr. C. E. Parkinson, some more material. It comprised three species, *Ixora villosa* Roxb., *I. merguensis* Hook. f., and

I. undulata Roxb., which so far were known to me from the description and from incomplete material only, and which, therefore, occupied a rather dubious position in my classification, one species, *I. oxyphylla* Wall. ex G. Don, which was not yet known from this area, six entirely new species, and one new variety. *I. Finlaysoniana* Wall. ex G. Don, a garden plant of unknown origin, was represented by slightly aberrant specimens collected in the Andaman Islands; it is not impossible that these specimens were wild.

I. villosa Roxb., *l. c.* p. 295, was put by me in the neighbourhood of *I. Brunonis* Wall. ex G. Don. It appears now that this species belongs to another series of the section *Brachypus*—namely, to the series *Subpaniculatae*. The specimen I have seen was collected in the District Upper Chindwin at Naisatmyaing, alt. 360 m., by *Po Chin*, 5890 Maymyo Herb.

I. undulata Roxb., *l. c.* p. 324, tentatively referred to the subgenus *Pavettoides*, section *Amphorion*, possesses articulated inflorescences and belongs therefore to *Eu-Ixora*, where it will find a place in the section *Otobactrum*. One of the specimens I have studied was collected in Upper Burma, Bhamo Division, alt. 130 m., by *G. E. S. Cubitt*, 608 Maymyo Herb. ex Herb. Hort. Calc.

I. merguensis Hook. f., *l. c.* p. 297, must be referred to the subgenus *Pavettoides*: neither the branchlets of the inflorescence nor the pedicels are articulated, and the bracts are often ascending on the branchlets and pedicels. It comes probably nearest to *I. brunnescens* Kurz, and may provisionally be included in the section *Amphorion*: from the other members of this section, however, it differs conspicuously by the large size of the flowers. Another remarkable feature is the sessile anther; so far as I know, it is the only species of *Ixora* in which the filaments are completely absent. The specimens studied by me were collected at Leikpok Chaung, Mergui District, by *Mr. Braybon's collector*, 135 Maymyo Herb. and 136 Dehra Dun Herb. and at Theinkun Chaung, Thebya, by *C. E. Parkinson*, 1923 Dehra Dun Herb.

I. oxyphylla Wall. ex G. Don, Gen. Syst. iii. 572 (1834), is a species nearly related to *I. subsessilis* Wall. ex G. Don: in fact, several authors consider the two species as identical. In my opinion, however, Don was right in keeping them apart: *I. oxyphylla* differs from *I. subsessilis* in its distinctly caudate, not merely tapering, leaves, its glabrous, instead of puberulous, inflorescences, and in the smaller size of the bracteoles, which are shorter than the ovary, and not about twice as long. Both species are apparently common in Assam, but of *I. oxyphylla* I have now seen a specimen collected in Upper Burma, Kachin Hills, by *Shaik Mohim*, s.n. Herb. Dehra Dun ex Herb. Hort. Calc.

Entirely new are :

Ixora decus-silvae, sp. nov. ; typus : *A. Rodger*, 956 Herb. Maymyo. Ad *I. fulgentem* Roxb. accedens, sed foliis simul angustioribus et nervos plures exhibentibus, corollæ lobis linearilanceolatis ab ea distinguenda.

Folia glabra petiolo 15 mm. longo ; lamina lineari-oblanceolata 24 cm. longa et 5·5 cm. lata, caudata et mucronata, basi acuta, utrimque opaca, sicc. brunnescens, nervis utroque latere costæ circ. 17 patulis et utrimque prominulis, venulis nonnullis e costa orientibus nervis parallelis, aliis subdense reticulatis. *Stipulæ* usque ad medium connatæ, late triangulares et in aristam parte libera paulo breviorem exeuntes. *Inflorescentia* sublaxa, glabra, floribus circ. 75 ; pedunculus 2·5 mm. longus, basi internodio æquilongo, foliis rudimentariis munito præcessus ; internodium basale axis 7 mm. ; internodia basalia ramulorum lateralium 7–14 mm. ; internodia ultima ramulorum 3–5 mm. ; pedicelli florum lateralium cuiusque triadis 5 mm. ; pedicellus floris centralis 1·5–3·5 mm. ; ramuli infimi foliis rudimentariis acuminatissimis 6 mm. longis, alii bracteis ovato-triangularibus 1 mm. longis suffulti ; bracteolæ florum lateralium bracteis persimiles, haud patentes tamen, ab ovario paulo remotæ ; flos centralis ebracteolatus. *Flores* glabri. *Calyx* tubo 0·5 mm. alto, lobis late ovatis subobtusis tubo subæquilongis an eo brevioribus. *Corolla* tubo 4 cm., lobis acutissimis 13 mm. longis et 4 mm. latis, omnino glabris. *Stylus* glaber.

Hab. TENASSERIM : District Tavoy, Kin Chaung, alt. 180 m., leg *A. Rodger*, 956 Maymyo Herb. ; " fl. March."

Ixora javanica (Bl.) DC. var. nov. **grandiflora** ; typus varietatis : *R. N. Parker*, 2744 Herb. Dehra Dun. Floribus majoribus (corollæ tubo 5·3 cm. longo, lobis 9–11 mm. longis et 4–5 mm. latis) salmoneis a typo recedit.

Hab. TENASSERIM : District Mergui, Yaungwa range, alt. 450 m., leg. *R. N. Parker*, 2744 Dehra Dun Herb.

Ixora tavoyana, sp. nov. ; typus : *Sukoe*, 10827 Maymyo Herb. Ad *I. pseudojavanicam* Brem. accedens, sed foliis angustioribus, bracteis bracteolisque minutissimis, corollæ tubo graciliore et lobis angustioribus ab ea diversa.

Frutex ramis teretibus, mox cortice griseo-brunneo subopaco vestitis. *Folia* petiolo crassiusculo circ. 5 mm. ; lamina lineari-oblanceolata 15 cm. longa et 3 cm. lata, apice caudato-acuminata et mucronata, basi cuneata et conduplicata, subcoriacea, sicc. utrimque griseo-brunnea, nervis utroque latere costæ 10–13 utrimque prominulis, venulis subdense reticulatis vix conspicuis. *Stipulæ* usque ad medium connatæ, dimidio superiore triangulares et in aristam parte libera circ. bis longiorem exeuntes. *Inflorescentia* longius pedunculata, subcontracta, minutissime puberula, floribus circ. 45 ; pedunculus 4·5 cm. longus, internodio 3 mm. longo foliis rudimentariis munito præcessus, basin versus glaber ; internodium basale axis 4 mm. ; internodia basalia ramulorum infimorum 5–7 mm. ; internodia alia 3 mm. haud superantia ; pedicelli florum lateralium triadis 1 mm. ; pedicellus floris centralis 0·6 mm. ; bracteæ bracteolæque omnes minutissimæ, vix distinguendæ ; flos centralis plerumque ebracteolatus. *Flores* glabri. *Calyx* tubo 0·2 mm. alto, lobis late triangularibus tubo subæquilongis. *Corolla* crocata tubo 4–4·5 cm. longo, 0·8 mm. diam., lobis obtusis, haud ciliatis 8·5 mm. longis et 3 mm. latis. *Stylus* sparse pilosus.

Hab. TENASSERIM : District Tavoy, Taungbyaung Chaung, alt. 45 m., leg. *Sukoe*, 10827 Maymyo Herb., " fl. Jan."

Ixora myitkyinensis, sp. nov. ; typus : *E. M. Buchanan*, 88 Maymyo Herb. Ad *I. Butterwickii* Hole vergens, sed foliis ellipticis, subtus puberulis, panicula brevius pedunculata et multo uberiore ab ea faciliter distinguenda.

Folia petiolo crasso puberulo 12 mm. longo ; lamina elliptica 32 cm. longa et 13·5–14·5 cm. lata, acuminata, basi acuta an subobtusa, subcoriacea, sicc. brunnescens, utrimque opaca, supra glabra, subtus præsertim nervis scabrido-puberula, nervis utroque latere costæ 17–18, venulis laxe reticulatis utrimque sed præsertim subtus prominulis. *Stipulæ* usque ad medium connatæ, dimidio superiore late ovato-triangulares et in aristam parte libera bis longiorem exeuntes. *Inflorescentia* pedunculata, subpaniculata, puberula, floribus circ. 700 ; pedunculus 5·7 cm. longus, basi foliis ordinariis munitus ; internodium basale axis 7 cm. ; internodia basalia ramulorum infimorum 7–8·5 cm. ; internodium secundum axis 4·5 cm. ; internodia basalia ramulorum jugi secundi 5 cm. ; internodia alia multo breviora, ultima usque ad 1 mm. decrescentia ; pedicelli florum lateralium 1 mm. haud superantes ; ramuli infimi foliis sessilibus 1·7 cm. longis et 1·2 cm. latis, ramuli jugis secundi foliis 1·0 cm. longis et 0·6 cm. latis, ramuli alii bracteis linearibus an anguste triangularibus a 10 mm. usque ad 3 mm. decrescentibus suffulti ; bracteolæ florum lateralium basi ovarii insertæ, 2 mm. longæ. *Flores* ovario calyceque puberulis. *Calyx* lobis oblongis obtusis 1·4 mm. longis. *Corolla* tubo 15 mm. longo, lobis obtusis 4·5 mm. longis et 1·6 mm. latis.

Hab. UPPER BURMA : District Myitkyina, Kintuhum, alt. 600 m., leg. *E. M. Buchanan*, 88 Maymyo Herb., " fl. April, vern. : sa-khri."

Ixora symphorantha, sp. nov. ; typus : *Mg Kyaw*, 89 Maymyo Herb. A speciebus aliis series *Subpaniculatarum* inflorescentia dense globosa faciliter distinguenda.

Fruticulus circ. 1·2 m. altus, ramis primum scabrido-puberulis, indistincte bisulcatis. *Folia* petiolo crasso puberulo 4 mm. longo ; lamina oblonga an anguste obovata 14–19 cm. longa et

4·7–6·2 cm. lata, caudato-acuminata, basi obtusa an rotundata, subcoriacea, utrimque opaca, supra glabra, subtus sparse puberula, nervis utroque latere costæ circ. 12 supra impressis et subtus prominulis, venulis laxe reticulatis utrimque distinguendis. *Stipulæ* usque ad medium connatæ, dimidio superiore late ovato-triangulares et in aristam parte libera bis longiorem exeuntes. *Inflorescentia* pedunculata, dense globoso-corymbosa, circ. 6·5 cm. diam., puberula, floribus circ. 300; pedunculus 6 cm. longus; internodium basale axis 3·5 cm.; internodia basalia ramulorum lateralium 2 cm.; internodia alia multo breviora; pedicelli florum lateralium 0·5 mm. longi; ramuli infimi foliis sessilibus 2–2·5 cm. longis, ramuli alii bracteis linearibus suffulti; bracteolæ florum lateralium basi ovarii insertæ et 1·6 mm. longæ. *Flores* ovario calyceque dense puberulis. *Calyx* lobis oblongis obtusis 1·1 mm. longis. *Corolla* tubo 9·5 mm. longo, lobis obtusis 3 mm. longis et 1·5 mm. latis.

Hab. Upper Burma: Kachin Hills, Mara, alt. 600 m., leg. *Mg Kyaw*, 89 Maymyo Herb., "vern.: mahkri."

Ixora tunicata, sp. nov.; typus: *J. M. D. Mackenzie*, 113 Maymyo Herb. Ad *I. multibracteatam* Pearson ex King & Gamble vergens, sed ab ea foliis sicc. saturate brunneis, nervos utroque latere costæ circ. 13 exhibentibus, calycis lobis linearibus, corolla extus glabra faciliter distinguenda.

Arbuscula ramis novellis glabris, veterioribus cortice luteolo nitidulo vestitis. *Folia* petiolo 10 mm. longo; lamina oblonga 13·5–19 cm. longa et 4·5–6·5 cm. lata, apice basique acuta, subcoriacea, glabra, sicc. saturate brunnea, supra nitidula, subtus opaca, nervis utroque latere costæ circ. 13 utrimque prominulis, reticulatione subdensa supra prominula, subtus venulis aliquibus crassioribus exceptis haud distincta. *Stipulæ* basi breviter connatæ, circ. 4·5 mm. altæ, in apiculam 1·5 mm. longam productæ, intus dense pilosæ. *Inflorescentia* breviter pedunculata, subcontracta, subglabra, floribus circ. 150; pedunculus 7 mm. longus, basi foliis reductis 4·5 cm. longis munitus; internodium basale axis 3 mm.; internodia basalia ramulorum infimorum 12 mm.; internodia alia breviora; pedicelli florum lateralium 2 mm. longi; ramuli infimi foliis usque ad 5 cm. longis, ramuli jugis secundi foliis minoribus suffulti; ramuli alii bracteis linearibus acutis 11–8·5 mm. longis et 1·7–1·0 mm. latis, glabris; bracteolæ florum lateralium bracteis supremis similiores, 7 mm. longæ et 0·8 mm. latæ. *Flores* glabri. *Calyx* tubo 1 mm. alto, lobis linearibus acutis 10–11 mm. longis et 2·2 mm. latis. *Corolla* extus intusque glabra, fauce densius villosa tamen, tubo 27–31 mm. longo, lobis obtusis 4·5–6 mm. longis et 3–3·2 mm. latis, margine revolutis et inde pseudo-oblongis.

Hab. Upper Burma: North Chin Hills, alt. 1200 m., leg. *J. M. D. Mackenzie*, 113 Maymyo Herb., "fl. May."

Ixora maymyensis, sp. nov.; typus: *Fatteh Din*, 6177 Maymyo Herb. Ad *I. spectabilem* Wall. ex G. Don vergens, sed foliis supra nitidulis nervos crassiores exhibentibus, corollæ lobis brevioribus ab ea recedens.

Frutex ramis novellis glabris opacis, veterioribus cortice luteo-brunneo nitidulo vestitis. *Folia* petiolo crasso 10–15 mm. longo; lamina anguste elliptica an interdum oblanceolata plerumque 15–18 cm. longa et 4·8–7 cm. lata, apice subobtusa, basi acuta, subcoriacea, supra nitidula, subtus opaca, sicc. olivacea, nervis utroque latere costæ 12–14 supra prominulis et subtus prominentibus, venulis laxe reticulatis supra distinguendis, subtus prominulis. *Stipulæ* subtruncatæ breves in aristam vaginæ æquilongam an ea paulo longiorem exeuntes. *Inflorescentia* plerumque longe pedunculata, puberula, floribus 150–300; pedunculus 4–15 cm. longus, basi foliis brevius petiolatis et brevioribus, basi rotundatis an subcordatis munitus et internodio brevi an satis longo (0·3–7·5 cm.) præcessus; internodia basalia axis et ramulorum infimorum 2·2–6·5 cm.; internodia alia peripheriam versus gradatim longitudine decrescentia; pedicelli plerumque subnulli et flores inde glomerati; ramuli pedicellique omnes bracteis anguste triangularibus suffulti; bracteolæ florum omnium triangulares, ovario paulo breviores. *Flores* graciliores. *Ovarium* puberulum. *Calyx* subglaber tubo subnullo, lobis ovatis obtusis 0·6 mm. longis. *Corolla* rosea extus intusque glabra, tubo 10·5 mm. longo et 0·3 mm. diam., lobis obtusis 3·5 mm. longis et 1·2 mm. latis.

Hab. Upper Burma: District Maymyo, Maymyo Plateau, near Nankok, alt. 1000 m., leg. *Fatteh Din*, 6177 Maymyo Herb., "fl. May"; District Maymyo, Thon daung, leg. *Po Kant*, 12441 Maymyo Herb., "shrub 4 ft."

Note.—A specimen with immature flowers, collected by *A. Rodger*, 530 Maymyo Herb., in the North Shan States, Gohteih Gorge, alt. 500–600 m., may belong to this species; the label describes it, however, as a tree.

I. Finlaysoniana Wall. ex G. Don is known as a garden plant only. In the neighbourhood of Rangoon it is apparently a very popular one, for from no other place have I seen so many specimens. This might mean that it has been grown here for a very long time, and if so the place from whence it was originally introduced would probably not be far off. Its nearest allies, *I. multibracteata* and the species described above under the name *I. tunicata*, are endemic in the same region. The plant is grown now in all tropical countries, but it shows very little variability; this is probably due to the fact that it is propagated as a rule (perhaps always) by cuttings. In this connection it is noteworthy that the only two specimens which I have seen from the Andaman Islands (Rongat Island, leg. *Kirat Ram*, 3787 Herb. Dehra Dun,

and Peel Island, leg. *C. G. Rogers*, 226 Maymyo Herb.) show a slight deviation from the common form: the leaves, which in the latter are always obtuse or subacute, are in these specimens distinctly acuminate. The labels give us no information with regard to the habitat of the plant, but the absence of evidence lends probability to the supposition that they grew wild, and that the Andaman Islands, therefore, might be the native country of this species.

A NEW *IXORA* SPECIES FROM ASSAM.

By C. E. B. Bremekamp.

Among the *Ixora* material which I received from the Forestry Institute, Dehra Dun, I found also a new species collected in Assam. It belongs to the Series *Subsessiles* of the section *Brachypus*:—

Ixora goalparensis, sp. nov.; typus: *Upendranath Kanjilal*, 5758 Herb. Dehra Dun. *I. subsessili* Wall. ex G. Don et *I. oxyphyllæ* Wall. ex G. Don valde affinis, sed calycis lobis multo longioribus ab eis faciliter distinguenda.

Frutex 0·9–1·5 m. altus, ramis novellis gracilibus glabris, veterioribus cortice griseo nitidulo vestitis. *Folia* petiolo circ. 5 mm. longo; lamina lanceolata an oblanceolata, 7·5–12·5 cm. longa et 2·4–4·4 cm. lata, caudato-acuminata et longius mucronata, basi acuta, subcoriacea, glabra, utrimque opaca, sicc. griseo-brunnea, nervis utroque latere costæ 7–9 subtus prominulis, venulis paucis supra plerumque vix distinguendis, subtus prominulis. *Stipulæ* ovato-triangulares in aristam vagina multo longiorem exeuntes. *Inflorescentia* subsessilis nutans, haud rare a ramo axillari in positionem pseudo-axillarem coacta, ramulis pedicellisque coccineis et puberulis, floribus circ. 45; internodia basalia axis et ramulorum infimorum usque ad 4 mm. longa, alia peripheriam versus gradatim longitudine decrescentia; pedicelli florum omnium subæquilongi, usque ad 1 mm. longi; ramuli infimi foliis linearibus sessilibus 1 cm. longis, ramuli alii bracteis angustissime triangularibus suffulti; bracteolæ florum omnium angustissime triangulares, calycis lobis subæquilongæ. *Flores* glabri. *Ovarium* coccineum. *Calyx* coccineus tubo 0·1 mm. alto, lobis 4·2 mm. longis, basi 0·4 mm. latis, acutissime exeuntibus. *Corolla* alabastro acuta, alba, tubo 17–20 mm. longo, 0·7 mm. diam., lobis acutis 3·5 mm. longis et 1·5 mm. latis. *Stamina* filamentis 0·5 mm., antheris 3·5 mm. longis. *Stylus* parte exserta stigmatibus 1·5 mm. longis comprehensis 4·5 mm. longa.

Hab. Assam: District Goalpara, Guma Reserve, leg. *Upendranath Kanjilal*, 5758 Herb. Dehra Dun, "fl. May."

NOTES ON THE OCCURRENCE OF *ORCHIS SIMIA* Lamarck IN KENT.

By B. J. Brooke.

In his 'Monograph and Iconograph of Native British Orchidaceæ' (p. 167) Colonel Godfery, referring to the distribution of *Orchis simia*, writes: "Apparently now confined to Oxfordshire, formerly found in Berkshire. There is a single record for Kent, the Rev. S. L. Jacobs having found it near Chilton, which, if not an error of identification, must have been due to a wind-borne seed."

To anybody familiar with the recorded history of *O. simia* in Kent the last sentence must seem rather surprising. Hanbury and Marshall, in their 'Flora of Kent' (1899), give several localities for the plant, including the Chilton station referred to by Colonel Godfery; they note, however, that it is "very rare, probably extinct." In most of the nineteenth-century Floras Kent is explicitly mentioned as one of the counties for *O. simia*, in addition to Oxfordshire and Berkshire. Babington, Sowerby, and Anne Pratt are unanimous on this point. Hooker ('Student's Flora of the British Islands') classifies *O. simia* as a subspecies of *O. militaris*, and includes Kent in a list of counties which apparently refers to both plants; though since it is generally agreed that true *O. militaris* has been "long extinct in Kent" (Hanbury and Marshall) one is perhaps safe in assuming that the Kentish reference is here intended to apply more particularly to the "subspecies" *simia*. More recently G. C. Druce ('British Plant List,' 1930) gives four vice-counties for *O. simia*, two of them "unconfirmed"—the doubtful pair being presumably East and West Kent, and the other two Oxford and Berks *.

From the above references it will be apparent that *O. simia* has, rightly or wrongly, been long associated with Kent. The opinions of earlier authorities have doubtless been perpetuated, without proper confirmation, by a number of more recent writers; but there would seem to be some reason for believing that *O. simia* (or something very like it) has occurred at one time or another in this county. How is it, then, that Colonel Godfery has been able to dismiss so many records as apocryphal?

The probable answer to this question is hinted at in Colonel Godfery's own words, already quoted. The single record which he tentatively accepts as authentic was very probably (he

* Thirty-three years previously, in his 'Flora of Berkshire' (1897), Dr. Druce remarked that "Oxfordshire is the only county where *O. simia* is now known to grow." Subsequent records from the Thames Valley, however, show that the plant was increasing there, at least during the early years of this century—which would account for the apparent discrepancy.

implies) an "error of identification." Whether or no the Rev. S. L. Jacobs was mistaken, it is a fact that many such reputed records for *O. simia* in Kent have turned out to be abnormal or variable forms of *Orchis purpurea* Hudson, which is frequent in some parts of the county. Mr. John Jacob, of Dover, tells me that he found, many years ago, what he believed to be a Kentish plant of *O. simia* which he identified—as he thought—from the plate in Anne Pratt's 'Flowering Plants of Great Britain.' He found it, moreover, near Chilton, where it had previously been recorded by his near-namesake. Mr. John Jacob's plant, however, was pronounced by the Kew Herbarium to be only a form of *O. purpurea*. Subsequently a number of reputed "Monkey Orchids" from Kent were examined by Mr. Jacob, and the result was always the same.

A similar confusion has often occurred in connection with *O. militaris*, which has sometimes been reported (though on less trustworthy evidence) from Kent. The close structural similarity of the subgeneric group *Militares*, coupled with the tendency of all three species to produce variable and quasi-intermediate forms, is doubtless sufficient to explain the prevalence of such confusion, at least among casual botanizers. Indeed, in the dried state some of these forms are capable of deceiving the expert—for example, the var. *pseudo-militaris* Druce of *O. purpurea*, which, as Colonel Godfery remarks, is "repeatedly mistaken for *O. militaris* when dried." Even in the living state some of the Kentish forms of *O. purpurea* bear a marked resemblance to *O. militaris*; less easy to account for, however, is the confusion between *O. purpurea* and *O. simia*, which may be said to represent the widest divergence within the group, *O. militaris* itself being intermediate, roughly speaking, between the other two species. It seems likely that other botanizers besides Mr. John Jacob (among them, possibly, the Rev. S. L. Jacobs himself) have been deceived by the extremely inaccurate coloured plates of *O. simia* in some of the illustrated Floras. I have never myself seen any form of *O. purpurea* which could conceivably have been mistaken for the true *O. simia*, though certain narrow-lipped albino forms might pass for the representations of *O. simia* in Sowerby's 'English Botany,' Anne Pratt's 'Flowering Plants,' and other less reliable works. *O. purpurea* is certainly very variable, and though hardly to be confused with true *O. simia* may possibly approach the Oxfordshire form of the plant, which presumably is the one usually illustrated in English Floras. Certainly, lacking more definite evidence on the point, Colonel Godfery might well be sceptical about the occurrence of *O. simia* in Kent.

I am able to record, however, that the true *O. simia* was found in Kent as recently as 1923. It occurred on an open grassy slope on the chalk, a few miles from Canterbury, and was originally discovered in 1920, in the same station but quite independently, by two botanizers, one of them a friend of mine. Only four or five plants were found, and of these not more than two flowered simultaneously. In 1923 I was fortunate enough to see one of these *in situ*; since that year, however, *Orchis simia* seems to have vanished completely from the district; nor have I heard of any other authentic Kentish station for it.

A dried specimen of the Canterbury plant is now at Kew, where it was identified, in the fresh state, as the true *O. simia*. Three other dried spikes are in my possession; a floret from one of these was kindly examined for me a short time ago by Colonel Godfery, who confirmed the original identification. It is somewhat surprising—assuming that the specimen sent to Kew was duly preserved and labelled—that this record was not made available to botanists at an earlier date. Since, however, it appears to have been overlooked, it is perhaps worth while to record it here, if only for the purpose of vindicating the long-disputed claim of *O. simia* to a place in the Kentish Flora. It is to be hoped that this very rare orchid may reappear in future years in the original station or in some other part of the county.

Colonel Godfery separates the Oxfordshire *Orchis simia* from the continental type under the title var. *macra*, which was Lindley's specific name for the British plant. Lindley himself considered it altogether distinct from the continental *O. tephrosanthos* *, and Colonel Godfery shares his opinion, giving as the distinguishing features of var. *macra* its "darker, more grey-green leaves, more cylindrical spike, bluer lip-segments, broader mid-lobe with smaller spots, and whiter spur." It might be expected, therefore, that the *O. simia* which occurred in Kent would be identical with the Oxford plant; such, however, was not the case. In the Kentish specimens the spike was short and tufted, *not* cylindrical, the lip more acutely divided than in var. *macra*, the mediastin short and nearly as narrow as the lip-segments, which themselves were abnormally long and slender, with a marked tendency to curl. In colour, too, the Kent plants showed a striking difference from var. *macra*, the lip being of a deep, almost uniform *crimson* (not bluish, as in *macra*), becoming paler only at the base; the sepals and petals pale rosy pink or nearly white (again without the violet tinge typical of *macra*), streaked and stippled with light crimson

* Dr. Druce, however, in his 'Flora of Oxfordshire' (1927), wrote: "Notwithstanding this positive expression by Dr. Lindley, British Botanists do not now separate *O. macra* from *O. simia* even as a variety." It seems probable, from this rather non-committal statement, that Druce had not himself compared living specimens of the Oxfordshire plant and the continental type. In any case, there seems little reason, in the light of Colonel Godfery's careful observations of both plants, to doubt the claim of *O. macra* to varietal status.

markings. In fact the Kentish plant seemed—rather surprisingly—to approach, in colour and general appearance, the true continental *O. simia*, though it differed from the type—as from var. *macra*—in the darker tint and abnormally slender divisions of the lip*. Lindley gives as a further distinctive feature of *O. macra* "the exceedingly large cells of the tissue of the lip, which project and have a watery appearance, as if the whole surface were covered with crystalline warts; the lip is moreover destitute of the hispid line which invariably runs through its centre in all the varieties of *militaris* or *tephrosanthos* I have examined." I am unable to state positively whether the Kent plant possessed these features or not; unfortunately no detailed description was made, at the time, of the living plant, and I have had to rely for the above notes on my memory of it, supported by the inadequate testimony of dried specimens and by a drawing of one spike, not found by me, now exhibited at the Beaney Institute, Canterbury. My description, however, is confirmed by the friend who found the plant in 1920; and I myself am reasonably certain that the Kentish Monkey Orchid was not Lindley's plant but a form of true *Orchis simia* Lamarck.

There is, of course, the possibility that the Canterbury plant was introduced into the locality, either deliberately or by accident—a hypothesis rather favoured by its brief appearance. But even if this were so (and I have reason for thinking it unlikely) one would still have to explain the fact of its marked variation from the normal continental type. Assuming it to be indigenous, the question arises: Did the earlier reports of *O. simia* in Kent refer to this plant? Leaving aside the fact that many reputed Kentish "Monkeys" can be put down as *O. purpurea*, there remain the records in the 'Flora of Kent,' backed up by the unanimous opinion of Babington, Sowerby, Anne Pratt and many other more or less trustworthy botanists. It would be odd, to say the least, if all these records had been founded on errors of identification; and it seems likely that some, at least, referred to *O. simia*—either to the form of it found near Canterbury or to Lindley's and Godfery's var. *macra*. So far as recent records go, however, var. *macra* appears to be confined to the Thames Valley; and lacking any information to the contrary, one is tempted

* According to Colonel Godfery *O. simia* probably arose from the same stock as *Aceras anthropophora*, which its lip somewhat resembles. In the Kentish *O. simia* this resemblance was more than usually noticeable, especially when dried specimens of the two species were compared. *Aceras* was very abundant in the Canterbury station of *O. simia*—a fact which might lead one to suspect a hybrid strain in the latter. Colonel Godfery, however, tells me that the continental hybrids between the two plants bear no marked resemblance to the Kentish form of *O. simia*. One can only conclude that the Kentish *O. simia* was perhaps nearer than is usual to the common ancestor from which it and *Aceras* derive.

to assume that the two British forms of *O. simia* so far recorded—the Kentish and the Oxonian—are peculiar to their respective counties*. Unfortunately *Orchis simia*, in whatever form, is now so rare in Britain that a comparative investigation of plants from different stations is almost impossible.

REVIEWS.

Die Binnengewasser, herausgegeben von Dr. August Thienemann. Bd. xvi. 1 Teil. *Das Phytoplankton des Süsswassers, Systematik und Biologie.* Von G. HUBER-PESTALOZZI. 1 Teil. 8vo, pp. 1–342, pls. i–lxvi. Stuttgart. Price R.M. 31.50.

PROBABLY no one is more fitted by long study of the subject to write a complete treatise on Phytoplankton than Dr. Huber-Pestalozzi, and all freshwater algologists will be glad to learn that he is doing so. The first of the four parts in which it is to appear contains the general introduction, running to about 120 pages, and the systematic accounts of Cyanophyceae, Bacteria, and Fungi. The remaining parts are to contain systematic accounts of the planktonic members of other plant groups, and the fourth part will contain an appendix on geographical distribution, and also the bibliography, except that of Bacteria and Fungi, which follows their systematic treatment.

The introductory or general part is a complete yet concise summary of our knowledge of phytoplankton as a community and its relations to its environment. Amongst the matters discussed are the chemical differences in the various types of lake and the effect of these differences on plankton, and also the changes in the environment caused by the plankton itself. An account is given of the vertical and horizontal distribution of plankton, and also a full consideration of the mechanical problem of how the algæ remain suspended. The author considers that the small size, and hence large surface : volume ratio which causes slow settling, and the continuous "microstreamings" in natural waters, are the most important factors.

The systematic part, however, is that which will prove of greatest interest and value to freshwater algologists interested in plankton. Workable keys are provided to the genera and species, an adequate description and figure of each species and variety is given, and also the geographical distribution. Not a great proportion of the figures are original, but most have been redrawn, and they are all extremely clear. Under a number of species also are given systematic and biological notes which

* There are no records, so far as I can gather, of the long-lipped, red-tinged Kentish form occurring in Oxfordshire.

will often be found useful. The treatment of the Cyanophyceae follows Geitler, and the keys and diagnoses are frequently taken with very little alteration from his work. There are certain minor differences, however, *Microcystis pseudofilamentosa* being reduced to a forma of *Microcystis aeruginosa* to quote one example. The synonymy given is not very extensive, but that is not a disadvantage in a handbook as distinct from a monograph. Unfortunately only the authority of each species and synonym is given, and not the place or even the year of publication. This also is perhaps not a great disadvantage except where new combinations are proposed. Here, however, this lack makes them invalid. In a number of other respects also the International Rules of Botanical Nomenclature have not been followed. The one new species published, *Anabaena Minderi*, has a German diagnosis only, and is thus technically a *nomen nudum*. Also, although the Rules lay down that nomenclature in the Nostocaceae heterocysteae shall start from Bornet and Flahault's Revision (1886–1888) and in the Nostocaceae homocysteae from Gomont's Monograph (1893), Huber-Pestalozzi gives as authority for many of the genera and species of these groups authors dead many years before these works appeared. We have, for example, *Anabaena* Bory, 1822. This is comparable to citing Tournefort instead of Linnaeus as the authority for *Bellis*. The author's general attitude to nomenclature is shown in his preface :—" It is fortunate that algological nomenclature has maintained a steady stability (in contrast to the continuous name changes in Phanerogams, and above all Zoology), and that one has found amongst algologists well established names retained, even when others have claims of priority." This means that, although the work will be of great use for the determination of what a form is, it will then be necessary to make further researches, often laborious, before deciding whether that form should bear that name. Perhaps this would not trouble many freshwater algologists, as with few exceptions they seem either to be ignorant of the rules of nomenclature or else deliberately to ignore them. The difficulty of deciding the proper application of names is perhaps more difficult in the lower algæ, where the specimens of the early authors are often useless or missing, and their descriptions, owing to their inadequate microscopic equipment, poor. There is for this reason a temptation to follow some later monographer, even when he has obviously misinterpreted some names, overlooked others, and taken up later homonyms and other invalid names. Some think that by doing this they will preserve a stable nomenclature, but the only way to ensure that a species is called by the same name, and a name refers to the same species, is to follow the rules.

It will be appreciated that the greater part of the last paragraph is not so much a criticism of the work under review as one of the contemporary school of freshwater algologists. That this work follows them does to some extent detract from its usefulness. In all other respects, however, it will prove an extremely welcome addition to the literature of freshwater plankton organisms.

R. Ross.

Die Flechtenbestände der Heiden und der Reitdächer Nordwestdeutschlands. By F. Tobler and F. Mattick. *Bibliotheca Botanica*, Heft 117, 1–71, 14 plates, 2 maps. Stuttgart. Price R.M. 28.50.

The distribution, ecology, and physiology of the lichens occurring in the north-west plain of Germany in the Oldenburg region were investigated. This region, of which the soil is a glacial alluvium, may be looked upon as one of the southernmost outposts of the Scandinavian lichen-tundras, others of a similar nature being found in East Prussia, Pomerania, and the Mark Brandenburg. The oceanic or " atlantic " influence in the region investigated is shown by the presence of many characteristically western European species, such as *Buellia canescens*, *Baeomyces placophyllus*, *Lobaria laetevirens*, *Nephroma lusitanicum*, *Normandina pulchella*, etc. As in many other areas, the lichens are markedly on the decrease ; this is due partly to the growth of the forest at the expense of the more favourable heathy habitats, and partly to the ever-encroaching human colonization and cultivation. Probably the last traces of these rich lichen-outliers will have disappeared in a few years. Nevertheless there is in places a profuse vegetation of *Cladonia* species (*C. sylvatica*, *C. rangiferina*, *C. tenuis*, *C. impexa*) on the more open pine-heaths, where the low pH value of the soil suits them.

The various lichen-associations observed, and their origin, are dealt with in considerable detail. As is usual on acid alluvial soils *Lecidea granulosa* and *L. uliginosa* are the first colonizers of humus-containing and sandy ground respectively. The latter is often joined by *Cornicularia aculeata* (here called *C. tenuissima*). These prepare the way for the various Cladonias which form the climax of the lichen-associations.

Physiological observations with regard to the intake of moisture in the form of dew by Cladonias were made ; those of the section *Cladina* were found to be capable of absorbing overnight 12–17 per cent. of their weight of water in the form of dew.

Vegetative propagation of the *Cladoniae* occurs by fragmentation in dry weather. The fragments detached by mechanical agencies are disseminated by rain and wind. By the latter agency they are enabled to colonize thatched roofs, although

probably here the main source of colonization is from the peat-blocks, with which the angle of the roof is covered, down on to the *Phragmites*-thatch below. Cladonias on thatched roofs are exposed to more severe conditions than those growing on the ground, and consequently are subject to a number of morphological aberrations. Thatched roofs were found to be divisible into two types from the lichenological standpoint: those of dry and sunny aspect, which harbour *Cladoniae* of the section *Cenomyce*, and those in more damp and shaded positions, upon which species of the subgenus *Cladina* (*C. sylvatica*, *C. tenuis*, *C. mitis*, *C. impexa*) attained flourishing development.

Of considerable systematic interest are the observations made on the phenomena of morphological convergence in many of the *Cladonia* species studied. These, illustrated by photographs of specimens from the herbarium of Dr. H. Sandstede, the pioneer of lichenological research in north-west Germany, show to what a remarkable extent species belonging to different sections of the genus may come to resemble each other under the influence of external conditions which may suppress or mask the distinguishing characters.

The excellent photographs convey a very good impression of the appearances of the various associations.—I. M. L.

BOOK-NOTES, NEWS, ETC.

Pt Ishwari Prasad Ramlal, of Kasganj, India, "want to know" whether a modern botanist has achieved what has been done by them as printed on their note-paper with the heading "We Know." The list reads:—

How to produce sweet mangoes from sour ones, as well as Kalmi mangoes from a Deshi (Country) tree by applying the branch of a Deshi instead of a Kalmi tree.

How to produce big and large fruits and flowers from small ones.

How to impart smell to the different kinds of fruits and flowers and also change their colours.

How to diagnose the different diseases of trees and plants and treat them on Ayurvedic lines.

How to grow, purify, and classify seeds.

How to protect plants from cold waves and water the different kinds of flowers, plants, etc.

How to test a piece of land, and turn a bad soil into a culturable one.

How to grow twelve kinds of lemons of different tastes on one and the same tree in different seasons.

ON SOME UMBELLIFERS FROM NAMAQUALAND.

By R. S. Adamson.

The three plants referred to were collected on the Kamiesberg in Namaqualand at altitudes over 4500 ft.

Peucedanum Pearsonii, sp. nov.

Perennis, glabra multicaulis, sublignosa. Caules 40–70 cm., basi nudi medio foliosi, superne pauce ramosi. Folia glauca sessilia multifida 3–4-ternata, segmentis subulatis congestis mucronatis superne sulcatis dorso minute serratis. Peduncula umbellæ longa, usque ad 25 cm., persistens superne ramosa. Umbella 6–8-radiata apice plana, radiis 3 cm. subæquilongis.

Umbellulæ multipedicellatæ, pedicellis inæquilongis.

Phylla involucri 4–5, parva, involucell. pauca pedicellis multo breviora. Flores lutei. Calyx minutus. Petala acuta apice incurva. Stylus reflexus stylopodium æquans vel paullo superans. Fructus immaturus conicus jugis parvis vix alatis.

Among rocks on upper slopes of Kamiesberg, locally abundant. Fl. Dec.–Jan. Leliefonteinberg, 5200 ft. *Adamson* 1438 (type in Bolus Herb.) Sneeukop, lower middle slopes, *Pearson* 5782*. Without exact locality, *Drège* 7604.

This plant is named in honour of the late H. H. W. Pearson, who rediscovered it (*cf.* Glover in Ann. S. Afr. Mus. ix. 4, 214 (1915)). Drège's specimen, which is the first collected, is incomplete and without flowers. The species has some resemblance to *P. ferulaceum* (Thunb.) Sond., but is readily distinguished by the habit, glaucous leaves, which are more condensed and have a flat-topped outline, the smaller number of longer and equal rays in the umbel, and the bright yellow flowers. The persistent peduncles which bear at their base the branches for the next season are a characteristic feature. In his notes Pearson says the plant can reach a height of five feet. None of the plants seen growing was more than half this.

Peucedanum sulcatum Sond.

This species was collected on rocky ridges at 4500–5000 ft. on the eastern part of the Kamiesberg Range (*Adamson* 1518*; 1530*). Previously it was known only from Sonder's incomplete description (Fl. Cap. ii. 559 (1862)), which was based on specimens of Ecklon and Zeyher (2347). The new collections agree exactly with Sonder's type, but are more complete and have ripe fruit which Sonder had not seen.

In the living state the stem is cylindrical and very slightly striate; the sulcate appearance is due to drying. The plant is scapose and reaches 1 metre in height, with basal leaves which

* Duplicate in British Museum Herbarium.

extend 30–40 cm. The leaves wither at or about the flowering period. The 30–40-rayed umbel is convex on top and enlarges very much in fruit. At flowering the rays are 8–10 cm., but reach 25–30 cm. when the fruit ripens. The fruit has a broad marginal wing 4–5 mm. wide. The mericarp with its wing measures 12–14 by 10–12 mm.

Annesorhiza latifolia, sp. nov.

Perennis, scaposa, 60–80 cm. Caulis teres, viridis, glaber, in sicco minute striatus, ramosus, ramis dichotomis erecto-patentibus. Folia radicalia latissima, sessilia, pallida, ternata, pinnatiloba, segmentis latis incisis grosse serratis, marginibus undulatis, rachide nervisque tantum hispidis.

Folia caulina ad vaginas parvas subscariosas reducta.

Umbellæ terminales 4–6 radiatæ radiis inæquilongis. Umbellulæ pedicellatis 18–24, æquilongis.

Involucri phylla 5, subscariosa; involucell. plurima minuta. Flores lutei. Fructus immaturus paullo compressus, stylopodio conico, lobis calycinis parvis obtusis. Mericarpia 5-jugata, jugis obtusus parvis subæqualibus vel dorsalibus paullo majoribus. Vittæ valleculares solitariæ, in commissura angusta duæ, intra-jugatæ nullæ.

Grassy places, swampy in winter, near Leliefontein. Fl. Dec.–Jan.

Adamson 1482* (type in Bolus Herbarium).

A very distinct species, with a stiff branched stem and broad basal leaves with overlapping edges. The leaves are round or oval in outline and 12–15 cm. across. They wither at the flowering period.

SOME *CLADONIAE* (LICHENES) OF THE BRITISH DOMINIONS: S. AFRICA, AUSTRALIA, THE ANTILLES; WITH A DICHOTOMOUS KEY TO THE SPECIES OF THE SUBGENUS *CLADINA*.

By H. des Abbayes.

The *Cladoniae* dealt with here are from various undetermined collections of the British Museum. My thanks are due to Dr. Ramsbottom, Keeper of the Department of Botany, and Mr. Mackenzie Lamb, Assistant Keeper, for allowing me to study these collections. Some of the specimens found among them add to our knowledge of the species' geographical distribution, as for instance those referable to *C. multiformis* Merrill, of which the occurrence in South Africa was completely unexpected.

In a monographic revision of the subgenus *Cladina*, which I am now preparing, I have seen fit to dismember the species *C. pycnoclada* (Gaud.) Nyl., as understood by Wainio. Although this work has not yet been published, I have made use here of the modifications which I have brought to bear on the interpretation of this collective species, and have employed the new name which I give to one of the species resulting from this dismemberment (*C. Sandstedei*). Latin diagnoses accompany those species and combinations which are published for the first time.

In order to facilitate henceforth the determination of the species of the subgenus *Cladina*, in accordance with the new interpretations, I have appended a dichotomous key to all the species which it is now known to contain.

* Duplicate in British Museum Herbarium.

I.—South Africa.

Cladonia impexa Harm. *pycnoclada (Gaud.) Nyl. **emend.** des Abb.—Similis habitu generali *C. impexae* Harm. et pariter chimico se habet. Differt autem leviter a *C. impexa* colore sæpius stramineo-flavescente vel pallide-flavescente, nec viridescente, et strato gonidiali constanter, ut videtur, minus evoluto, disperso-areolato, glomerulos subarachnoideo-tomentosos efficiente, et strato chondroideo quoque tomentoso et semper semipellucido.

Autonomam speciem evidenter non constituit sed vix et si volumus, ut nomen *C. pycnoclada* in litteratura perpetuetur, subspeciem geographicam *C. impexae* sub tropicis et in hemisphærio australi vigentem.

Cape Province: Hankey, coll. *T. R. Sim*, 1922.—E. Pondoland, coll. *T. R. Sim*, 1922.

The general appearance of these two collections is exactly that of *C. impexa* Harm. f. *laxiuscula* (Del.) Sandst.; in colour pale yellowish, KHO—, P—, KHO(ClONa)+yellow. Only the consistency of the surface of the podetia allows it to be separated.

C. impexa Harm. *pycnoclada (Gaud.) Nyl. *emend.* des Abb. f. exalbescens (Wain.) **emend.** des Abb.—One may apply the name f. *exalbescens* to decolorised specimens in which the yellow shade is hardly perceptible, and which are KHO(ClONa)—.

Natal: Marietzburg, coll. *T. R. Sim*, 1918.

I have been able to verify the fact that the gelatine of the conidangia is colourless.

C. didyma (Fée) Wain. var. muscigena (Eschw.) Wain. Zahlbr. Catal. no 8792.—Knysna: Deepwalls, on a piece of putrid wood, coll. *R. Phillips*, 1924. The specimen is well fertile. KHO—, P—.

C. didyma (Fée) Wain. var. muscigena (Eschw.) Wain. f. subulata Sandst.—Knysna: Deepwalls, on decomposed mosses, coll. *Phillips*, 1924. Podetia subulate, sterile.

C. BACILLARIS Nyl. Zahlbr. Catal. no. 8745.—Knysna: Deepwalls, on decomposed vegetable detritus, coll. *R. Phillips*, 1924.

C. BACILLARIS Nyl. f. PITYROPODA Nyl. Zahlbr. Catal. no. 8745. S. Rhodesia: Mount Nuza, altit. 1950 m., on damp turf, coll. *H. B. Gilliland*, 1934.

C. GORGONINA (Bory) Wain. var. SUBRANGIFERINA (Nyl.) Wain. Zahlbr. Catal. no. 8812.—Nyasaland, altit. 1750 m., coll. *Dr. J. Burtt Davy*, 1929. Specimen little developed, the primary thallus still visible. KHO+yellow, P+orange-red, taste mild.

C. MULTIFORMIS Merrill f. SUBASCYPHA (Wain.) Evans. Zahlbr. Catal. Suppl. no. 8851.—Knysna: Deepwalls, on earth and a rotten trunk, coll. *R. Phillips*, 1924.—S. Rhodesia: Mount Nuza, altit. 1950 m., on damp turf, coll. *H. B. Gilliland*. A small specimen mixed with *C. bacillaris* Nyl. f. *pityropoda* Nyl. KHO−, P+red.

The Deepwalls specimen is very typical and absolutely similar to specimens in my possession from America determined by Evans. Hitherto this species was known only from North America. Its presence in South Africa is very remarkable, and leads one to suppose that it may eventually be met with in South America.

C. FIMBRIATA (L.) Fr. var. CHONDROIDEA Wain. f. CHLOROPHAEOIDES Wain. Zahlbr. Catal. no. 8801.—Natal: Edgehill, Mooi River, on the ground, coll. *T. R. Sim*, 1924. KHO−, P+red.

C. FIMBRIATA (L.) Fr. var. CHONDROIDEA Wain. f. SUBRADIATA Wain. Zahlbr. Catal. no. 8801.—Natal: Mid Illovo, coll. *T. R. Sim*, 1919. KHO−, P+red.

C. FIMBRIATA (L.) Fr. var. CHONDROIDEA Wain. f. BALFOURII (Cromb.) Wain. Zahlbr. Catal. no. 8801.—Transvaal, coll. *H. Wager*, 1914.—Natal: Port Natal, Imleezane, coll. *T. R. Sim*, 1918. KHO−, P+red.

C. PITYREA (Flk.) Fr. var. SUBAREOLATA Wain. Zahlbr. Catal. no. 8863.—Natal: Ihluku Harding, coll. *T. R. Sim*, 1920. KHO−, P+red.

II.—AUSTRALIA.

C. DIDYMA (Fée) Wain. var. VULCANICA (Zolling) Wain. Zahlbr. Catal. no. 8792.—Australia and New Zealand, without indication of precise locality, coll. *Dr. Leichardt*, 1858. KHO+yellow, P+yellow. Fertile.

C. SCABRIUSCULA (Del.) Coem. f. ASPERATA Müll. Arg. Zahlbr. Catal. no. 15163.—Australia: Caley, without name of collector, 1801. KHO−, P+red.

C. SCABRIUSCULA (Del.) Coem. f. CANCELLATA Müll. Arg. Zahlbr. Catal. no. 15163.—Australia and New Zealand, without indication of precise locality, coll. *Dr. Leichardt*, 1858. KHO−, P+red.

C. BORBONICA (Del.) Nyl. Zahlbr. Catal. no. 15138.—Australia, without indication of precise locality, Pt. Phillips, without name of collector. KHO−, P+red. Fertile.

C. OCHROCHLORA Flk. f. CERATODES Flk. (=*C. coniocraea* Sandst. f. *ceratodes* Sandst. Zahlbr. Catal. no. 15143).—Central Australia, without indication of precise locality, coll. *A. Cunningham*. KHO−, P+red.

C. VERTICILLATA Hoffm. var. CERVICORNIS (Ach.) Flk. f. PHYLLOCEPHALA (Flot.) Harm. Zahlbr. Catal. no. 8914.—Australia: Lotrobi River, coll. *Baron F. von Mueller*, 1872. KHO−, P+red.

III.—ANTILLES.

C. Sandstedei des Abb., sp. nov.—Thallus primarius non visus. Podetia tenuia circiter 0 mm., 3–0 mm., 6 (1 mm.) crassa, base axem sympodialem dichotomiis inaequalibus efficientia, summo dichotomiis subæqualibus, raro trichotomiis, ramosa; cæspitoso-conferta; circiter 5–10 cm. alta; axillis integris vel raro perforatis; ramulis ultimis tenuibus, vulgo rectiusculis divaricatis que vel leviter undique deflexis prædita; tota albida vel albido-cinerascentia vel base emoriente nigricantia et apicibus ultimis dilute-fuscescentia; ecorticata, semipellucida, parte superiore subarachnoideo-tomentosa, parte inferiore verruculosa; KHO+bene lutescentia; paraphenylenediamina+bene rubescentia, amara gustu. Apothecia non visa. Conidangia fusco-nigrescentia, ovoidea, plus minusve base constricta, materiam coccineam continentia.

In memoriam satis revocat habitu generali nec colore *Cladoniam impexam* Harm. paulo tenuiorem.

Jamaica: near Cinchona, altit. 1480 m., on talus, coll. *W. Harris*, 1896. Another specimen from Jamaica without indication of precise locality, coll. *D. Bickmore*, 1934.

C. IMPEXA Harm. *PYCNOCLADA (Gaud.) Nyl. **emend.** des Abb.—Jamaica: near Cinchona, altit. 1480 m., on talus sheltered by bushes, coll. *W. Harris*, 1896. KHO−, KHO(ClONa)+yellow, P−.

C. DIDYMA (Fée) Wain. var. RUGIFERA Wain. Zahlbr. Catal. no. 8792.—Jamaica: Cinchona, altit. 1520 m., coll. *W. Harris*, 1896. KHO−, P−. Fertile.

C. FURCATA (Huds.) Schrad. var. RACEMOSA (Hoffm.) Flk. f. FURCATOSUBULATA Hoffm. Zahlbr. Catal. no. 8808.—Jamaica, without indication of precise locality, coll. *D. Bickmore*, 1934. KHO+yellow, P+red. The podetia are slender, almost white, only slightly brown at the apices, completely devoid of folioles. The reaction KHO+yellow of this specimen forms a transition to **C. subrangiformis* Sandst.†.—Jamaica: near Cinchona, altit. 1480 m., coll. *W. Harris*, 1896. This shows the same reactions as the preceding specimen, but the plant is more robust and completely white, similarly devoid of folioles. By the white colour and the robust character of the podetia this lichen approaches the var. *pinnata* Flk., with which it might, strictly speaking, be united. I prefer, however, to place it with var. *racemosa* on account of the lack of folioles on the podetia, observing at the same time that it constitutes an intermediate condition. In the same way its reaction KHO+yellow forms a transition towards the subspecies *subrangiformis*.

C. CERATOPHYLLA (Sw.) Spreng. Zahlbr. Catal. no. 8764.—Jamaica: near Cinchona, altit. 1480 m., coll. *W. Harris*, 1896. KHO+faint yellow, P+red. Sterile.

C. FIMBRIATA (L.) Fr. var. CHONDROIDEA Wain. f. SUBPROLIFERA Wain. Zahlbr. Catal. no. 8801.—Antigua: Macailty Hill, altit. 365 m., on scanty soil, coll. *H. E. Box*, 1937. KHO— or dirty yellow passing into a reddish brown, P+red. Sterile.

C. DACTYLOTA Tuck. Zahlbr. Catal. no. 8784.—Jamaica: Cinchona, altit. 1520 m., on talus and rocks, coll. *W. Harris*, 1896. KHO—, P+red. Sterile.

C. STREPSILIS (Ach.) Wain. Zahlbr. Catal. no. 8892.—Jamaica: near Cinchona, altit. 1480 m., on talus, coll. *W. Harris*. ClONa+green. Thallus without podetia.

APPENDIX.

Clavis specierum omnium Cladoniarum *sub-generis* Cladinae.

1 (8). Podetia cinerea vel cinereo-albescentia, nec flava nec straminea:
2 (7). Podetia P+rubescentia, amara gustu:
3 (4). KHO— vel sordide lutescentia deinde fuscescentia, gracilia. Extremitates eodem latere deflexæ. Conidangia materiam coccineam continentia ..... [(Europa occidentalis.) *C. leucophaea* des Abb.‡

† On the value and limitation of *C. subrangiformis* Sandst., see H. des Abbayes in Bull. Soc. Sc. Bretagne, xiv. 154–64 (1937).

‡ *Cf.* H. DES ABBAYES, Bull. Soc. Sc. Bretagne, xiii. 125–128 (1936).

4 (3). KHO+lutescentia:
5 (6). Extremitates eodem latere deflexæ. Podetia robusta. Conidangia materiam albidam continentia..... [(Cosmopolitica.) *C. rangiferina*(L.)Webb.
6 (5). Extremitates rectiusculæ et divaricatæ vel raro undique deflexæ. Podetia gracilia. Conidangia materiam coccineam continentia ..... *C. Sandstedei* des Abb., [sp. nov. (America tropica et subtropica.)
7 (2). Podetia P—, mitia gustu. KHO+ intense lutescentia. Extremitates divaricatæ et rectiusculæ nec deflexæ. Conidangia materiam albidam continentia .... *C. Evansi* des Abb., [sp. nov. (America septentrionalis tropica et subtropica.)
8 (1). Podetia plus minusve flava vel straminea vel stramineo-viridescentia. KHO— vel fere —; KHO(ClONa)+lutescentia (vulgo):
9 (14). Podetia P+rubescentia, amara gustu:
10 (13). Extremitates eodem latere deflexæ:
11 (12). Podetia gracilia, amarissima; P+intense rubescentia. Conidangia materiam coccineam continentia .... *C. tenuis* (Flk.) Harm. [emend. des Abb. (Cosmopolitica.)
12 (11). Podetia robusta, leviter amara; P+minus intense rubescentia. Conidangia materiam albidam continentia. *C. sylvatica* (L.) Hoffm. [emend. Sandst. (Cosmopolitica.)
13 (10). Extremitates rectiusculæ et divaricatæ vel raro undique leviter deflexæ. Conidangia materiam coccineam continentia ..... *C. flavida* (Wain.) [emend. des Abb. (America tropica et meridionalis.)
14 (9). Podetia P—, mitia gustu:
15 (16). Extremitates eodem latere deflexæ. Conidangia materiam albidam continentia. Facies similis *C. sylvaticæ* sed extremitates minus nutantes..... *C. mitis* Sandst. [(Cosmopolitica sed præcipue in regionibus frigidis.)
16 (15). Extremitates divaricatæ vel undique deflexæ:
17 (18). Extremitates divaricatæ, breves et satis crassæ, capita globosa formantes. Conidangia materiam coccineam continentia ..... *C. alpestris* (L.) Rabh. [(In regionibus frigidis et montuosis hemisphærii [septentrionalis.)
18 (17). Extremitates vulgo undique deflexæ. Conidangia materiam albidam continentia:
19 (20). Podetia plerumque stramineo-viridescentia, vulgo impellucida. Glomeruli gonidiorum sat crebri et paulo tomentosi ..... *C. impexa* Harm. [(Hemisphærium septentrionale.)
20 (19). Podetia plerumque flava vel pallide straminea, semipellucida. Glomeruli gonidiorum rari et subarachnoideo-tomentosi..... **C. pycnoclada* (Gaud.) [Nyl. emend. des Abb. (Hemisphærium australe [et regiones tropicæ.)

Note.—It is possible that *C. signata* Wain. may belong to the subgenus *Cladina* rather than to the subgenus *Cenomyce*. The morphology and the structure of the podetia undoubtedly approaches that of *Cladina*. Wainio, however, attributes a squamose primary thallus to it. This species, originally described from Brasil, is white, and has the apices most divaricate, colourless gelatine in the conidangia, and the following reactions: KHO—, KHO(ClONa)—, P+red (taste bitter). If this species should be placed in the subgenus *Cladina*, it would come into the group of species with ash-grey or whitish ash-grey podetia, next to *C. Sandstedei*.

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LUZULA LUZULOIDES (LAM.), COMB. NOV.

By J. E. Dandy and A. J. Wilmott.

In the course of checking some of the nomenclature for the forthcoming 'Flora of Devon' it became clear that the above new combination is required for the species commonly known as *Luzula albida* (Hoffm.) DC. or *L. nemorosa* (Pollich) E. Mey. The following synonymy, which includes all the relevant specific synonyms together with explanatory remarks, makes evident the unavailability of the existing names in use for this species under *Luzula*. It may be useful to add that Richter, in his 'Plantæ Europeæ,' vol. i. pp. 183–184 (1890), transposed the synonyms *Juncus nemorosus* α and *J. nemorosus* β from their correct positions under *L. angustifolia* and *L. sylvatica* respectively.

Luzula luzuloides (Lam.), comb. nov.

Juncus nemorosus Pollich, Hist. Palat. i. 352 (1776), excl. var. β.

Juncus luzuloides Lam. in Encycl. Méth. Bot. iii. 272 (1789). Under this species Lamarck remarked "*An Juncus nemorosus.* Pollich." Since he was doubtful whether his own species was the same as Pollich's the name *J. luzuloides* is legitimate.

Juncus angustifolius Wulf. in Jacq. Collect. iii. 56 (1789), *nomen illegitimum*. This name is illegitimate since Wulfen included *J. nemorosus* Pollich in the species. In any event Wulfen's specific epithet could not be validly used under *Luzula* because of *L. angustifolia* Poir. (see below).

Juncus leucophobus Ehrh. Beitr. vi. 141 (1791), *nomen illegitimum*. Ehrhart's name is illegitimate because he included "*Juncus nemorosus* α. Pollich," meaning the type of *J. nemorosus*: Pollich had no variety α, but only a variety β appended to the species and distinguished from it by a varietal definition.

Juncus albidus Hoffm. Deutschl. Fl. 126, t. 4 (1791).

Luzula albida (Hoffm.) DC. Fl. Franç. ed. 3, iii. 159 (1805), *nomen illegitimum*. This combination is illegitimate because De Candolle included both *J. nemorosus* Pollich and *J. luzuloides* Lam.

Luzula angustifolia [Wulf.] Wenderoth in Schrift. Marburg, i. 150 (1823)—non *L. angustifolia* Poir. in Encycl. Méth. Bot. Suppl. iii. 530 (1814).

Luzula nemorosa (Pollich) E. Mey. in Linnaea, xxii. 394 (1849)—non *L. nemorosa* [Host] Baumg. Enum. Stirp. Transsilv. iii. 329 (1816). Baumgarten's name was based on *Juncus nemorosus* Host, Ic. & Descr. Gram. Austr. iii. 64, t. 97 (1805), which was published as a new specific name having no connexion with *J. nemorosus* Pollich.

Juncoides nemorosum (Pollich) Kuntze, Revis. Gen. Pl. ii. 724 (1891).

CORNISH MICRO-FUNGI.

By F. Rilstone, A.L.S.

The Rust Fungi recorded below were collected by the late Dr. P. G. M. Rhodes and myself in various parts of east and west Cornwall, but chiefly in the large parish of Perranzabuloe in west Cornwall and about Looe and Polperro in east Cornwall. The records of Pyrenomycetes and of Fungi Imperfecti are supplementary to those published in this Journal in April 1935. Of the latter the Coelomycetes are arranged as in W. B. Grove's 'Stem and Leaf Fungi.' I am greatly indebted to Mr. Grove, Professor J. H. Miller, Dr. F. Petrak, and Herr H. Sydow for kindly naming difficult plants.

Rust Fungi.

Uromyces Scrophulariae Fuck.; on *Scrophularia aquatica*, Lambriggan, Perranzabuloe: teleutospores occur in winter on the dead stems. *U. Armeriae* Lév.; on *Armeria vulgaris*, Polperro (Rhodes). *U. flectens* Lagerh.; on *Trifolium repens* in the neighbourhood of Looe, and on a purple-spotted form of the same species in a garden, Lambourne, Perranzabuloe. *U. Jaapianus* Kleb.; on *Trifolium minus*, Perranzabuloe and Polperro: uredospores only. *U. Loti* Blytt; on *Lotus angustissimus* in an inland station (2 miles from sea) near Polperro: only uredospores seen—Dr. C. C. Vigurs has found it on the same host near Newquay, west Cornwall. *U. Ervi* Westend.; on *Vicia hirsuta*, Talland Bay, near Polperro (Rhodes). *U. Fabae* Pers.; on *Vicia Faba*, Perranzabuloe. *U. Betae* Lév.; on *Beta maritima*, Talland Bay (Rhodes). *U. Rumicis* Wint.; on *Rumex*, West Looe (Rhodes) and Perranzabuloe. *U. Polygoni-avicularis*

(Pers.) Ramsb.; on *Polygonum aviculare*, Perranporth (west Cornwall), Looe, and Polperro. *U. Scillarum* Wint.; on *Scilla campanulata*, Perranzabuloe and Polperro. *U. Scirpi* Pers.; marshy meadow by tidal river, Sandplace near Looe: æcidia on *Glaux maritima* in early summer, remaining stages on *Scirpus maritimus*.

Puccinia Virgaureae Lib.; on *Solidago Virgaurea*, Trelawne Woods, near Looe. *P. Chrysanthemi* Roze; on garden chrysanthemums, Perranzabuloe and Polperro. *P. Carlinae* Jacky; on *Carlina vulgaris*, Polperro (Rhodes). *P. Centaurae* DC.; on *Centaurea nigra*, Callestick, Perranzabuloe. *P. obtegens* Tul.; on *Cirsium arvense*, very common. *P. Lapsanae* Fuck.; on *Lapsana*, common: teleutospores in winter on dead stems. *P. Hypochaeridis* Oud.; teleutospores in late autumn on dead stems of *Hypochaeris radicata*, Lambourne. *P. Taraxaci* Plowr.; Callestick and Polperro, on leaves of *Taraxacum*. *P. Sonchi* Rob.; uredospores on leaves of *Sonchus oleraceus* in summer, teleutospores on dead stems in autumn, Looe, Polperro, and Perranzabuloe. *P. Crepidis* Schroet.; on *Crepis virens*, cliffs, Polperro (Rhodes). *P. Hieracii* Mart.; on *Hieracium umbellatum*, Trelawne Woods, near Looe. *P. clandestina* Carm.; in 1929 I gathered near Trelawne a few *Puccinia*-infected leaves of *Scabiosa succisa* which were sent to the late Dr. Rhodes. I did not at the time realize the importance of the find, for the rust, though somewhat immature, agreed quite well with Carmichael's description of his *P. clandestina*, previously only known from Scotland and not re-found there since Carmichael's discovery of it a century ago. But unfortunately a search in the Trelawne locality for further affected leaves was without result, nor have I been able to find any on more recent visits. The locality is in a lane between Trelawne Mill and Watergate on the western bank of the West Looe River. *P. punctata* Link; on *Galium Mollugo*, Talland Bay (Rhodes). *P. difformis* K. & S.; on *Galium aparine*, Polperro (Rhodes) and Penhallow, Perranzabuloe. *P. Veronicae* Schroet.; on *Veronica montana*, Longcoombe Lane, Polperro. *P. Menthae* Pers.; on *Mentha spicata*, Perranzabuloe. *P. Glechomatis* DC.; on *Glechoma hederacea*, Polperro cliffs (Rhodes). *P. Antirrhini* Diet.; on garden antirrhinums, Perranzabuloe and Polperro: not seen until 1937. *P. Betonicae* DC.; on *Stachys Betonica*, not infrequent. *P. Primulae* Duby; on *Primula acaulis*, Lambriggan, Perranzabuloe. *P. Saniculae* Grev.; on *Sanicula*, Trelawne Woods. *P. Smyrnii* Corda; Bolingey, Perranzabuloe; Bodinnick, near Fowey; also Talland Bay (Rhodes). *P. Circaeae* Pers.; on *Circaea lutetiana*, West Looe (Rhodes); Lambriggan, Perranzabuloe; Polperro. *P. pulverulenta* Grev.; on *Epilobium hirsutum*, Polperro. *P. aegra* Grove; on cultivated Violas, Lamborne Hill, Perranzabuloe. *P. Buxi* DC.; on *Buxus sempervirens*, Polperro and Perranzabuloe. *P. Malvacearum* Mont.; on *Malva sylvestris* at Looe (Rhodes) and Polperro, but commonest on Hollyhocks in gardens, east and west Cornwall. *P. Pruni-spinosae* Pers.; on *Prunus spinosa*, Perranzabuloe. *P. Umbilici* Guep.; a frequent and striking rust on *Cotyledon Umbilicus* in both east and west Cornwall. *P. Lychnidearum* Link f. *Arenariae* Schum.; on *Stellaria Holostea*, Polperro cliffs (Rhodes). *P. Acetosae* Koern.; on *Rumex Acetosa*, Perranzabuloe. *P. Iridis* Wallr.; on *Iris foetidissima*, Perranporth sand-dunes. *P. Porri* Wint.; on *Allium vineale*, Polperro. *P. obscura* Schroet.; on *Luzula Forsteri*, Looe, and on *L. campestris*, Ventongimps, Perranzabuloe. *P. extensicola* Plowr.; æcidia on *Aster Tripolium*, uredo- and teleutospores on *Carex extensa*, marshy ground by West Looe River. *P. graminis* Pers.; on grasses and cereal crops, common: uredospores may be found throughout the winter on leaves of grasses, especially of *Dactylis*, and on self-sown corn. *P. Festucae* Plowr.; æcidia on *Lonicera Periclymenum*, Perranzabuloe Church. *P. sessilis* Schneid.; on *Phalaris arundinacea*, Talland (Rhodes). *P. Phragmitis* Koern.; uredo- and teleutospores on *Phragmites*, Talland Bay (Rhodes) and Carnkief, Perranzabuloe. *P. Poarum* Niels.; æcidia on *Tussilago Farfara*, Perranzabuloe. *P. Baryi* Wint.; on *Brachypodium sylvaticum*, Polperro.

Triphragmium Ulmariae Wint.; on leaves of *Spiraea Ulmaria*, Polperro.

Phragmidium Fragariastri Schroet.; on *Potentilla Fragariastrum*, rather frequent. *P. Sanguisorbae* Schroet.; on *Poterium Sanguisorba*, Perranporth. *P. violaceum* Wint.; very common on bramble leaves. *P. Rubi-Idaei* Karst; on *Rubus Idaeus*, Polperro.

Gymnosporangium confusum Plowr.; teleutospores on bushes of *Juniperus Sabina* in garden, Lambourne, Perranzabuloe; æcidia on *Crataegus monogyna* in the neighbourhood: a hawthorn hedge near the juniper was smothered in rust (*Roestelia*) and badly damaged by it.

Coleosporium Senecionis Fr.; very common on groundsel; also on *Senecio sylvaticus*, Polperro (Rhodes). *C. Tussilaginis* Tul.; on coltsfoot, Perranzabuloe. *C. Rhinanthacearum* Lév.; on *Euphrasia*, Polperro, and on *Bartsia viscosa* and *Euphrasia*, Perranzabuloe. *C. Campanulae* Lév.; on *Campanula persicifolia*, Polperro.

Melampsora Hypericorum Wint.; on *Hypericum Androsaemum* in various localities.

Melampsoridium Betulinum Fuck.; on *Betula*, Lamorran Woods on the Fal; Carnkief, Perranzabuloe; Trelawne, near Looe.

Pucciniastrum Agrimoniae Trauz.; on *Agrimonia*, Mount, Perranzabuloe. *P. Circaeae* Speg.; on *Circaea lutetiana*, West Looe (Rhodes).

Milesina Dieteliana Magn.; on *Polypodium vulgare*, Bonython Plantation, Bochym near the Lizard (Rhodes). *M. Blechni* Syd.; on *Blechnum Spicant*, Looe, and Bonython Plantation (Rhodes). *M. Scolopendrii* Syd.; on *Scolopendrium*, Looe and Bonython Plantation (Rhodes). *M. Kriegeriana* Magn.; on *Lastraea* (probably *L. spinulosa*), Bonython Plantation (Rhodes). *M. Polystichi* (Wint.) Grove; on *Polystichum angulare*, Bonython Plantation (Rhodes).

COELOMYCETES.

Phomopsis Achilleae von Hoehn.; on dead stalks of *Achillea Millefolium*, Perranzabuloe; var. *Asteris* Grove, on Michaelmas daisy, Polperro; var. *Senecionis* Grove; on *Senecio Greyii*, Polperro, and on *S. Jacobaea*, Fowey (Grove). *P. albicans* Sydow; on *Hypochaeris radicata*, Lambourne, Perranzabuloe. *P. Arctii* Trav.; on *Arctium*, Perranzabuloe. *P. oblita* Sacc.; on *Artemisia vulgaris*, Looe. *P. occulta* Trav.; on leaves of *Pinus sylvestris*, Perranzabuloe. *P. cruciferae* Grove; on *Lepidium Smithii*, Perranzabuloe. *P. Coronillae* Trav.; on *Coronilla glauca*, Polperro. *P. Choisyae* Grove; on *Choisya ternata*, Polperro. *P. elliptica* Grove; on *Galium Mollugo*, Polperro. *P. picea* von Hoehn. f. *Obiones* Grove; on *Atriplex*, Lambourne, Perranzabuloe. *P. Lathyrina* Grove; on *Lathyrus silvestris*, Par. *P. brachyceras* Grove; on *Ligustrum vulgare*, Fowey. *P. Desmazierii* Grove var. *Phlomidis* Grove; on *Phlomis fruticosa*, Polperro (Grove). *P. subordinaria* Trav.; very common on dead stalks of *Plantago lanceolata*. *P. striaeformis* Grove; on *Kerria japonica*, Polperro. *P. Prunorum* Grove; on *Prunus Laurocerasus*, Par (Grove). *P. pungens* Grove; on *Ribes nigrum*, Perranzabuloe. *P. Durandiana* Died.; on *Rumex obtusifolius*, common. *P. Tulasnei* Sacc.; on dead potato haulms, Lambourne, Perranzabuloe, common. *P. ligulata* Grove; on *Tamus communis*, Perranzabuloe. *P. hysteriola* Grove; on *Sison Amomum*, Looe. *P. Ampelopsidis* Petr.; on *Ampelopsis* Polperro. *P. viticola* Sacc.; on *Vitis vinifera*, Polperro.

Dothiorella pyrenophora Sacc. var. *Mali* Karst.; on *Pyrus Malus*, Lambourne.

Cytospora oxyacanthae Rab.; on *Crataegus monogyna*, Perranzabuloe. *C. Laurocerasi* Fuck.; on *Prunus Laurocerasus*, Callestick, Perranzabuloe. *C. Prunorum* Sacc. & Syd.; on *Prunus spinosa*, Callestick. *C. microspora* Rabenh.; on apple twigs, Lambourne Hill. *C. clypeata* Sacc.; on *Rubus fruticosus* agg., Lambourne Hill.

Ceuthospora Laurocerasi Grove; on *Prunus Laurocerasus*, Callestick.

Ascochyta Fabae Speg.; on *Vicia Faba*, Perranzabuloe. *A. Pisi* Lib.; on cultivated peas, Perranzabuloe. *A. Senecionis* Fuck.; on *Senecio Greyii*, Polperro.

Ascochytula Symphoricarpi Died.; on *Symphoricarpus racemosus*, Polperro.

Diplodina Aloysiae Grove; on *Aloysia citriodora*, Polperro. *D. Galii* Sacc.; on *Galium Mollugo*, Polperro (Rhodes), and Fowey (Grove). *D. Grossulariae* Sacc. & Bri.; on *Ribes Grossularia*, Lambourne Hill. *D. Eurhododendri* Voss; on living leaves of *Rhododendron*, Callestick. *D. graminea* Sacc.; on runners of *Agrostis alba*, Perranzabuloe.

Stagonospora subseriata Sacc.; on *Molinia coerulea*, Perranzabuloe. *S. innumerosa* Sacc.; on *Juncus maritimus*, St. Ives (Grove).

Septoria Cheiranthi Rob. & Desm.; on leaves of *Cheiranthus Allionii*, Lambourne Hill. *S. Chrysanthemi* Allesch.; on chrysanthemum leaves, Polperro and Perranzabuloe. *S. cercosporioides* Trail; on leaves of *Chrysanthemum maximum*, Polperro. *S. Convolvuli* Desm.; on leaves of *Convolvulus arvensis*, Perranzabuloe. *S. Galiorum* Ellis; on *Galium Aparine* and *G. Mollugo*, near the Lizard (Rhodes); Polperro. *S. Rhododendri* Cooke; on *Rhododendron*, Looe. *S. Ribis* Desm.; on *Ribes nigrum*, Perranzabuloe. *S. Acetosae* Oud.; on *Rumex Acetosa*, Perranzabuloe. *S. Stachydis* Rob. & Desm.; on *Stachys silvatica*, Perranzabuloe. *S. Veronicae* Rob. & Desm.; on leaves of a shrubby *Veronica*, Polperro. *S. Gladioli* Pass.; on leaves of *Gladiolus*, Polperro. *S. nodorum* Berk.; on *Lepturus incurvatus*, Lelant (Grove). *S. lunata* Grove; on grasses, Polperro.

Rhabdospora Hypochaeridis Allesch.; on *Hypochaeris radicata*, Polperro (Rhodes). *R. phomatoides* Sacc. var. *brachyspora* Sacc.; on *Phlomis fruticosa*, Polperro (Grove). *R. Scrophulariae* Grove var. *Hesperidis* Grove; on *Hesperis matronalis*, Polperro. *R. Buddliae* Grove; on *Buddleia variabilis*, Polperro.

Coniothyrium Buddliae Grove; on *Buddleia variabilis*, Polperro (Grove). *C. Obiones* Jaap; on *Atriplex Halimus*, Polperro (Rhodes) and near Lamorna Cove (Grove). *C. Viburni* Died.; on *Viburnum Opulus*, Losthwithiel (Rhodes). *C. Phormii* Cooke; on *Phormium tenax*, St. Ives (Grove) and Polperro. *C. Psammae* Oud.; on *Psamma arenaria*, Padstow (Rhodes).

Sphaeropsis Betulae Cooke. In 'Stem and Leaf Fungi,' ii. p. 17, Grove gives the spore measurements as 23–25 μ long, though Cooke had given 30–32 μ. In December 1937 I found at

Ventongimps a few pustules of what is evidently this species on small twigs of birch branches cut down and left lying. One pycnidium examined contained only pale yellowish spores, oblong-elliptical and about 20–25 μ long. In another the spores were dark brown and up to slightly more than 30 μ long, with a rather obscure central guttule. Many of these larger spores were narrowed at one end. I could nowhere find any trace of septum or constriction in the spores. *Otthia ambiens* occurred on larger branches of a near-by tree.

Microdiplodia ononidicola Rhodes; on *Ononis arvensis*, Looe (Rhodes).

Diplodia ramulicola Desm.; on dead leaves and twigs of *Euonymus japonicus*, Perranzabuloe and Polperro: this seems never to be abundant, just an occasional dead twig or fallen leaf will be covered with the pustules. *D. Pinastri* Grove; on dead leaves and branches of *Pinus sylvestris*: the large brown spores are often continuous, sometimes a gathering will be entirely so (*Sphaeropsis Pinastri* Sacc.), but in most pycnidia septate spores may be found. *D. malorum* Fuck.; abundant on old prunings of apple trees, Lambourne Hill: colourless and brown continuous spores (*Phoma malorum* Sacc. and *Sphaeropsis malorum* Berk.) and the mature 1-septate spores of the *Diplodia* occur in the same receptacle. *D. Quercus* Fuck.; on *Quercus sessiliflora*, Ventongimps, Perranzabuloe. *D. Rubi* Fr.; on dead bramble stems, Perranzabuloe, rather common.

Hendersonia culmicola Sacc.; on dead culms of *Cynosurus cristatus* with *Pleospora infectoria*.

Dinemasporium hispidulum Sacc.; on dead wood, Lambourne.

Discella carbonacea B. & Br.; on dead twigs of *Salix*, Perranzabuloe.

Heteropatella Bonordenii Lind; with asci of the perfect stage, *Heterosphaeria patella*, on *Foeniculum*, Talland Bay: previously recorded as *H. lacera* Fuck.

Leptostroma Juncacearum Sacc.; on *Juncus maritimus*, St. Ives (Grove). *L. osmundicola* Bub. & Syd.; on *Osmunda regalis*, Lostwithiel (Rhodes).

Hainesia Rubi Sacc.; underside of leaves of *Rubus rusticanus* with *Phragmidium violaceum*, Lambourne Hill.

Rhodesia subtecta Grove; on *Psamma arenaria*, Perranporth sand-dunes; previously recorded as *Hainesia subtecta*.

Gleosporium Robergei Desm.; on leaves of *Carpinus Betulus*, near Perranzabuloe Church.

Myxosporium carneum Lib.; on dry branches of *Fagus silvatica*. *M. Lanceola* Sacc.; on oak twigs, Perranzabuloe.

Septomyxa Tulasnei von Hoehn.; frequent on recently dead branchlets of sycamore, Perranzabuloe.

Cryptosporium Tami Grove; on *Tamus communis*, Perranzabuloe.

Melanconium apiocarpum Link; with *Melanconis Alni* on alder branches, Carnkief, Perranzabuloe. *M. Hederae* Preuss; on *Hedera Helix*, Perranzabuloe.

Thyrsidium hedericola Dur. & Mont.; on *Hedera Helix*, Lambourne.

Coryneopsis Rubi Grove; on dead bramble stems, Perranzabuloe.

Coryneum Kunzei Corda; on *Quercus sessiliflora*, Lambourne Hill. *C. umbonatum* Nees; on *Quercus Ilex*, Callestick, and on *Q. Cerris*, near Perranzabuloe Church.

Scolecosporium Fagi Lib.; on twigs of beech, Callestick.

Pestalotia neglecta Thuem.; on dead leaves of *Euonymus japonicus*, Perranzabuloe and Polperro; previously recorded as *Pestalozzia Guepini* Desm.

Steganosporium pyriforme Corda; on *Quercus Ilex*, Perranzabuloe.

Hyphomycetes.

Ramularia plantaginea Sacc. & Berl.; on *Plantago lanceolata*, Perranzabuloe. *R. macrospora* Fres.; a troublesome disease on Canterbury Bells, Perranzabuloe (Beckley) and Polperro. *R. purpurascens* Wint.; on leaves of *Petasites fragrans*, Perranzabuloe. Mr. Grove told me that he had seen the round purple-bordered spots very frequently in Cornwall, as at Fowey, but only rarely was the *Ramularia* actually present on the underside of the leaf.

Coniosporium sphaerospermum (Pers.) Mason f. *Bambusae* Sacc.; on old bamboo-canes, Perranzabuloe.

Helminthosporium microsorum D. Sacc.; on dead but not fallen twigs of *Quercus Ilex*, Perranzabuloe Churchyard. *H. Smithii* B. & Br.; on *Ilex Aquifolium*, Callestick.

Pyrenomycetes.

Erysiphe Heraclei DC.; on *Heracleum* and *Angelica*, Perranzabuloe.

Uncinula Aceris (DC.) Sacc.; on sycamore leaves, Perranzabuloe.

Sporomia Roumegueri Sacc.; on old fragments of wood in a field near Perranzabuloe Church.

Herpotrichia macrotricha (B. & Br.) Sacc.; on dead stems of bramble, Lambourne Hill: the tomentum on which the perithecia are situated is apparently produced only where the dead wood is lightly buried in loose soil or leaf-mould.

Melanomma Pulvis-pyrius (Pers.) Fuck.; on apple wood, Lambourne Hill.

Otthia ambiens Niessl. (det. Petrak); on *Betula*, forming dark bands round the smaller branches, Ventongimps, Perranzabuloe.

Lophiosphaeria Fuckelii Sacc.; on dead bramble stems, rather common in Perranzabuloe.

Rosellinia byssiseda (Tode) Schroet; on dead sticks of hazel and other wood where lightly buried in mould, Perranzabuloe.

Didymosphaeria futilis Rehm; on dead cuttings of rambler roses, Lambourne Hill. *D. diplodioides* (Crouan) Sacc.; on *Eupatorium cannabinum*, Lambourne Hill.

Leptosphaeria vagabunda Sacc.; on fragments of old wood lying on grass, field near Perranzabuloe Church.

Pleospora infectoria Fuck.; on dead culms of *Cynosurus cristatus*, especially the upper part, Perranzabuloe. *P. vagans* Niessl. (det. Sydow); common on the upper parts of culms of *Dactylis glomerata*, Perranzabuloe.

Gnomonia cerastis (Riess) Ces. & De Not.; on petioles of dead sycamore leaves, Lambourne Hill.

Valsa ambiens (Pers.) Fr.; on *Crataegus monogyna*, Lambourne Hill.

Eutypa heteracantha Sacc. (det. Petrak); on *Ligustrum*, *Buddleia*, and *Sambucus*, Lambourne Hill.

Eutypella Brunaudiana Sacc. (det. Sydow); on *Ribes nigrum*, *R. rubrum*, and *R. Grossularia*, Lambourne Hill. *E. Prunastri* Sacc. (det. Sydow); on dead plum branches, Lambourne Hill.

Diaporthe Desmazierii Niessl.; on *Phlomis fruticosa*, Polperro. *D. trinucleata* Niessl. (det. Petrak); on *Digitalis*, Perranzabuloe. *D. discors* Sacc.; on *Rumex obtusifolius*, Perranzabuloe. *D. coneglanensis* Sacc.; on *Aesculus*, Perranzabuloe Church. *D. Ligustri* Allesch. (det. Sydow); on *Ligustrum*, Lambourne Hill. *D. Sarothamni* Nits.; on dead twigs of broom, Callestick. *D. Crataegi* Fuck.; on *Crataegus monogyna*, Lambourne Hill. *D. conjuncta* Fuck.; on *Corylus*, Penhallow, Perranzabuloe. *D. leiphaemia* Sacc.; on oak, common in Perranzabuloe.

Melanconis betulina Otth.; on *Betula*, Ventongimps. *M. Alni* Tul.; on *Alnus*, Carnkief, Perranzabuloe.

FIG. 1.

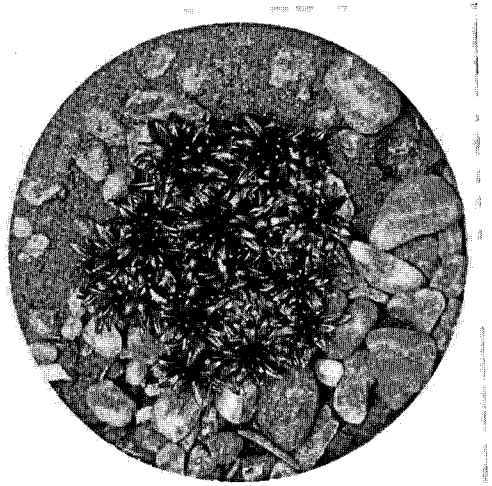

FIG. 2.

FIG. 3.

SAGINA BOYDII BUCH.-WHITE.

Pseudovalsa umbonata Sacc. ; on *Quercus* near Perranzabuloe Church.

Diatrype Stigma Fr. ; common in Perranzabuloe, especially on hawthorn and beech.

Diatrypella favacea Nits. ; on birch ; *D. nigro-annulata* (Grev.) Nits. ; on beech : *D. quercina* (Pers.) Nits. ; on oak ; all in Perranzabuloe.

Melanops Cydoniae (Arn.) Pet. & Syd. (det. Petrak) ; on branches of hawthorn cut down two years previously, Lambourne Hill.

Sillia ferruginea Karst. ; not infrequent on *Corylus*, near base of stem, Perranzabuloe.

Daldinia concentrica Ces. & de Not. ; on old ash trees by streams, Penwartha and Golla, Perranzabuloe.

Hypoxylon serpens (Pers.) Fr. (det. Miller) ; on *Corylus*, Lambourne. *H. fuscum* (Pers.) Fr. ; common on *Corylus* in all parts of the county. *H. Howeianum* Pk. (det. Miller) ; on *Crataegus monogyna* cut down several years previously, Lambourne Hill.

Nectria episphaeria (Tode) Fr. ; on old stromata of *Diatrype Stigma*, Lambourne.

Hypoderma virgultorum DC. ; on dead bramble stems, Lambourne Hill.

Lophodermium arundinaceum (Schrad.) Chev. ; on *Phragmites*, Perranporth.

NOTES ON TWO SAGINAS.

BY F. R. ELLISTON WRIGHT.

(PLATE 615.)

IT is now sixty years since Mr. W. B. Boyd discovered *Sagina Boydii* Buch.-White, and to-day many botanists regard it almost as a myth.

To reawaken some interest in *S. Boydii* might lessen the risk of passing the plant by without notice. Now that so many more botanists visit the highlands of Scotland there is, I think, some likelihood that *S. Boydii* may be found again.

Although it cannot be proved that *S. Boydii* did not come from Switzerland, I think it is unlikely, for it is improbable that anyone interested in plants would send to England so distinct a looking plant, new and unknown, without any comment.

If the plant did not come from Switzerland, it almost certainly came from the Braemar district, with Ben A'an perhaps as the most likely hill, and here we have a very large area of hills, with some parts of them difficult of access, where a scarce and local plant might escape observation apart from some lucky chance.

The growth form of *S. Boydii* is similar to that of other plants seen on the higher parts of Ben A'an, and evidently suitable for existence on that cold wind-swept hill. The force of the wind there must be experienced to be believed. Over large areas none of the vegetation exceeds an inch in height.

If *S. Boydii* arose as a chance mutation, there is little likelihood that it would be found again ; but I think it will be admitted that the plant varies in too many characters from any existing British *Sagina* for it to be a mutant. If it were a hybrid, it might be less likely to turn up again ; but I cannot see sufficient evidence for it to be a possible hybrid of parents at present existing, quite apart from the rarity of undoubted hybrids in the genus.

It is well known that some hybrids, unusual forms of flowering plants, and especially ferns, only reproduce by apomixis or vegetatively. The sterility of *S. Boydii* is rather to be regarded as a replacement of sexual by vegetative reproduction, where conditions for seed formation and germination are unsuitable. This is frequently found in plants of the high hills ; though many such plants, when removed to lower and more hospitable situations, may be induced to produce flowers. Everyone must have noticed how, on the highest ground, *Polygonum viviparum* has no flowers, only bulbils, whereas, as we see the plant on lower ground, it has more and more flowers on the spike.

S. Boydii varies in no such way. Even in my garden in Devonshire it grows in unchanged form. I have often seen rudimentary white petals in my cultivated plants too abortive to allow of any description of petal shape, and these rudiments may not be found in the plant growing in its natural habitat.

The excellent short description of *S. Boydii* in Babington's 'Manual of British Botany' is sufficient for identification. The densely imbricate, short, fleshy, rigid, recurved leaves are unlike those of any other *Sagina*, and under cultivation with favourable conditions of soil and moisture, with protection from exposure, these leaves are unaltered (Pl. 615, fig. 1).

In spring, when active growth is taking place, the young leaves show along their edges and on their upper surface many minute "spinous" (? glandular) outgrowths, somewhat similar to those seen on *S. procumbens* var. *spinosa* Gibs., but in this latter plant they are rarely on the leaf-surface and are slightly longer and more attenuate. Later in the season these on *S. Boydii* are not noticeable. It is unlikely that these leaf-additions are the result of cultivation.

The sepals (Pl. 615, fig. 2) never open to any extent, more than a slight separation of their tips, just allowing a limited view of the white anthers, which crowd over the top of the immature capsule. The stamens are well formed, varying from five to the full ten. The pollen-grains have a normal appearance. The stigmas are ill-developed, quite rudimentary in some flowers (Pl. 615, fig. 3). The appearance of receptive tissue is only seen badly developed at their extreme ends. The central area between them on the flat top of the ovary is mainly occupied by those curious spherical, shining, apple-green bodies, which are very variable in number and size. These are probably related to those malformations often found in the remains of embryonic tissue left on the suppression of some organ which has become useless or obsolete (fig. 3 *a*).

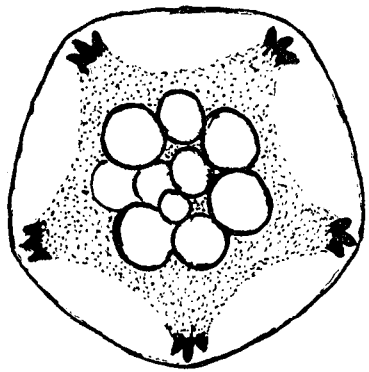

Fig. 3 *a*.—*Sagina Boydii* Buch.-White. Diagram representing upper surface of capsule.

The undeveloped ovules are present with their usual attachment to the columella. They are never fertilized, so the capsule never develops, and very gradually, with the whole flower, withers away.

Cultivated here in Devon, flowers were plentifully developed in early May—none were produced after July.

Dr. K. B. Blackburn has found the chromosome count to be $2n=22$, which places *S. Boydii* in the same group with *S. procumbens*, *subulata*, *saginoides*, *repens*, and *pilifera*.

The compact growth-form of *S. Boydii*, with the absence of any spreading branches which might form adventitious roots and give rise to daughter plants, as in the other British perennial Saginas, raises some speculation as to the possibility of the plant's means of dispersal. Parts of similar small plants can be detached

by violent hail-storms, or by wind, and carried for some distance by the same agencies.

Sagina Reuteri Boiss., material found in England which has been placed under this name, has been well described by W. H. Pearsall in B. E. C., 1927. There are British botanists who consider that this English material may not be identical with the Spanish plants described by Boissier. From his original description, I can see no real reason to indicate that our English plants are not the plant described by Boissier; but to obtain Spanish material to prove the point seems at present impossible.

Dr. K. B. Blackburn has found the chromosome count of English material to be $2n=12$, which merely leaves *S. Reuteri* in the same group with *S. ciliata* and *apetala*.

It is worth repeating that the sepals are erect and close to the capsule, and that the two outer sepals, although hooded, with the tip of the hood turned in and slightly downwards, end in a small apiculus, a character commonly found in dwarf maritime forms of *S. ciliata*.

Ilfracombe plants found by Mr. C. P. Hurst, named by Dr. Druce as *S. Reuteri*, have since been referred to *S. ciliata*.

During the past three years I have had under cultivation English *S. Reuteri* from four different habitats in the British Channel area. Under conditions of shelter, sufficient moisture, and good soil, all plants have developed into *S. ciliata*.

I therefore propose to treat the plant as *S. ciliata* forma **Reuteri** (Boiss.), comb. nov.

Explanation of Plate 615.

Fig. 1.—*Sagina Boydii* Buch.-White. Cultivated May 28th. Nat. size.
Fig. 2.—Ditto. Flower and peduncle. ×2¼.
Fig. 3.—Ditto. Flower with sepals forcibly opened. Greatly enlarged.

A NOTE ON *HODGSONIA CAPNIOCARPA* Ridley.

By B. C. Kundu, M.A.

The genus *Hodgsonia* was first described by Hooker f. and Thomson (Proc. Linn. Soc. ii. (1853) 258), the type-species being *Trichosanthes heteroclita* Roxburgh ('Flora Indica,' p. 695 (1874)). Hooker f. (Illustr. Himal. Pl. pls. 1–3 (1885)) subsequently published a large coloured plate of *Hodgsonia heteroclita*, and made the following observations on its taxonomic relationships: "Some of the botanical characters of the plant are most remarkable. The flower in all respects resembles that of a *Trichosanthes*, but the ovary and fruit wholly differ from that genus, and ally it more to the curious East African genus *Telfairia*. The placentæ

are decidedly marginal and the two collateral ovules, at the base of each side of the placenta, contract an adhesion and together form only one seed with two cells, and often two embryos, though one is frequently imperfect." These characters are quite sufficient to warrant its treatment as a distinct genus.

Ridley (Fl. Malay Pen. i. p. 843) described a second species, *Hodgsonia capniocarpa*, from some specimens from the Malaya Peninsula which had been referred to *H. heteroclita* by Hooker f. and Thomson. He distinguished it from *H. heteroclita* by (1) the hairy underside of the leaves, (2) the much smaller flowers with a much thicker calyx-tube and shorter lobes, and (3) the fruit. He remarked: "*H. heteroclita* has a pointed red fruit, thin-walled; that of this species is woody, velvety, grey, and quite flat on the top and base."

During my study of *Hodgsonia* I have found that the characters ascribed to *H. capniocarpa* by Ridley do not all hold good for the specimens determined by him as belonging to that species. The structure of the leaves of *H. capniocarpa* completely agrees with that of *H. heteroclita*, except in the nerves on the lower surface of the leaves being hairy. The calyx-tube has been described as 0·5 in. long and the corolla-tube 2 in. long (2·5 in. in the 'Flora of the Malay Peninsula'). Actually, the calyx-tube is never so short in a fully expanded flower; it is about 5 cm. long and dilated from the middle upwards. There is practically no corolla-tube. There does not appear to be any difference in the structure of the fruit of the two species. Ridley stated that *H. heteroclita* has a pointed red fruit, thin-walled. Roxburgh in his original description of *Trichosanthes heteroclita* and Hooker f. and Thomson in their description of *H. heteroclita* state distinctly that the berry is depressed-globose. The two fruits of *H. heteroclita* preserved in the Museum of the Royal Botanic Gardens, Kew, are depressed-globose. The longitudinal section of the fruit of *H. heteroclita* in the Kew Herbarium also proves that it is really depressed-globose, as described by Hooker f. I do not think that the fruit of *H. heteroclita* has a thin coat; the sections of the fruit preserved in the Kew Herbarium are taken from very young ones, as the seeds are quite immature and have not developed a hard testa. The two fruits preserved in the Museum appear to have thick coats. The fruit of both species are tomentose.

A key to the two species and an amended description of *H. capniocarpa* are given below:—

Key.

Leaves glabrous on both sides, with conspicuous depositions of waxy substances in the areolæ of the veins on the under surface; calyx-tube 7·5–12 cm. long, dilated at the extreme apex; calyx-teeth 2·5–4 mm. long..	[et Thomson. *H. heteroclita* Hook. f.

Veins on the under surface of the leaves hairy, depositions of waxy substances not frequently found; calyx-tube 5–6 cm. long, dilated from near the middle upwards; calyx-teeth very minute ..... *H. capniocarpa* Ridley.

I have seen two Indian specimens, one from Lushai Hills, Assam, and the other from Chittagong, where the veins on the lower surface of the leaves are slightly hairy, but in all other respects they agree with *H. heteroclita*.

H. capniocarpa Ridley, in Journ. F.M.S. Mus. x. 135 (1920); Ridley, Fl. Mal. Penins. i. 843 (1922).

Large climber with very strong 2–3-fid tendrils. Leaves alternate, evergreen, coriaceous, palmately 3–5-lobed; petioles elongated, 2·5–7 cm. long; lobes acute or shortly acuminate, reticulations very conspicuous, nerves on the under surface of the leaves hairy. Peculiar axillary conical bodies present, one in the axil of a leaf. *Male racemes* woody, stout, growing to 15–18 cm. long. Calyx-tube about 5–6·5 cm. long, dilated from the middle of the tube, 1 cm. wide at the top when open; calyx-teeth very minute. Corolla gamopetalous, adnate to the calyx-limb; limb spreading, thick scurfy pubescent, 5 cm. across when open, fimbriate. Stamens 5, triadelphous, anthers connate, extrorse. *Female flowers* solitary, axillary. Calyx and corolla as in ♂ flower. Ovary unilocular with 3 parietal placentas which are biovulate on both sides; style elongated; stigmas 3-lobed. Fruit very large, depressed-globose, velvety grey, woody. Seeds closely stuck together by pairs in six nuts and embedded in a firm oily pulp. Testa very hard and woody.

REVIEWS.

Zur Morphologie des Vegetativen Sprosses der Loganiaceen. By G. B. E. Hasselberg. Symbolae Botanicae Upsalienses, 1937, 2, pp. 1–170. Price 9 Kr.

The great similarity between the Loganiaceae and that very large family the Rubiaceae has always been recognized by systematic botanists. The distinction, depending on the superior ovary in the Loganiaceae in contrast to the inferior ovary of the Rubiaceae, has sometimes seemed trivial when compared with the extreme similarity of the other floral and the vegetative characters. The approach of the two families to one another is most marked in the peculiar structure of the stipules between the opposite leaves, which is such a constant character of the Rubiaceae, and which is found in all but a single isolated group of the Loganiaceae.

A close investigation of the stipular structure is therefore of considerable systematic importance. Two main types of

stipules are found in the Loganiaceae, which are termed the *Couthovia*-type and the *Fagraea*-type. The former is the most general, and it is this type which is so similar to the interpetiolar stipules of the Rubiaceae. The *Fagraea*-type shows more resemblance to the stipules found in the Tabernaemontanideae, a tribe of the Apocynaceae. In the Buddleioideae the stipules of opposite leaves do not unite, a circumstance so distinct as to support the view advanced by Solerader, on evidence of the structure of the vascular bundles, that this group must be treated as a subfamily.

It is reassuring to learn that the vascular structure to be found in plants so diverse in stature as the Australian *Mitrasacmes* and the various species of *Strychnos* are in all essentials similar. The paper is divided into two parts, which deal respectively with the structure and morphology of the stipules and the vascular system of the vegetative shoot. At the end of each part the structures described are discussed in their relation to the systematic positions of the groups within the family, and of the family as a whole. There is undoubtedly good correspondence between the results of this anatomical investigation and those of systematists, but the full value of the work will not be apparent until similar work has been undertaken in the related families of the Contortae and the Rubiaceae. The author mentions preliminary investigations in these groups; let us hope that they can be continued as comprehensively as the present work. W. R. P.

La Mortola Garden. Hortus Mortolensis. Compiled with the assistance of S. E. Mario and C. L. Maurizio; introduction by Lady Hanbury. With 61 plates, including coloured frontispiece and two photographs; 2 charts and 2 maps. Oxford University Press. 28*s*.

This illustrated catalogue of the plants cultivated in the famous garden at La Mortola, Ventimiglia, Italy, is very lavishly produced. Sir Cecil Hanbury, who died during its preparation, had been engaged upon it for two years in collaboration with Lady Hanbury. There is a biographical sketch of Sir Cecil as a foreword, accompanied by a photograph. This is followed by a section headed "Sir Cecil Hanbury," which consists of two biographical notes from 'The Times' and an account of the origin of La Mortola from 'Country Life.' Sir Thomas Hanbury bought the palazzo and some land in 1869. The botanical and scientific character of the garden owe much to his eldest brother Daniel, who made it a centre for the acclimatisation of plants from subtropical countries. Backed by the great limestone hills of the Mentone range, which keep off the cold winds of the Alps, the position and aspect of La Mortola, which now occupies

112 acres, are very favourable to gardening, and the climate is probably more temperate than that of any other part of the Riviera. The soil is very scanty and poor, and its calcareous nature is uncongenial to many plants. However, over sixty years of cultivation has given the garden a wealth of trees.

An alphabetical list of the contents of the garden was published in 1889, a systematic enumeration of about 3600 species in 1897, and 'Hortus Mortolensis' by Alwin Berger in 1902.

Thomas Hanbury died in 1907, and in 1920 Cecil Hanbury came into possession of La Mortola. It had been much neglected, chiefly owing to the War, and he and Lady Hanbury decided to remodel the garden.

The Introduction occupies 64 pages. It is written in the prolix light style affected by so many writers on horticulture. The list of Species (6300) is given under 'Hortus Mortolensis,' both genera and species being in alphabetical order with Family, authority, reference to figures, and growth symbols. This part occupies 138 pages and is followed by 20 pages of notes on species and garden notes. Here there is much interesting information, but it requires to be searched out. One of the features of La Mortola has always been the distribution of packets of seeds—in 1937, 18,000 packets were distributed.

There are 58 plates of views and plants, a seed distribution, and a rainfall graph, also two maps of the garden—1914 and 1937. The illustrations show the charm of the garden and its more interesting plants.

The title-page is without any author's name, and is of an unusual type. The cover bears the legend "In Memoriam C. H."

BOOK-NOTES, NEWS, ETC.

"I DESIRE to correct an error in my paper on new species of tulips published in your last issue. Aitcheson and *Aitchesonii* should be Aitchison and *Aitchisonii*. The name commemorates James Edward Tierney Aitchison, M.D., F.R.S., who was an Edinburgh graduate and a member of the Bengal Medical Service. He was attached to the Afghan Delimitation Commission, and made considerable collections of plants, which are described in the Trans. Linn. Soc. (Botany), iii. 119 (1888).

"The specific name *Veneris*, attached in the same paper to a tulip from Cyprus, was given to mark the ancient association of Cyprus with Aphrodite or Venus."—A. D. HALL.

Dr. HANDEL-MAZZETTI points out that *Saussurea Kingii* Drummond (p. 289) had already been described by C. E. C. Fisher in Bull. Misc. Inf. Kew, p. 98 (1937).

CORRECTION.—For L. Fosberg (p. 276) *read* F. R. Fosberg.

INDEX.

For Classified Articles, see—Obituaries; Reviews. New genera, species, varieties, and names are distinguished by an asterisk.

Unsigned Reviews and Notes are by the Editor. The first two numbers of this volume were edited by Mr. I. H. Burkill.

The Index to the Supplement is included above.

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