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CORRIGENDA.

P. 23, l. 24 from bottom, for "Banks's" read "Bligh's."
P. 52, l. 19 from top, for "*Higsonia*" read "*Buttia*."
P. 98, l. 14 from top, for "Walton" read "Dalton"; l. 17 for "Haysgarth" read "Aysgarth."
P. 193, l. 2 from top, for "Surrey" read "Middlesex."
P. 195, l. 4 from bottom, for "F. Schmitz" read "her."
P. 224, l. 21 from bottom and p. 227, l. 15 from top, for "Armitagei" read "Armitageæ."
P. 252, l. 10 from top, for "Moffat" read "Moffatt."
P. 253, l. 11 from bottom, for "1872" read "1881"; l. 12, for "Mosses" read "Moses."
P. 301, l. 15 from top, for "RIGSLEY" read "PUGSLEY."
P. 333, line 13 from top, for "Chub" read "Chubb."

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THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

NOTES ON BRITISH EUPHRASIAS.—II.

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

(Continued from Journ. Bot. 1919, 175.)

Euphrasia confusa Pugsley.

Being interested in the yellow-flowered Eyebright of Exmoor, which I had described in this Journal (lvii. 169; 1919) as a new species, *Euphrasia confusa*, I took the opportunity, while staying at Lynmouth in September 1919, of visiting the plant *in situ* in the station discovered by the late E. S. Marshall near Simonsbath. The Eyebright was growing there at that date in moderate quantity over a limited area, and I quickly noticed, as Mr. Marshall had done, that the hue of its flowers varied in different individuals from straw-colour to a deep orange-buff. With these yellow-flowered plants, however, and extending over a wider stretch of ground, there grew a white-flowered form that seemed to differ only in the tint of its corolla; and on subsequently examining the specimens then collected I was unable to find any other point of distinction, unless that, on an average, the white-flowered plants were a little more vigorous.

Mr. Hiern, in his account of this *Euphrasia* in Journ. Bot. xlvii. 170 (1909), remarked that with the yellow-flowered plant grew a greater abundance of specimens having whitish or purplish flowers, though in other respects scarcely differing. But he excluded these latter forms from his description and made no attempt to define them.

Last winter I received from Mr. F. Rilstone dwarf examples of a similar Eyebright bearing white flowers, collected the previous summer on St. Cleer Downs and Helmen Tor, in East Cornwall. Mr. Rilstone identified these plants with *E. confusa*, although he could meet only with white flowers.

On seeing this fresh material I was led to re-examine the dwarf, branched *Euphrasiæ* of my herbarium, and I now think that the plant from Derwentwater sent to the Botanical Exchange Club by Mr. Pearsall in 1918 as "*E. Kerneri*, simulating *E. minima*" should be regarded as an identical form. It is possible that some of the plants referred to *E. minima* var. *arbuscula* Bucknall may also belong here, but I do not possess any material that can be so named.

I have further seen quite recently at the South London Botanical Institute a sheet collected in 1903 near Farthing Downs, Surrey, and labelled "*E. stricta*" by Townsend, that I can only separate from *E. confusa* by its white corollas.

It thus appears that we have in the hilly, silicious moors of Devon and Cornwall, in the Lake District, and possibly on the calcareous hills of south-east England and elsewhere, a seemingly endemic *Euphrasia*, of dwarf, decumbent and freely branching habit, and generally bearing white flowers, which, however, tend on Exmoor to become more or less yellow. The yellow colouring is evidently an unstable character, and not a uniform feature as with most forms of *E. minima* of the Alps, where, among thousands of plants in any particular locality, the flowers are usually exactly alike in colour.

As *E. confusa* was founded on the yellow-flowered plant, the commoner white-flowered one must, if separated, take subsidiary rank; and it seems best distinguished as a form only, which may be diagnosed thus:—

E. CONFUSA Pugsl. b. ALBIDA forma nova.

Planta corollis albidis nec luteis, quam typus interdum robustior.

A plant with white (not yellow) corollas, sometimes more robust than the yellow-flowered type.

If it is thus admitted that these yellow and white-flowered plants are but forms of one species, and that the yellow colouring is exceptional and, when present, of varying intensity, it will be seen that *E. confusa* shows little affinity with *E. minima* Jacquin, and requires careful differentiation from *E. nemorosa*, to which Townsend originally assigned it, and from *E. gracilis*. The best distinguishing character of *E. confusa*, when white-flowered, is its essentially dwarf, decumbent, flexuous and much-branched habit—much dwarfer and slenderer than any form of *E. nemorosa* of normal growth, more branched and leafy than *E. gracilis*, and distinctly less erect than either of them. Its leaves, both cauline and floral, are narrower, with fewer and less acute teeth, than what commonly obtains in *E. nemorosa*, and their arrangement on the stem and branches is more clearly alternate than in that species or in *E. gracilis*. The corolla, whether yellow or white, is variable in size, on an average exceeding that of *E. gracilis* and approximating to the typical form of *E. nemorosa*. A feature of the flowers is that in dried specimens the style is frequently exserted. The capsule is generally broader than in the two kindred species, but, although commonly emarginate or retuse, its apex is sometimes truncate or occasionally rounded-obtuse.

In 1920 I collected on the Lynmouth Foreland a slender, much branched Eyebright, with lavender-tinted flowers, that looks intermediate between *E. confusa* and *E. nemorosa*. Such plants may probably be found in other localities, and may render it difficult or even impossible to maintain the two separate species.

E. Kerneri Wettst., under which name Mr. Pearsall sent out the Derwentwater plant referred to above, sometimes resembles *E. confusa* in its profuse branching and numerous small leaves, but I think it very rarely assumes the same decumbent habit, and its flowers are very much larger.

Dr. Druce, in the Report of the Botanical Exchange Club for 1919 (p. 572), has a brief note on *E. confusa* that is rather misleading in that it suggests a diversity of opinion concerning these plants between Dr. Ostenfeld and myself. The reverse is really the case, as may be seen by a reference to my original account of *E. confusa*, where I twice alluded to the resemblance between *E. minima* and *E. scotica*, both of which are equally unlike *E. confusa* (Journ. Bot. lvii. 170, 173).

Euphrasia stricta Host.

This species was first recorded as a British plant in 1896 in Wettstein's *Monograph*, p. 103, where one habitat only is given—"Surrey Downs." A year later Townsend, in his *Monograph of the British Species of Euphrasia* (Journ. Bot. xxxv. 398), reported that this record was erroneous and that he did not know the plant as British; but in the addenda and corrigenda to this paper (*l. c.* p. 475) he amended this view by citing five British stations, two of which were on Wettstein's authority. Subsequently, in his last years Townsend named various British specimens "*E. stricta*" or "Confer *E. stricta*," and the 10th edition of Babington's *Manual* treats this plant as widely distributed in England, Scotland, and Ireland.

In 1910 I found what I thought to be true *E. stricta* at Bossington, West Somerset, and this was recorded as such by Marshall in this Journal (xlix. 285; 1911).

Mr. Bucknall (*British Euphrasiæ*, p. 8; 1917) remarks that many plants referred to *E. stricta* really belong to *E. nemorosa*, but he admits the former species for four English counties, citing seven localities, of which one is my Bossington station. In addition, four habitats are given in County Galway.

E. stricta has since been reported as British through the Exchange Clubs or elsewhere up to the present year, when Mr. W. C. Barton sent out for distribution as "*E. stricta*?" an extensive gathering from Wales. As Mr. Barton kindly referred his plants for my remarks, I have examined them in conjunction with Townsend's earliest British examples in the South London collection and other material for which this name has been subsequently suggested. But I can find no British specimen that seems to me really to agree with undoubted Continental exsiccata of *E. stricta*; and I can only conclude that all of our plants are referable either to a polymorphic *E. nemorosa*, or more rarely to *E. brevipila*, *E. borealis*, or *E. Kerneri*.

Euphrasia stricta, which looks like a relatively uniform and well-marked species, was originally described as a plant of mountain woods in Austria in Host's *Flora Austriaca*, ii. 185 (1831), and his diagnosis may be translated thus:—

"Root annual or biennial. Stem strict, subterete, clothed with deflexed hairs, simple or divided above into few erect branches. Leaves ovate, glabrous, on the margins prickly and dentate. Flowers axillary, solitary, sessile. Calyx angular, 4-fid, with subulate teeth rough on the margins. Corolla purplish, pubescent externally, marked with darker lines within, smaller than that of *E. officinalis* (=*E. Rostkoviana*); upper lip bifid, with tridentate segments, lower lip pubescent, trifid, with emarginate segments. Capsule obcordate, pubescent."

The salient features of Wettstein's account (Mon. p. 93) are:—Stem erect, simple or with few ascending branches in the lower part, and up to 75 cm. in height; lower leaves quickly caducous; upper cauline leaves, as well as bracts, with aristate teeth; spike soon elongate; calyx not accrescent in fruit; corolla pale violet, rarely blue or white; and capsule narrow, cuneate-obovate, truncate or sub-emarginate, not exceeding the calyx-teeth. Wettstein's diagnosis is repeated by Townsend (*l. c.*), and coincides with that of Chabert (*Les Euphrasia de la France* in Bull. Herb. Boiss. 2me sér. ii. 277 (1902)), except that the last-named author gives the maximum height as 40 cm. only.

Wettstein and Chabert agree in combining with *E. stricta* the French *E. ericetorum* and *E. rigidula* of Jordan, and they cite, for the most part, the same exsiccata. Four of the sets quoted, Billot nos. 2724, 2724 bis, 3672 and 3672 bis, are represented in Herb. Mus. Brit.; and they evidently belong to one species and are identical with other Austrian material sent out as *E. stricta*. These exsiccata agree generally with the descriptions and with the figures of original *E. stricta* and *E. ericetorum* on Wettstein's plate (vii. 5 & 6); but Townsend's figure of *E. stricta* (Journ. Bot. xxxv. t. 374), taken from a Lausanne specimen, does not appear to me characteristic.

From these descriptions, figures and exsiccata it is possible to determine *E. stricta* with some accuracy. It is a notably tall plant—according to Wettstein it may reach nearly twice the height of any other British Eyebright,—of strict habit and with few nearly erect branches at some distance from the base. It will be noticed that while Host says the plant is branched above, Wettstein terms it "branched in the lower part," which would be applicable at a later stage of growth. The only British *Euphrasia* approaching this habit is *E. gracilis*, which may be said to simulate a miniature *E. stricta*. The leaves (especially the floral) are peculiar for their spreading aristate teeth, which give them a pectinate aspect and almost recall some forms of *E. salisburgensis*. They are readily caducous, so that during most of the flowering period the lower parts of the stem and branches are naked. The calyx is relatively small and remains so in fruit, not becoming accrescent or inflated as in *E. nemorosa*. The characteristic pale purple tint of the corolla, which is rather large though less than in Continental *E. Rostkoviana*, is uniform in all the specimens that I have seen. The fruit, though variable in shape in this as in other *Euphrasiæ*, is generally narrow and truncate as described by Wettstein, and is smaller than in many other species. I cannot understand Host's definition of this organ as obcordate.

Of the English and Scottish plants referred to *E. stricta* I have seen none that shows this combination of characters, or even possesses the strict robust habit, with nearly erect central branching, that is so marked a feature of Host's species. The specimens originally determined by Wettstein and cited by Townsend are mostly quite small examples, of slender habit and branched towards the base, with rather large white flowers, which, if not forms of *E. nemorosa*, are probably connected with the British *E. Kerneri.* The plants to which Townsend in his last years applied Host's name are most diverse in appearance, but are mainly white-flowered forms approaching *E. nemorosa.* My Bossington plant of 1910 is perhaps as near to *E. stricta* as any English form that I have seen, but its branching is too basal and too profuse, and it bears white flowers. This likewise is probably connected with a polymorphic *E. nemorosa.* Mr. Barton's Welsh plants, though robust, are not stiffly erect, but somewhat decumbent below, and sometimes considerably branched near the base. Their cauline leaves lack the spreading aristate teeth of *E. stricta*; and their flowers are white with the calyx becoming distinctly inflated and accrescent, enclosing a relatively large capsule. These plants seem to be a coarse, luxuriant form of *E. nemorosa.* Forms of *E. borealis* also have been confused with *E. stricta*, but these differ widely in their less strict habit, large leaves with broad teeth, strongly accrescent calyx, white corollas and large capsules.

E. stricta is a typical and widely distributed Eyebright of Central Europe, extending, according to Wettstein, from the Pyrenees to Russia and from North Italy to Denmark and Sweden. In France it grows chiefly in the south-east, but it is reported to reach Normandy and Brittany, so that its occurrence in the south of England would not be surprising. But, as it is one of the few readily determinable species, it should be possible to prove beyond doubt the identity of British specimens, and I do not think it can be admitted on present evidence as a native of Great Britain. Respecting the occurrence of *E. stricta* in Ireland I cannot express a definite opinion, having seen only fragmentary specimens, but it is possible that County Galway is an outlier of the range of this species as of *E. salisburgensis.*

Since writing this paper I have seen the note on *E. confusa* by Messrs. Pearsall and Lumb in the Botanical Exchange Club Report for 1920 (p. 241), in which the writers contend that *E. minima* (of which they do not appear to have read Wettstein's diagnosis) may be extended to include *E. confusa.* The modern species of *Euphrasia* are too finely cut to admit of much extension, and I cannot see that any essential feature of *E. minima* is mentioned which is peculiar to that plant and to *E. confusa.* I think that on the reasoning adopted *E. confusa* might be much more easily included with *E. nemorosa*, and almost equally well with any other British species. The British plants that may perhaps be united with *E. minima* are in my opinion some of those that have been referred to *E. scotica* and *E. foulaensis.*

THE SEEDLING FOLIAGE OF ULEX GALLII.

By T. A. Sprague, B.Sc., F.L.S.

The occurrence of trifoliolate leaves on the seedlings of *Ulex* has been known for over fifty years. Syme stated that the "first leaves of young seedlings of *Ulex* are trifoliate, but all the subsequent ones are unifoliate," and that in *U. europæus* "trifoliate leaves are only present on the plant immediately after germination" (Engl. Bot. ed. 3, iii. 3, 4; 1864). J. D. Hooker described the leaves of *Ulex* as "trifoliolate in seedling plants" (Student's Fl. 86; 1870), and so did Willkomm and Lange (Prodr. iii. 442; 1880). Wohlfarth stated that the leaves on young plants of *U. europæus* were often trifoliolate, trifid or unequally bifid (Koch, Syn. ed. 3, i. 489; 1891).

Lubbock, however, seems to have been the first to describe the seedlings of *Ulex europæus* in detail (*Seedlings*, i. 409; 1892). Out of five representative specimens examined by him, one had all the leaves simple, another had the first six pairs trifoliolate, and the succeeding ones simple, and three specimens had trifoliolate, bifoliolate, and simple leaves more or less mixed. Some of the leaves were merely tripartite or bipartite instead of being trifoliolate or bifoliolate. Koehne mentioned that the leaves of *Ulex* are often trifoliolate on the lower branches (Dendrol. 327; 1893); and Ascherson and Graebner stated that trifoliolate leaves occur on young and injured plants of *Ulex* (Syn. vi. Abt. 2, 281; 1907), and that it is especially in gardens on good soil that the lower leaves of *Ulex europæus* are compound (*l. c.* 285).

According to Goebel (*Organographie*, i. 146; 1898), the seedling of *Ulex europæus* bears trifoliolate leaves, apart from the first primary leaves. The results of an examination of 2895 seedlings of *Ulex europæus* by Boodle (Ann. Bot. xxviii. 527; 1914) lend no support to this qualification. Boodle found that the axis usually bears a certain number of trifoliolate leaves after the cotyledons and before the simple leaves. Of the simple leaves those first formed are nearly always flat, while the later ones are normally spiniform. A few seedlings bore simple leaves only, while others produced trifoliolate leaves in various numbers from one up to twenty or more. In some cases the trifoliolate leaves began directly after the cotyledons, and formed an uninterrupted series succeeded by the simple leaves; in other cases the series of trifoliolate leaves was preceded, or interrupted, once or many times by simple or bifoliolate leaves. Two-lobed and three-lobed (or more deeply divided) leaves were occasionally present, and among the apparently simple leaves some were noticed which had an articulation at a distance from the base, this being an indication of a compound nature.

The number of seedlings examined by Boodle was 2895, of which 1094 were grown on good soil and 1801 on sand. The seedlings on soil gave an average of 10·79 compound leaves per plant, while those on sand gave an average of 8·27, the difference (2·52) amounting to about 23 per cent. Boodle suggested that this is a case of an ancestral character [trifoliolate leaves] being favoured by ancestral soil conditions, since the gorse plant may be supposed to be descended from a plant with trifoliolate leaves, and having normal habitats among richer soil than that usually frequented by gorse.

To sum up what is known of the seedling foliage of *U. europæus*: a certain number of compound leaves usually occur after the cotyledons and before the simple leaves, but they may be preceded or interrupted by simple leaves, and in a few cases all the leaves are simple. Seedlings grown on good soil produced an average of 10·79 compound leaves per plant, and those on sand an average of 8·27. Compound leaves have also been found on older plants grown in gardens on good soil, and on injured plants.

Nothing appears to have been published as to the seedlings of other species of *Ulex*. During Aug.–Sept. 1921 I was fortunate in observing some thousands of seedlings of *U. Gallii* on the Quantock Hills, Somerset, where they had sprung up after heath fires which had occurred in June. Five hundred seedlings were examined with the following results. Seventeen (3·4 per cent.) bore simple leaves only, and 483 (96·6 per cent.) had one or more (up to 11) compound leaves. The average number of compound leaves per plant was 2·6. Of the compound leaves 79·6 per cent. were trifoliolate and 20·4 per cent. bifoliolate, *i.e.* 4 trifoliolate leaves to each bifoliolate one. For the purpose of these calculations trifid and bifid leaves have been counted as "compound"; as Boodle remarked with reference to *U. europæus*, both bifoliolate and lobed leaves "may be regarded as showing an 'attempt' to realize the ancestral trifoliolate type," and it is therefore desirable for theoretical purposes to include the lobed leaves among the "compound."

No compound leaves were found after the sixth pair. The series of uninterruptedly simple pairs commenced in 17 cases (3·4 per cent.) immediately after the cotyledons; in 330 cases (66 per cent.) after the first pair; in 94 (18·8 per cent.) after the second; in 23 (4·6 per cent.) after the third; in 16 (3·2 per cent.) after the fourth; in 15 (3 per cent) after the fifth; and in 5 cases (1 per cent.) after the sixth pair. The expressions "compound," "mixed," and "simple" pairs are used below to denote pairs composed respectively of two compound leaves, a compound and a simple one, and two simple leaves:—

Percentages of compound, mixed, and simple pairs in the first six pairs.

Compound:	(1) 87·2;	(2) 17·4;	(3) 4·2;	(4) 4·4;	(5) 1·8;	(6) 0·2.
Mixed:	(1) 8·8;	(2) 10·0;	(3) 5·4;	(4) 2·8;	(5) 2·2;	(6) 0·8.
Simple:	(1) 4·0;	(2) 72·6;	(3) 90·4;	(4) 92·8;	(5) 96·0;	(6) 99·0.

It will be observed that there is a regular reduction in the frequency of compound pairs from the first to the sixth pair, except that the fourth pair has 0·2 per cent. more than the third; compound pairs greatly predominate in the first pair, are frequent in the second, and few in the following pairs. The mixed pairs are fairly frequent in the first and second pairs, and gradually decrease in the remaining ones from a maximum of 10 per cent. in the second pair. Simple pairs are few in the first pair, and greatly predominate in the remainder, rising to a maximum in the sixth pair:—

Percentages of trifoliolate, bifoliolate, compound and simple leaves in the first six pairs.

Trifoliolate: (1) 81·8; (2) 14·3; (3) 2·9; (4) 2·9; (5) 1·5; (6) 0·3.
Bifoliolate: (1) 9·9; (2) 8·1; (3) 4·0; (4) 2·9; (5) 1·4; (6) 0·3.
Compound: (1) 91·6; (2) 22·4; (3) 6·9; (4) 5·8; (5) 2·9; (6) 0·6.
Simple: (1) 8·4; (2) 77·6; (3) 93·1; (4) 94·2; (5) 97·1; (6) 99·4.

It will be noticed that the percentages of compound leaves, and of trifoliolate and bifoliolate leaves separately, regularly decrease from a maximum in the first pair. Trifoliolate leaves are commoner than bifoliolate in the first two pairs; bifoliolate are commoner than trifoliolate in the third pair; and the two types of compound leaves are equally common in the remaining pairs. Simple leaves are comparatively few in the first pair, being less numerous than bifoliolate ones; from the second pair onwards they greatly predominate.

In the following table each type of pair (or whorl of three leaves) is expressed by a formula in which each leaf is represented by the number of its leaflets, or, if simple, by the figure 1. Thus the formula 3+2+1, for example, represents a whorl of three leaves—one trifoliolate, one bifoliolate, and the third simple:—

Percentages of various types of pairs (or threes) in the first six pairs (or threes).

3+3: (1) 74·4; (2) 10·0; (3) 1·6; (4) 1·2; (5) 1·0; (6) 0.
3+2: (1) 9·2; (2) 4·6; (3) 1·4; (4) 2·0; (5) 0·4; (6) 0·2.
3+1: (1) 4·8; (2) 3·8; (3) 1·2; (4) 1·4; (5) 0·6; (6) 0·4.
2+2: (1) 3·2; (2) 2·8; (3) 1·2; (4) 1·2; (5) 0·4; (6) 0.
2+1: (1) 3·6; (2) 6·0; (3) 4·2; (4) 1·4; (5) 1·6; (6) 0·4.
1+1: (1) 4·0; (2) 72·6; (3) 90·4; (4) 92·8; (5) 96·0; (6) 99·0.
3+3+3: (1) 0·2.
3+3+2: (1) 0·2.
3+2+1: (1) 0·4.
3+1+1: (1) 0; (2) 0·2.

It will be observed that the four types (3+3, 3+2, 3+1, 2+2) in which there is no reduction or a reduction of 1–2 leaflets are commonest in the first pair. The type (2+1) in which three leaflets are unrepresented is commonest in the second (6 per cent.) and third (4·2 per cent.) pairs. 3+3 is the commonest compound or mixed type in the first and second pairs, but in the third pair the arrangement 2+1 is 2·6 times as frequent.

Out of the 330 cases in which only the first pair is compound or mixed 244 or 73·9 per cent. are of the type 3+3; out of 153 cases in which one or more subsequent pairs are compound or mixed 129 or

84·3 per cent. have the first pair 3+3. Thus there is a greater probability that the first pair will be 3+3 if compound leaves occur in subsequent pairs.

Taking the first six pairs together, the relative frequency of the various compound and mixed types is as follows :—

3+3 (60·7 per cent.); 3+2 (12·3 per cent.); 3+1 (8·4 per cent.); 2+2 (6·1 per cent.); 2+1 (11·8 per cent.); in threes (0·7 per cent.).

The pairs (3+2, 3+1) composed of one trifoliolate and one reduced leaf account for 20·7 per cent., while those composed of two reduced leaves (2+2, 2+1) account for 17·9 per cent. Of the pairs in which reduction has taken place the anisomerous ones (3+2, 3+1, 2+1) account for 32·5 per cent. and the isomerous (2+2) for only 6·1 per cent., anisomerous reduction being more than five times as frequent as isomerous. The two leaves of a pair pass through the intermediate (bifoliolate) stage of reduction concurrently in only 15·7 per cent. of all cases.

The 500 seedlings examined are referable to 72 different types according to the arrangement of trifoliolate, bifoliolate, and simple leaves preceding the continuously simple series. These types may be expressed by formulæ in which each leaf of a pair (or whorl of three) is represented by the number of its leaflets, or if simple by the figure 1, successive pairs being separated by a semicolon. Thus the formula 3+2; 2+1 denotes a seedling in which the leaves of the first pair are trifoliolate and bifoliolate respectively, those of the second pair bifoliolate and simple, and all the subsequent leaves simple.

Out of 72 types 53 occur once only, 5 twice, 2 three times, and 1 four times. 427 seedlings out of 500 (85·4 per cent.) belong to the remaining 11 types, which occur respectively from 8 to 244 times. These relatively common types have not more than two pre-simple pairs, and are as follows in order of frequency :—

3+3 (244 seedlings). 3+2 (34). 3+3; 3+3 (25).
3+3; 2+1 (23). 3+1 (17). 2+1 (17). 1+1 (17). 2+2 (15).
3+3; 3+1 (15). 3+3; 3+2 (12). 3+3; 2+2 (8).

It will be noticed that in these common types, where two pairs of leaves are compound or mixed, the total number of leaflets of the second pair is either equal to or less than that of the first. Such types may be known as "unreversed," a "reversed" type being one in which the total number of leaflets in any pair exceeds that of the preceding pair. As has been stated, all the leaves are simple in 3·4 per cent. of all cases, and the remaining 96·6 per cent. is composed as to 88·2 per cent. of "unreversed" and as to 8·4 per cent. of "reversed" types. The greater the number of pairs preceding the continuously simple leaves, the more frequent are the "reversed" types. Thus of seedlings with 2 pre-simple pairs 5·3 per cent. are "reversed," with 3 pairs 47·8 per cent., with 4 pairs 68·8, with 5 pairs 73·3, and with 6 pairs 80 per cent. The reversal "trough" is in the second pair in 45·1 per cent. of cases, in the third in 35·3 per cent., and in the first pair in 19·6 per cent. Out of 42 seedlings of "reversed" type, the reversal is due in 16 cases to the interpolation of a single simple pair, and in 7 cases to the interpolation of two successive simple pairs. The single simple pair is the second pair in 9 cases, the third pair in 5 cases, and the first pair in 2 cases. The two successive pairs are the second and third in 6 cases, and the first and second in one case. Out of 30 interpolated simple pairs, 16 are in the second pair, 11 in the third, and 3 in the first.

The bifoliolate leaves are usually composed of a terminal leaflet and a lateral one, rarely of two lateral leaflets. In the case of a bifoliolate pair one leaf is sometimes the mirror-image of the other, owing to the right lateral leaflet being developed in one leaf and the left lateral in the other; in other cases it is the two right laterals or the two left laterals which are developed. No correlation was found between vertically superposed anisomerous pairs: sometimes the more developed leaf was above the more developed one of the pair below, but the reverse arrangement occurred about as frequently.

Four tricotyledonary seedlings were found. Two were of the formula 3+2+1, *i. e.* had a whorl composed of a trifoliolate, a bifoliolate, and a simple leaf, alternating with the cotyledons and followed by continuously simple pairs. In one of these seedlings a solitary simple leaf above one of the cotyledons intervened between the 3+2+1 whorl and the series of simple pairs. The third seedling was of the type 3+3+2, and the fourth was 3+3+3; 3+1+1, simple pairs following on in both cases. As about 300 dicotyledonary seedlings had to be rejected as being too undeveloped for examination, the tricotyledonary seedlings formed approximately 0·5 per cent. of those collected.

Boodle found in *U. europæus* that backward seedlings produced a lower average of compound leaves than those which developed earlier. The same appears to be the case in *U. Gallii.* The seedlings were collected in two batches, those of the second batch being considerably more developed than the first. In the first batch only 2 per cent. had compound leaves extending to the fourth or fifth pairs, while in the second batch 15 per cent. had compound leaves up to the fourth, fifth, or sixth pairs. In the first lot the seedlings were taken as they came, while in the second lot collected a few days later the largest ones were selected in order to facilitate examination.

To sum up: 96·6 per cent. of the seedlings of *U. Gallii* bore from 1 to 11 compound leaves after the cotyledons and before the continuously simple leaves. 48·8 per cent. had both leaves of the first pair trifoliolate and all the following simple. No compound leaves were found after the sixth pair, and the percentage of compound leaves diminished progressively from the first pair onwards. The series of compound and mixed pairs may be preceded or interrupted by one or two simple pairs.

The ratio of trifoliolate to bifoliolate leaves diminished progressively from the first pair to the third: in the first two pairs trifoliolate leaves were more numerous than bifoliolate ones, while in the third pair the reverse was the case. In the fourth, fifth, and sixth pairs trifoliolate and bifoliolate leaves occurred in about the same numbers. The more developed pair-types 3+3, 3+2, 3+1, and 2+2 diminished progressively from the first pair to the sixth (with a slight reversal in the fourth pair in the case of 3+2 and 3+1). The less-developed type 2+1 attained a maximum in the second pair and diminished onwards (with a slight reversal in the fifth pair).

It does not appear from the accounts given by Lubbock and Boodle of the seedlings of *U. europæus* whether the trifoliolate condition is any commoner in the first pair than in the ones immediately following. In *U. Gallii*, however, the trifoliolate condition is realized in the first pair in nearly 75 per cent. of all cases, and progressively less in the subsequent pairs, all trace of compound leaves disappearing after the sixth pair.

The sub-tribe *Cytisinæ* includes the four genera *Hypocalyptus*, *Loddigesia*, *Cytisus*, and *Ulex*. The two former have trifoliolate leaves, some species of *Cytisus* have trifoliolate and others have simple leaves, and *Ulex* normally bears only simple leaves on the adult plant. Few botanists will be inclined to dispute that the ancestral leaf-condition of the *Cytisinæ* was trifoliolate, unless they accept the view that compound leaves are derived from simple ones (G. Henslow, Orig. Pl. Struct. 246; 1895). Some idea of the probable course of leaf-reduction in *Ulex* may be gained by comparing the foliage of *Cytisus scoparius* with that of *U. europæus* and *U. Gallii*. *C. scoparius* usually has trifoliolate leaves on the main stem and branches, and simple ones on the final branchlets, the extent to which trifoliolate leaves develop apparently depending to some extent on the environment. Bifoliolate leaves often occur between the trifoliolate and simple ones. In the next stage of reduction the compound leaves may have been confined to the lower part of the main stem. In *U. europæus* they are usually restricted to the seedling foliage, namely to the leaves between the cotyledons and the first spiniform leaves. Finally, in *U. Gallii* they are largely confined to the first two pairs of leaves following the cotyledons, and it is only in the first pair that they are more frequent than simple leaves.

Note.—After the foregoing was in type, my attention was called by Mr. L. A. Boodle to a paper by H. Wager, "Observations on the Morphology of Species of the Genus *Ulex*" (*International Journal of Microscopy and Natural Science*, January 1897). This was not cited by Mr. Boodle (Ann. Bot. xxviii. 527; 1914), as he was unaware of its existence at the time of writing his paper. Wager "found that taking a large number of seedlings [of *U. europæus*] from two equally exposed but different soils, one humus and the other sandy loam, the percentage of seedlings with trifoliolate leaves is not only greater on humus soil than on the sandy loam, but the spinescent character is more quickly assumed in the latter case than in the former" (reprint, p. 9). "In a normal seedling the cotyledons are succeeded by one or two pairs of trifoliate leaves . . . . succeeded by several pairs of spathulate leaves . . . . These first leaves may be alternate and spiral, but are usually opposite to each other and in pairs" (*l. c.* 14). He described seven examples of first-year seedlings, which bore 1–30 compound leaves; he also mentioned seedlings of the second year's growth with more than 100 trifoliolate and bifoliolate leaves, but many of the compound leaves were doubtless borne on lateral branches. In one seedling collected in the shade "the lower thirty leaves were neither trifoliate nor simple, but were in all stages of transformation of the former into the latter" (*l. c.* 19).

CAREX FORMS WITH LONG PEDUNCLES.

By H. Stuart Thompson, F.L.S.

In the *Kew Bulletin* (1920, No. 4) is an article by Mr. W. B. Turrill, quoted by Dr. Druce in Rept. B. E. C. (Sept. 1921), in reference to *Carex riparia* var. *gracilis* in Britain. It was pointed out that the earliest name applicable to this plant is *C. riparia* Curt. var. β *gracilis* Coss. et Germ., *Flore de Paris*, 1845, where the description ran:—"Tiges presque lisses sur les angles. Feuilles souvent vertes. Epis mâles solitaires ou géminés. Epis femelles laxiflores, longuement pédonculés, souvent pendants. Utricules longuement dépassés par les écailles. Ecailles très longuement cuspidées-aristées." Rouy and Foucaud make it a synonym of var. *gracillescens* Hartm. sub-var. *aristata* Rouy et Fouc.

Of the three plants mentioned in the note, one was gathered by Miss Ida Roper at Tickenham Moor, N. Somerset, and sent to the B. E. C. and reported on by Mr. Bennett and the late E. S. Marshall. Miss Roper recently showed this plant at a meeting of the Bristol Botanical Club, and I was reminded of a series of strange forms of *C. acutiformis* Ehrh. (*C. paludosa* Good.) gathered at Max, Winscombe, N. Somerset, on the very day, June 5th, 1915, that Miss Roper had gathered her *riparia* variety. After exhibition at the above-mentioned Botanical Club, I sent specimens to Dr. Rendle for Herb. Brit. Mus.; and in 1917 the late Mr. Marshall commented thus on my mounted series of five sheets of *C. acutiformis* from Max:—

(1) "Evidently a monstrosity, rather than a true variety. The arrested growth of the fruit has been made up by the elongations of the glumes. Very remarkable." Some of the glumes on fertile spikes are 28 mill. long, others 10–15 mill., and a 50 mill. bract-like glume comes from the lowest abortive flower on one spike. The peduncles are long and very slender, and most of the leaves are extremely filiform, fifteen of them springing from one of the fruiting plants.

(2) "A monstrosity, I believe." One of the fertile heads on this sheet is on a filiform pendulous stalk extending as much as 3½ decimetres from its junction with the rachis; glumes only 5–10 mill. long, and the leaves more normal. Probably an abnormal form of var. *subulata* Doell. = *Kochiana* DC. = *C. spadicea* Roth. The glumes in (1) and their lower portions in (2) are strongly dentate-serrate.

(3) "Yes, tending towards the more extreme 'monstrosity' forms." Here the glumes and leaves are almost normal. The flower-heads very distant.

(4) "Yes. Fruit normal. This comes under the var. *spadicea*."

(5) "Yes." (*Carex acutiformis* Ehrh. typical.)

Forms 1 and 2 are apparently analogous, in regard to the main feature, to the variety *gracilis* of *C. riparia*; and have the loose spikes (laxiflores) of that variety. The spikelets are quite distant in two specimens on sheet 1. I am unaware if any name has been given to such long peduncled a form. At Max it was growing in some quantity at the border of the mill-stream. Besides *C. spadicea* Roth., which Rouy gives under the, to us, rather vague term "race," he mentions the sub-var. *depauperata* (Lange, *pro var.*) nob. var. *brachystachys* Lambert (1907). Épis femelles plus courts (1 cent. env. de long.); and var. *abbreviata* (Beck, *pro var.*) nob. = var. *brachylepis* Lambert. Ecailles femelles très courtes, presque entièrement cachées par les utricules.

In recent years I have gathered two or three other species of *Carex* with very long filiform peduncles, notably *C. flacca* Schreb. (*C. glauca* Scop. the earlier name) with some of the peduncles five inches (10–12 dec.) long and springing from the base. These thread-like peduncles bear heads of ♀ flowers only. Normal thicker stems bearing heads of both sexes arise from the same root-stock. I believe the French would call this gynobasique, but I find no reference to it under this species. These specimens were growing in some number in gravel at the side of a new road by Leigh Woods, Bristol, May 31, 1916. Examples were sent to Kew and elsewhere. In 1920 I gathered in Leigh Woods specimens of *C. pallescens* with the same tendency. They were associated with a very tall growth of *C. flacca* with thread-like peduncles.

Unless simply a matter "of opinion," it would be interesting to know if all such examples of *Carex*, including *C. vesicaria* L. var. *pendula* Uechtr. Herb., should be considered varieties; or monstrosities, as suggested by Marshall in regard to two of the above *paludosa* series; or merely accidental forms due to habitat or some other ecological factor.

NOTE.—Husnot (*Cypéracées*, 1905–6) observes that in *C. riparia* and *C. paludosa* the ♀ lower spike is sometimes very distant from the others, borne on a long peduncle emerging from the long sheath of the upper leaf. (I have such specimens with peduncle 10 cent. long.) Under *C. vulgaris* he gives var. *basagyna* Reichb. fil. "Pédoncule inférieur très long et grêle, naissant dans le bas de la tige."

NEW OR NOTEWORTHY FUNGI.—Part VII.

By W. B. Grove, M.A.

Part VI., of which this is a continuation, appeared in the *Journal of Botany* in October–December, 1918. Mr. D. A. Boyd continues to furnish a number of highly interesting new discoveries from the rich part of Scotland in which he lives.

Cœlomycetes.

304. Phyllosticta anceps Sacc. Syll. iii. 39. Allesch. vi. 132. f. noxiosa f. nov.

Spots small, scattered, roundish, pale ochraceous-yellow (not greenish at first), visible on both sides of the leaf, 1–2 mm. across, but the leaf-tissue round the spots becomes of a bright yellow to a considerable distance. Pycnidia amphigenous, frequently circinate, black, globose-lens-shaped, 70–80 μ diam., pierced by a pore or faintly papillate; texture truly *Phyllosticta*-like, thinly parenchymatous, slightly darker round the pore. Spores oblong or ellipsoid, rounded at both ends, often slightly curved, mostly with a rather large guttule at each end, $4–5 \times 1\frac{1}{2}–2\ \mu$.

On young radical leaves (and especially the leaf-bases) of *Nasturtium amphibium*, on the banks of the river Cole, Yardley Wood, April.

The spots are most abundant on the narrowed leaf-bases, crowded and killing the tissues over a wide and conspicuous bright yellow area. On the lamina the spots are more distinct, fewer and bordered by a narrow brown line, each enclosing a few pycnidia. Many of the lower leaves were all but destroyed.

305. Phyllosticta Asperulæ comb. nov.

Depazea Asperulæ Lasch. Sacc. Syll. iii. 63; non *Phyllosticta Asperulæ* Sacc. & Fautr. Syll. xvi. 840.

Pycnidia hypophyllous, round, globose-lens-shaped, 60–75 μ diam., black, immersed, at length somewhat superficial, opening by a central pore; texture brownish, plectenchymatous, darker round the pore. Spores oblong, biguttulate, $3–4 \times \frac{3}{4}–1\ \mu$; no sporophores.

On fading or dead leaves of *Asperula odorata*. Dalry, Ayrshire (Boyd). Jan.

Pycnidia on irregular spots which are indistinct, withered and pale, but not bleached white. Most of the pycnidia were immature and contained no spores; see Klotsch, Herb. Myc. no. 1867. The spores were found in pycnidia on the dead leaflets.

306. Phyllosticta Briardi Sacc. Syll. x. 109. Allesch. vi. 66. *P. mali* Briard, Suppl. p. 79 (*non* Prill. & Delacr.).

Spots very various in form, visible alike on both sides of the leaf, brown or subochraceous, with a similar but darker (or even purplish) border, chiefly marginal or apical, up to 2 cm. across. Pycnidia epiphyllous, scattered, punctiform, immersed, black, 80–100 μ diam., at times aggregated. Spores cylindrical, obtuse at both ends, 4–5 × 1½–2 μ.

On living leaves of *Pyrus Malus*. Stevenston, Ayrshire (Boyd). Aug.

The spots are very conspicuous, but appear as if the leaf were merely dry and dead; the pycnidia can be seen only with a lens.

307. Phyllosticta buxina Sacc. Syll. iii. 24. Allesch. vi. 25.

Spots variable in form, becoming pale, with a distinct narrow dark purple border. Pycnidia scattered, rather dense, punctiform, about 100 μ diam., prominent, black, with a pale spot in the centre. Spores oblong-ellipsoid, 4–5 × 1½–2 μ, eguttulate, hyaline.

On living leaves of *Buxus sempervirens*. Box Hill, Surrey. Aug.

This is probably an early state of *Ascochyta buxina* Sacc. *l. c.* p. 393. It is quite distinct from *P. limbalis* Pers. in its minute pycnidia, etc.

308. Phyllosticta Grossulariæ Sacc. Syll. iii. 17. Allesch. vi. 82.

Pycnidia epiphyllous, round, up to 120 μ diam. and on spots as described; texture thin, plectenchymatous, dark honey-coloured, hardly darker round the pore. Spores of two kinds, intermixed in the same pycnidium, (1) ellipsoid, biguttulate, 5–6 × 3 μ, (2) oblong-linear, 3–4 × 1 μ, obtuse at both ends.

On the same leaves was

309. Ascochyta ribesia Sacc. & Fautr. in Bull. Soc. Myc. Fr. 1900, p. 22. Sacc. Syll. xvi. 926. Allesch. vii. 879.

Spots like those of the *Phyllosticta*, in fact often the same spots. Pycnidia epiphyllous, few, lens-shaped, 150 μ diam., blackish, opening by a central pore; texture somewhat parenchymatous, olive-brown, darker round the pore. Spores oblong-fusoid, 1-septate, acute at both ends, or somewhat obtuse, especially at the upper end, pale olivaceous. 13–14 × 2½–3 μ.

On living leaves of *Ribes Grossularia*. Bute and Ayrshire (Boyd). Aug., Sept.

Pycnidia darker than those of the *Phyllosticta*. This *Ascochyta* is probably only the leaf-form of *Hendersonia Grossulariæ* Oud. (Sacc. Syll. xiv. 954; Allesch. vii. 230), for many of the spores of the *Ascochyta* were 4-guttulate, in such a way as to suggest tri-septation, although only two or three spores were seen, out of many hundreds, in which the two additional septa could be discerned. If it were a distinct species, it would be placed, on account of its spores, in the genus *Ascochytella* Died.

310. Phyllosticta helianthemicola Allesch. in Ber. Bayer. Bot. Gesell. 1895, p. 31; Rabenh. Kr. Flor. vi. 125; see also vii. 767.

Spots indefinite, ochraceous, or none. Pycnidia roundish or angular, lens-shaped, blackish, densely scattered, often occupying the whole leaf, 80–100 μ diam., furnished with a pore; texture thin, pale brown, indistinctly prosenchymatous. Spores oblong-cylindrical, ± rounded at the end, faintly biguttulate, 6–8 × 1½–2 μ, but varying much.

On dead leaves, sepals, and petals of *Helianthemum*. Perceton, Ayrshire (Boyd). Aug.

Most of the pycnidia contained only the spores described above, but here and there, *in the same pycnidia*, were also found many *Septoria* spores, cylindric-filiform, eguttulate, 25–60 × 1–2 μ; these could hardly be anything else than *Septoria Helianthemi* (Vest.) Allesch. The pycnidia were exactly as in Vestergren's description, except that none were found quite so large.

311. Phyllosticta Heucherae Brun. in Act. Soc. Linn. Bord. 1890, p. 57, extr. Sacc. Syll. xiv. 853. Allesch. vii. 768. f. sanguineae, f. nov.

Spots brown, irregular-roundish, without a definite border. Pycnidia as in the type; spores ellipsoid, somewhat curved, apiculate at base, 7–9 × 2–2½ μ.

On fading leaves of *Heuchera sanguinea*. West Kilbride, Ayrshire (Boyd). Aug.

The variety differs from the type (which was found in France) in the size and colour of the spots (brown instead of grey) and in the longer, narrower, and curved spores (spores of the type oval, 5–7 × 3 μ).

312. Phyllosticta Holosteae Allesch. in Ber. Bayer. Bot. Gesell. 1897, p. 3; Rabenh. Kr. Fl. vi. 151.

Spots none. Pycnidia scattered, few, chiefly epiphyllous, globose-lens-shaped, minute (about 125 μ), black; texture thin, pale-brown, slightly darker near the roundish pore. Spores numerous, oblong or cylindrical, rounded at both ends, hyaline, biguttulate, 5–6 × 1½ μ.

On dead bleached leaves of *Stellaria uliginosa*. Kilwinning, Ayrshire (Boyd). July.

The spores were much more regular than those described by Allescher, and were never more than 1½ μ wide; his specimens were on *S. Holostea*.

313. Phyllosticta Marchantiae Sacc. Syll. iii. 61. Allesch. vi. 167.

Spots indistinct, brownish. Pycnidia lens-shaped, punctiform, black, about 70–80 μ diam., pierced by a pore; texture distinctly parenchymatous, clear brown, darker round the pore. Spores oblong-cylindrical, straight or faintly curved, biguttulate, 4–5 × 1–1½ μ.

On dead archegoniophores of *Marchantia polymorpha*. Kilwinning, Ayrshire (Boyd). Sept.

The pycnidia are chiefly situated on the upper side of the rays. The spores are exactly those of *Phyllosticta*, but the pycnidial texture approaches that of *Phoma*.

314. Phyllosticta Oxalidis Sacc. Syll. iii. 39. Allesch. vi. 134.

Spots various, chiefly marginal, whitish-pallid, with a golden-tawny border. Pycnidia few, epiphyllous, scattered, lens-shaped, brown, pierced by a pore; texture very thin and translucent. Spores oval or ovoid, tapering slightly below, about 5 × 2½ μ.

On leaves of *Oxalis Acetosella*. Beith, Dalry, and West Kilbride, Ayrshire (Boyd). July, Aug.

The spots in all cases remind one strongly of those of *Stagonospora hygrophila* var. *vermiformis*; see Journ. Bot. 1918, p. 318, and also below. Saccardo suggests that the *Phyllosticta* is the pycnidial stage of a *Mycosphærella*.

315. PHYLLOSTICTA TYPHINA Sacc. & Malbr. Syll. iii. 60. Allesch. vi. 165.

P. Renouana Sacc. & Roum. Syll. iii. 60.

Spots amphigenous, at first oblong-lanceolate, 10–15 mm. long, bright cinnamon-rust-coloured, becoming paler in the centre, afterwards involving the whole of the leaf-tip. Pycnidia occupying the centre of the spots, afterwards scattered over the whole of the dead area, minute, punctiform, 60–75 μ diam., lens-shaped, black, at length opening by a wide pore; texture parenchymatous, thin, somewhat tawny. Spores ovoid or ellipsoid, hyaline, $4–5 \times 1\frac{3}{4}–2\ \mu$.

On the tips of the leaves of *Typha latifolia*. Kilwinning, Ayrshire (Boyd). July.

The mycelium is at first truly parasitic, forming numerous ochreous spots, with a broad rusty border, towards the tip of the leaf, the centre of each being occupied by the pycnidia; but afterwards, as the leaf dies, similar but more minute pycnidia are found over the whole of the ochraceous dead area, arranged more or less in rows. *Phyllosticta Renouana* Sacc. & Roum. is evidently only one of the stages of growth of *P. typhina*.

316. PHOMA ENDORHODIA Sacc. Syll. iii. 124. Allesch. vi. 278.

Pycnidia gregarious, covered by the epidermis, globular, 200–250 μ diam., ostiole obtuse, piercing the epidermis; contents rosy pink; texture thin, submembranaceous, distinctly parenchymatous, dingy ochraceous, only faintly darker round the ostiole. Spores oblong to cylindrical, rounded at both ends, biguttulate, $8–9 \times 1\frac{1}{2}–2\ \mu$ (or even $2\frac{1}{2}\ \mu$)

On dead peduncles of *Lapsana communis*. Hopwood, Birmingham. April.

317. DENDROPHOMA PLEUROSPORA Sacc. Syll. iii. 178. Allesch. vi. 405.

In this Journal, 1912, p. 50, I recorded what I considered to be this species on twigs of Gooseberry. Then there was a slight doubt, but in March, 1921, I found what is undoubtedly the true species on twigs of *Salix fragilis* at Quinton (Ws.). The species has been recorded on *Salix* and *Ribes* before; and also, abroad, on *Laurus*, *Populus*, *Prunus*, *Quercus*, *Rosa*, and *Vitis*.

It is very remarkable for its peculiarly branched sporophores, on the lateral teeth and short branches of which the spores are obliquely seated, but the sporophores on *Salix* were much longer than those on *Ribes*.

(To be continued.)

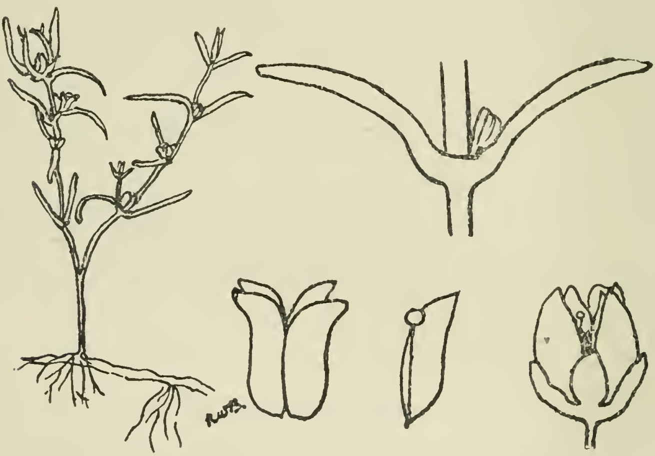
A NEW BRITISH FLOWERING PLANT.

By R. W. Butcher.

[We are indebted to the Editors of *The Naturalist* for permission to reproduce the following article from their issue for November, 1921.—Ed. Journ. Bot.]

While at Adel, near Leeds, on September 1st, I found a small plant growing on the margin of a pool, which proved to be *Tillæa aquatica* L., a species new to Great Britain.

It is a small, bright green, succulent, glabrous plant, from 1 to 3 inches high, somewhat of the habit of a *Sagina*. Stem erect or decumbent, rooting at the lower nodes, the lower portion faintly red. Leaves glabrous, opposite, entire, linear, $\frac{1}{2}$ in. long, connate at the



base, sessile. Flowers sessile, or with a very short pedicel, axillary, solitary, one in each pair of leaves, $\frac{1}{10}$ in. diam., 4-partite. Sepals small, green, ovate, blunt, united at the base. Petals white or pinkish, lanceolate. Stamens 4, opposite the petals, alternating with 4 wedge-shaped staminodes; the filaments very slender, anthers spherical. Gynœcium apocarpous, of four carpels, each 6–10 seeded, the upper portion only slightly recurved when mature.

The above plant differs from the description of the German plant in the very feeble development of any red tint to the stem, and in the less recurved upper portion of the fruit.

A sub-species (*T. Vaillantii*) with flowering pedicels longer than the leaves occurs in France and Italy.

It was the dominant plant, growing in abundance on the drying-up mud on the margin of the pool, associated with: *Polygonum minus*, *P. Hydropiper*, *Limosella aquatica*, *Radicula palustris*, and

Callitriche. On the bare mud it was semi-prostrate. Further from the water among the *Polygonum* it was more erect and two or three inches high.

There does not appear to be any reason why this plant should not be a true native, as it is in grounds that are seldom visited, and in many seasons it is probably covered by the water, in the same way as the species of *Elatine* and *Subularia*.

ELISIA, A BOTANICAL ROMANCE.

By W. E. Safford, Ph.D.

In the number of this Journal for last September (pp. 261–264) there appeared an article by Dr. A. B. Rendle under the heading "*Elisia*—an Overlooked Genus-Name." In this paper Dr. Rendle calls attention to a "Description of a New Genus of the Family Solanaceæ, with Remarks on its Characters and Properties," published in March, 1847, in vol. iii. of the *New Orleans Medical and Surgical Journal* and signed "Milano." As the characters and properties of the plants which this paper purports to describe are largely imaginary, it seems fitting to call attention in this Journal to the untrustworthy character of the paper itself. I am further impelled to take notice of this paper on account of the serious consideration given it by Dr. Rendle, who not only calls attention to the generic name *Elisia* as one which has hitherto escaped the attention of botanists, but notes its absence from the *Index Kewensis* and comments upon its omission from my recently published "Synopsis of the Genus *Datura*" (Journ. Washington Acad. Sciences, xi. 173–189; 1921).

The plants included under the generic name *Elisia* were described as very elegant shrubs with large terminal campanulate and pendulous flowers having a longitudinally split persistent calyx. It is evident that the author had in mind the group segregated by Persoon in 1805 under the name *Brugmansia*. It is equally evident that his descriptions were drawn, not from actual specimens before him, but from memory, or, more probably, from his imagination. Not one of his descriptions applies to any known species, and they are so vague and misleading as to be worthless.

Dr. Rendle suggests that some of the plants described by Milano may possibly be identified with species included in my recent "Synopsis of the Genus *Datura*," and that it will be interesting to know just where I place Milano's names, "provided that the descriptions are adequate." I can state without hesitation that not one of the descriptions is adequate to identify any plant named by Milano. "*Elisia formosissima*" cannot possibly be the same species as *Datura arborea* L., to which the author refers it, since he states that his plant has a subspinose, scabrous, four-valved pericarp, and this description does not apply to the pericarp of *D. arborea* L., which is smooth, peach-shaped, and quite indehiscent. Moreover, it is quite devoid of a persistent calyx, as shown by recently published photographs taken by Mr. O. F. Cook of specimens growing in the Andes of Peru (see Journ. of Heredity (Washington, D.C.) xii. 189, figs. 3, 4; 1921).

"*Elisia mutabilis*," described as a little shrub having serrate leaves, flowers passing from a whitish to a reddish or yellowish colour, and a scabrous, four-valved, four-celled pericarp, can be referred neither to the red-and-yellow-flowered *Brugmansia bicolor* of Persoon nor to *Brugmansia versicolor* of Lagerheim. Neither of these species, nor indeed any known species of *Brugmansia*, has leaves with serrate margins or a scabrous, four-valved, four-celled pericarp. That of *Brugmansia versicolor* is slender and spindle-shaped, terminating in a very long point.

As to the third name, "*Elisia laciniata*," applied to a diminutive woody perennial with deeply-cut glabrous leaves, corollas of some unknown colour "unchangeable except in the warmest part of the day," and a four-valved pericarp, it is impossible to place it with any species hitherto described. Certainly no *Datura* of the section *Brugmansia* has leaves which can be called laciniate or a fruit which is four-valved.

The baneful properties attributed by Milano to his Elisias are as imaginary as the form of their leaves and their pericarps. It is true that certain tribes of Indians in South America use the seeds of tree-Daturas as the source of narcotics; but there is no warrant for the statement that they extract from them a kind of starch or white powder with which they stupefy and kill their enemies. A careful search through the chemical literature of Milano's day has failed to confirm his claim of discovering a substance called "*elisine*"—or, indeed, to reveal the identity of Milano himself. As to his statement that the shade of tree-Daturas is dangerous to animals and injurious to plants which vegetate in their vicinity, it can be characterized as nothing else but one of those fictitious stories which travellers love to repeat, and which botanists are called upon to contradict again and again.

From what has been said, it is not surprising that Milano chose to remain unknown. His reputation as a botanist, a chemist, or an observer of nature could only suffer from the publication of a paper like that which is here considered. His signature is undoubtedly a pseudonym, as suggested by Dr. Rendle. It is to be regretted that the name *Elisia* cannot with propriety be substituted for *Brugmansia*. The name itself is beautiful, and the descriptive adjectives *formosissima* and *mutabilis* are most appropriate for a hypothetical genus presumably dedicated to some fair Élise. One is moved to sadness by the thought that she disappeared from this earth with no other record of her loveliness than the name *Elisia*, proposed by her faithful Milano "in memory of a much esteemed friend."

SHORT NOTES.

Cirsium tuberosum All. in Cambridgeshire. *Cirsium tuberosum*, though a fairly common plant on the Continent, is exceedingly rare in this country. Until a few years ago, when its occurrence on many parts of the Glamorgan coast was established by the Rev. H. J. Riddelsdell, its British distribution appeared to be confined to two localities in Wiltshire. It is therefore of considerable interest to record that this plant occurs also in the Eastern Counties. It was found by one of us (Mills) in July 1919 in Cambridgeshire, in the south of the county, growing among rough herbage on a chalk subsoil at an altitude of a little over 200 ft. There were many plants on a very old grassy way and a number on the wide border of an arable field separated from the road by a hedge (unfortunately part of this border has since been ploughed up and some of the plants destroyed). The site is to all appearances original downland that escaped being broken up at the enclosure of the district, which is well known to have taken place at the beginning of the last century. As the district in question was in former days carefully examined by that excellent botanist the Rev. W. W. Newbould, it is only fair to him to state that, in Prof. Babington's MS. list in the Cambridge Herbarium, there is a record, afterwards crossed out, of *C. pratensis* from the vicinity. Inasmuch as *C. pratensis* and *C. tuberosus* used to be considered conspecific, Newbould may actually have seen the plant in our locality. Mr. A. Shrubbs, of the Botany School, Cambridge, very kindly went to collect a specimen for the University Herbarium and carefully compared it with those already in the collection. We last year visited the locality and examined most carefully the fusiform root-fibres which are the characteristic feature of the plant.—W. H. Mills; A. H. Evans.

Calla palustris L. The *Quarterly Summary* of the Royal Botanical Society of London for October 1921 records the finding last summer of *Calla palustris* in a pond at Knotty Green, near Beaconsfield (Bucks), where it was growing in abundance; how or when it got there Miss Crabb, the discoverer, was unable to ascertain. The *Summary* contains a reference to the occurrence of the plant in a pond among pine-trees between Esher and Claygate in Surrey, which was first recorded by H. C. Watson in *Topographical Botany*, p. 411 (1874). Watson states that, although not indigenous, the plant "there presents an equal semblance of genuine nativity as the *Hypericum elodes*, among which it creeps along the shallow margin of the pond. It is stated," Watson continues, "to have been planted there by 'a medical man';—a statement which may well be credited, as medical men usually succeed only in doing mischief when unwisely they interfere with nature. This record is made here to prevent future botanists being deceived by the doctor's reprehensible experiment in science." Later in the same volume (p. 660) Watson publishes a correction of the statement that *Calla* had been planted "by a medical man"; he does not, however, afford any information as to who was actually responsible for its introduction, and this, by the kindness of Dr. Daydon Jackson I am able to supply. Dr. Jackson, in company with W. W. Reeves (1819-92), was taken to the pond in the year (1874) in which Watson's record was published by William Thomas Suffolk, who had introduced a single specimen of the plant from his garden in South London. Later, owing to a dry season, the water of the pond receded, and several more specimens were introduced. Suffolk was a well-known microscopist, and Treasurer of the Royal Microscopical Society from 1893 till his death, which took place on New Year's Day, 1900. Mr. C. E. Salmon—whose *Flora of Surrey*, our readers will like to know, is proceeding as rapidly as the nature of the work will allow—tells me that the plant still occurs in the locality, where, according to a note in this Journal for 1873 (p. 339), it was first planted in 1861.—James Britten.

REVIEWS.

Captain Bligh's Second Voyage to the South Sea. By Ida Lee (Mrs. Charles Bruce Marriott), F.R.G.S. With Maps and Illustrations. 8vo, cloth, pp. xvi, 290. London: Longmans. Price 10*s.* 6*d.* net.

The story of the Mutiny of the *Bounty*—the ship in which Captain William Bligh undertook his Voyage to the South Sea (1787) with a view to the introduction of the Bread-fruit from Otaheite to the West Indies—is well known; first issued as an independent narrative, and subsequently embodied in Bligh's account of the voyage, it has been constantly reprinted in volumes of adventure. The object of the voyage not having been obtained, a second expedition (1791–3) on the *Providence* was undertaken with satisfactory results; and it is of this that the volume before us, based on Bligh's log-books, gives us the first detailed account. The log-books themselves, after a long period of disappearance, were recovered and restored to the Admiralty Library, whence they had been lent to the Great Exhibition of 1851; they have now been published by Mrs. Charles Marriott, who had already undertaken similar work with much success.

The aim of the book, Mrs. Marriott tells us in her interesting and well-written preface (which contains a summary of the two voyages), is "to show the part played by Bligh as a seaman and a discoverer"; and she has no difficulty in establishing his claim to distinction in both capacities. The course of the voyage afforded numerous opportunities for observation, and of these Bligh fully availed himself; this is especially evident in the chapters devoted to Tahiti and Fiji—the latter group had been seen by him during his former voyoge and had then been called Bligh's Islands. The value of the records is much increased by the numerous and careful footnotes supplied by Mrs. Marriott, which appear throughout the volume.

Although not himself a naturalist, the log supplies ample evidence that Bligh was an intelligent observer and interested in the natural productions of the localities visited. It indeed abounds in incidental notes on trees and other plants, although, of course, its value lies chiefly in the account of the natives of the various regions.

Bligh's career after his return to England is briefly summarised in the preface to the volume, and is, of course, more fully dealt with in the *Dictionary of National Biography*. In that work, however, there is a gap between 1797 and 1801, and it may be interesting to note that this is to some extent filled by the letters from Bligh, hitherto unpublished, included in the transcript of the Banksian Correspondence which is preserved in the Department of Botany in seventeen folio volumes. It may be noted incidentally that these, the contents of which range from 1766 to 1819, are fully indexed under writers and are readily accessible; the letters, many of them from persons of historical importance, contain much information relating to the period, and deserve to be more generally known.

Bligh's letters, as was pointed out by the present writer in the *Times Literary Supplement* (August 25, 1921), range from Oct. 13, 1789, to Nov. 5, 1807; they are supplemented by others from Bligh's wife (1808–9), relating to and written after his supersession as Governor of Sydney. From an earlier letter (Dec. 5, 1795) it appears that at that period Bligh thought of retiring from the Navy, and his wife wrote to Banks asking him to use his influence to obtain for her husband a position then vacant in Greenwich Hospital, on the ground that his health was "much impaired by service." Banks wrote to Earl Spencer strongly urging Banks's claims, but the vacancy had already been filled. The letters, especially those relating to Bligh's conduct in Sydney, contain much of interest, but for present purposes it is sufficient to call attention to their existence.

Although not a botanist, Bligh's election as F.R.S. in 1801 was partly "in consideration of his distinguished services in botany." Nor could James Wiles and Christopher Smith, at the period of the expedition, which they accompanied, be regarded as "skilled botanists"; their engagement was due to Banks, a transcript of whose instructions, the original of which was in his own hand, will be found in the Banksian Correspondence (vii. 218–226). The instructions are very full, relating to the various places where the ship might be expected to call; and, while insisting on the primary object of the expedition, urge the claims of the Royal Gardens: "Whenever you shall meet with plants in your opinion particularly beautifull or curious, you are to acquaint the commanding officer, who, if he thinks proper, will give you leave to take on board one or two of each sort for the use of His Majesty's Botanic Garden at Kew; provided, however, that the stock of bread-fruit trees and useful plants is never diminished by the admission of curious ones, which are on no account to be planted except in such pots or cases in which the bread-fruit and other usefull plants have died. . . . On the ship's arrival in the English seas, whichever of you is on board must take the earliest opportunity to acquaint me by letter of her return, and furnish me with a list of the plants brought home for His Majesty, distinguishing the number of each species, and the kind of pots or tubs in which they are planted, in order that proper boats may be provided to carry them to Kew, which will be sent to meet you with as much dispatch as possible, especially if the season should unfortunately be cold. On the arrival of these boats, immediate measures must be taken, with such assistance as the commanding officer can spare, to embark all the plants in their respective pots and tubs, and stow them away to the best advantage; which done, you are to embark with them, both of you, if both of you return, and never quit them till you have delivered them to his Majesties Botanic Gardener at Kew, who will be ready at Kew bridge to receive them; and you are particularly to take notice that no plant, cutting, layer, sucker, or part of plant, be, on any condition whatever, taken away by any other person, but that the whole be safely and carefully delivered to his Majesties use."

It has seemed worth while to print these somewhat copious extracts as evidence of the care and thoroughness of Banks's instructions to collectors, and of his desire for the fullest possible use, from a scientific as well as from an economic standpoint, of the opportunities presented by the voyage. The instructions were addressed in the first instance to Wiles, who had been gardener to R. A. Salisbury with whom he continued to correspond; they were "to be carried into execution by his assistant Mr. Christopher Smith, in case [Wiles] himself should be prevented by any unexpected event from executing that service." Wiles on the way back stayed in Jamaica and "was engaged in the capacity of Gardener to remain in B th" (p. 215)—or perhaps at the Liguanea garden: see Fawcett in Bot. Gaz. xxiv. 345–369 for a full account of "The Public Gardens and Plantations of Jamaica." Here Wiles remained until 1806, after which time his history cannot be traced: he sent dried plants to Lambert, which are now in the National Herbarium.

It thus fell to the lot of Christopher Smith, who before the voyage appears to have been employed in Kew Gardens, to carry out Banks's instructions; his claims to be considered a botanist were evidently more considerable than those of Wiles. In 1793 he brought back with him to Kew a large collection of West Indian plants, many of which are recorded in the second edition of the *Hortus Kewensis* (1810–13) as of his introduction. On account of this collection and of his connection with the introduction of the Bread-fruit, he was in the same year elected a Fellow of the Linnean Society. In 1794 Smith became Botanist to the East India Company at Calcutta, whence he also sent plants to Kew.

At the beginning of 1796, by the instructions of the Company, Smith went through the Molucca Islands, "for the purpose of collecting the spice plants of various kinds, hitherto natives of those parts only," with a view of establishing their cultivation in Prince of Wales's Island (Penang). "The most sanguine expectations could scarcely have looked for such a successful experiment," the results of which, with a high tribute to Smith's "known character as a botanist and his unwearied attention to the duties of his profession, are narrated in a communication from "a gentleman lately arrived from Prince of Wales's Island," published in the *Annals of Botany* (vol. i. pp. 569–573: 1805), to which it was sent by Banks. A "list of Clove, Nutmeg, and other valuable plants" collected and shipped by Smith to various centres—Kew, the Cape, Madras and Calcutta—as well as to Penang—is appended by Smith to the communication; 71,266 nutmeg, 55,264 clove, and a "variety of rare and valuable plants" amounting to 29,988" were so shipped. Nearly two hundred drawings of plants by a native artist made at this period, localised in Smith's hand, are in the Department of Botany; dried specimens were sent to Banks and to J. E. Smith, who in Rees's *Cyclopædia*, xi. (s. v. *Dicksonia*), acknowledges his indebtedness to Smith "for most numerous and valuable additions to his herbarium." In 1805 Smith became Superintendent of the Gardens at Penang, where he probably remained until his death, which occurred in or before 1808; J. E. Smith refers to him as "the late," and the volume of Rees quoted was published on Nov. 28 of that year.

It remains to be added that Mrs. Marriott's volume is well printed and embellished with maps and illustrations, and has an excellent index.

Index Kewensis Plantarum Phanerogamarum Supplementum Quintum Nomina et Synonyma omnium Generum et Specierum ab initio MDCCCXI usque ad finem anni MDCCCCXV nonnulla etiam antea edita complectens ducta et consilio D. PRAIN *confecerunt Herbarii Horti Regii Botanici Kewensis curatores.* Oxonii e prelo Clarentoniano MDCCCCXI. 4to, cloth. Price £3 15*s*.

FEW publications receive a warmer welcome from systematists than is extended to each supplement to the *Index Kewensis* as it appears; and few of the many important works undertaken at Kew are of more utility to botanists in general. So indispensable has the *Index* become that it is difficult to realise that it began its existence less than thirty years ago—the first part appeared in 1893, and only those who were working before that period can fully realise the boon which has been conferred by Dr. Daydon Jackson's industry and Darwin's generosity.

In some respects each part is more welcome than its predecessors have been, for, as the work has proceeded, additions have been made which, while not interfering with its general plan, have considerably increased its value. These were noticeable in the Fourth Supplement, in which the dates of publication of each species—the absence of which was a serious drawback to the usefulness of the *Index* and its earlier Supplements—were supplied; the use of italics and the sign "=" in connection with synonymy were wisely abandoned: the work in its later Supplements is what it purports to be—an index, and nothing more. In the present Supplement we have an additional improvement in a fuller indication of the geographical distribution than has hitherto appeared.

It is hardly to be expected that no omissions will be detected, but, so far as we have tested the Supplement, we have not noted any. It may be noted that the entries are not confined to the years indicated on the title-page—thus under *Aristolochia* we find "*A. frutescens*, Marsh. Arbust. 12 (1785)," and two species published by Hoehne in 1910. Nomina nuda—there are thirty under *Myrcia*,—although not entitled to recognition, are included, we think wisely. Students of *Hieracia* will be interested to know that no fewer than ten pages of three columns each are presented for their consideration; it may be noted, however, that the majority of these date from periods earlier than those indicated in the title of the Supplement—the genus seems to have been neglected by previous compilers.

For such an undertaking, so successfully carried on, there can be nothing but praise, coupled with an expression of gratitude to those who have undertaken the work.

BOOK-NOTES, NEWS, ETC.

An interesting paper on "The Distribution of Certain Elements of the British Flora" was read by Mr. J. R. Matthews at the meeting of the British Association last year. These elements were defined geographically in terms of their distribution in the British Isles, and do not correspond exactly to what have been called Iberian, Atlantic, Germanic, Scandinavian, &c. Thus the plants of the British Flora confined to England, to Scotland, and to Ireland respectively, and those confined to two of these countries were shown on separate maps. Maps so constructed help one to visualise the mass distribution of the floral element treated, and taken in conjunction with the European distribution of the same plants are extremely suggestive. Whatever may have happened during the Glacial period and by whatever means those temperate plants (about 270 species) of our Flora which occur only in England reached Britain, it is clear from the map that their headquarters are in France, while in England they are most abundant in the south and south-east counties, gradually thinning out as we move north and north-west. This seems to indicate the main lines of migration followed by the bulk of our temperate Flora. Similar conditions seem to have affected the migration of about seventy species, which have reached England and Ireland, but which are absent from Scotland; on the other hand, the distribution of over a hundred species confined to England and Scotland indicates a co-mingling of southern and northern types. About forty of these species are found in Scotland and in the north of England, but are absent from south and south-east England. These boreal types may have migrated more from east to west, rather than from south to north; this may help to explain their greater prevalence in North Britain, although the possibility of their having been exterminated in the south during or since the incoming of a southern temperate flora has to be considered. Sixty species confined to Scotland represent, probably, the oldest portion of our Flora. Whether they survived the Ice Age on "nunataks" or reached their present stations after the retreat of the ice, they are best regarded as relics of that old palæarctic flora which girdles the globe within the Arctic Circle, but which, during the period of maximum glaciation, was driven southwards in every longitude. It is to be hoped that these mass-results will be further analysed, as the method appears capable of giving conclusive evidence on some of the old questions of distribution.

At the meeting of the Linnean Society on Nov. 17, Capt. A. W. Hill gave an account of his recent official visit to the Cameroons and Nigeria. He described the settlement of Victoria and gave its history, passing to the Botanic Garden there having an area of about 200 acres, with laboratory, herbarium, and museum buildings, now awaiting the restoration of their proper function. The site is admirable, and the soil good; connected with this garden are the experimental plots of tea and cinchona at Buea, at an altitude of 3300–3600 feet on the Cameroon Mountain. He then sketched his journey in Nigeria and his visit to the Bauchi Plateau, Northern Provinces, where he had the good fortune to enlist the services of Mr. H. V. Lely, the Forestry Officer of the district, and others for collecting specimens of the local flora. Over 600 specimens have already been received at Kew from Mr. Lely, which so far as they have been determined show a large proportion of new species. The flora of the plateau shows interesting affinities with the flora of Abyssinia and Nyasaland.

Mr. H. H. Haines, C.I.E., is publishing (Adlard and Sons) *The Botany of Bihar and Orissa*—"an account of all the known indigenous plants of the Province and of the most important or most commonly cultivated exotic ones,"—of which the second part has reached us: the first, not yet issued, will contain the "introduction and general remarks on the Botany of the Province." The author was until recently Conservator of Forests for the region indicated, and the work bears evidence of intimate acquaintance with its flora. The arrangement followed is in the main that of the *Flora of British India*: "adherence to the International Code has caused, unfortunately, several departures from the names used in that monumental work"; in some instances, however, from motives of convenience, "well-known names have been retained in spite of these Rules," the "new name" being added as a synonym and hence not available for citation. There is a clavis to both genera and species, with very full descriptions and references to economic uses: also a new verb—we are told that *Odina wodier* "coppices freely."

Messrs. Lovell Reeve have published in a handsome quarto book (4 guineas net) *Illustrations of the Flowering Plants and Ferns of the Falkland Islands*, by Mrs. E. F. Vallentin, with descriptions by Mrs. E. M. Cotton. The plates, sixty-four in number, are well drawn and carefully coloured; the species figured are mostly endemic, and it is in these that the interest of the volume lies—such common plants as *Stellaria media* and *Cochlearia officinalis* might, we think, have been dispensed with. The plates show an intimate acquaintance with the habits of the plants, and sometimes—e. g. *Caltha sagittata*—give two widely differing forms: there are also useful dissections of the flowers. Mrs. Vallentin had originally intended to prepare "an illustrated flora of her native land," but a serious breakdown in health caused the indefinite postponement of the plan, and it was therefore decided to issue the present volume, for which the materials were already available. Mrs. Cotton's descriptions are full and carefully drawn up; and the volume, which is admirably produced, is a useful and attractive addition to our knowledge of the flora of the Islands.

It will, we think, be news to our readers, as it was to ourselves, that the late Lord Salisbury, when a boy of about sixteen, was interested in botany. During his life at Hatfield, after leaving Eton, we learn from his recent biography that "he discovered at this period one open-air interest—the study of botany—which appealed to the scientific side of his nature and which remained with him through life. He pursued it with characteristic thoroughness . . . . With a packet of sandwiches in his pocket, he would range the country on botanical excursions from morning till night, scrambling through or over any obstruction that presented itself in his search for specimens. On one occasion he was arrested as a poacher by the keeper of a neighbouring squire, and only released after an exhaustive search of his pockets and specimen-tin had failed to produce any damning evidence of his guilt" (*Life of Robert Marquis of Salisbury*, by his daughter Lady Gwendolen Cecil, vol. i. p. 17 (1921)).

We are indebted to Mr. Robert Gurney for a copy of an interesting paper on *Utricularia* and its distribution in Norfolk, which was contributed by Mr. W. G. Clarke and himself to the *Transactions of the Norfolk and Norwich Naturalists' Society for* 1920–21 (vol. xi. pp. 128–161). After chapters on flowering and distribution comes an interesting account of the turios or winter buds and their germination, and of the structure, considered under the heads of leaf-form, stomata, and bladders, each species being treated separately. Under "capture of prey," lists are given of the animal contents of the bladders; at the end is a useful bibliography. The paper is illustrated by six excellent plates.

At the meeting of the British Mycological Society held at University College, London, on Nov. 19th, there was a large attendance of foreign and colonial phytopathologists, who had been visiting the International Potato Conference. Papers were read on the use of fungicides on potatoes in North America, by Dr. G. R. Bisby; the growth of fungi in cultures, by Dr. W. Brown; an Eocene microthyriaceous fungus from Mull, Scotland, by Mr. W. N.

Edwards; the grouping of the simpler Ascomycetes by Dame Gwynne-Vaughan; and fungi from a diseased *Hevea* trunk by Dr. A. S. Horne.

The Provincial Museum of Natural History of Victoria, B.C., has issued what is evidently a careful and useful *Preliminary Catalogue of the Flora of Vancouver and Queen Charlotte Islands.* It is based on the works of the Macouns, who had hoped to have seen it through the press; this, however, was prevented by their deaths. The bulk of the information here given has been compiled by Mr. W. R. Carter, who has collected extensively on Vancouver Island, assisted by Dr. C. F. Newcombe. The list, which is well printed, includes the scientific and English names—real or manufactured—of each species and an indication of their local distribution.

No. 8 of the *Kew Bulletin* (1921) contains descriptions of new African plants, by N. E. Brown, mostly collected in Africa by Archdeacon Rogers; a note on the flowering of *Arundinaria falcata* at Kew, by J. S. Gamble, who also continues his notes on the Flora of Madras; a continuation of the "Decades Kewenses"; and an account of the twenty-three years' work of Miss Matilda Smith, whose retirement took place last July and whose election to the Associateship of the Linnean Society was mentioned in our last issue.

Mr. N. E. Brown is continuing in the *Gardeners' Chronicle* his important series of papers on *Mesembryanthemum.* In the issue for Nov. 26 he takes up Haworth's genus *Gibbæum*, of which he describes and figures a new species.

We learn from the *Gardeners' Chronicle* (Nov. 26) that the negotiations between the purchasers of the copyright of the *Botanical Magazine* and Kew, to which the Magazine had been offered, have fallen through, the Department of Agriculture, to which Kew is attached, having declined to accept the responsibility for its continuance. It is gratifying, however, to know that the Royal Horticultural Society has secured the copyright, and it is hoped to resume the publication of the Magazine at an early date: the Society is to be congratulated on the success of its efforts to prevent the disappearance of a work which for so many years has been invaluable both to botanists and horticulturists.

The Report on the Vascular Plants collected during the Canadian Arctic Expedition, 1913–18, was issued at Ottawa (Oct. 14, 1921) as a Government publication. The Report had been undertaken by the late James M. Macoun, but at the time of his death in January, 1920, was unfinished, and its completion was intrusted to Dr. Theodore Holm, who had already collaborated in the work. The list contains 230 species, the distribution of which is fully given; there are thirteen excellent plates representing numerous species, the plants selected being for the most part such as have not been figured before or have been published in works not readily accessible.

The publication of *Webbia*, edited by Prof. Martelli of Pisa, which has been suspended since 1914, has been resumed by the issue of the first part of the fifth volume, which appeared towards the end of last year. It contains a revision by the late Prof. Beccari (of whom an excellent portrait and biography are given) of the *Coryphea* of the Old World, with descriptions of new species; and an account by the same author of the Palms of New Caledonia, which includes descriptions of new genera: three—*Dolicokentia*, *Brogniartikentia*, and *Clinosperma*—based on species of *Cyphokentia*, and one (*Rhynchocarpa*) on *Cyphosperma Vieillardi*: two others are established—one, *Neoveitchia*, from Viti, on *Veitchia Storckii*, the other, *Bentnickiopsis* (sic) on *Cyphokentia carolinensis*, from the Caroline Islands: the paper is illustrated by thirteen plates. Dr. Chiovenda, under the title "La Culla del Cocco" makes a long and important contribution "alla ricerca della patria originaria della Palma del Cocco." While congratulating Prof. Martelli on the renewal of his work, we venture to suggest that in future issues the wrapper should contain, in accordance with usual practice, some indication of the contents of the number, and that the headings of the pages, now blank, should be devoted to some useful purpose.

To the meeting of the Linnean Society on Dec. 1, Prof. W. Neilson Jones contributed a note on the occurrence of *Brachiomonas*, which appeared last year in abundance in rain-water pools in an empty lake in the grounds of Regent's Park College. This organism had previously only been reported from brackish water at Sheerness, Stockholm, and the Black Sea—an interesting problem arising as to its introduction into the London area.

At the same meeting, Mr. J. Burtt-Davy gave an account of the distribution of *Salix* in South Africa. He remarked that confusion of species in this region was partly due to the dimorphism of the leaves, those of young shoots being often quite different from the adult leaves. We can recognise in South Africa ten possible species or varieties, and in tropical Africa twelve named species, only one being common to both areas, a form characteristic of the Limpopo River basin, but not crossing the Zambezi; the other nine are strictly endemic, mostly in very limited areas, so that cross-pollination is practically impossible. Usually each species is confined to one particular drainage-basin; where more than one species is found in the same basin, now isolated by erosion, the streams were formerly united. Thus the distribution of *S. Woodii* and *S. gariepina* suggest a coast origin and subsequent ascent to the mountains following the erosion of the streams; had it originated on the Drakensberg, the two could hardly have failed to reach the same drainage-basin, as they now occur only fifty miles apart. *S. Woodii* may be the connecting-link by way of Pondoland, the Transkei, and Eastern Cape with *S. Safsaf* in Rhodesia. Although the Orange River is now isolated from Angola by the wastes of the Kalahari, it is possible that these three species, or a common ancestor, came down from the north during the time when the Cunene discharged into the Orange by way of the Molopo. A form of *S. Safsaf*—*S. huillensis* Seemen—is found on tributaries of the Cunene River.

Mr. Miller Christy, at the same meeting, read a paper on "The Problem of the Pollination of our British Primulas"—*Primula vulgaris*, *P. veris*, and *P. elatior*. He presented his own numerous observations, extending over forty years, in the form of three tables, and further cited all known observations recorded by others; and discussed the relation necessarily existing between the depths of the corolla-tubes of the flowers and the length of the tongues of insects known to visit the flowers. The observations showed that some thirty species of insect had been seen to visit or frequent the flowers of the three Primulas. A small proportion of these (namely Hymenoptera, Diptera, and Lepidoptera) had long tongues and were certainly able to effect pollination in the regular manner; their visits to the flowers were, however, so comparatively rare that it was impossible to suppose they effected pollination to an extent adequate for the perpetuation of any of the three species of Primula. Most other insect visitors were short-tongued bees, totally unable to effect pollination at all; and, as these visited the flowers only to steal their pollen, their visits were actually detrimental, rather than beneficial, to the plants. Yet other insects, chiefly Coleoptera, frequented, rather than visited, the flowers in considerable abundance; and these seem quite capable of pollinating them, though in an irregular manner which one cannot suppose to have been intended. Thus far, therefore, the problem remained unsolved, and it was necessary to search for some other agency for the normal and regular pollination of the flowers. This agency, the speaker concluded, was to be found in night-flying moths—a surmise advanced by Darwin at the very outset of the controversy, but not carried further by him.

The *Botanical Gazette* for November contains papers on "the Decay of Brazil Nuts" (with 5 plates), by E. R. Spencer; "Growth Rings in a Monocotyl," by C. J. Chamberlain; "Invasion of Virgin Soil in the Tropics," by D. S. Johnson; "Pectic Material in Root Hairs," by C. G. Howe; "Destruction of Mosses by Lichens" (1 plate), by F. P. McWhorter; "Annual Rings of Growth in Carboniferous Wood" (1 plate), by Winifred Goldring.

We have received Part vii. of the *Journal of the Botanical Society of South Africa*, edited by Mr. R. H. Compton, Director of the National Botanic Gardens at Kirstenbosch. The part contains a paper by Mrs. L. Bolus, with plate showing generic characters, on South African *Proteaceæ* and an account of the Roedean Reserve for native South African plants, by Gwendolen Edwards, B.Sc. In Journ. Bot. 1920 (p. 160) we called attention to the eccentric method of pagination adopted: we note that each number is paged separately, which will render reference difficult in volume form. We learn from the pages of the Journal that the first number has appeared of *Bothalia*, "a record of contributions from the National Herbarium, Union of South Africa, Pretoria," edited by Dr. Pole-Evans.

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EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM,

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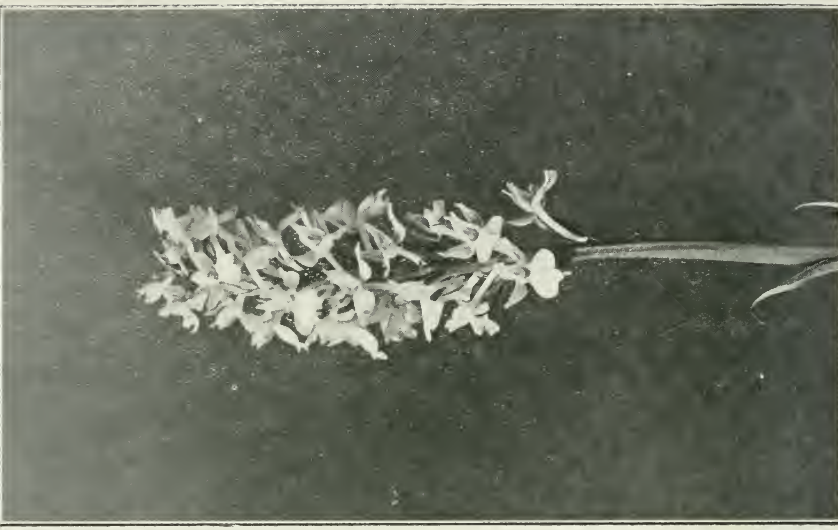

Orchis purpurella Stephenson.

HYBRIDS OF ORCHIS PURPURELLA.

By T. and T. A. Stephenson.

(Plates 561, 562.)

In this Journal for 1920, where *O. purpurella* was first described, we referred (pp. 169–70) to two hybrid forms of that species which we had noted. Since that time we have found two other crosses, and it appears to us desirable briefly to describe and then to name them, especially because, in the case of three of the forms so many individuals occur as to make it awkward to have no name for them when one meets them in the field. In the same volume (t. 556. figs. 11, 12) and in 1921 (t. 559. figs. 21, 22, and in the *Orchid Review*, Nov. 1921) illustrations of some of them are given. In the last reference there is a brief description of the forms concerned.

1. × Orchis insignis (*O. purpurella* × *O. latifolia* (L.). (A) At Aberystwyth *O. purpurella* form A appears to cross with a small form of *O. latifolia*. In t. 556, above referred to, figs. 9 and 13 give the parents and fig. 11 the cross. It is, however, impossible to reproduce the full colour-values, and *O. purpurella* should be somewhat darker and brighter. The hybrid has about half the colour-saturation of this parent, and is otherwise intermediate. Most plants are tall, a fair number taller than either parent, but some are dwarf. Most have leaves with large blotches, and sometimes rings, but a few have the small dots of *O. purpurella*, and some have no spots at all; but, with all these vegetative variations, the flowers are quite alike. These forms all grow together in the same patch of ground, so that environment can hardly account for the variations. They are most handsome plants, which would be set down as an unusual type of *O. latifolia* but for the obvious influence of *O. purpurella*.

(B) In Arran, form B of *O. purpurella* also crosses with *O. latifolia*, producing plants of almost identical flower-type, both as to shape, colour, and markings, with those at Aberystwyth. These are found in many stations near the shore in fair numbers. The only difference as to foliage-type is that we have noted very few, if any, dwarfs, or leaves other than with large blotches, which were mostly dark, though sometimes faint.

2. × Orchis formosa (*O. purpurella* × *O. ericetorum* Linton). (A) *O. purpurella* form A also crosses with *O. ericetorum*. The plants are not numerous. They form a rather denser spike, sometimes of a rather duller purple tone, but in some cases of a curious brick-red-purple of peculiar brilliance, redder but less deep in tone than the colour of *O. purpurella*. The lip is usually larger than in the previously described hybrid, and has much more crenulate side-lobes; the lip-pattern has more spots than lines, which latter, if present, are very fine. The spur is much stouter than in *O. ericetorum*. The leaves are blotched or spotted (t. 556. fig. 12).

(B) Both near Ambleside and in Arran are found crosses of

O. purpurella form B with *O. ericetorum*. The flower is often exactly the same as in the cross with form A, but sometimes with heavier lines and of a more pinkish colour. The plants appear to be nearly always taller than the *purpurella* parent—at any rate, we have not found the dwarf segregate. The leaves are sometimes unspotted.

3. × ORCHIS VENUSTA (*O. purpurella* × *O. Fuchsii* Druce). Although *O. Fuchsii* is fairly plentiful in the vicinity of *O. purpurella* at Aberystwyth, we have not found a case which suggests crossing with form A, but from Ambleside one splendid example was sent us of the cross with form B, and in Arran it frequently occurs. There is the same fine colour as in the case of × *O. insignis*, but the side-lobes of the lips are nearly always narrower; the centre-lobe is very large, and deeply marked off from the side-lobes. The lip-pattern is of more or less broken lines, the leaves are heavily or faintly blotched. Of this hybrid we found a single specimen with the dwarf habit and small spots of *O. purpurella*, but with the intermediate flower.

4. × ORCHIGYMNADENIA VARIA (*Gymnadenia conopsea* R. Br. × *Orchis purpurella*). Of this hybrid two forms were found in Arran last July, one nearer the one parent, one nearer the other. In the *Orchid Review* for November 1921 (p. 132) a photograph of form A, a group of three plants, was published, with a short description of both types; but no name was then assigned to it.

(A) Three plants were found, which looked at a distance very like a coarse type of *Gymnadenia conopsea*. The flowers were strongly scented, the spurs long and very stout—if anything, a little darker in tint than the lip, which is unusual. The lip was small, though larger than that of *G. conopsea*, trilobed, with a pattern of spots and much-broken lines. The leaves were rather short, stout, unspotted, rather pale green. It might be difficult to decide between the claims of *O. latifolia* and *O. purpurella* to be one of the parents; but we considered the very stout, deep-coloured spur to be decisively in favour of *O. purpurella* as the spur of *O. latifolia* is pale, and much more slender. The tallest plant was about 2 dm. high. By the courtesy of the editor of the *Orchid Review*, the figure above referred to is here reproduced (Pl. 561 A).

(B) Only a single plant of this was found. It was gathered as a very slender, delicate example of *O. purpurella*, and only recognised as a hybrid on closer examination at home. It was a dwarf plant about 1 dm. high, with leaves and stem inclining to yellowish green; leaves slender, narrow, and spotted. The flowers were small, scented; the lips smaller than those of *O. purpurella*, of a redder purple, with a long and very stout spur, exceedingly large, in fact, in comparison with the rest of the flower. It is a distinct and most interesting type.

In the case of the Arran plants (but not of the others) it should be said that *O. prætermissa* var. *pulchella* Druce might be one parent, rather than *O. purpurella*—in all except the last (4 B). Dr. Druce's plant is discussed in connection with *O. purpurella* in our paper (Journ. 1920, 164–170), and the close connection of the two forms is recognised. We found at Arran plenty of both forms, which there grow together. The flowers are of precisely the same type, the differences being that *O. purpurella* is dwarf, with minutely spotted leaves, whilst *O. pulchella* is much taller, stout or slender, and with unspotted leaves. More work needs to be done on the forms; but we are inclined to think that we have here a case of linked species, differing only by the unit-characters for "dwarfness" and "leaf-spots." As far as present observations go they are mostly found apart, though at Arran they are found constantly together.

Those who do not recognise *O. latifolia* as a true British species will quarrel with our × *O. insignis*. It may be said that the type is very distinct from that of the other two, and needs to be named and described, even if its exact origin be questioned. The number of individuals is relatively large. It is interesting to note that, though in Arran *O. prætermissa* is entirely absent and *O. pulchella* takes its place, examples of *O. latifolia* are to be found exactly like those in areas where there is no *pulchella*. That an identical type should arise from two such different parents seems most unlikely.

The other figure here reproduced (Pl. 561 B) from the *Orchid Review* is *Orchigymnadenia Evansii* (*Gymnadenia conopsea* × *O. maculata* subsp. *ericetorum* Linton; × *O. Evansii* Druce in Report Bot. Exch. Club, 1906, p. 199). The spike was pale lilac in colour with three minute dots in rows on each side of the lip. The flower was scented. The great length of the spur is well seen in the photograph. The plant was about 2·5 dm. high, with long, narrow, rather fleshy, unspotted leaves. A solitary specimen was found in Arran last July, the finest example of this hybrid we have seen. We saw a dozen or more examples in Wales, all charmingly graceful plants, varying a good deal in colour and markings, but all with very long spur and scented flowers.

P.S.—In the *Orchid Review* for December, we published a photograph of form A of *O. purpurella*, here reproduced (t. 562), with a brief note on the species. Two points raised in our paper in this Journal can be further developed. Form B is very closely connected with *O. prætermissa* v. *pulchella* Druce. In Arran they are found together. It can now be quite definitely stated that *O. purpurella* is not the same as *O. cruenta* O. F. Mueller, which is much nearer to *O. incarnata* L. The simplest way of stating the relationship of the various forms is to say that *O. cruenta* and *O. purpurella* are dwarf spotted-leaved variants of *O. incarnata* and *O. pulchella* respectively: but the leaf-markings of *O. cruenta* are of a very different type from those of *O. purpurella*. In view of this we suggest that it would be advisable to separate *O. pulchella* from *O. prætermissa*, from which, in the floral characters, it differs a good deal. It is now certain that previous records of *O. cruenta* for Britain are incorrect; the plants found must be assigned to *O. purpurella*.

THE FLOWERING-TIMES OF SOME BRITISH ELMS.

By Miller Christy, F.L.S.

The respective times of flowering of our various species of Elm are, of course, known approximately; but these times have never been observed and recorded with that amount of precision which is desirable, as it seems to me, for various reasons. The subject is not so much as alluded to in our leading work on British trees; and even those who have made and recorded observations on the point have usually omitted to identify carefully and to indicate precisely the particular species observed.

Owing to this lack of definite information, it has hardly been adequately recognized hitherto that each species has its own special flowering-time—all, of course, in spring; and that, though these flowering-times vary somewhat in different years (mainly, no doubt, as a result of weather-influences), they are sufficiently fixed and regular to constitute specific characters of value in distinguishing between the various members of this highly-"critical" genus. In these circumstances, the following more or less casual observations, made by myself in Essex during the last few years, seem worth recording.

My attention was first drawn pointedly to the subject in the year 1911, when Mr. E. E. Turner, then of Coggeshall in the same county, communicated to me a series of observations, made by himself in the vicinity of that town and extending over twenty-eight consecutive years (1882–1911). These observations, published shortly after in the *Essex Naturalist* (xvi. 331; 1912), showed that, in 1890 and 1905, he first saw the Elms in his district in flower at the end of January; while in 1886, 1889, 1895, 1904, and 1909, he did not see them in flower until quite the end of March—thus showing extremely wide variation. Mr. Turner assumed, unfortunately, that all the trees he had had under observation were of one species, which he speaks of as *Ulmus campestris*; but there can be no doubt that he had observed, and failed to discriminate between, trees belonging to at least two species which have widely-different flowering-times; and this fact detracts largely from the value of his diligent and long-continued observations. It was my early recognition of this which led me to attempt more precise observations upon certain Elms growing in and around my own garden at Chignal St. James, near Chelmsford, with results hereafter set forth.

It is not always easy to make observations of the kind. In the case of the Elms, flowering takes place chiefly near the tops of the trees, often 60 or 80 feet above the ground; and it is difficult to ascertain, even with a good glass, just when the swelled buds change into opened flowers with dehiscing anthers. For this reason I found it necessary to collect with a shot-gun not a few of the twigs which I required in order to make sure on the point. Further it must be understood that by "flowering" I mean the opening of the flower-bud just before the anthers dehisce: not the emission of the stigmas, which cannot be seen except very close at hand.

The trees observed by me belong certainly to two species and include, I believe, some hybrids between them. These two species I indicate hereafter, but, I fear, not very clearly. When dealing with any species of *Ulmus*, I always feel myself on treacherous ground, owing to the number of puzzling intermediate forms (due, without doubt, to hybridisation) with which one meets. I am familiar, I believe, with all the critical matter dealing with the genus which has been published in England during the last ten years; yet I have a feeling that I know less of the matter now than I thought I knew at the outset. The specific distinctions laid down by those who have written on the subject seem to me highly confusing, and the decisions they have arrived at often contradictory; at all events, when I have met with an unusual form in the field, I have generally found myself unable to identify it beyond doubt with any described species or variety. In the present case, I have had valuable assistance from Prof. Augustine Henry, who has kindly examined and identified flowers, fruit, and mature foliage from the trees in question. The two species concerned may be defined as follows:—

(1) The Smooth-leaved Elm (the "Common Essex Hedgerow Elm," as I have been accustomed to call it), *Ulmus nitens* Moench (= *U. glabra* Miller, *non* Hudson; *fide* Moss, Cambr. Engl. Flora, ii. 89; 1904); it is, however, certainly the tree which most Essex botanists have been accustomed to regard as *U. campestris*. It is exceedingly abundant throughout the greater part of Essex, growing usually in hedgerows and similar places; very seldom in woods. Its head is narrow (not rounded). It suckers very freely, especially when young, and usually leafs very late in the year—often not until nearly the 1st of June. In most years it produces an exceedingly thin crop of fruit, its samaras being very small and usually infertile; yet in some years, at long intervals, it produces an enormous crop, and so exhausts its vegetative powers that it develops little or no foliage until very late in the summer and is often affected similarly in the following summer also. The last year in which this remarkable phenomenon occurred was 1909, when it was observable throughout the whole of Essex and in many adjoining counties. In that year our Essex trees, almost without exception, indulged in a perfect orgy of reproduction, and the crop of fruit they bore was truly amazing in quantity—so much so that it attracted the attention of and surprised everyone who saw it: I published at the time (*Essex Naturalist*, xvi. 73–81; 1910) a full account of the phenomenon. One feature of it was that some of the seed produced on this occasion was certainly fertile, though I had a suspicion that this may have been borne by trees which were hybridized in some degree with the next species, which habitually produces fertile seed.

The trees of this species on which the following observations (which I give in diary form) were made were some twenty fine examples, averaging about 85 feet high, and at or rather past their best (say, 100 or 125 years old, for this is a comparatively short-lived species); most of them stand either actually in my garden or in the drive leading up to the house, but a few in adjacent fields and hedgerows:—

1911, *Feb.* 19.—A number of trees standing in hedgerows near the house were in full flower. Six days earlier, on the 12th, I had noted that a number of trees, apparently of this species, growing in a more exposed situation at Stisted, in North Essex, were just about to flower, though none had actually done so.

1912, *February* 4 (*about*).—Trees in the drive now in full flower, especially one which seems always to flower rather earlier than the others, but the exact date of first opening not noted. Mr. Turner informed me that certain trees which he believed to be of this species, growing near Coggeshall, were in flower on 21st Jan. in this year.

1912, *December* 27 (*about*).—The specially-early tree mentioned above must have been in flower on or before this date (that is, *for the second time within the year*); but I did not perceive the fact until a week later, namely, on—

1913, *January* 4, when it and some of the other trees in the drive were well in flower, though not fully so. The quantity of flower seems likely to be exceptionally large this year.

January 10.—A violent wind has stripped nearly all the flower off the trees round the house and has carried a large quantity of it into the pond in the garden, where, floating on the surface, it was driven by the wind up to one end, forming a thick coating or scum, dark red in colour, which could be gathered up in large hand-fulls, and must have been sufficient in total quantity to fill several bushels.

1914, *February* 21.—The trees round the house are now all in full flower. They must have been out at least a fortnight ago, but I failed to observe their first opening. They are, therefore, about six weeks later in flowering this year than they were last. A high wind last night has again stripped the trees of most of their flowers, which have again formed a thick red scum on the surface of my pond, though not nearly to the same extent as last year.

April 13.—In spite of the destruction of flower by the high wind nearly two months ago, the trees are all bearing, especially near their tops, fair crops of samaras, which is very unusual for this species.

April 28.—The samaras are still developing, but are not yet mature. It looks as though the trees were going to produce a large crop of fertile seed, though not nearly to the same extent as in 1909.

May 2.—The samaras are beginning to fall. Some appear to enclose fertile seeds, but the great majority are clearly infertile. A trip on this date to north-west Essex, *via* Dunmow, Thaxted, Saffron Walden, and Ashdon to the borders of Cambridgeshire and back, shows that everywhere the Common Essex Hedgerow Elm is producing this year an unusual crop of fruit.

May 13.—The garden is strewn with samaras, most of which have now fallen. Examination shows that some enclose seeds which look quite capable of germinating, but that the majority are certainly infertile. Clearly this is one of those years in which this species bears fruit, though the interval since it last did so (in 1909) is much shorter than is supposed to be usual. Clement Reid, who speaks of the tree as *U. campestris*, gives the interval in England as usually about forty years (see his *Origin of British Flora*, 11). On this occasion, however, the phenomenon is on a much smaller scale than then, and presents slightly different features; for then the trees retained their samaras until quite the end of May or beginning of June and did not come into leaf until late in June. Mr. G. T. Rope observed the same phenomena this year in connection with the Elms (probably of this species) growing in the valley of the Stour (north Essex and south Suffolk) (see *Selborne Magazine*, 1914, 206).

1915, *February* 14.—First observed flowers open, but a few only. Many flowers have looked, for some time past, as though about to open.

1916, *January* 15.—First observed the Elms in my drive to be in flower, though they have probably been so for some days at least.

1917, *March* 24.—The Elms in the drive have only just begun to flower. They are doing so more sparingly and very much later this year than in any year since I first began to observe them.

1918, *February* 15 (*about*).—The Elms in both garden and drive flowered at about this date and did so in considerable abundance, but I omitted to note the exact date when I observed the first flower.

1919, *February* 9.—A very few flowers on one tree in the drive are just opening; but there is no flower on any of the other trees, and no prospect of any.

March 2.—The trees have borne practically no flower this year. (The same was the case with all trees of this species in my district.)

The foregoing observations show that, in this species, the flowering-time varies somewhat widely in different seasons. Thus, in 1912–13, my trees flowered at the end of December: in 1917, at the end of March—a variation of as much as three months. Such extremes are, however, exceptional. The ordinary (*i. e.*, average) flowering-time appears to range from the beginning of January to the beginning of February. This accords well with the statement by Dr. Moss (Camb. Brit. Flora, ii. 90; 1904) that this is "the first to come into flower," its flowers "opening from January to March." (This work is the only one I know of in which the flowering-times of the various species are noted with any precision.) The foregoing evidence shows also that this species is extremely variable as to the *amount*, both of flower and of fruit, which it produces in different years.

The other species of Elm on which I have made observations has been identified by Prof. Henry as

(2) The Wych Elm, *Ulmus montana* Stokes (= *U. glabra* Hudson, *non* Miller). The name "Wych Elm" seems to be associated particularly with *U. montana*; but I regard its application by botanists to *any* species of Elm as undesirable, because its use leads inevitably to confusion. So far as I can gather, the name Wych Elm is applied promiscuously, in most parts of England, to any species of Elm which is less common than whatever species happens to be most prevalent in that district. It might, therefore, be written more appropriately *Which* Elm? This species is much less common in mid-Essex than the foregoing. It grows almost exclusively in woods, especially those in the damp bottoms of stream-valleys: very seldom in hedgerows. It never produces suckers, or to a very small extent only; its head is always more or less distinctly globular. In most respects it is a larger, handsomer, and much longer-lived tree than the foregoing. Unlike that species, it produces fertile fruit abundantly in most years, if not in all. Its samaras are larger, and they hang in conspicuous bunches, like hops; for which reason it is often called in Essex the "Hop Elm."

How completely fertile this species is, and how unlike the foregoing in this respect, is shown by an observation I made, on 20 May, 1911, on some forty or fifty trees (identified by Prof. Henry), planted about 1860, beside a road, at Stisted, Essex. All were covered thickly with samaras, fully developed, but still quite green. Large numbers of these had been picked off by birds (probably sparrows and greenfinches), which had snipped each into two halves with their bills and had eaten the enclosed soft and succulent seed, afterwards letting fall the mutilated green wings of the samaras, thousands of which covered the ground below the trees. How thoroughly they did this may be judged from the fact that when, a month later, I asked a friend to procure me some ripe samaras, he reported that, having searched, he had been unable to find a single one which the birds had not mutilated. A similar observation has been made in Suffolk by Mr. G. T. Rope (see *Selborne Magazine*, 1914, p. 207). Further, I was able to observe regularly two trees growing on the edge of Broom Wood, about 250 yards from my house. These I found fruited freely every year. They usually began shedding their samaras before they had developed any foliage (as, for instance, on 7th May, 1916). That the seed they bore was fully fertile is shown by the fact that, when the undergrowth was cut about 1909, a large number took root. The result was that, when the wood grew up again, that part of it adjacent to the two parent trees consisted largely of young seedling elms, which soon attained a height of ten or twelve feet. Nothing of this kind ever occurs, so far as my observation goes, in connection with the preceding species.

No trees of *U. montana* grew actually upon my ground; but at least twenty grew within a few hundred yards, chiefly in or beside woods; and upon these the following observations were made:—

1913, *March* 10 (*about*).—A single young tree (height 41 feet) growing in a meadow beside College Wood (a portion of which, cut down within my recollection, formerly included it) had not come into flower when visited at this date.

March 30.—The tree has flowered since the 10th inst., and young samaras are just beginning to form.

April 6.—The samaras are now largely developed, giving a decidedly green tinge to the tree, though no foliage has yet appeared.

1914, *March* 22.—Tree in flower very fully.

April 29.—Tree bearing samaras in abundance.

1915, *April* 5.—Tree in flower very fully.

1916.—Date of flowering not noted.

I made also a few observations on ten or a dozen trees of the same species, growing near Chobbins Farm, a few hundred yards distant:—

1917, *March* 24.—Flowers not yet open or very few, if any. (This is unusually late for this species.)

1919, *March* 2.—Trees just beginning to flower.

The foregoing observations show that in Essex *Ulmus montana* flowers, with fair regularity, about the middle or the end of March, though sometimes not until the beginning of April, as in 1915 and 1917: that is to say, its flowering-time averages from four to six weeks later than that of *U. nitens*.

In most years, therefore, there is little probability of these two species hybridizing, even when they grow in close proximity to one another, as they did round my house. Yet in years in which *U. nitens* happens to flower exceptionally late (as it does sometimes), the flowering-times of the two become synchronous. This was the case, for instance, in 1917, when the trees of both species which grew round my house flowered together during the last week of March. In such years hybrids may easily be produced. Few botanists realize, I fancy, how profuse is the amount of pollen produced by our Elms. I have several times brought into the house twigs of both the species noticed above and bearing flowers with anthers just about to dehisce, and I have been surprised the following morning by the amount of pollen the anthers, assisted by the warmth of the room, had shed on my writing-desk. This abundance of pollen, carried by the wind, would, of course, facilitate hybridization, probably even between trees growing a mile or more apart.

In addition to the foregoing, I made one observation on a single tree (pronounced by Prof. Henry to be probably *U. major* Sm.) growing in a roadside hedge at Stisted in North Essex. It had a much rounder head than any typical example of *U. nitens*, and the ends of the lower branches were remarkably long and pendant. It may have been a hybrid with some ornamental tree in an adjacent garden.

1911, *February* 12.—Tree in full flower.

May 16.—It was reported to me that this tree had produced no fruit.

NEW OR NOTEWORTHY FUNGI.—VII.

By W. B. Grove, M.A.

(Plate 563.)

(Continued from p. 17.)

317 a. Dendrophoma pruinosa f. *Ligustri* Strasser, in Annal. Mycol. ix. 91. *Sphæria pruinosa* Fr. Syst. Myc. ii. 486.

Pycnidia about ½ mm. diam., subglobose, unilocular, surrounded by a thin *Cytospora*-like wall, remaining long covered by the epidermis, at length emerging by a black bullate ostiole; contents distinctly olivaceous. Spores sausage-shaped, $6–7 \times 1\ \mu$; sporophores up to $25\ \mu$ long, repeatedly branched, occasionally in a verticillate manner.

On twigs of *Ligustrum vulgare.* Seamill and Stevenston, Ayrshire (Boyd). June, July.

This is, I believe, really a *Cytospora*, but the specimens are too poorly developed for certainty. Other species of *Cytospora* have branched sporophores. It is said to be the spermogone of *Valsa Cypri* Tul.; see Ann. Sci. Nat. 1856, v. 116, and Sacc. Syll. i. 133. Both *Valsa Cypri* and "*Sphæria pruinosa* Fr." are known to occur also on *Fraxinus.* Dr. J. W. Ellis found the var. *Lantanæ* on *Viburnum Opulus* in Cheshire.

318. **Placosphæria Ulmi**, sp. n.

Stromatibus rotundatis, convexis, nigrescentibus, cuticula tantum tectis, crassis, intus atro-brunneis, iis *Dothidellæ Ulmi* perfecte habitu specieque similibus; loculis plurimis, globosis, ostiolo leviter exserto pertusis. Sporulis cylindrico-oblongis, utrinque rotundatis, hyalinis, bi- vel pluriguttulatis, $17–25 \times 4\frac{1}{2}–5\ \mu$, sporophoris brevibus, rectis, e totis loculi parietibus oriundis suffultis. (Fig. 11.) (Tab. 563. fig. 1.)

Hab. in foliis emortuis *Ulmi campestris.* Southampton (Rayner legit); Quinton (Ws.) in company with the *Dothidella*, Oct. 1918.

A transition-form between *Piggotia astroidea* and the *Dothidella*; immature spores of the latter were found in the loculi of the *Placosphæria.* No doubt overlooked on account of its similarity to the *Dothidella.* Cf. *Placosphæria graminis* Sacc. & Roum.

319. Fusicoccum cinctum Sacc. & Roum. Rel. Lib. iv. no. 94, pl. 43. f. 23. Sacc. Syll. iii. 249. Allesch. vi. 549.

Stromata pulvinate, scattered or loosely gregarious, immersed, erumpent only by the flat oval disc, dark-olive, sometimes surrounded beneath the bark by a subolivaceous zone, falsely plurilocellate. Spores oblong-fusoid, narrower towards the base, hyaline or faintly granular, eguttulate, $14–18 \times 3–4\ \mu$; sporophores rod-shaped, half as long as the spore. (Fig. 4.)

On dead twigs of *Castanea sativa.* West Kilbride, Ayrshire (Boyd). Sept. Agreeing with Roum. Fung. Sel. Exs. no. 4377!

The dark-olivaceous zone, surrounding the disc and faintly showing as a halo through the periderm, is not always present. The dark oval disc is placed longitudinally on the twigs.

320. PHOMOPSIS CRUSTOSA Trav. in Flor. Ital. Crypt. p. 256. Died. Annal. Mycol. ix. 22; Fung. Brand. p. 256. *Phoma crustosa* Bomm. Rouss. & Sacc. Bull. Soc. Bot. Belg. 1887, xxvi. 215. Sacc. Syll. x. 149. Allesch. vi. 217. *Phomopsis Ilicis* v. Höhn. Hedwig. 1918, lx. 206; non *Sphæropsis ilicicola* Cooke & Ell. Grevill. vi. 3.

Pycnidia somewhat scattered, occasionally a few clustered together, conical-depressed, up to ½ mm. diam., shining-black, long, covered by the epidermis, which is at length elevated and whitish in the centre, surrounded by a circular blackish-brown halo, sometimes several occupying a common blackish area which is bounded by a distinct narrow black *Diaporthe*-like line; the split epidermis is finally penetrated by a minute black ostiole; texture everywhere thick, of squarish dark olive-brown parenchyma. Spores fusoid, occasionally more rounded above, biguttulate, $7–9 \times 2\frac{1}{2}–3\ \mu$; sporophores subulate, acuminate, granular-guttulate below, $12–22 \times 1\frac{1}{2}–2\ \mu$: with these a few B-spores, lunate-acuminate, rarely hooked, $20 \times 1\ \mu$.

On dead twigs of *Ilex Aquifolium.* West Kilbride, Ayrshire (Boyd). Aug.

Von Höhnel mistakenly confuses this with *Phoma Ilicis* Desm., and therefore renames it *Phomopsis Ilicis* v. Höhn. The spores of *Phoma Ilicis* Desm. are very different, being more like those of *Macrophoma cylindrospora. P. crustosa* belongs to *Diaporthe crustosa* Sacc. & Roum. in Rev. Mycol. 1881, p. 43, pl. 19. f. 3 (Syll. i. 682), which is also *D. ilicina* Cooke in Grevill. 1890, xviii. 74. This *Diaporthe*, as well as the *Phomopsis*, occurs on leaves and branches. Only traces of it are found on the Ayrshire specimens. The "B-spores" are doubtful, but did not seem to be merely elongated narrow sporophores.

321. **Phomopsis Garryæ**, sp. n.

Pycnidiis superne incompletis, stipatis, ca. $200\ \mu$ diam., conicis, pallidis, diu epidermide tectis, denique nigris. A-sporulis ellipticofusoideis, sæpe biguttulatis, utrinque acutis, $5\frac{1}{2}–7 \times 2–2\frac{1}{2}\ \mu$, sporophoris lineari-subulatis, plerumque curvatis, $15–20 \times 1\frac{1}{2}\ \mu$, suffultis: B-sporulis immixtis, linearibus v. anguste fusoideis, utrinque acuminatis, $15–17 \times \frac{3}{4}–1\ \mu$, sporophoris non visis.

Hab. in ramulis emortuis *Garryæ ellipticæ*, socia *Diaporthe.* West Kilbride, Ayrshire (Boyd). Aug.

The *Diaporthe* will be described later.

322. **Phomopsis Hyperici**, sp. n.

Pycnidiis sparsis v. subgregariis, irregulariter seriatis, diu epidermide convexa pustulatim elevata tectis, demum vertice leviter erumpentibus, oblongis, usque $400\ \mu$ latis; contextu crasso et fuliginoso. A-sporulis fusoideis, utrinque acutis, biguttulatis, $7–8 \times 1\frac{1}{2}–2\ \mu$, sporophoris lineari-subulatis, subæquilongis, e strato crasso olivaceo oriundis suffultis: B-sporulis filiformibus, curvatis, plerumque hamatis, $25–30 \times 1\mu$, A-sporulis immixtis, sed sporophoris brevioribus suffultis.

Hab. in ramulis emortuis *Hyperici Androsæmi.* West Kilbride, Ayrshire (Boyd). July.

Both kinds of spores grew intermixed in the same pycnidium. Cf. *Phoma leptidula* Sacc. Syll. iii. 137, which might well be the C-spores of the same fungus.

323. Phomopsis laurella Trav. in Flor. Ital. Crypt. p. 276. *Phoma laurella* Sacc. Syll. iii. 82. Allesch. vi. 219. *Phoma nobilis* Sacc. Mich. ii. 616.

Pycnidia incomplete, very numerous and often crowded, roundish, depressed or conical, 250–300 μ diam., becoming pallid, at length elevating and piercing the epidermis in the centre by a minute pore. A-spores fusoid, nearly always straight, indistinctly guttulate, $8–10 \times 2\frac{1}{2}–3\ \mu$; sporophores subulate, $8–11 \times 1\frac{1}{2}\ \mu$, rising from a thick yellowish-olive or fuliginous stratum: B-spores linear, mostly curved or hooked, $16–18 \times 1\ \mu$.

On dead twigs of *Laurus nobilis*; also on the leaves. Kew Gardens (Cooke). Balbriggan, Dublin (Scriven). West Kilbride (Boyd). May–Sept.

The pycnidia are small and very imperfect above. In the Irish specimens, the fungus appeared to be killing the twigs backwards, beginning at the tips, exactly as *P. aucubicola* does. In Mr. Boyd's, A- and B-spores occurred together on the twigs; but only the A-spores on the leaves, in similar pycnidia. The latter may possibly be *Phyllosticta Lauri* Westd., for they were thickly spread over the upper surface of large brown dry, darker margined, spots, like a normal *Phyllosticta*. This *Phomopsis* is the pycnidial stage of *Diaporthe nobilis* S. & S.

324. **Phomopsis minuscula**, sp. n.

Pycnidiis sparsis v. pluribus in maculas fuliginosas linea atra indistincta cinctas aggregatis, oblongis, usque $\frac{1}{2}$ mm. diam., nigrescentibus, epidermide nitidula obscurata tandem poro pertusa tectis; contextu circa ostiolum crassiusculo atrofusco, alibi tenuiore. Sporulis numerosissimis, oblongo-clavatis v. ellipsoideis, apice obtusis, biguttulatis v. ad medium vacuolatis, $7–8 \times 1\frac{1}{2}–2\ \mu$, sporophoris linearibus subulatisve, erectis, achrois, $10–15 \times 2\ \mu$, e strato molli olivaceo oriundis suffultis.

Hab. in stipitibus, pedunculis, pedicellis, capsulis *Campanulæ rapunculoidis*, Bidford Churchyard, Mart.

The spermogonial stage of *Diaporthe minuscula* Sacc. & Speg. The pycnidium is of the usual character, consisting at first of little except the dusky basal proliferous stratum and the epidermis darkened by a thin brownish mycelium; but afterwards a true and thick pycnidial wall is formed above.

325. **Phomopsis Oleariæ**, sp. n.

Pycnidiis superne incompletis, sparsis, $\frac{1}{4}–\frac{1}{2}$ mm. diam., atris, halone pallide brunneo cinctis, erumpentibus. Sporulis elliptico-fusoideis, a latere visis curvis et subclavatis, basi subacutatis, raro guttulatis, $7–8 \times 2\ \mu$, sporophoris subulatis, paullo spora brevioribus, e strato atro-olivaceo oriundis suffultis.

Hab. in ramulis *Oleariæ Haastii.* West Kilbride, Ayrshire (Boyd). Sept.

Some of the pycnidia are situated on a blackened patch reminding one of a *Diaporthe*, but no *Diaporthe* on *Olearia* is known. On the same twigs, but not intermixed, was a *Sphærella* (?) with long fusiform 1-septate spores, acuminate at both ends, curved in profile, triseriate in the ascus, 30×2 μ.

326. CYTOSPORA GERMANICA Sacc. Syll. iii. 262. Allesch. vi. 604.

Stromata scattered, conico-truncate or convex, with a roundish base, $\frac{1}{2}$–$1\frac{1}{4}$ mm. broad, disc whitish, then cinereous, at length marked with a small black central papilla which is pierced with a pore, multilocular at base, the loculi radiately disposed and often imperfectly divided; walls of the chambers of thick brown prosenchymatous tissue. Spores cylindrical, curved, $5 \times 1\frac{1}{2}$ μ; sporophores crowded, long, slender, filiform, usually simple, 20–25×1–$1\frac{1}{4}$ μ.

On dead twigs of *Salix*. Sutton Coldfield. Apr.

On the same twigs was an abundance of *Valsa germanica* Nits., of which it is the spermogone; when the two occurred together, the 6–9 black ostioles of the *Valsa* formed a ring round the spermogone, at a distance of $\frac{1}{2}$–1 mm. away from it. Occasionally the grey disc of the *Cytospora* was pierced by two papillæ. See below for the *Valsa*.

327. **Cytospora Hyperici**, sp. n.

Stromatibus dense sparsis, pulvinatis, ovalibus, usque 2 mm. long., convexis, poro centrali disco minuto subatrato cincto apertis, perfectis intus plurilocellatis; loculis plus minus circinatis, parietibus tenuibus e cellulis viridulis iis *Cytosporæ Oxyacanthæ* Rab. similibus constantibus. Sporulis allantoideis, 4–5×1 μ, sporophoris bacillaribus rectis, ca. 10×1 μ, suffultis.

Hab. in ramis emortuis *Hyperici*, West Kilbride, Sept. (Boyd).

328. CYTOSPORA KERRIÆ Died. Pilz. Brand. p. 346.

Stromata loosely gregarious, tearing the epidermis into laciniæ, erumpent, conical, with a blackish disc pierced by one or two pores, irregularly pseudolocellate; texture dark-olive, a little paler within. Spores 6–$8 \times 1\frac{1}{2}$–2 μ; sporophores fasciculate, mostly simple, 15–25×1 μ.

On dry twigs of *Kerria japonica*. Saltcoats, Ayrshire (Boyd). July.

329. CYTOSPORA LAURI Sacc. Syll. iii. 279, p. p.— f. *ramulicola*. non *Ceuthospora Lauri* Grev.

No definite conceptacle. Pycnidia scattered, conico-truncate, $\frac{1}{2}$–1 mm. diam., with a rather large whitish furfuraceous disc, dark olive within, composed (when perfect) of many compact, narrow, radiately arranged pseudolocelli or labyrinthiform chambers; walls of the locelli, under the microscope, thick and dark brown without a trace of green. Spores sausage-shaped, curved in profile, 4–$5 \times \frac{3}{4}$–1 μ, rather more acute at the ends than is usual; sporophores linear, not very crowded, $\pm$ curved, 10–12×1 μ.

On dead twigs of *Laurus nobilis*. West Kilbride, Ayrshire (Boyd). May.

The confusion originated by Greville's mistake in calling our "Common Laurel" *Laurus nobilis*, and perpetuated in Saccardo's *Sylloge*, vol. iii., has never been completely dispersed. *Ceuthospora Laurocerasi* (Fckl.) = *C. Lauri* Grev., on *Prunus Laurocerasus*, is very common in Britain (see Journ. Bot. 1916, p. 1916, p. 191), but *Cytospora Lauri*, on *Laurus nobilis*, is not. The two species are, as might be expected, quite different in structure.

330. CYTOSPORA SUBCLYPEATA Sacc. in Malpigh. 1896, x. 273, pl. 6. f. 1; Syll. xiv. 917.

Stromata scattered, pustular, $\frac{1}{2}$–$\frac{3}{4}$ mm. diam., swollen, covered by the shining black epidermis, grey within and unequally plurilocellate; disc minute, grey. Spores sausage-shaped, curved, 4–5 × 1 μ; sporophores verticillately branched, 25 × 1 μ, branches acute.

On dead twigs of *Rhododendron*. Bidston, Cheshire (J. W. Ellis); Ayrshire (Boyd). May–Nov.

In these specimens the epidermis over the pustules is dark reddish-brown, shining especially at the apex when young; many of the sporophores are rather fasciculate at the base than branched; spore-mass colourless, spores 3–6 × $\frac{3}{4}$–1 μ.

331. ASTEROMA VERNICOSUM Fckl. Symb. Myc. p. 385. Allesch. vi. 457. *Sphæria vernicosa* DC. Flor. Fr. vi. 138.

Spots smooth, shining, inky-black, with a paler radiating margin. Pycnidia occupying the centre of the spots, more or less convex or conical, somewhat prominent, mouthless, black.

On dead stems of *Spiræa Aruncus*. Edgbaston Botanic Gardens. Apr., May.

The spots on these specimens are for the most part oval, about 5–8 mm. long; the pycnidia are very black, some few containing oval continuous spores, measuring 7–8 × $2\frac{1}{2}$–3 μ. With them was to be found an immature Pyrenomycete.

332. CONIOTHYRIUM EQUISETI Lamb. & Fautr. in Rev. Mycol. 1896, p. 142. Sacc. Syll. xiv. 924. Allesch. vii. 36.

Pycnidia rather large (150–250 μ diam.), oblong, obtuse, covered, at length erumpent by the vertex. Spores oblong, obtuse, yellowish-brown, with one large guttule or 2–5 smaller ones, 8–10 × 4–5 μ.

On dead stems of *Equisetum maximum*. Whiting Bay, Isle of Arran (Boyd). June.

333. CONIOTHYRIUM GLOMERULATUM Sacc. Syll. iii. 314. Allesch. vii. 23.

Pycnidia aggregated (2–5 together), immersed, then erumpent, subglobose, black, about 150 μ diam.; texture of minute cells, very thick and dark. Spores copious, oval, 3–4 × $1\frac{1}{2}$–2 μ, olivaceous-brown; sporophores not seen.

On cone-scales of *Picea excelsa*. Hereford. May.

334. ASCOCHYTA CARPATHICA Grove, f. *caulicola*.

No spots. Pycnidia scattered, lens-shaped, depressed, brownish, covered, then erumpent by the vertex, which is pierced by a minute pore; texture parenchymatous, thin, translucent, pale-brown. Spores at first ovoid, 1-celled, then oblong and 1-septate, rounded at the apex, 7–9 × $2\frac{1}{2}$–3 μ. (Fig. 12.)

On dead peduncles of *Campanula Trachelium*, *C. rapunculoides*. Edgbaston; Bidford Churchyard. Oct.–March.

As the spores become 1-septate, they usually become a little longer and a little narrower. But both kinds can be found continually intermixed in the same pycnidium, and so there can be little doubt that *Phyllosticta carpathica* All. & Syd. in Hedwig. xxxvi. p. (157) is merely the younger condition of this fungus.

335. Ascochyta chærophylli Bres. in Hedwig. 1894, p. 207. Sacc. Syll. xi. 523. Allesch. vi. 637.

Spots epiphyllous, fuscous, unbordered, at first small, at length spreading over the leaf. Pycnidia epiphyllous, punctiform, 60–75 μ diam., very pale brown, translucent. Spores subcylindrical, straight or rarely bent, hardly constricted, colourless, with 2 or 4 guttules, 10–12 × 3–4 μ : sporophores very short.

On leaves of *Chærophyllum temulum*. West Kilbride, Ayrshire (Boyd). Nov.

336. Ascochyta Pteridis Bres. in Hedwig. 1894, p. 208. Sacc. Syll. xi. 525. Allesch. vi. 661. Died. Pilz. Brand. p. 393.

Spots scattered, circular or nearly so, very minute, scarcely $\frac{1}{4}$ mm. diam., pale-ochraceous, thickened at the edge, surrounded by a much broader purple-brown border. Pycnidia epiphyllous, few, rather crowded (but sometimes only one on each spot), about 100 μ diam., subglobose, black, piercing the epidermis and at length becoming somewhat superficial; texture thin, pale-brownish. Spores oblong-cylindrical, obtuse at both ends, often bent or flexuose, with a septum which is sometimes median, sometimes above the middle, slightly constricted, 15–20 (or even 30) × 4–6 μ, cloudy and furnished with 2, 4, or more guttules. (Fig. 6.)

On dead pinnules and petiolules of *Pteris aquilina*, lying in damp places. West Kilbride, Ayrshire (Boyd). July.

According to German accounts, the fungus appears first on the living leaves; when it occupies the petiolules, the part of the leaf above that place dies and becomes brown, by which means the presence of the fungus can be recognised at some distance.

337. Ascochyta Stellariæ Fautr. in Rev. Mycol. 1896, p. 68. Sacc. Syll. xiv. 943. Allesch. vi. 665.

Spots none or indefinite. Pycnidia more or less aggregated in patches on the dead leaf, immersed, hardly prominent, 150–200 μ diam., globose-lens-shaped, honey-fuscous, pierced by a pore; texture very thin, membranaceous, pale, except for a narrow dark circle round the faintly projecting pore. Spores irregular, oblong, rounded at both ends, colourless, very clouded and multiguttulate within, eseptate, slightly curved at times and bent as if about to become 1-septate, but not constricted, 23–30 × 6–7 μ. (Fig. 2.)

On fading or dead leaves of *Stellaria uliginosa*. West Kilbride, Ayrshire (Boyd). May.

The spores of these specimens, being irregular in form, sometimes clavate or even pyriform, have a very unusual look for an *Ascochyta*, and have more the appearance of going to be a *Stagonospora*. But there was no septum visible, although there were the usual signs that one or more were going to be formed. The texture of the pycnidium, however, was truly *Ascochyta*-like; the narrow black line around the pore is conspicuous even with a lens.

338. Ascochyta Sonchi, comb. nov. *Phyllosticta Sonchi* Sacc. Syll. iii. 44.

Spots roundish, fuscous-brown with a dark-brown border, 8–15 mm. across. Pycnidia rather crowded, about 100 μ diam., punctiform, blackish. Spores oblong-ovoid, long 1-celled, straight or curved, with 2–4 guttules, $7–9 \times 2\frac{1}{2}$ μ, then 1-septate, $8–10 \times 2–3$ μ, with one guttule in each cell.

On leaves of *Sonchus oleraceus*. Ardrossan, Ayrshire (Boyd); Warwickshire. Aug.

339. Ascochyta Taraxaci Grove.

Phyllosticta Taraxaci Hollós in Ann. Mus. Nat. Hung. 1907, v. 456. Sacc. Syll. xxii. 852.

Spots roundish or somewhat irregular, 4–7 mm. diam., dark brownish-cinereous, often marked with concentric lines, bordered by a narrow black margin. Pycnidia epiphyllous, few, scattered, lens-shaped, blackish-brown, pierced by a pore. Spores oblong-ellipsoid, rarely tapering below, colourless, $9–10 \times 2\frac{1}{2}–3$ μ.

On living leaves of *Taraxacum officinale*. Kilwinning, Ayrshire (Boyd). Aug.

This is the more advanced state of *Phyllosticta Taraxaci*, the spores of which were found in some pycnidia in large numbers mixed with the more mature septate spores, and some pycnidia had only the simple spores, differing from Hollós's description merely in being perfectly colourless.

It is probable that *Septoria Taraxaci* Hollós (*ibid.* p. 462; Sacc. *ibid.* p. 1107) is another form of spore in the same life-cycle, even if not a further development of the *Ascochyta* as that is of the *Phyllosticta*. But *Septoria Taraxaci* Ellis (Trans. Brit. Myc. Soc. 1914, iv. 294) is, as his specimens in Herb. Kew. show, only *Ramularia Taraxaci* misobserved.

340. Ascochyta vulgaris Kab. & Bub. in Œsterr. Bot. in Zeitschr. 1904, liv. 23. Sacc. Syll. xviii. 343.

Var. *Symphoricarpi*.

On *Symphoricarpus racemosus*. Arran (Boyd); Kew Gardens. Aug.

The species, on *Lonicera*, is common; probably both are merely the highly developed form of *Phyllosticta vulgaris* Desm. There is an *Ascochyta* on *Philadelphus* (Lanarkshire; Kew Gardens, etc.) which may be = Saccardo's variety *Philadelphi* (Syll. iii. 19).

341. Darluca Tussilaginis Oud. in Catal. Raison. Champ. Pays-Bas, 1905, p. 442.

Ascochyta Tussilaginis Oud. Contr. Flor. Mycol. Pays-Bas, xvi. in Nederl. Kruidk. Arch. 3. i. 498 (1899); Hedwig. 1898, p. 178. Sacc. Syll. xvi. 931.

Pycnidia numerous, agglomerated, membranaceous, black. Spores oblong-fusoid, 1-septate, slightly constricted, often rounded at both ends, and provided with a gelatinous mucro there, pluriguttulate, $11–15 \times 3–4$ μ.

On fading leaves of *Tussilago Farfara*, among the spermogones of *Æcidium Tussilaginis*. Ardrossan, Ayrshire (Boyd). Late autumn or early winter.

Oudemans met with this fungus in the same situation, and described it further thus:—"Epiphyllous, occupying the centre of the groups of spermogones which are found on the upper face of the leaf opposite to the æcidia." In 1905 he transferred it to *Darluca*, as well as the similar fungi *Darluca contubernalis* (on *Rumex*) *D. ammophila* (on *Ammophila*), and *D. mucronulata* (on a grass, with *Puccinia*). The present species, on *Tussilago*, is interesting, because *Darluca* is usually found in the sori of uredospores or teleutospores. It is by no means impossible that all the described forms of *Darluca* belong to one and the same fungus, which has found an easy mode of living by acting as a parasite on the parasitic Uredines.

(To be continued.)

DR. ANTHONY ROBINSON, OF JAMAICA.

THERE is in the possession of the Institute of Jamaica a collection of drawings, 455 in all, of Jamaica birds, reptiles, fishes, mammals, and plants by Dr. Anthony Robinson, accompanied by volumes of manuscripts treating on the natural history of Jamaica. Unfortunately, the original manuscript is missing; all that the Institute possesses is a copy made under the direction of Robert Long in 1769.

That this copy of the manuscript had a chequered career is evident from the fact that in *The Transactions of the Jamaica Society of Arts* published in 1854, in the Report of the Committee which was preparing exhibits to be forwarded to the Paris Universal Exhibition of 1855, we read:—

"We cannot take leave of this section of our Museum number, without asking what has become of the MSS. and illustrations of animal as well as vegetable products of the island, collected by Dr. Anthony Robinson, now a hundred years ago. On the breaking up of the Jamaica Society, and the distribution of its pillaged and mutilated books in 1850, the MSS. of Anthony Robinson were directed to be deposited in the Library of the University of Glasgow. They were in the hands of Dr. MacFadyen for transmission thither at the time of his lamented death. Into whose hands have they passed, and why have they not reached their destination? We would gladly avail ourselves of them for a transcript to make the first instalment for our Museum."

MacFadyen died of cholera in Kingston in 1850; and the MSS. and drawings lay hidden, until they came into the possession of the Institute at its foundation in 1879.

In 1881, at the request of the Board of Governors of the Institute, the late Sir Edward Newton, K.C.M.G., for some time Colonial Secretary of the Island, consented to edit, with a view to publication, that part of the manuscripts which related to Ornithology; but the work was not proceeded with. In 1894 Professor T. D. A. Cockerell, who had recently resigned the curatorship of the Museum of the Institute, published in the September number of *The American*

Naturalist (pp. 775–780) an article entitled "A Little-known Jamaican Naturalist: Dr. Anthony Robinson," in which he reproduced a number of Robinson's observations on the reptiles of Jamaica; other notes and descriptions are published by P. H. Gosse in his *Naturalist's Sojourn in Jamaica* (1851). In 1920 the portfolios of botanical drawings were lent to Mr. William Fawcett and Dr. Rendle for use in connection with their *Flora of Jamaica*, and they have identified most of the species depicted.

In the West India Reference Library of the Institute is a manuscript book of about the years 1825–30, entitled 'The Omnibus or Jamaica Scrap Book: A Thing of Shreds and Patches. By Jack Jingle.' In this appears the following account of Robinson:—

"Anthony Robinson, Esq., was a native of Sunderland, in the county of Durham, where he served a regular apprenticeship to his father, a man exceedingly respectable in his profession of surgeon and apothecary. From his earliest youth he became attached to botanical studies, and whilst he continued under paternal tuition he devoted all his leisure hours to Gerard, Parkinson, and other ancient herbalists, or to excursions abroad and a collation of their pages with the great volume of Nature. It was not till after his arrival at Jamaica, that he met with the 'Systema Naturæ' and other works of Linnæus, which opened to his mind a new and beautiful theory in his favourite science and engaged it so forcibly, that for several years he scarcely gave attention to any other pursuit. The chief objects of his enquiry in this island were *non descript* plants of which he discovered many, unnoticed either by Sloane or Browne, and he corrected their descriptions of many other plants which had been already discovered. A desire of strengthening and enlivening his ideas of the true generic or specific alliance of the vegetable races naturally first pointed out to him the necessity of an *hortus siccus*; but this having its imperfection, next suggested the necessity of copying Nature more expressively by the pencil, in the management of which although he had never been grounded, yet his natural turn this way very soon enabled him to attain a degree of excellence. The western world presented him with an inexhaustible variety of subjects; and the frequency of his delineations so improved his hand, that, among those specimens he left behind him, were not a few which have been pronounced, by good judges, equal to the works of professed draughtsmen. His judgment was clear and sound, and his memory so retentive, that he could once recount the genera, names, and characters, of above 1000 European plants. He had a great general knowledge in some other sciences, and was particularly well read in modern history. He was distinguished beyond most men for a feeling heart, a warm and steady attachment in his friendships—a behaviour perfectly inoffensive, an integrity that nothing could corrupt—a rigid adherence to truth, and for a pliancy and vivacity of temper which rendered him acceptable to all companies. His only blemish, in short, was a certain thoughtless improvidence, to whose ascendancy it is to be imputed, that the public has never profited by his botanical remarks, which were always hastily scribbled in a hand almost illegible, upon the first scraps of paper he could meet with—these blurred and blotted, and sometimes soiled with dirt, were promiscuously thrown together, from which cause the greater part of them have been irretrievably lost. He never transcribed nor reduced them to any kind of order, still procrastinating this as the destined occupation of some future days of leisure—which unhappily never arrived, for in July 1768 he was seized with a violent illness which terminated fatally. Of his poetry also several essays were left, but never published, but his talent in versification was that in which he least excelled. He was the first discoverer of the art of manufacturing a vegetable soap from the juice of the great American Aloe leaf [*Agave Morrisii* Bak.], and for this invention he received a grant of 100 pistoles from the House of Assembly. This soap, being equally miscible with salt as with fresh water, is therefore very useful to mariners. He obtained from a species of palm tree [*Cycas revoluta* Thunb.], which abounds in the more rocky and arid parts of the island, a very fine and nutritive *farina*, not palpably different from the sago powder. He discovered likewise a vegetable blue dye of rather more brilliancy than indigo. And lastly, it was in attempting to perfect the discovery of a tree balsam [*Symphonia globulifera* L. f.] analogous in quality to the celebrated balsam of Mecca that he underwent a fatigue so excessive as to occasion the disorder of which he died."

[Lunan, in the preface to his *Hortus Jamaicensis* (1814), says that Robinson's manuscripts afforded him "the greatest assistance," and quotes from them in the course of his work. On one of Robinson's descriptions (Hort. Jam. 149, not 169 as stated by De Candolle) is based *Amyris? Robinsonii* DC. Prodr. ii. 82, which Mr. Fawcett identifies with *Hypelate trifoliata* Sw.]

By his Will, dated the 21st of April, 1768, "Anthony Robinson, of the parish of St. Catherine practitioner in Physic and Surgery," after arranging for the payment of his debts and funeral charges by the sale of his negro woman Phyllida and his negro boy, directed the remainder of his estate and effects to be sold, and the value thereof remitted to his sister, Anne Walker, of Sunderland. The will continues:—"Item my Will is that my collection of drawings and writings on plants and other Natural productions shall not be comprehended among the effects so directed be sold or remitted as above mentioned But I do give such collection unto my good friend Robert Long now of the Kingdom of Great Britain Esq in testimony of my regard for him and lastly I do nominate constitute and appoint Edward Long of the parish of Saint Catherine aforesaid Esqre to be my Executor of this my Will."

The Edward Long alluded to is the well-known historian of Jamaica, and Robert was his brother. They were the second and fourth sons of Samuel Long, grandson of the original Samuel Long who came out as Secretary to the Commissioners sent by Cromwell in the Penn and Venables's Expedition. Edward Long was secretary to his second cousin and brother-in-law Sir Henry Moore (Governor of Jamaica and later Governor of New York), and Chief Judge of the Vice-Admiralty Court, but he is best known by his *History of Jamaica*, published in 1774.

There is in the Jamaica Portrait Gallery of the Institute of Jamaica a pencil drawing of Robinson's head made from life by Edward Long. It was formerly in Robinson's collection of drawings.

FRANK CUNDALL.

Robinson's drawings vary much in style. They are sometimes quite rough, just sufficient to indicate important points of structure, and are often accompanied by memoranda for his further use. Most of the drawings are so accurate that it is possible to name them. The manuscript descriptions are good. Robinson's object seems to have been to supplement and, if necessary, to correct Sloane and Browne. For instance, he states his opinion that the genus *Ellisia* of Browne must be the same as *Duranta* of Linnæus; later he receives the new edition (2nd) of Linnæus's *Species Plantarum*, and finds that Browne's plant is described as a new species of *Duranta*, namely, *D. Ellisia*. He described and named new genera, but never published his descriptions. For instance, he gave a generic description with complete drawings of the tree known in Jamaica as the Boar Wood Tree, Hog Doctor Tree, or Hog Gum Tree (*Symphonia globulifera* L. f.) with a generic name (*Higsonia*), and a specific diagnosis. Sloane (Hist. ii. 90), followed by Browne (Hist. Jam. 177, t. 13. f. 3) and De Candolle (Prodr. ii. 67) had assigned the common names to *Rhus Metopium* L. Dr. E. N. Bancroft, of Jamaica, read a paper there in 1829 (published in 1841 in Hooker's Journ. Bot. iv. 136), in which he describes the history of the discovery of the true source of the "hog gum." Bertero was in Jamaica in 1821 and met Higson, a Kingston merchant, and later Island Botanist and Curator of the Bath Garden. Higson showed Bertero the tree growing in the mountains, and Bertero wrote a botanical description of the flowers, and gave a copy to Higson. Bancroft wrote a detailed description of the tree from specimens of flowers and fruit supplied by Higson, with Bertero's notes before him. It is interesting to note that the name *Higsonia* inscribed on Robinson's drawings is there attributed to Bertero.

W. FAWCETT.

ON THE GENERIC NAME WIKSTRŒMIA.

IN 1918 I proposed (Contr. Gray Herb. n. ser. liii. pp. 36–41) to replace the name *Laplacea* H.B.K., under which a good-sized genus of the *Ternstrœmiaceæ* has been generally known for many years, by the earlier *Wikstrœmia* Schrad. At the same time I suggested that the name *Wickstrœmia* Endl., published some years after Schrader's genus, and placed on the list of "*nomina conservanda*" by the International Congress in 1905, should be replaced by *Capura* L. Rehder (Journ. Arn. Arb. ii. p. 158; 1921) and Sprague (Kew Bull. 1921, pp. 175–176; 1921), have shown independently that this course was incorrect, inasmuch as under the International Rules the name *Wickstrœmia* Endl. must be retained in all cases, and therefore *Wikstrœmia* Schrad., although the first use of this name, is unavailable. Mr. Sprague's conclusion that the name *Laplacea* H. B. K., is to be retained for the genus in question under the International Rules is, however, incorrect, and is somewhat incomprehensible in view of the detailed synonymy given in my paper.

A reference to my paper will show that if *Hæmocharis* Salisb. (1806) be rejected under the International Rules, because unaccompanied by diagnosis, and if *Wikstrœmia* Schrad. (5 May, 1821) be rejected because of *Wickstrœmia* Endl. (1833), which, in the form *Wikstrœmia*, has been made a *nomen conservandum*, the earliest name available for the genus is *Lindleya* Nees (21 May, 1821), based upon the same species as *Wikstrœmia* Schrad. Although the name *Lindleya* H.B.K. is now in common use for a genus of Rosaceæ, this use of the name dates only from 1823 or perhaps 1824 (see Barnhart, Bull. Torr. Club, xxix. 597; 1902), and the proper name of the genus in question is *Lindleyella* Rydb. (1908). The name *Lindleya* was also used for two species belonging to *Casearia*, as a plate name only, by Humboldt Bonpland and Kunth*, and later in the same year appears as a *nomen nudum* in Kunth's *Malvaceæ* (p. 10; 1822); but these uses are invalid and, moreover, subsequent to the use of the name *Lindleya* by Nees. The latter therefore stands under the International Rules as the proper name for the genus formerly known as *Laplacea*.

Mr. Sprague gives the date of *Wikstrœmia* Spreng. as 1826. The name, however, was published in 1821, as correctly given in the *Index Kewensis* and in my paper. His statement that "Schrader and Endlicher both used the spelling *Wickstrœmia*, which was corrected by subsequent authors" is also incorrect. Endlicher's spelling was *Wickstrœmia*, but Schrader's was *Wikstrœmia*, as definitely stated in my paper (p. 38).

Two corrections in my own paper may be mentioned. The combination of the names *Wikstrœmia* Schrad. and *Lindleya* Nees, under the latter name, in connection with the publication of *Wikströmia* (sic) Spreng., was made not by Sprengel, but by the editor of the journal in which the name appeared, being signed "Red." The specific name of Schrader's *Wikstrœmia* was originally spelt "*fructicosa*," by an obvious typographical error, and was first given correctly (*fruticosa*) by Nees, *Flora* (iv. pt. 1, 328; 7 June, 1821), who, however, spelled the generic name *Wickstrœmia*. Although by an oversight it was not so stated, the species which I transferred to *Wikstrœmia* in the paper above cited were the American forms only.

S. F. Blake.

It is desirable that no uncertainty should exist as to the interpretation of the International Rules. It is therefore satisfactory that Dr. Blake now agrees that his twenty-four new combinations under

* Nov. Gen. & Sp. v. pl. 479, 480 (Feb. 1822). In one of the two copies of the quarto edition which I have examined in this connection these two plates appear twice, labelled respectively in each case *Lindleya glabra* and *Casearia javitensis*, *Lindleya mollis*, and *Casearia mollis*. In the other copy the plate (479) labelled *Lindleya glabra* is wanting.

Wikstrœmia Schrad. (Contrib. Gray Herb. n. s. liii. 36–41; 1918) are invalid according to the Rules, since the inclusion of *Wikstrœmia* Endl. in the list of "nomina conservanda" precludes the substitution of *Wikstrœmia* Schrad. for *Laplacea* H.B.K.

Dr. Blake finds it "somewhat incomprehensible" that I should recommend the retention of the name *Laplacea* (Kew Bull. 1921, 176). Has he considered the reasons for the recognition of "nomina conservanda"? Technically he is correct in stating that *Lindleya* Nees is the earliest valid name for *Laplacea* under the Rules, but it may be hoped that he will not proceed to re-name all the species accordingly. It was precisely to avoid nomenclatural disturbance of this kind that a list of "nomina conservanda" was provided, and the inclusion of *Laplacea* in the next list would dispose of the difficulty. If the next International Congress decides *against* the claims of *Laplacea* to be put on the list, it will then be time to re-name the species. Pending a decision, the name *Laplacea* H.B.K. should be retained. Otherwise another set of new combinations may have to be relegated to synonymy.

Is it too much to expect from botanists who adhere to the International Rules that they should refrain from making extensive nomenclatural transferences immediately on the discovery of a prior name for a well-known genus? One of the chief aims of the Rules is "the avoidance of all useless creation of names" (Art. 4). Surely the proper course to adopt in such a case is to state the arguments for and against the recognition of the later name as a "nomen conservandum," and to leave the matter for decision at the next International Congress.

Rehder's action with regard to the genus *Erica* may be cited as a commendable instance of nomenclatural restraint. He has shown that the type species of *Erica* is *Calluna vulgaris*. Instead, however, of proposing new combinations for the five hundred species now included under *Erica* he has suggested (Journ. Bot. 1921, 291) that *Erica* Linn. emend. Salisb. should be treated as a "nomen conservandum."

T. A. Sprague.

SHORT NOTES.

Nitellopsis obtusa in Northern India. The recorded distribution of this curious plant is as follows:—Sweden, Finland, Russia, England, France, Germany, Bohemia, and (var. *ulvoides*= *C. ulvoides* Bertol.) Italy. Among the Charophyta in the herbarium of the Botanic Gardens at Calcutta, which, through the courtesy of Sir David Prain, my late brother and I had the opportunity of examining, there is a very poor specimen of a plant collected in 1892 by Abdul Huk at Fort Stedman, Upper Burma; this, in the absence of gametangia of either kind, we could only refer with doubt to this species. Mr. G. O. Allen, has very kindly sent me a tube containing some charophytes in formalin in excellent condition which were collected by him, in the autumn of 1921, in Dhal Lake (about 1500 m.), near Srinagar, Kashmir. The tube contained three species:—*N. obtusa*, both male and female examples, thus settling the plant down as Asiatic; *Lychnothamnus barbatus*, hitherto only recorded from a very few countries in Europe, but known to us as Indian from specimens collected by Sir George Watt and Prof. S. P. Agharkar; and *Chara fragilis*, a very fine form, the antheridium having a diameter of about 550 μ, and the oogonium, including coronula, a length of about 1250 μ. Mr. Allen tells me that the open shallow parts and channels of the large lake in which these plants occurred were carpeted with charophytes, and from the very satisfactory results he obtained, it would appear to be a particularly happy hunting ground for these plants.—James Groves.

Potamogeton × sudermanicus in England. In his *Critical Researches on Potamogeton* (p. 73) (1916), Dr. Hagström names "*P. acutifolius* × *pusillus* L. (*P. sudermanicus* n. hybr.") and describes it. He says "I have named it after my beautiful native county Sudermania, where it has been gathered by Dr. C. J. Hartman. It is labelled 'Rorvik prope Hjelmaren Aug. 1831.' Herb. Upsal."; he very kindly sent me a specimen. The plant was gathered by Mr. C. E. Salmon in "Sussex E., Ditch near Camber Castle. 17.7.1900," and has remained without a certain name until now.—A. Bennett.

A New Form of Wood Violet. The study given to the varieties and hybrids of our violets has led to the recognition of plants that have been regarded either as good species or as forms that leave doubts about their real origin. During the past season I have met with a form that may be only a lusus or sport, or may afford suggestions of an effort of the Wood Violet to throw off its natural modest habit and develop towards a showy head of flowers. From three separate localities in the neighbourhood of Bristol, v.c. 6, I gathered specimens of *Viola Riviniana*, in which the usual single-headed blossom was replaced by three perfect flowers. Each was borne on a short stalk produced together at the top of the main peduncle rising directly from the usual pair of bracts; there were bracteoles as well on these secondary stalks. The general effect of this branched inflorescence was noticeable amongst the normal plants, but the peculiarity did not suggest that a special cause was at work either in the nature of the soil, or from the action of an insect. Had these brought about the change, more examples should have been obtainable close by, and therefore the increase must be attributed to special activity of the protoplasm. It seems out of the common for the effort to show itself in this trifloral manner; should the present sport repeat itself next season, the name forma *multiflora* might be given it.—Ida M. Roper.

Hieracium pulmonarioides Villars. In reporting the occurrence of this plant in Perthshire (Journ. Bot. lviii. 281; 1920) I remarked that it might be found in other British localities and confused with *H. amplexicaule* L. At the end of last September, when I happened to be in Bristol, it occurred to me to look for the plant recorded in Mr. White's *Flora* as *H. amplexicaule* growing on a wall in Richmond Hill, Clifton. This I found to be *H. pulmonarioides.* I also noticed recently, among the latest additions in Hb. Mus. Brit., a sheet of *H. pulmonarioides* sent to the Botanical Exchange Club by Mr. C. Bailey in 1897 from a wall near Saltburn, Yorkshire, under the name of *H. amplexicaule,* and passed as such. The Cleish Castle, Kinross, and the Oxford specimens that I have seen are true *H. amplexicaule* L. When in Northern France last summer, visiting the grave of my eldest son near Arras, I observed *H. pulmonarioides* growing on the ruins of the cathedral there and on the walls of other buildings in the town destroyed in the War. The naturalisation on ruins and old walls in Britain and Northern France of these two similar but perfectly distinct hawkweeds, both natives of the Alps, is a somewhat curious fact that does not seem to admit of a ready explanation.—H. W. Pugsley.

Cerastium hirsutum Tenore. The observations of Mr. F. N. Williams on this species (Journ. Bot. 1921, 352) are rather behind the times. He quotes from Nyman some remarks of mine of the year 1884, but it seems to have escaped him that I have dealt fully with the subject in *Bullettino della Società Botanica Italiana* for 1912, p. 109, and have distributed in Fiori and Béguinot's *Flora Italica Exsiccata,* nos. 1653 and 1654, specimens of the typical glandular form and of my var. *eglandulosum.* Till a few months ago the only known stations for the species were the mountain range that separates the gulfs of Naples and Salerno, where it is exceedingly plentiful, to the exclusion of all forms of *C. arvense* L. or of *C. Columnæ* Ten. (*C. tomentosum* auct.), and the slopes of Vesuvius and Monte Busambra in Sicily. In July 1921 I found it in abundance on Monte Mai, due north of Salerno; this is the first record for the ranges east of the railway-line from Nocera to Salerno. Farther east, north and south, it gives way to *C. Columnæ,* of which the *locus classicus* is Monte Vergine. Specimens from other districts are sometimes wrongly labelled *C. hirsutum*: these are usually *C. arvense* var. *etruscum* mihi, or *C. Scarani* Ten., which is also a form of the *arvense* group. Similar false records—*e. g.* La Mongiana in Calabria—occur in Italian Floras.—C. C. Lacaita.

Tillæa aquatica L. (*Bulliarda aquatica* DC.). The following details supplement the account of this plant given on p. 18:—

Fig. Fl. Danica, ix. fasc. 26, t. 1510 (1816). Blytt, Haandb. Norges Flora, p. 299 (1906)—an excellent figure.

Exsicc. Fries, Herb. Norm. 9, n. 42 (Dec. 1842).

Distrib. Europe. Norway to 63° 45′ n. lat.; Sweden from Scania to Vesterbothen; Finland from Åland to Ostrobothnia borealis c. 66° n. lat.; Denmark; Russia (Petropolis, Livonia); Schlesw.-Holstein; Germany; Bohemia; Moravia.

Asia. Siberia Urals and Siberia E.

Africa. Abyssinia; Nyassaland.

N. America. Canada, United States.

The figure in Fl. Danica represents *T. prostrata* Hornem.=

T. aquatica var. *prostrata* Schkuhr in Usteri Annalen, ii. t. 3 (1791).—Arthur Bennett.

Thomas Nuttall (1786–1859). A short time ago, I was asked by an American correspondent to supply the burial place of Thomas Nuttall, the botanist and ornithologist. I therefore applied to the Mayor of St. Helens, asking him to put my letter in the hands of some local antiquary who could answer my question. The Mayor was kind enough to place it in the hands of Mr. F. R. Dixon-Nuttall, who at once gave the desired information, and from his letter I make the following extract as supplying information of interest not only to botanists but to naturalists generally:—

". . . . Thomas Nuttall lived at Nut-Grove Hall, near Prescot, Lancashire, which was left to him by his brother Jonas, who built it in 1808–9, on condition that he slept there at least one week every six months. One time he was weather-bound just outside the River Mersey, and only arrived home the day before the [period of] six months was up; I remember his speaking of this when I was a boy. He died Sept. 1859, and was interred at Christ Church, Eccleston, near St. Helens. Jonas and Thomas Nuttall were my father's uncles. Jonas left Nut-Grove Hall to my father with the life interest of Thomas Nuttall, and when he died we went to live there."—B. Daydon Jackson.

A Defiled Sanctuary. I should like to endorse Mr. Praeger's condemnation of the interference with the natural vegetation of the Snowdon district (Journ. Bot. 1921, 354). I know of several instances where very amateur botanists, as railway-guards or engine-drivers, have scattered seeds broadcast on the railway-sides, but instances of such interference with natural conditions on the part of competent botanists are happily rare. It is quite possible that some strictly scientific results could be obtained, if proper limitations were able to be put; but it seems practically impossible to exercise the amount of care and control necessary to limit the scope of investigation. The experimental questions would be of a much wider range than the experimenters intended, and future botanists would certainly not bless the hand which introduced needless complications in their attempts to unravel the history of the competitive struggle between the native plants of Snowdonia.—W. Watson.

Calla palustris (p. 21). The reference to this plant as an established Surrey species, omits mention of a second locality, viz., by the Hut Pond, Wisley Common, recorded in Journ. Bot. 1915, 177, where the present writer stated that in recent years it had flourished exceedingly, and in 1914 was quite a feature of the aquatic vegetation, flowering profusely in July. Formerly, the plant grew only in an adjoining swamp, in no great profusion, but since its access to the pond it has increased exceedingly and is a handsome addition to the pond-flora. The locality "between Esher and Claygate" is presumably the well-known Black Pond on Esher Common, where the occurrence of the plant was noted in an interesting article by Dr. H. B. Guppy in *Science Gossip* for 1895, p. 109.—C. E. Britton.

Ophrys neocamusii nom. nov. When I gave the name × *Ophrys olbiensis* to the hybrid *O. arachnitiformis* Gren. et Phil. × *O. Bertolonii* Moret (Journ. Bot. 1914, 271), I was not aware that this name had already been applied to another hybrid *Ophrys, O. bombyliflora* Link. × *O. scolopax* Cav. (Camus, Mon. Orch. Europe, p. 306, 1908). I therefore now replace it by × *Ophrys neocamusii*, in honour of Mdlle A. Camus, joint author of the monograph quoted above and responsible for the anatomical detail of that work, in recognition of her great and numerous services to botanical science.—M. J. Godfery.

REVIEWS.

A Catalogue of British Scientific and Technical Books. Covering every Branch of Science and Technology carefully Classified and Indexed. Prepared by a Committee of the British Science Guild, 6 John Street, London, W.C. 2. 8vo, cloth, pp. xviii, 376. Price 10*s*. net.

The object of this handsome, well-printed volume is to supply "a complete record of scientific and technical books other than those intended for primary schools, and elementary volumes of like nature, in the current lists of publishers in the United Kingdom, and obtainable through booksellers in the usual way." The aim of the Catalogue, although somewhat ambiguously expressed, is admirable; as, from a bibliographical standpoint, is its execution; the classification of the titles—more than six thousand in number—if a little complicated, is rendered easily accessible by the list of contents; there is a very complete "name index," extending to fifty pages, as well as one of subjects: in all these important details the Catalogue could hardly be more satisfactory; moreover, it is admirably printed, in double columns.

The preface makes special mention of the help afforded by Mr. P. Passenger, one of the Committee, "who not only possesses wide knowledge and long experience in the handling of books on science and technology, but is also keenly interested in the cataloguing of them." It is, however, judging from the section on Botany, with which alone we are concerned, in books on science that the Catalogue is weakest; this indeed might be anticipated from the composition of the Committee, in which biologists are hardly represented. In Botany proper—Forestry and Palæontology are separately treated,—which occupies ten pages, a number of useful and standard works are catalogued, but it is not easy to discover on what principle the selection is made. The first entry, for example, is R. A. [H.] Alcock's *Botanical Names for English Readers*, which, published in 1876, is certainly not in "current lists of publishers," and although it stands under the heading "General," can hardly be regarded as "Botany." The entries under "General" should have been grouped; we find among them De Bary's *Bacteria*, though there is a section on Bacteriology. Under "Algæ," none of the works save G. S. West's Cambridge volume are of recent date, nor is George Murray's useful *Introduction* included. Lichens and Mycetozoa are entirely omitted. The entries under "Flora" include such diverse works as Willis's *Dictionary of Flowering Plants* (surely "General"?), Rogers's *British Rubi*, Arber's *Devonian Floras* (Pal.), Mrs. Gregory's *British Violets*, R. T. Baker's *Pines of Australia*; Dr. Druce's *List of British Plants* appears but not the *London Catalogue*, and the same author's *Flora of Berkshire*, but not his *Flora of Oxfordshire*—the other British Floras are those of Hampshire and Bristol; Mr. Thompson's *Flora of the Riviera* is given, but not his *Alpine* nor *Subalpine Plants*; and we find nothing relating to the Swiss Flora. Colonial Floras are well represented, but the *Flora of Jamaica* is omitted; the publications of the Department of Botany seem to be unknown to the Committee, perhaps because, owing to their somewhat cryptic method of publishing, the books issued by the British Museum do not find their way into catalogues. The omissions are as remarkable as the inclusions—Kerner and Oliver's *History of Plants*, Knuth's *Pollination*, Scott's *Fossil Botany*, Warming's *Œcology*, are only examples which might readily be multiplied; on the other hand, two books by Margaret Plues and two by F. G. Heath find place.

It would be easy to extend our criticisms, but enough has been said to show that the object of the Catalogue, so far as Botany is concerned, has not been achieved; nor is this to be wondered at, for we find no evidence that any botanist has taken part in its compilation. This omission, which extends to other branches of biology, and indeed to biology generally, is not easy to understand—there are many who would willingly have coöperated in the work; but it more than suffices to account for the inadequacy of what might have been an extremely useful book.

A Bibliographic Enumeration of Bornean Plants. By E. D. Merrill, *Botanist, Bureau of Science, and Professor of Botany, University of the Philippines, Manila, P. I.* (Journal Straits Branch Royal Asiatic Society, Special Number, Sept., 1921). 8vo, pp. 637. Price $8.50. Raffles Museum, Singapore; London, W. Wesley.

We have more than once had occasion to call attention to the thoroughness which characterises Mr. Merrill's work, and his latest output maintains the high standard of its predecessors. As in those, so in this, Mr. Merrill shows that acquaintance with botany and bibliography which is essential to a complete presentment of the flora of a country; in addition to this, he has the gift of summarising his facts in a manner which is interesting as well as instructive; of this the introduction on the leading features of the Bornean flora, prefixed to the *Enumeration*, is an excellent example.

The scope of the *Enumeration*, which is limited to spermatophytes, is, as its title denotes, mainly bibliographical, but it includes, in addition to a full synonymy, an indication of the general as well as the local distribution of each species, with the names of the collectors and the numbers under which their plants have been distributed. "While certain necessary new combinations have been made, and certain new names proposed, this bibliographic enumeration has not been made a vehicle for the publication of new species, but includes only those that have elsewhere been described." We especially commend the care with which the making of new combinations has been avoided, save in cases of absolute necessity; thus under *Eugenia* the plants assigned to genera relegated to that genus stand in the alphabetical list of species under the name by which they were originally described—thus "*Syzygium campanulatum* Korth." stands between "*Eugenia borneensis* Miq." and "*E. capitata* Merr.": if this practice had been generally adopted we should have been spared the creation of unnecessary synonymy, and it may be hoped that the example now set may be generally followed.

The index is arranged on a somewhat novel plan. Names of genera, whether retained or reduced, are in roman type, those of species, whether accepted or regarded as synonyms, in italic; to the latter is appended the name of the genus to which the plant is referred in the body of the work. In this arrangement we fail to find any advantage; thus, to take an example, having learnt that *Ptyssoglottis anisophylla* is referred to *Hallier acantha*, we still have to turn up the reference in order to ascertain the full name of the plant. The usual plan, by which an index is limited to names, seems to us in every way preferable; the object of an index is not to supply information, but to indicate where information can be obtained; moreover, as here printed, the index occupies more space than is usual, and that again is not an advantage.

Another point which affords ground for criticism is the entire neglect of the opportunity provided by the heads of pages for the conveyance of useful information. In a work such as this, the placing at the head of each page the name of the order treated below is a considerable help to ready consultation: at present it is necessary to refer to the index in order to ascertain where an order is to be found. The practice indicated is that of the British Museum and Kew publications, and it is so manifestly useful that it seems strange that it should not always be followed. The sequence of orders, by the way, is that of Engler and Prantl; we note that, as in Mr. Merrill's other works, names derived from those of persons do not begin with a capital.

It remains to be said that the volume is excellently and carefully printed.

Botany for Students of Medicine and Pharmacy. By F. E. Fritch, D.Sc., Ph.D., F.L.S., and E. J. Salisbury, D.Sc., F.L.S. 8vo, cloth, pp. 357, 163 figs. 10*s*. 6*d*. net. G. Bell: London, 1921.

By the favourable reception of their previous volumes, *An Introduction to the Study of Plants*, followed by *An Introduction to the Structure and Reproduction of Plants*, the authors are quite justified in the production and issue of this handsome and useful volume, which will appeal to a far wider circle of students than that for which it is nominally intended. As the authors imply in the prefatory note, "the ordinary medical syllabus and that of the Pharmaceutical Society's Minor Examination is" much more "than adequately covered." Should the young aspirant, enthusiastic beyond the limits of his examinational syllabus, carefully go through and study the thirty chapters, he will provide himself with the material for a thorough groundwork of structural and physiological botany; and should he acquire a compound microscope, he will find a perennial interest in its use for extending his studies, assisted by the summary in the form of an appendix. The logical sequence of the chapters (and their apt titles) is a commendable feature of the handbook, beginning with the plant considered as a whole and ending with a concise review of heredity and evolution as applied to plants. Moreover, the subject-matter of the text is not disfigured with notes, comments, partisan views, and controversial points. The figures, of which a large proportion are original, are extremely good, though the Potometer represented on p. 159 (fig. 76) may remind one of an Egyptian divinity holding up a sacred symbol with one arm and indicating with the other a hieroglyphic script, so that the *pot*-part seems to support a double function.

The authors are fortunate in their selection of common and familiar types as pegs whereon to hang examples which serve the purposes of discussing variation in structure and function from the biological standpoint, especially where the same types are referred to under several headings. The diligent tyro is encouraged in his general observations when diverse aspects of plant-economy can be readily demonstrated in "easy finds," such as Shepherd's Purse, Horse Chestnut, Buttercup, Dead-Nettle, and Bracken. The subject of the non-living contents of cells (chap. ix.) receives, as it deserves, much more attention than it usually gets in manuals of this kind; the origin and use of such food-substances as starch, sugar, oils, inulin, proteins, built up from simple inorganic compounds, is lucidly dealt with, ending with a useful table of the food-content of various plant-products. In the following chapter a similarly useful table summarizes the action and source, etc. of the principal alkaloids familiar in medicine and pharmacy. The section on the nutritive processes of the plant (chap. xvii) treats the subject in a practical manner (often neglected in text-books), discussing successively water-cultures, chlorophyll, photosynthesis, parasites, saprophytes, and insectivorous plant. The chapter on Classification of Plants is brief, but not out of proportion to the relative importance of the many other subjects dealt with.

The final chapter on Heredity and Evolution is one of the most interesting and lucid in the book, though it will hardly appeal to the average medical or pharmaceutical student. The central idea, borrowed from a great naturalist, is concisely stated:—"The organisms of the present are the offspring of those of the past, and will themselves, in turn, give rise to the organisms of the future. The large numbers of animals and plants which have become extinct, must be supposed to have failed to 'make good' in the competitive struggle." Mutation, hybridization, and the investigations associated with Mendel dealing with dominant and recessive characters, allelomorphs, gametes, and segregation are briefly mentioned. Probably the patient and unassuming student of practical problems ancillary to heredity of characters would prefer to be designated as a Moravian abbot rather than an Austrian monk (p. 326). The book is well printed and the index is carefully done.

F. N. Williams.

A Handbook of some South Indian Grasses. By Rai Bahadur K. Ranga Achariyar, M.A., Indian Agricultural Service, assisted by C. Tadulinga Mudaliyar, F.L.S. 8vo, pp. iv, 318. Government Press, Madras, 1921. Price 4 rupees 8 annas.

This book is intended to serve as a guide to the study of the grasses of the plains of South India, and includes about one hundred species of wide distribution, many of which occur also in other parts of India. The rarer grasses of the plains and those growing on the hills have been omitted; it is proposed to deal with these separately. As an introduction the author briefly describes the general structure of a common species (*Panicum javanicum*), and then at greater length the characters of the vegetative organs, inflorescence, and flower, and the histology of stem and leaf of grasses generally. The greater part of the book is occupied with a systematically arranged descriptive account of the genera and species, the arrangement being that adopted by Sir Joseph Hooker in the *Flora of British India*; keys to the genera included are given under each tribe. The descriptions of the genera and species are adequate and clear, and the illustrations depicting the habit of the plant or the characters of the spike and spikelet are helpful. The practice of beginning each description at the top of a page entails some waste of space and gives an unusual appearance to the text; and the impressions of the figures are not always sharp. The text is, however, clear, and the name of each species stands out well. The handbook should prove very useful to the members of the Agricultural and Forest Departments and others interested in the grasses of the plains of Southern India.

A. B. R.

BOOK-NOTES, NEWS, etc.

The *Quarterly Journal of the Geological Society*, lxxvii. pt. 2 (issued 11th Nov., 1921), contains a joint paper by the late Clement Reid and Mr. James Groves on "The Charophyta of the Lower Headon Beds of Hordle Cliffs." The first part, written by Mr. Reid, is a careful stratigraphical account of the beds from which the specimens were obtained; the second is a systematic account of the fossil remains. These latter consisted for the most part of detached oogonia, in a few cases containing oospores. The vegetative remains comprised a number of small fragments of stems and branchlets, and a few stem-nodes. In no case was an oogonium found attached to the branchlet, and as more than one kind of fruit was found in each bed, it was not possible to identify the fruits with the vegetative parts to which they belonged. The fruits of twelve species are described and figured, ten being treated as new. Two of these are referred to *Tolypella*, closely resembling those of living species of that genus; the rest, in the absence of sufficient evidence to determine their generic position, are placed under the parent genus *Chara*, although the authors do not consider that they all belong to that genus as now understood. The coronules and stalk-cells of the oogonia are missing; and from this fact and the improbability of the spiral-cells when filled with protoplasm being preserved in the clays and limestones, the authors conclude that it is only oogonia, the spiral-cells of which have become calcified, that are present as fossils in these deposits. This would explain the absence of any remains of *Nitella*, the oogonia of which do not form a lime-shell. Some of the "fruits" illustrated resemble those of the living species, while others evidently belong to extinct types. The three excellent plates are from photographs taken by Mr. Reid.

The *Annals of the Bolus Herbarium* (vol. iii. pt. 2; December 1921) contains a description and figure of a new genus (*Pagella*) of *Crassulaceæ*, by Dr. Schonlund; "Novitates Capenses," by Mrs. L. Bolus and others, includes a revision of *Restio*, to which many species of *Hypotæna* and *Leptocarpus* are reduced, by Mr. Pillans; "Notes on *Acmadenia*," by R. A. Dummer; and an account of "The Tyson Collection of Marine Algæ in the Bolus Herbarium" by Dr. Ellen M. Delf, in the course of which the paper on Cape Algæ by "Miss Barton" (Mrs. Gepp), published in this Journal for 1893 is referred to and quoted: there is also a biography with portrait of William Tyson (1851–1920) whose herbarium (save for the Algæ) was acquired by the Cape Government in 1892.

For some years before the War, in which he fell, C. L. Gatin was engaged in an extensive work on the embryo and germination of monocotyledons; the work is being continued by his widow, who publishes in the *Annales des Sciences Naturelles* (issued in November last) a first instalment relating to the *Araceæ*, in the course of which *Arum maculatum* and *A. italicum* are considered: the paper is accompanied by ten plates. In the same number Joseph Magrou has a long paper, with nine plates, on Symbiosis and Tuberisation.

The *Gardeners' Chronicle* for Dec. 24 contains an interesting biographical sketch by Sir David Menzies of Archibald Menzies (1754–1842), illustrated by a portrait and a picture of his birthplace—Stix House, Aberfeldy. It may be worth while to note that several letters from Menzies ranging in date from 1784 to 1795, some of which contain matter of interest, are included in the transcript of the Banksian Correspondence preserved in the National Herbarium.

Nos. 5 and 6 of *Annales Mycologici*, concluding vol. xix., contain a continuation of F. Petrak's "Beiträge zur Pilzflora von Mähren und Österr-Schlesien" with descriptions of many new species; H. Diedicke writes "Ueber einige *Septoria*-Arten" with two new genera—*Rhabdostromina*, based on *Septoria Empetri* Rostr., and *Leptochlamys* (*S. thecicola* B. & Br. var. *scapicola* Karst.): P. Dietel has a paper "Zur Umgrenzung der Gattung *Pileolaria*; and H. Sydow continues his descriptions of "Novæ fungorum species."

The *Botanical Magazine* of Tokio (Oct. 1921) includes an enumeration of Corean *Labiatæ* by Takenoshin Nakai, in the course of which a new species of *Mosla* (*M. leucantha*) is described of economic importance, containing as it does a larger quantity of thymol than *M. Orthodon*. Observations on the life-history of *Isoetes japonica* and *I. asiatica*, with numerous text-figures, are communicated by Noboru Takamine.

The *Naturalist* for January contains a continuation of Mr. J. A. Wheldon's "Key to the Harpidioid *Hypna*" and the first portion of an interesting paper by Mr. T. Petch on "*Statice Limonium* on the north bank of the Humber."

The New Phytologist (xx. no. 5; Dec. 31) contains continuations of Mr. Walter Stiles's paper on "Permeability" and Mr. W. A. Hodgetts's "Periodicity of Freshwater Algæ in Nature"; Messrs. R. H. Dastur and W. T. Saxton discuss "Vegetative Multiplication in *Crotalaria Burhia*" (1 plate); Miss Florence Rich describes and figures a new species of *Cœlastrum* (*C. schizodermaticum*) from Leicestershire; Miss Ethel M. Poulton describes "An Unusual Plant of *Cheiranthus Cheiri*." This is not, we think, as "unusual" as the title of her paper suggests. It forms the subject of a paper by Duchartre (with plate) in Ann. Sci. Nat. 5 s. xiii. 315–339 (1871) and of a note by Robert Holland in this Journal for 1882 (p. 282), and is not infrequently met with.

Mr. A. S. Macmillan is publishing in weekly instalments in the *Somerset County Herald* an interesting list of the popular plant-names of Somerset and the neighbouring parts of Devon, Dorset, and Wilts.

Mr. J. E. Arnett is collecting material for a Flora of Pembrokeshire, and will be glad to receive help: his address is 7 Norton, Tenby.

To Our Readers. We are glad to say that the deficit on the working of the Journal for 1921, although still considerable, has been less than in recent years, and has been met by the balance remaining from the fund raised for its support. The cost of corrections is a heavy item: contributors are asked carefully to revise their MSS. before sending, and to make in proofs only such as are absolutely necessary.

"JOURNAL OF BOTANY" REPRINTS.

In view of the fact that the stock of these is in some cases practically exhausted, the attention of our readers is directed to the list which appears on the following page. Old subscribers of course already possess the matter contained in them in the pages of the *Journal*; but some of them appeared several years ago, and recent subscribers will thus not possess them. Some, which do not appear in the list, are already out of print; of others very few copies remain, and it will of course be impossible to reprint them: among the latter may be mentioned Mr. Dallman's *Notes on the Flora of Denbighshire* (1911), and Mr. Bennett's *Supplement to 'Topographical Botany.'* Of the Supplements to the *Biographical Index* no complete sets remain. It had been hoped before this to issue the second edition of the work, in which these Supplements are of course incorporated, but the present cost of paper and labour has rendered this impossible. Of the *Index* itself no copies remain, these having been lost in the course of transferring the stock to Messrs. Adlard. Mr. Garry's *Notes on the Drawings of Sowerby's 'English Botany,'* containing, as it does, much topographical information and numerous unpublished notes by Smith, Sowerby and others, should be in the possession of all interested in the history of British Botany; only sixteen copies remain.

It may be pointed out that, although for the most part relating to British Botany, certain of the reprints have a more general appeal. Such are the *Index Abecedarius*—a list of the plants in the first edition of Linnæus's *Species Plantarum*, showing at a glance what are included in that work, which has no index of species; the *History of Aiton's 'Hortus Kewensis,'* which contains much information as to the authors and contents of that classical work; the *Flora of Gibraltar*, which, besides a complete list, contains notes on the more interesting species; Linnæus's *Flora Anglica*—the first English Flora—has a bearing upon nomenclature: of all these there are numerous copies.

[*Over.*

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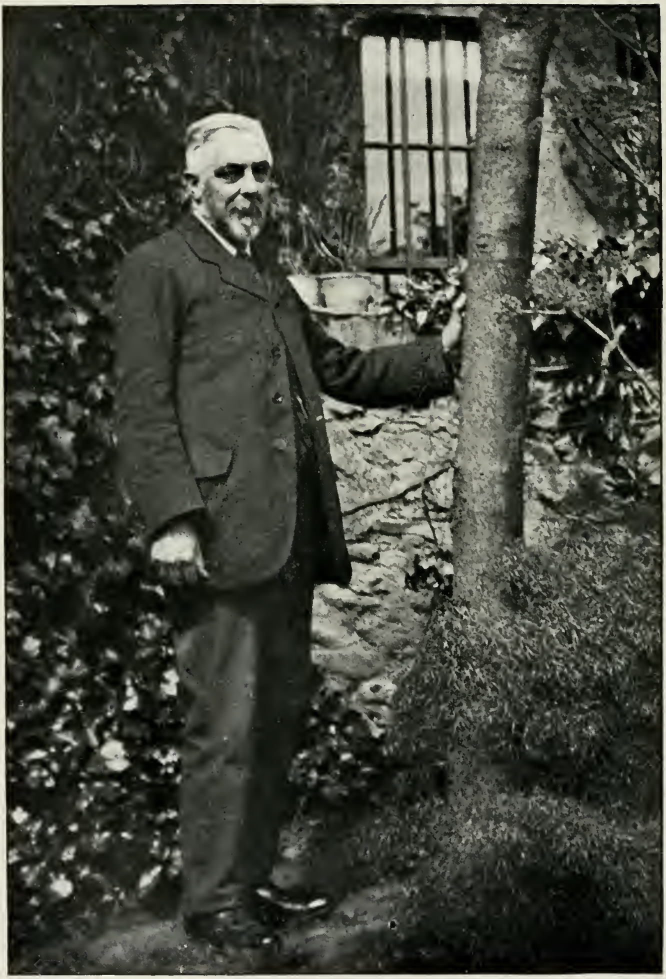

CEDRIC BUCKNALL

CEDRIC BUCKNALL.

(1849–1921.)

(With Portrait.)

On the morning of December 12th, 1921, within a few minutes of waking from his customary rest, there passed away another devoted student of systematic botany, one of the very few remaining of his generation—so woefully thinned of late. The loss of Cedric Bucknall will be widely felt, for those who knew him but little liked him much, while his death was a grievous shock to the comrade who had been almost daily by his side for half a lifetime. Yet surely this was a good ending to a thoroughly good life, and we could not wish it otherwise.

Cedric Bucknall was born at Bath on May 2, 1849. He showed musical tendencies at a very early age, tapping out tunes on a toy harmonicon as soon as he could talk. At fourteen he was the organist of a country church. Then for a while he worked at St. Matthias, Stoke Newington, under Dr. Monk, who highly esteemed his skill as an executant and patience as a teacher. An engagement at Southwell Minster followed. There he married in 1873 and qualified for the degree of Mus. Bac. in Keble College, Oxford. Appointed to the well-known church of All Saints, Clifton, in 1876, he held that post until his death, maintaining the rather elaborate services at a continuous high level of choral excellence.

But although he had adopted music as a profession, taking high rank as an organist and composer, blessed with a marvellous gift of improvisation, and lecturing on harmony and counterpoint in Bristol University, the genuine enthusiasm that inspired his youth waned perceptibly with age. It may be that the monotony of his calling wearied his spirit (he played five services the day before he died), but he was never known to grumble, and, indeed, always seemed interested in the work of training and teaching. Still it was a manifest relief to get away from it all, and on our Continental tours it was never an easy matter to make him touch a piano. On one exceptional night in the Austrian Tyrol I remember that something moved him after dinner to sit down to a concert grand in the big dining-room. Within five minutes all the hotel guests and most of the servants were jostling in the doorways, attracted by unaccustomed melody. Noticing this, the performer plunged straightway into the country's national airs, to the general delight. Bucknall's brain could always supply his fingers with whatever might be needed at the moment; thus in a Palermo drawing-room he accompanied the weird songs of a Roumanian vocalist to her entire satisfaction. Once or twice in humble southern hostelries, when the innkeeper's daughter, in compliment to the foreigners, strummed out our National Anthem, my companion, not a whit behind in courtesy, would follow and play the fitting rejoinder with variations *ad lib.* On the other hand, if there were a large organ within reach, Bucknall would get at it somehow. In Carcassonne, that ancient city, the cathedral organ was under repair, but Bucknall tipped the workmen to blow for him and contrived to show that the violinist's feat of making good music on one string could be matched in other ways. The great church of Santa Maria de Mahon has a fine organ with a curious history of capture at sea during one of the old wars when Minorca was a British possession. By permission of the officiating padre, who, as he himself admitted, played rather as a pianist, Bucknall took his place after a morning service and using every resource of the splendid instrument, trumpets and all, made the old walls resound to his improvisation. The congregation stayed and stared, and the padre threw up his arms in amazement when, on asking whose composition it was he had listened to, he learnt that the music was spontaneous.

This serious young graduate, permeated with the meaning and significance of music, could have gone on to the higher distinction easily enough had he not branched off at the critical period and become absorbed in astronomy and the microscope. So, unhappily, the red gown was never his. He got a big telescope, however, that was not often used, for it could only be effectively set up out of doors. There was no fact nor hypothesis affecting the heavenly host that he could not explain with readiness, especially when planets and constellations invited a talk in the brilliant starlight of the Alps or Mediterranean. He weighed his words too carefully to be a fluent speaker, nor was he a born lecturer; and it must be owned that his sense of humour was not fully developed.

By the microscope Bucknall was led to botany by way of diatoms and fungi. The latter group engrossed his whole leisure for many years; his "Fungi of the Bristol District" (1878–1891), published in the *Proceedings of the Bristol Naturalists' Society*, contains 1431 species with excellent drawings of the more interesting. More than a hundred of these were new to Britain or to science, comprising seven Agaricini (*A. Bucknalli* B. & Br., *A. electicus* Bucknall, etc.) and many micro-species. Of the figures in Cooke's *Illustrations*, forty-four were taken from Bucknall's coloured drawings of Bristol specimens. When the supply of fungi failed him, Bucknall turned his attention to flowering plants; and although that branch of botany was comparatively new to him, his industry and capacity for dealing with difficulties soon secured him a standing among systematists. His critical "Revision of the Genus Symphytum" (Journ. Linn. Soc.) and his work among the Eyebrights, published as a supplement to this Journal in 1917, enhanced a reputation already well founded; while his discovery in the Bristol district of *Stachys alpina*, a plant previously unknown in Great Britain, aroused keen interest among the botanists of the country.

Painstaking and accurate in everything he did, Bucknall's purpose was ever to reach the truth by all available means. Nothing slipshod could be countenanced; he made no shots. Through his pertinacity he often determined the most hopeless-looking material. Tiny scraps among our gatherings in other lands, after their parts had been dissected, sectioned, soaked or boiled, and finally taken to Kew or South Kensington for comparison with books and specimens, sometimes rewarded him by proving of rarity. In the course of such endeavours to reach the bottom of problems that faced him he had learnt to read at least six languages, and could converse in four. He taught Spanish to his choir boys, knowing well that after English it is the most widely spoken language in the world.

Bucknall was an ideal companion on our collecting expeditions, for his patience, sympathy, and tolerance of discomforts that ruffled the nerves and temper of ordinary mortals, never failed. Restricted to an absence of two Sundays or at most three, on account of his engagements, we yet managed to reach Carinthia, the Apennines, Naples, Sicily, the Baleares, and Southern Spain, travelling with hand-baggage only to the farthest point planned in the shortest possible time. As may be supposed, we usually arrived, after days and nights of dozing weariness, dishevelled, ravenous, and as black as tinkers. Revelling till the last minute in the fine air, sunshine, and novel vegetation, we hurried homeward in a like continuous rush. The great War, of course, put a stop to it all, and only one trip has been undertaken since. This was in April of last year, when, in company with the Rev. E. Ellman, we went down the east coast of Spain from Tarragona to Almeria and back by way of Aranjuez, Madrid, and the Escorial. We had sixteen days' collecting, and brought away four hundred species; perhaps the rarest of these was *Paronychia brevistipulata* Lange, of which, according to Nyman, the only existing example was in Lange's herbarium. On this, as on every occasion, Bucknall's instinct for kindness, for the comfort of others, showed itself continually. If among the rooms allotted at an inn there was one especially dark, small, and stuffy, he was instantly installed therein, asserting that a small person was happier in a space that corresponded.

Without doubt Bucknall possessed the foundational virtues of Christian character—faith in truth, a love of justice, and a hatred of all forms of deceit or self-assertion. Now he has gone one feels with sorrow that as a man and as a scientist he leaves a blank that must remain unfilled.

JAS. W. WHITE.

[The photograph here reproduced was taken in Bucknall's garden in 1915.]

SOUTHBYA NIGRELLA (DE NOT.) SPR. IN BRITAIN.

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

WHILE botanizing in Portland, Dorsetshire, early in November 1921, I gathered on the detritus in one of the disused quarries between West Bay and the village of Easton a small quantity of *Cephaloziella Baumgartneri* Schffn., which was growing mixed with a small form of *Weisia calcarea* C. M. On examining this material after my return to Lewes, I found a single well-developed bifurcate stem of

S. nigrella (De Not.) Spr. with a very little younger growth of the same hepatic growing with it. The specimen is very scanty, but in so marked a species is amply sufficient for the purposes of identification.

The genus *Southbya* was founded by Spruce in 1849 (Ann. Mag. Nat. Hist. 2 s. iii. 501) in his paper on the Musci and Hepaticæ of the Pyrenees to commemorate his friend Dr. Anthony Southby, who travelled with him in that region, for the reception of his *S. tophacea*, which he believed to be a new species; this has since been shown to be identical with *Jungermannia scalaris β stillicidiorum* Raddi (1817). The name *Southbya* has been used by various authors, but as limited to the present species and *S. stillicidiorum* (Raddi) Lindb. it appears to form a natural genus between *Alicularia* and *Haplozia*, distinguished from both and from *Eucalyx* by the opposite leaves. I append a description:—

Southbya nigrella (De Not.) Spr. Paroicous. In dark green to blackish tufts. Stem procumbent, oval in transverse section, broader than it is high, often forked, upper surface almost flat, undersurface semicircular in section; rhizoids abundant and long, at first hyaline but turning brown later. Leaves opposite, closely approximate, imbricate, almost circular, broadest at the base, olive green, sometimes almost black on the margin, which is often recurved and sometimes obtusely toothed, folded inwards when dry, showing the black shining undersides. On the under surface of the leaves near the antical margin there is generally a finger-shaped appendage. Leaf-cells thin-walled, angles not thickened, 24 μ at the apical margin, wider in the middle, longer and narrower on and near the postical margin towards the base; cuticle more or less papillose. Under leaves absent except in the immediate neighbourhood of the perianth. Involucral bracts larger than the leaves, erect, concave, coarsely toothed, adherent to one another, and to a smaller extent to the perianth. Perianth small, scarcely equalling the involucral bracts, plicate, irregularly lobed towards the apex; lobes coarsely toothed, bleached, stem somewhat bulbous below the perianth. Capsule almost spherical, brown. Spores reddish brown, 15 to 18 μ, maturing in the spring.

Hab. Detritus of disused quarry, Portland.

S. nigrella is not likely to be confused with any other British hepatic. It has some superficial resemblance to *Alicularia scalaris* (Schrad.) Corda, but it is distinguished from this by the darker colour, the opposite leaves, the absence of under leaves except in the immediate neighbourhood of the perianth, and the black colour of the underside of the leaves, which gives the plant a very peculiar and characteristic appearance when dry, somewhat recalling that of *Riccia nigrella*. Moreover, the *Alicularia* is a plant of siliceous soils, while the present plant is confined to those which are calcareous. It is distinguished from *S. stillicidiorum* by its darker colour and particularly by the black underside of the leaves, the appendage on the underside of the leaves, the more closely approximate leaves, and the paroicous inflorescence.

S. nigrella is widely distributed in the Mediterranean region, where I gathered it near Amalfi several years ago: it comes a long way north in the western parts of France, having been found by M. Douin in the department of Eure et Loir; it is also recorded for the neighbourhood of Rouen. It is probable, therefore, that the species will be found in other suitable places on the limestone in the south and west of England.

THE NOMENCLATURE OF PLANT FAMILIES.

By T. A. Sprague, B.Sc., F.L.S.

According to the International Rules (Art. 15), each natural group of plants can bear only one valid designation—namely, the oldest, provided that it is in conformity with the Rules of Nomenclature and the conditions laid down in Articles 19 and 20. Art. 19 fixes the starting-points of nomenclature for the various groups—1753 for Phanerogamæ. Art. 20 relates to genera only. Families are designated by the name of one of their genera or old generic names with the ending *-aceæ* (Art. 21); but eight names which are not so formed are retained as *nomina conservanda*, namely *Palmæ*, *Gramineæ*, *Cruciferæ*, *Leguminosæ*, *Guttiferæ*, *Umbelliferæ*, *Labiatæ*, *Compositæ* (Art. 22).

It is often troublesome, however, to ascertain the authors and dates of publication of family names, and the result has been that two or more names are in use for the same family. Thus the Willow-herb family is variously known as *Onagraceæ*, *Œnotheraceæ*, and *Epilobiaceæ*, and the Tea family as *Ternstrœmiaceæ* and *Theaceæ*. It is obviously undesirable that botanists who recognize the same Rules of Nomenclature should employ different names for the same group, and it has therefore seemed worth while to ascertain which names should be adopted in such cases.

The first question which arises is: Is the effective date of publication of a family name the date at which it appeared with the termination *-aceæ*; or may names with other terminations be accepted for purposes of priority, the alteration of suffix being regarded as an orthographic correction?

If only those family names published with the termination *-aceæ* were valid, many well-known names would have to go. For example, *Dioscoreaceæ* (1836) would be replaced by *Tamaceæ* (1821), although the family name *Dioscoreæ* dates from 1813. This was the view taken by Barnhart (Bull. Torr. Bot. Cl. xxii. 2; 1895).

The convention by which the names of orders, families, and tribes are made to end in *-ales*, *-aceæ*, and *-eæ* respectively was not proposed until 1836 (Lindley, Nat. Syst. ed. 2, p. xiii), and was not generally adopted until many years later. Names of plant families were usually feminine adjectives agreeing with the word "Plantæ," which was understood. Most of those proposed by Linnæus (Phil. Bot. 27; 1751) were descriptive, such as *Spathaceæ*, *Coniferæ*, *Compositæ*, *Umbellatæ*, *Asperifoliæ*, *Siliquosæ* and the like. A. L. de Jussieu (Gen. Pl. p. lxxii; 1789), on the other hand, employed many plurals of typical genera (or old generic names)—e. g., *Junci*, *Onagræ*, *Nyctagines*, *Polemonia*. Such names were afterwards felt to be inappropriate, as they should denote, strictly speaking, only the species of *Juncus*, *Onagra*, *Nyctago*, and *Polemonium* respectively. A. P. De Candolle (Théorie Élém. 213; 1813) accordingly adopted the following suffixes which had been used by various authors to indicate that the families were composed of plants related to their type genera: *-aceæ*, *-iceæ*, *-eæ*, *-ineæ*, *-aneæ*, *-arieæ*, *-ideæ*, e. g., *Tiliaceæ*, *Hippocraticeæ*, *Menispermeæ*, *Cistineæ*, *Flacourtianeæ* (ed. 2; 1819), *Onagrarieæ*, *Polemonideæ*. The actual form given in the Théorie Élémentaire was gallicized in accordance with prevailing custom in books of a semi-popular nature. The corresponding Latin forms were mostly given by the authorities cited by De Candolle. The choice of the particular suffix was largely a matter of euphony. Such diversity of termination for groups of the same rank was found to be confusing, especially for teaching purposes, and Lindley (*l. c.*) accordingly advocated the uniform adoption of the suffix *-aceæ* for family names.

It is, I think, clear from this brief historical sketch that the priority of a family name formed from that of a genus should date from its first publication with a diagnosis, notwithstanding that it may have appeared in the form of the plural of the genus or with some suffix other than *-aceæ*. In such cases the name of the original author should be cited in parentheses. Whatever rule is adopted, however, it will be necessary to have a list of *nomina conservanda* for families, in order that well-known names may not be superseded on purely technical grounds.

A few examples may now be considered of family names which should be accepted under the International Rules.

The name *Scheuchzeriaceæ* has been adopted in recent years by some authors in place of *Juncaginaceæ* (Buchenau in Engl. Pflanzenreich, iv. 14; Engl. Syll. ed. 7, 120). But *Juncaginaceæ* is valid under the Rules. It was formed from the old generic name *Juncago* Tourn. (adopted in Moench, Meth. 644; 1794), a synonym of *Triglochin*, and was published in 1836, whereas *Scheuchzeriaceæ* dates only from 1858. The forms *Juncagines* and *Juncagineæ* are still earlier. Incidentally it may be mentioned that *Scheuchzeriaceæ* Agardh was a segregate from *Triglochineæ* and included only *Scheuchzeria*.

JUNCAGINACEÆ (L. C. Rich.) Lindl. Nat. Syst. ed. 2, 367 (1836).

Juncagines L. C. Rich. Anal. Fruit, p. ix (1808).

Juncagineæ L. C. Rich. in Mém. Mus. Par. i. 365 (1815); M. Micheli in DC. Monogr. Phan. iii. 94.

Triglochineæ Dumort. Anal. Fam. 59, 61 (1829); Agardh Theor. 42.

Scheuchzeriaceæ Agardh Theor. 44 (1858); Buchenau in Engl. Pflanzenr. iv. 14, 1.

Lilæaceæ Hieron. in Ber. Ges. Naturf. Freunde Berlin, 1878, 116.

The case of *Roxburghiaceæ* versus *Stemonaceæ* is even clearer. The family *Roxburghiaceæ* was published by Wallich in 1832, and it was not until 1879 that the name was changed to *Stemonaceæ*. Similarly *Chailletiaceæ* antedates *Dichapetalaceæ* by many years, whether priority is reckoned from publication with the suffix *-eæ* or with *-aceæ*; and *Canellaceæ* has priority over *Winteranaceæ*.

ROXBURGHIACEÆ Wall. Pl. As. Rar. iii. 50 (1832); Benth. et Hook. f. Gen. Pl. iii. 746.

Stemonaceæ Franch. et Sav. Enum. Pl. Jap. ii. 92 (1879); Engl. in Engl. et Prantl, Pflanzenfam. ii. Abt. 5, 8.

CHAILLETIACEÆ (R. Br.) DC. Prodr. ii. 57 (1825); Benth. et Hook. f. Gen. Pl. i. 340.

Chailleteæ R. Br. in Tuckey, Congo, 442 (1818).

Dichapetaleæ Baill. in Mart. Fl. Bras. xii. pars 1, 365 (1886).

Dichapetalaceæ Engl. in Engl. et Prantl, Pflanzenfam. iii. Abt. 4, 345 (1896).

CANELLACEÆ Mart. Nov. Gen. iii. 170 (1829); Benth. et Hook. f. Gen. Pl. i. 121.

Winteranaceæ Warb. in Engl. et Prantl, Pflanzenfam. iii. Abt. 6, 314 (1895); Engl. Syll. ed. 7, 266.

The case of *Ficoidaceæ* versus *Tetragoniaceæ* and *Aizoaceæ* is not quite so simple. *Ficoïdes* Tourn. is a synonym of *Mesembryanthemum*, and *Ficoïdea* Dill. is *Aizoön*. Jussieu's name *Ficoïdeæ* was derived from the former: the French form was "les Ficoïdes," and "Ficoïde" was the vernacular name of *Mesembryanthemum* (Gen. 317). If family names ending in *-eæ* are accepted for purposes of priority, then the family should be called *Ficoidaceæ*; if, on the other hand, the earliest family name in *-aceæ* is adopted, then it becomes *Tetragoniaceæ*. *Aizoaceæ* is a synonym in any case.

FICOIDACEÆ (Juss.) Rohrb. in Mart. Fl. Bras. xiv. pars 2, 307 (1872).

Ficoïdeæ Juss. Gen. 315 (1789); Benth. et Hook. f. Gen. Pl. i. 851.

Ficoïdæ Mirb. Elem. ii. 898 (1815).

Aizoïden Spreng. Anleit. ed. 2, ii. 842 (1818).

Aizoïdeæ Spreng. Syst. ii. 473, sub nn. 1852–3, 1858–9 (1825).

Mesembrinæ Link, Handb. ii. 12 (1831).

Tetragoniaceæ Link, l. c. 17 (1831); Lindl. Nat. Syst. ed. 2, 209.

Mesembryaceæ Lindl. Nat. Syst. ed. 2, 56 (1836).

Mesembryanthemeæ Fenzl in Ann. Wien. Mus. i. 347 (1836).

Sesuviaceæ Horan. Tetractys Naturae, 29 (1843).

Aizoaceæ A. Br. in Aschers. Fl. Brandenb. i. Einleit. 60 (1864); Pax in Engl. et Prantl, Pflanzenfam. iii. Abt. 1 B, 33.

Molluginaceæ Rohrb. in Mart. Fl. Bras. xiv. pars 2, 229 (1872).

Mesembrianthemaceæ Lowe, Fl. Madeira, 306 (1868).

Mesembryanthemaceæ Baill. Hist. Pl. ix. 46 (1886).

Engler and others have adopted the name *Œnotheraceæ*, but *Onagraceæ* has priority over all other names for the Willow-herb family, whether the earliest form or the form ending in *-aceæ* is taken. *Epilobiaceæ*, erroneously attributed to Ventenat by De Candolle in 1828, was cited in synonymy, and the publication was therefore invalid under the International Rules.

ONAGRACEÆ (Adans.) Dumort. Anal. Fam. 36, 39 (1829).
Onagræ Adans. Fam. ii. 81 (1763); Juss. Gen. 317.
Œnotheratæ Neck. in Act. Theod. Pal. ii. 489 (1770).
Epilobianæ Vent. Tabl. iii. 307 (1799).
Onagrariæ Juss. in Ann. Mus. Par. iii. 315, 473 (1804).
Onagreæ Blume, Bijdr. 1131 (1826).
Onagrideæ Dumort. Fl. Belg. Prodr. 88 (1827).
Epilobiaceæ "Vent." ex DC. Prodr. iii. 35 (1828), in syn.
Onagrarieæ Cambess. in A. St.-Hil. Fl. Bras. Mer. ii. 253 (1829); Benth. et Hook. f. Gen. Pl. i. 785.
Circæaceæ Lindl. Synopsis, 109 (1829).
Œnothereæ Endl. Gen. 1188 (1840).
Onagrariaceæ Baill. Hist. Pl. vi. 458 (1877).
Œnotheraceæ (*Œnotheracées*) Van Tiegh. Traité Bot. 1513 (1884); Engl. Syll. ed. 7, 283.
Jussieuaceæ Drude in Schenck, Handb. iii. II. 385 (1887).

Those who treat the *Samydaceæ* and *Flacourtiaceæ* as constituting a single family should adopt the former name under the Rules. The family *Samydeæ* was published in 1807; the name *Flacourtianeæ* dates from 1815, and the description from 1824. Reichenbach united the two families in 1827 under the name *Samydeæ*.

SAMYDACEÆ (Vent.) Dumort. Anal. Fam. 16, 18 (1829); Benth. et Hook. f. Gen. Pl. i. 794.
Samydeæ Vent. in Mém. Inst. 1807, ii. 149; Reichb. in Mössl. Handb. i. p. lix, sensu lato.
Flacurtianæ L. C. Rich. in Mém. Mus. Par. i. 366 (1815), in obs., nomen.
Homalinæ R. Br. in Tuckey, Narr. Congo, 438 (1818).
Flacourtianeæ (*Flacourtianées*) DC. Théor. Élém. ed. 2, 244 (1819), nomen; DC. Prodr. i. 255 (1824), descr.
Paropsiaceæ Dumort. Anal. Fem. 37, 42 (1829).
Flacurtiaceæ Dumort. l. c. 44, 49.
Flacourtiaceæ Lindl. Nat. Syst. ed. 1, 21 (1830); Warb. in Engl. et Prantl, Pflanzenfam. iii. Abt. 6 A, 1.
Kiggelariaceæ Link, Handb. ii. 221 (1831).
Blackwelliaceæ Schultz, Nat. Syst. 444 (1832).
Patrisiaceæ Mart. Consp. 58 (1835).
Homaliaceæ Lindl. Nat. Syst. ed. 2, 55 (1836).
Pangieæ Blume in Tijdschr. Nat. Geschied. i. 132 (1833); Ann. Sc. Nat. sér. 2, ii. 90 (1834).
Pangiaceæ Lindl. Nat. Syst. ed. 2, 70 (1836); Endl. Gen. 922 (1839).

Those, on the other hand, who accept the delimitation of *Bixineæ* given by Bentham and Hooker (Gen. Pl. i. 122) should use the name *Bixaceæ* for the group, as *Bixinæ* dates from 1822, and no description of *Flacourtianeæ* was published until 1824. The *Bixaceæ* are perhaps more usually treated as a separate family nowadays, either including *Cochlospermum* and *Amoreuxia* (Pflanzenfam. iii. 6, 310) or not (Engl. Syll. ed. 7, 266). The dates of publication of the various forms of the family name are as follows:—

BIXACEÆ (Kunth) Reichb. Consp. 190 (1828); Warb. in. Engl. et Prantl, Pflanzenfam. iii. Abt. 6, 307.

Bixinæ Kunth, Malv. 17 (1822); H. B. K. Nov. Gen. v. 351 (1823).

Bixineæ DC. Prodr. i. 259 (1824); Benth. et Hook. f. Gen. Pl. i. 122.

The name *Theaceæ* should be adopted for the family more generally known in this country as *Ternstrœmiaceæ*. The two families *Theaceæ* and *Ternstrœmieæ* were proposed in the same paper in 1813 by Mirbel, who separated them from the *Aurantiaceæ*. *Theaceæ* included *Thea* and *Camellia*, and *Ternstrœmieæ* comprised *Ternstrœmia* and *Freziera*. David Don (1825) was the first author to unite the two families, and he chose the name *Theaceæ*: this choice cannot be reversed by subsequent authors (Art. 46). It may be mentioned that *Ternstrœmieæ* has "priority of place," but this is not an effective consideration under the International Rules.

THEACEÆ (*Théacées*) Mirb. in Bull. Soc. Philom. iii. 381 (1813); D. Don, Prodr. 224 (1825); Szysz. in Engl. et Prantl, Pflanzenfam. iii. Abt. 6, 175.

Ternstrœmieæ (*Ternstromiées*) Mirb. l. c.

Ternstrœmiaceæ R. Br. in Abel, Narr. 378 (1818); Benth. et Hook. f. Gen. Pl. i. 177.

Camelliaceæ Dumort. Anal. Fam. 43, 47 (1829).

The acceptance of the name *Aquifoliaceæ* for the family typified by *Ilex* seems to be contrary to the Rules. The name appeared in 1813, but without description (DC. Théor. Élém. ed. 1, 217), and the publication was therefore invalid. De Candolle in 1825 gave a description of the group under the name *Aquifoliaceæ*, but treated it *as a tribe* of *Celastrineæ* (DC. Prodr. ii. 11). Under Art. 46, when a tribe becomes a family the earliest name received by the group in its new position must be regarded as valid, if it is in conformity with the rules, unless there exist any of the obstacles indicated in the articles of section 7. Now the earliest valid name for the group *as a family* is *Ilicineæ* Brongn. (1827). Bartling did not raise *Aquifoliaceæ* to the rank of a family until three years later. The publication of *Iliceæ* Dumort. (1822) was invalid owing to the absence of a description. Those who accept for purposes of priority other suffixes than *-aceæ* should use the name *Ilicaceæ*; those who adopt the first name ending in *-aceæ* will of course uphold *Aquifoliaceæ*.

ILICACEÆ (Brongn.) Lowe, Fl. Madeira, ii. 11 (1868).

Iliceæ Dumort. Comm. Bot. 59 (1822), sine descr.; Anal. Fam. 21, 27 (1829), descr.

Ilicineæ Brongn. in Ann. Sc. Nat. x. 329 (1827); Benth. et Hook. f. Gen. Pl. i. 355.

Aquifoliaceæ Bartl. Ord. 228, 376 (1830); Kronfeld in Engl. et Prantl, Pflanzenfam. iii. Abt. 5, 183.

CRITICAL NOTES ON SOME SPECIES OF *CERASTIUM*.

By Frederic N. Williams, F.L.S.

(Continued from Journ. Bot. lix. 1921, 353.)

154. C. holostea Hornem. Hort. Bot. Hafniensis, 434 (1813):—"Caule adscendente foliisque lanceolatis mollissime pubescentibus, pedunculis reflexis." Sent to Hornemann by Fischer in 1812 from the Gorenki Garden in Russia. But it is not mentioned in Fischer's "Cat. Jard. Comte A. de Razoumoffsky à Gorenki" (1812). The question of how this account of a Russian nobleman's garden was printed with a French title and introduction while the French army was marching on Moscow I cannot solve. Fischer afterwards sent specimens to herb. Cand. labelled "*C. holosteum*," and these Seringe described in the *Prodromus*, i. 415, under the name of "*C. davuricum* var. *holosteum*." Reduced to typical *C. nemorale* Bieb. by Fenzl in Ledeb. Fl. Rossica, i. 401. Seringe's description is somewhat different:—"Foliis lanceolato-linearibus amplexicaulibus subciliatis, caule pedunculisque subpilosis." As *C. holostea* is not a var. of *C. davuricum*, it is actually an earlier name than *C. nemorale*, but the description is too vague and too scrappy.

155. C. holosteiforme Schur, Enum. pl. Transsilv. 119 (1866).—This is a long and carefully drawn-up description of *C. semidecandrum*, to which it has been referred by Simonkai, Enum. fl. Transsilv. 132 (1866), after examination of authentic specimens in herb. Lemberg. Found in grassy places near Nagy-Szeben (*Germ.* Hermannstadt), in Rumania, prov. of Transylvania (till recently in Hungarian territory). Stated by Schur to have the habit of *Holosteum umbellatum*.

156. C. holosteoides Fries, Novit. fl. Suecic. 32 (fasc. 3, 1816–17); et Fl. Hallandica (1817); = *C. triviale* var. *holosteoides* Rchb. Fl. Germ. excurs. 796 (1832).—1–3 dcm. Caules secus intermedia alterna bifariam unilineato-pubescentes (ut cf. *Stellaria media*), ceterum glabri, laxe dispositi, magis autem robusti quam in typo. Folia oblonga nitida ciliata. Bracteæ 4 mm., ciliatæ. Pedicelli centrales 5–9 mm., pilosi. Flores majores. Calyx 5 mm.; sepala glabrescentia, vel pilis paucis longis instructa. Petala longiora quam in typo. Capsula 1 ctim.

The above description is based on two sheets of specimens in Herb. Kew.:—(1) authentic examples of Fries, Herb. norm. Scand. fasc. xv. n. 42, from Carlskrona in the amt of Blekinge, and (2) examples from Tyneside, near Newcastle (J. Storey, 1846, no. 193 *b*).

Hab. Britain, France, Norway, Sweden, Denmark, Germany, Czecho-Slovakia, Austria, and Rumania.—When the plant is entirely glabrous, it is the form *glabratum* Neilr. Fl. Nied. Oesterr. 798 (1859). It is described by Reichenbach as "glabriusculum, humilius plerumque, in pascuis siccioribus." It is well figured in his Ic. Plant. crit. ii. 318, 319.

Distrib. in Britain. Hampshire: Isle of Wight, top of Shanklin down, and on Bembridge down, near the fort, with *C. pumilum*

(Townsend, *Flora*, ed. 2, 63). Surrey. Cheshire. Northumberland: near the river Tyne, above Redheugh (Baker & Tate, *Flora*, 140). Durham: Langdon Dale (Baker & Tate, *l. c.*). Kirkcudbrightshire. Wigtownshire: along the river Luce. Stirlingshire. Perthshire: common on the banks of the Firth of Tay, and along the river Earn where it joins the Tay (White, *Flora*, 80). Londonderry: on the south side of the Bann, near Coleraine (Cyb. Hib., ed. 2, 53).—In these places it nearly always is found in the meadows on the banks of rivers which are frequently flooded with fresh tidal water.

Mr. G. C. Druce suggests that it is the plant referred to by Dillenius (in Ray's Syn. ed. 3 [1724], 349), "ad ripas Thamesis prope Battersea, cum foliis glabris, inven. D. Doody":—*Cf.* Cambr. Brit. Fl. iii. 49 (1920).

157. C. HUMIFUSUM Cambess. in St. Hil. Fl. Brasil. mer. ii. 166 (1829); Rohrb. in Martius, Fl. Brasil. xiv. ii. 279 (1 Feb., 1872).—Not included in the "Provisional List," as, not having seen specimens, I was not sure of its systematic position in the genus.

Subg. *Strephodon.* Glabrum, annuum. Caules 1–2½ dcm., humifusi debiles repentes, ad nodos sæpe rudicantes, ramellis decumbentibus pluribus, obvie sulcati. Folia 10–30 × 3–9 mm., oblonga, sensim ad basin vix ad apicem angustata, inferiora internodia æquantia. Flores pauci solitarii in dichasio aperto dispositi, longe pedicellati, pedicellis 25–50 mm., adscendentibus filiformibus glanduloso-puberulis. Sepala 4 × 1½ mm., ovato-oblonga puberula. Petala 8 mm., oblonga biloba, unguibus glabris. Filamenta glabra. Capsula 7 mm. Semina tuberculata fusca.—In wet places and marshes.

Hab. Brazil: prov. Rio Grande do Sul, near the village of Sao Francisco de Paul, at the south end of the Lago dos Patos, and at the north end near the town of Porto Alegre.—Argentine: on the Rio de la Plata, near Buenos Aires; on the Sierra al Sud de San Roque and on the Sierra Arhala (1881).

The description based on specimens in Herb. Kew. ex herb. J. Ball (1881), from the last two localities in Argentina. Quite unlike any species of the eastern hemisphere. Overlooked by Grenier in his monograph (1841).

158. C. IANTHES nobis, in Bull. Herb. Boiss. vii. 131 (Févr. 1899).—A slender annual plant, of the habit of *C. nutans*, from which it differs in the higher covering of short hairs, broad apiculate leaves, looser and more spreading flowers, with acute sepals.

Hab. Coast of Japan (Herb. U.S. North Pacific Expl. Exped. 1853–56 (*Wright*).

Described from authentic specimens in Herb. Kew., I have nothing to add since.

159. C. ILLYRICUM Ard. Animad. Bot. spec. ii. 26, n. 12, t. 2 (1763).—From Corsica eastward to Syria, on Mt. Lebanon (*Boiss.* Fl. Orient. i. 720). It is an oriental species, the Corsican variety being *C. illyricum* var. *androsaceum* nobis, in Journ. Bot. 1899, 212 (under n. 80), and there described from Soleirol's Pl. de Corse, n. 1007. With *C. pedunculare* forms the section Cryptodontia. Good typical specimens in Herb. Kew. from the island of Thasos,

Greece (*Sint. & Bornm.* It. Tucicum, 1891, n. 370); also from the valley of Lacedæmon, Vourlia, and the Stymphalian lake, in the nome of Lacedæmon (*J. S. Mill*, 1842).

160. C. IMBRICATUM H. B. et K. Nov. Gen. Sp. Amer. vi. 28 (1823).—Rohrbach distinguishes three varieties of this under the species, all represented in Herb. Kew., in *Linnæa*, xxxvii. 292, 293 (1871–73). They are on three separate sheets.

α. *genuinum.*—Folia dense quadrifariam imbricata; calyx 4 mm.; petala et capsula calyce longiora.

Hab. Ecuador: the Andes south of Quito, at 3600–4420 metres, near the summits of Mt. Cotopaxi and Mt. Antisana (*Humboldt, Jameson*).

β *laxum.*—Folia, internodiis paullum longioribus, parum remota; calyx 4 mm.; petala calycem æquantia; capsula eum subsuperans.

The few capsules on the specimen are much shorter than in α.

Hab. Ecuador: the Andes south of Quito, on Mt. Antisana,—"in the neighbourhood of the farm of Antisana."

γ *Mandonianum.*—Folia imbricata; calyx 2–2½ mm.; petala et capsula calycem æquantia.

Hab. Bolivia: prov. Larecaja, near Sorata, Apacheta de Chuchu, at 4200 metres (*Mandon* Pl. Andium Boliv. 1856, n. 981).

161. C. INCANUM Hoffm. Hort. mosq. ann. 1808, n. 805, ex Bieb. Fl. Taur. Cauc. iii. 320 (1819): = *C. grandiflorum.*

162. C. INCANUM Ledeb. in Mém. Acad. Pétersb. v. 540 (1815); et Fl. Altaïca, ii. t. 149 (1830); Ser. in Cand. Prodr. i. 418, n. 34 (1824); = *C. arvense* var. *angustifolium* lusus 2, Fenzl in Ledeb. Fl. Rossica, i. 413. Pubescens. Cauliculi stricti confertifolii, inferne pilis elongatis eximie reversis vestiti. Folia caulina majora oblonga vel late linearia, ramorum ac fasciculorum anguste linearia vel lineari-lanceolata basi attenuata. Lobi petalorum ovato-oblongi.

Hab. Russia (chiefly Siberia).

There are four specimens in Herb. Kew.:—(1) Subalpine pastures of Snoktau by the R. Lepsa, prov. of Semirechinsk, south of Lake Balkash (*Karel. & Kiril.*, 1841, Enum. pl. Soungar. n. 184; (2) Pl. exs. Soc. Imp. Nat. Cur. Mosq. n. 1316; (3) Island of Kolguev, in the Arctic Sea (*Col. Fielden*, 1895); (4) Altaï (*Karel & Kiril.* Enum. pl. Altaïc. n. 177). But, according to Fenzl, in Ledeb. Fl. Rossica, i. 782, addend. (1842), this last belongs to *C. triviale* var. *leiopetalum.*

It also occurs in the European province of Cis. Caucasia.

163. C. INCANUM Schur, Sertum fl. Transsilv. n. 540 (1853); = *C. arvense* var. *incanum* Schur, Enum. pl. Transsilv. 123 (1866). Pubescens, pilis brevissimis incano-glandulosis vestitum. Cauliculi geniculati ad medium foliati, superne nudi. Folia minora tenuiter hirsuta. Flores minores multi trichotomo-cymosi. Petala spathulata.—Pl. 2½–3 dcm.

As Simonkai points out, Enum. fl. Transsilv. [addend.] p. 618 (1886), this is not the same as the Siberian plant of Ledebour.

The descriptions of both are here given, to indicate the points of deviation from the type,—chiefly in the very short hairs and the much smaller leaves in the latter, which is also completely glandular.

Hab. Rumania: near Brasov (formerly Kronstadt) and near Hammersdorf (both in prov. of Transylvania).—Germany: near Insterburg in prov. of E. Prussia.

This last locality is based on a poor specimen (without capsules) in Herb. Kew. labelled "C. incanum" (*Kuehn*, 1895, ex herb. Churchill), and agreeing well with Schur's description, and certainly not with that of Ledebour. There are 3–5 flowers to each dichasium, bent backwards at the top of the pedicels, the central one being subtended by scarious bracts, and it is obviously a perennial plant with leafy stems very tufted at the base. It has the characteristic facies of *C. arvense*.

164. C. INDICUM Wight & Arn. Prodr. fl. Ind. Or. 43 (1834); Wight, Illustr. i. t. 26 (1840); Hooker f. Fl. Brit. Ind. i. 227; Trimen, Fl. Ceylon, 85 (1893); Gamble, Fl. Pres. Madras, 61 (Nov. 1915).

Hab. Madras Presidency: Nilgiri and Anamalai Hills, in the Utakamand district, and Palni Hills in the Madura district, Ceylon. Ascends to 2000 metres.

Among Asiatic species seems nearest to the Mesopotamian *C. macrocarpum* Boiss. & Haussk. It was overlooked in Grenier's *Monograph*, as probably he had not seen the Indian Flora. There are nine sheets of specimens in Herb. Kew.:—

(1) Nilgiri Hills (ex herb. *Wight*, sub Cat. n. 149); (2) Nilgiri Hills, Kaity Brow (*F. Foulkes*, n. 2957, 26 Dec., 1850); (3) ex herb. *Griffith*, n. 107; (4) Palni Hills, 1836 (ex herb. *Wight*, n. 111); (5) Nilgiri Hills, Kaity Brow (Pl. Ind. Or. n. 1512, ed. *Hohenacker*); (6, 7, 8) Palni Hills (*A. Sanlière*, n. 364), and Bombay Shola and Kodaikamal (1897,—no collector's name); (9) Nilgiri Hills, at 456 metres (*Viscount Gough*).—There are Ceylon specimens in Herb. Mus. Brit., but not at Kew. Trimen correctly says, "I find the styles always 5, not 3, as given in Fl. Brit. Ind."

165. C. INFLATUM Link ex Desfont. Cat. Fl. Hort. Paris, ed. 3, 462 (in addit., 1832).—Ind. Kew. cites "Link ex Sweet, Hort. Brit. ed. 2, 57" (1830), where, however, it is only a *nomen nudum*. Grenier, Monogr. 45, cites ed. 2 of Desfontaine's *Catalogue* (1818), as the earliest reference, where it is not to be found. Ed. 3 was published in 1830; but the Kew Library copy has not the *additamentum* of 1832 (*i.e.* pp. 417–484).

Closely allied to *C. dichotomum* Linn.—from which it is distinguished by the more branching stems, the broader ovate-lanceolate leaves, and the distinctively inflated calyx, inclosing a capsule the size of a small cherry. As Grenier points out, both are cultivated "in hortis botanicis." See also Grenier in Acad. Sc. Besançon, séance publ. 24 Août 1839, 124.

Hab. Turkey, Syria, Palestine ("Arabia Petræa"), Persia, and British Baluchistan.—There are 5 sheets of specimens in Herb. Kew.

Turkey.—Kurdistan: Mts. Ak-dagh and Bey-dagh, and Mt. Akker-dagh above Marash (*Boiss.* Fl. Orient. i. 721); Mardin, on rocky places (*Sintenis*, It. Orient. 1888, n. 871, in Herb. Kew.).

Umbellatæ, *Asperifoliæ*, *Siliquosæ* and the like. A. L. de Jussieu (Gen. Pl. p. lxxii ; 1789), on the other hand, employed many plurals of typical genera (or old generic names)—e. g., *Junci*, *Onagræ*, *Nyctagines*, *Polemonia*. Such names were afterwards felt to be inappropriate, as they should denote, strictly speaking, only the species of *Juncus*, *Onagra*, *Nyctago*, and *Polemonium* respectively. A. P. De Candolle (Théorie Élém. 213 ; 1813) accordingly adopted the following suffixes which had been used by various authors to indicate that the families were composed of plants related to their type genera : *-aceæ*, *-iceæ*, *-eæ*, *-ineæ*, *-aneæ*, *-arieæ*, *-ideæ*, e. g., *Tiliaceæ*, *Hippocraticeæ*, *Menispermeæ*, *Cistineæ*, *Flacourtianeæ* (ed. 2 ; 1819), *Onagrarieæ*, *Polemonideæ*. The actual form given in the Théorie Élémentaire was gallicized in accordance with prevailing custom in books of a semi-popular nature. The corresponding Latin forms were mostly given by the authorities cited by De Candolle. The choice of the particular suffix was largely a matter of euphony. Such diversity of termination for groups of the same rank was found to be confusing, especially for teaching purposes, and Lindley (*l. c.*) accordingly advocated the uniform adoption of the suffix *-aceæ* for family names.

It is, I think, clear from this brief historical sketch that the priority of a family name formed from that of a genus should date from its first publication with a diagnosis, notwithstanding that it may have appeared in the form of the plural of the genus or with some suffix other than *-aceæ*. In such cases the name of the original author should be cited in parentheses. Whatever rule is adopted, however, it will be necessary to have a list of *nomina conservanda* for families, in order that well-known names may not be superseded on purely technical grounds.

A few examples may now be considered of family names which should be accepted under the International Rules.

The name *Scheuchzeriaceæ* has been adopted in recent years by some authors in place of *Juncaginaceæ* (Buchenau in Engl. Pflanzenreich, iv. 14 ; Engl. Syll. ed. 7, 120). But *Juncaginaceæ* is valid under the Rules. It was formed from the old generic name *Juncago* Tourn. (adopted in Moench, Meth. 644 ; 1794), a synonym of *Triglochin*, and was published in 1836, whereas *Scheuchzeriaceæ* dates only from 1858. The forms *Juncagines* and *Juncagineæ* are still earlier. Incidentally it may be mentioned that *Scheuchzeriaceæ* Agardh was a segregate from *Triglochineæ* and included only *Scheuchzeria*.

JUNCAGINACEÆ (L. C. Rich.) Lindl. Nat. Syst. ed. 2, 367 (1836).

Juncagines L. C. Rich. Anal. Fruit, p. ix (1808).

Juncagineæ L. C. Rich. in Mém. Mus. Par. i. 365 (1815) ; M. Micheli in DC. Monogr. Phan. iii. 94.

Triglochineæ Dumort. Anal. Fam. 59, 61 (1829) ; Agardh Theor. 42.

Scheuchzeriaceæ Agardh Theor. 44 (1858) ; Buchenau in Engl. Pflanzenr. iv. 14, 1.

Lilæaceæ Hieron. in Ber. Ges. Naturf. Freunde Berlin, 1878, 116.

The case of *Roxburghiaceæ* versus *Stemonaceæ* is even clearer. The family *Roxburghiaceæ* was published by Wallich in 1832, and it was not until 1879 that the name was changed to *Stemonaceæ*. Similarly *Chailletiaceæ* antedates *Dichapetalaceæ* by many years, whether priority is reckoned from publication with the suffix *-eæ* or with *-aceæ*; and *Canellaceæ* has priority over *Winteranaceæ*.

ROXBURGHIACEÆ Wall. Pl. As. Rar. iii. 50 (1832); Benth. et Hook. f. Gen. Pl. iii. 746.

Stemonaceæ Franch. et Sav. Enum. Pl. Jap. ii. 92 (1879); Engl. in Engl. et Prantl, Pflanzenfam. ii. Abt. 5, 8.

CHAILLETIACEÆ (R. Br.) DC. Prodr. ii. 57 (1825); Benth. et Hook. f. Gen. Pl. i. 340.

Chailleteæ R. Br. in Tuckey, Congo, 442 (1818).

Dichapetaleæ Baill. in Mart. Fl. Bras. xii. pars 1, 365 (1886).

Dichapetalaceæ Engl. in Engl. et Prantl, Pflanzenfam. iii. Abt. 4, 345 (1896).

CANELLACEÆ Mart. Nov. Gen. iii. 170 (1829); Benth. et Hook. f. Gen. Pl. i. 121.

Winteranaceæ Warb. in Engl. et Prantl, Pflanzenfam. iii. Abt. 6, 314 (1895); Engl. Syll. ed. 7, 266.

The case of *Ficoidaceæ* versus *Tetragoniaceæ* and *Aizoaceæ* is not quite so simple. *Ficoïdes* Tourn. is a synonym of *Mesembryanthemum*, and *Ficoïdea* Dill. is *Aizoön*. Jussieu's name *Ficoïdeæ* was derived from the former: the French form was "les Ficoïdes," and "Ficoïde" was the vernacular name of *Mesembryanthemum* (Gen. 317). If family names ending in *-eæ* are accepted for purposes of priority, then the family should be called *Ficoidaceæ*; if, on the other hand, the earliest family name in *-aceæ* is adopted, then it becomes *Tetragoniaceæ*. *Aizoaceæ* is a synonym in any case.

FICOIDACEÆ (Juss.) Rohrb. in Mart. Fl. Bras. xiv. pars 2, 307 (1872).

Ficoïdeæ Juss. Gen. 315 (1789); Benth. et Hook. f. Gen. Pl. i. 851.

Ficoïdæ Mirb. Elem. ii. 898 (1815).

Aizoïden Spreng. Anleit. ed. 2, ii. 842 (1818).

Aizoïdeæ Spreng. Syst. ii. 473, sub nn. 1852–3, 1858–9 (1825).

Mesembrinæ Link, Handb. ii. 12 (1831).

Tetragoniaceæ Link, l. c. 17 (1831); Lindl. Nat. Syst. ed. 2, 209.

Mesembryaceæ Lindl. Nat. Syst. ed. 2, 56 (1836).

Mesembryanthemeæ Fenzl in Ann. Wien. Mus. i. 347 (1836).

Sesuviaceæ Horan. Tetractys Naturae, 29 (1843).

Aizoaceæ A. Br. in Aschers. Fl. Brandenb. i. Einleit. 60 (1864); Pax in Engl. et Prantl, Pflanzenfam. iii. Abt. 1 B, 33.

Molluginaceæ Rohrb. in Mart. Fl. Bras. xiv. pars 2, 229 (1872).

Mesembrianthemaceæ Lowe, Fl. Madeira, 306 (1868).

Mesembryanthemaceæ Baill. Hist. Pl. ix. 46 (1886).

Engler and others have adopted the name *Œnotheraceæ*, but *Onagraceæ* has priority over all other names for the Willow-herb family, whether the earliest form or the form ending in *-aceæ* is

S. PURPUREA L. Ippolyts Brook, below Oakfield, ♀; Ash Brook; Cadwell Common, ♂ & ♀; Burford's Ray; Charlton Mill Head, ♂.

S. VIMINALIS L. Ash Brook, near Oakfield, ♂ & ♀; The Willows, Dog Kennel Farm, ♀; pond near Dye's Farm, Langley, probably planted. For hybrids, see below.

× S. ACUMINATA Sm., ♀. Pond on Midland Railway near Ickleford, about 20 trees or bushes. "Very fine specimens of *S. acuminata* Sm." E. F. Linton. A single tree, ♀, in a boggy swamp on the right bank of the Hiz, opposite the lower end of Hitchin Sewage Farm.

S. CAPREA L. Typical bushes or trees in the woods on higher ground; Wain Wood; Titmore Green; Knebworth Great Wood. Those on the lower ground near watercourses more open to suspicion of hybridism with *S. cinerea.* (f.) *androgyna.* Vicarsgrove Wood; Rush Green.

S. caprea × *viminalis* (*S. mollissima* Sm.). (1) ♂. Pond on right bank of river Hiz, opposite the lower end of Hitchin Sewage Farm. "I think undoubtedly correct" E. F. Linton. (2) ♀. Near Great Wymondley (det. W. H. Pearsall); pond, Ickleford. "I suppose correct, but am not quite satisfied that *S. caprea* is the other parent" E. F. Linton. If my determinations are correct, this is one of our commonest hybrids, and occurs in addition at Gt. Wymondley Springs; Walsworth, above the footbridge; watercourse from Letchworth to Purwell; hedgerow near the top entrance to Hitchin Sewage Farm.

S. AURITA L. The type, ♂ & ♀, is found in some abundance north of Knebworth Great Wood, and near Dye's Farm, but appears to be absent north of this region. Its place is there taken by *S. aurita* × *cinerea.*

S. aurita × *caprea* ♀. Lane between Rush Green and Dye's Farm, Langley. "Yes, a very good intermediate: the *aurita* bracteoles show very clearly" E. F. Linton.

S. aurita × *cinerea*, 1 ♂. On the Ash Brook. "*S. aurita*! × with, I suppose, a strain of *S. cinerea* in it" E. F. Linton. 2 ♀. Pond, halfway between Dye's Farm and Rush Green, Langley. "I agree" E. F. Linton. Burleigh Meadows, Langley. "*S. aurita* × *cinerea* ♀, correct," E. F. Linton.

S. CINEREA L. Typical. Spring by roadside, halfway between Charlton and Well Head, ♂; Great Wymondley Springs, ♀; The Willows, ♀; Ippolyts Brook, below Brook End, ♂; lane between Grove Mill and Hyde Mill. In two localities, viz., at Oughton Head and in the triangle between the Midland and Great Northern Railways, typical *S. cinerea* is intermixed with plants having the leaves of *S. cinerea,* but suggesting by their glabrescent buds and twigs (sometimes reddish) the hybrid *S. aurita* × *cinerea.*

S. cinerea × *viminalis.* ♂. Folly Alder Swamp, Hitchin. "Apparently correct: adult leaves desirable" E. F. Linton. Near Sootfield Green, ♂ (with *S. cinerea*, ♀, *S. viminalis*, ♂, and *S. caprea*, ♀). "An interesting form from its brighter green colouring" E. F. Linton.

NEW OR NOTEWORTHY FUNGI.—VIII.

By W. B. Grove, M.A.

(Continued from p. 49.)

342. Microdiplodia Salicis Died. in Flor. Mark Brand. Pilz. ix. 598.

Pycnidia gregarious, occupying long stretches of the twigs, covered, at length bursting the epidermis at the summit, depressed-globose, thick-walled, 60–70 μ diam.; texture very dark brown, with an indistinct pore. Spores shortly cylindric or oblong, with rounded ends, scarcely or not constricted, brown, $8–10 \times 3\frac{1}{2}–4\frac{1}{2}$ μ.

On dry dead branches and twigs of *Salix*. Bagshot Woods, Aug. 1920, in company with *Diplodia salicina* Lév.

343. Hendersonia vagans Fckl. Symb. Myc. p. 392.

Var. Corni, var. nov.

Pycnidia round or oblong, convex, up to 400 μ diam., black, covered, then bursting the epidermis, surrounded by a brownish stain; texture very soft and yellowish-brown, composed of small cells. Spores oval or elliptic-oblong, acute at base, more obtuse above, pale yellowish-brown, very translucent, with one, then often two, more rarely three septa, $10–13 \times 4$ μ; sporophores linear, filiform, persistent, $10–15 \times 1$ μ.

On twigs of *Cornus alba*. Kilwinning, Ayrshire (Boyd). Dec.

Distinguished by its pale colour and long slender sporophores. The 2-septate spores were very common; in them the loculi were sometimes equal, but usually one septum was median, and the other at the lower quarter length. Hendersonias like *vagans* should form a distinct section of the genus.

344. Camarosporium Pini Sacc. Syll. iii. 465. Allesch. vii. 259. *Hendersonia Pini* Westd. in Bull. Acad. Belg. 2, ii. no. 7.

f. *conorum*, nov. f.

Pycnidia up to $\frac{1}{2}$ mm. diam., rather crowded, black, very convex, roundish or elongated, covered by the epidermis, then bursting it irregularly or by a slit; texture thick, dark, indistinct, paler inwards. Spores oblong, rounded at both ends, often slightly curved, 3-septate, not or hardly constricted, with frequently one or two longitudinal divisions, $15–18 \times 7–8$ μ, cells uniformly brown, the central cells often shorter than the terminal ones; sporophores short and indistinct.

On cone-scales of *Picea excelsa*. Hereford. May.

The spores were of all sizes and colours, from small hyaline ones, exactly like those of *Phoma strobiligena* Desm., through 1-septate or brownish up to those of a *Hendersonia*, one or two of the central cells finally becoming divided by a longitudinal septum.

345. Stagonospora hygrophila Sacc. in Malpigh. xiii. 22, 1899, f. iii 2. Syll. xvi. 947.

Spots on both sides, mostly marginal, more or less semicircular, whitish, with a rather broad burnt sienna border. Pycnidia amphigenous, globose-lens-shaped, blackish-brown, opening with a pore, 100 μ diam., at first covered, then erumpent; texture thin, brownish.

Spores oblong-fusoid, when young eseptate and biguttulate, 7–9 × 2 μ, then 1-septate, with 2, 3, or 4 guttules, 12–16 × $2\frac{1}{2}$–3 μ, hardly at all constricted, faintly curved at times, hyaline, occasionally with a mucous appendage at the end; all these forms occurring in the same pycnidium.

On living leaves of *Oxalis Acetosella*. Dalry, Ayrshire (Boyd). July, 1919.

Evidently an earlier state of the variety recorded in Journ. Bot. 1918, p. 318, as var. *vermiformis*. The latter was found by Mr. Boyd in August 1918, about $4\frac{1}{2}$ miles from Dalry. The link between the two forms is furnished by the type specimens of Saccardo, which had spores 17–20 × 3–$3\frac{1}{2}$ μ, with three septa. By referring back to no. 314, *Phyllosticta Oxalidis*, and remembering that the spots on which these various fungi occur are all of exactly the same character, it will be seen that there is a strong suggestion of a series resembling that of *Septoria Chenopodii* (see Journ. Bot. 1917, p. 346). This gradual change of spore-form and spore-size, as development advances, has been overlooked by many observers in the past, and its recognition must react greatly upon the conception of a "species" among the Cœlomycetes.

Many of the younger forms showed no trace of colour in the spores, whereas those of Saccardo and of the var. *vermiformis* both had a faint yellowish tinge. The four guttules possessed by the largest of the spores of the present gathering are a step towards the formation of the lateral septa of the later forms: even in the variety *vermiformis* there were a few spores which were 4-guttulate, but only 1-septate.

The occurrence of more than one form of spore upon the same host and even upon the same "spot" is, of course, no proof of genetic connection, although the "spots" may in many cases be regarded as pure cultures: but, when the various forms occur in the same pycnidium, it would require strong evidence to rebut the suggestion of a common origin.

AMPHORULA, gen. nov.

Pycnidia immersa, solidiuscula, carbonacea. Sporulæ ampulliformes, longirostratæ, septatæ, hyalinæ.

Genus *Kellermaniæ* Ell. & Ev. (in Journ. Mycol. 1885, p. 153; Sacc. Syll. x. 337) affine, sed forma sporularum pycnidioque solidiore bene distinctum.

346. **Amphorula sachalinensis**, sp. unica.

Pycnidiis sparsis, depresso-globosis vel placentiformibus, 300–750 μ diam., vix papillatis, immersis, epidermide tectis eique primo arcte adhærentibus, eandem postea poro orbiculari minutissimo deinde ampliore v. rimiformi penetrantibus, postremo epidermide emortua desiliente superficialibus aut subinde cum eadem dilapsis, diu astomis, atris, periodio crasso opaco sed stratum versus proliferum pallidiore circummunitis. Sporulis elliptico-fusoideis, superne in longum rostrum filiforme attenuatis, rostro incluso 40–60 μ longis, parte inferiore elliptica $15–22 \times 2\frac{1}{2}–4\ \mu$, achrois, sæpe guttulatis, dein tenuissime 1-septatis, sporophoris rectis brevibus suffultis. (Fig. 1.)

Hab. in stipitibus emortuis *Polygoni sachalinensis*, in horto culti, Sutton Coldfield, mensibus Jun. Jul. per annos plures reperta.

This species presents a certain resemblance to *Kellermania Polygoni* Ell. & Ev. (*op. cit.* 1886, p. 111), and to *K. Rumicis* Fautr. & Lamb. (in Rev. Mycol. 1897, p. 141; Sacc. Syll. xiv. 964), but differs from the description of both in the thick and many-layered (not membranaceous) pycnidial wall. In the type species *K. yuccigena*, moreover, the subulate beak is a distinct and definite appendage to the spore, much as the bristles of *Pestalozzia* are, whereas in *A. sachalinensis* the beak is a mere prolongation of the spore, not separable from it, but continuous with it. This beak is occasionally curved or flexuose, and is often longer than the basal portion; except for that, the whole spore bears a strong likeness in outline to an exaggerated shoemaker's awl. The median septum is quite distinct, especially after treatment with iodine, but the one or two other lateral septa which were occasionally suspected are uncertain, and may be only false appearances in the protoplasm. The texture of the thick pycnidial wall is close and hard, composed of parenchymatous cells, of which the outer are dark brown, and the inner ones gradually paler; the proliferous stratum is colourless, and lines the whole of the inside cavity. It is conceivable that *K. Polygoni* and *K. Rumicis* (of which unfortunately neither specimens nor figures are at hand) belong likewise to *Amphorula*, and should be called *A. Polygoni* and *A. Rumicis*, but *K. yuccigena*, of which original specimens have been examined, certainly does not.—On the same stems at Sutton Coldfield *Myxosporium Polygoni* Grove also occurred.

347. Septoria Jasiones, comb. nov.

Phlyctæna Jasiones Bres. in Hedwig. 1897, p. 381. Sacc. Syll. xiv. 987. Allesch. vi. 939.

Pycnidia hypophyllous, scattered or aggregated, subglobose or lens-shaped, blackish, 60–100 μ diam.; texture parenchymatous in the centre, paler and more prosenchymatous towards the margin, darkest round the ostiole. Spores elongated, filiform, straight or more often arcuate, scarcely guttulate, $20–35 \times 1–1\frac{1}{4}\ \mu$. (Fig. 8.)

On living and dead leaves, stems, and involucral bracts of *Jasione montana*. Stevenston and West Kilbride, Ayrshire (Boyd). Aug.

These specimens agree so closely with the description of Bresadola that there can be little doubt of their identity. But they are not a *Phlyctæna*; the pycnidium is complete, all round, and exactly that of a typical *Septoria*. The fungus appears to be a parasite, since it is found on the stem, etc., of the still living plant.

348. Septoria polaris Karst. in Hedwig. 1884, p. 38. Sacc. Syll. iii. 523. Var. scotica, var. nov.

Spots indistinct, brownish-black or fuliginous, without any distinct border. Pycnidia here and there densely aggregated, mostly epiphyllous, immersed, then emergent, globose-conical, black, up to 100 μ diam., at length pierced by a pore; texture very thin, pale brown, of loose parenchymatous cells. Spores linear-fusoid, tapering at both ends, straight or somewhat curved, furnished with a row of guttules, $33–35 \times 1\frac{1}{2}\ \mu$. (Fig. 7.)

On fading leaves of *Ranunculus Flammula*. Kilwinning, Ayrshire (Boyd). July.

Differing a little from Karsten's species in the proportions of the spores, but the spots are almost exactly the same. His specimens were on *R. lapponicus*.

349. **Septoria Polypodii**, sp. n.

Maculis nullis. Pycnidiis sparsis, discretis, sed interdum breviter seriatis v. aggregatis, orbicularibus, lentiformibus, prominulis, atronitidis, $100–150\ \mu$ diam., poro minuto ($7–8\ \mu$ diam.) pertusis; contextu parenchymatico, tenui, membranaceo, sed impellucido, brunneo-fuliginoso, circa porum obscuriore. Sporulis copiosis, angustissimis, filiformibus, plerumque rectis, hyalinis, eguttulatis, $35–45 \times \frac{1}{2}\ \mu$, sporophoris linearibus, achrois, septatis, arrectis, spora triplo v. quadruplo amplioribus, $9–10 \times 1\frac{1}{2}\ \mu$ suffultis.

Hab. in foliis emortuis *Polypodii Phegopteridis*, Glen Falloch, Perthshire (Boyd), Maio.

The pycnidia usually occupy the rachis, and the petiolules and nerves of the leaflets. On the petioles of the same leaves was *Leptostromella Polypodii* (see no. 359), a species allied to *L. Scolopendrii* Sacc. *Septoria Polypodii* is not identical with *S. Asplenii* Ell. & Ev. in Proc. Acad. Philadelph. 1895, p. 434.

350. Septoria posoniensis Bäuml. in Hedwig. 1885, p. 75. Sacc. Syll. x. 367. Allesch. vi. 757.

Spots roundish, 3–6 mm. diam., greyish-green or dark-cinereous, without any distinct border, very inconspicuous. Pycnidia epiphyllous, closely gregarious, globose, $60–130\ \mu$ diam., immersed, penetrating the epidermis with a rather prominent widely-pierced papilla; texture thin, pale-fuscous, darker round the ostiole. Spores numerous, filiform, flexuose or bent, faintly and minutely guttulate, $25–56 \times 1{\cdot}3–1{\cdot}5\ \mu$.

On living leaves of *Chrysosplenium oppositifolium*. West Kilbride, Ayrshire (Boyd). Aug.

351. Septoria Sii Rob. & Desm. in Ann. Sci. Nat. 1853, xx. 92. Sacc. Syll. iii. 529. Allesch. vi. 857.

Spots roundish or angular, very irregular, brownish, then paler, often surrounded by a paler border. Pycnidia epiphyllous, minute, brown, slightly prominent. Spores filiform, straight or curved, with numerous guttules, $30–40 \times 2\frac{1}{2}\ \mu$, emerging in colourless tendrils.

On leaves of *Sium erectum*. West Kilbride, Ayrshire (Boyd). Sept.

352. Rhabdospora Euphorbiæ Brun. Liste Sphærops. p. 52. Sacc. Syll. x. 396. Allesch. vi. 903.

? *Phoma Euphorbiæ* f. *amplior* Brun. in Bull. Soc. Sci. Nat. Nantes, 1894, iv. 34. Sacc. Syll. xiv. 884. Allesch. vii. 801.

Pycnidia crowded, gregarious, subepidermal, then erumpent by a slit, $120–200\ \mu$ diam., shining, black; texture thick, dark olive-brown. Spores cylindrical, usually straight, sometimes with a faint guttule at each end, $10\frac{1}{2}–18 \times 2\ \mu$; sporophores very short.

On dead stems of *Euphorbia palustris.* Edgbaston Botanic Gardens. Feb.–Mar.

353. Leptothyrium macrothecium Fckl. Symb. Myc. p. 383, pl. 2. f. 28. Sacc. Syll. iii. 633; Fung. Ital. pl. 1489. Allesch. vii. 338. ? *L. protuberans* Sacc. Syll. iii 635. ? *Ceuthospora concava* Desm. Sacc. Syll. iii. 280.

Pycnidia hypophyllous, scattered, oblong or hemispherical, convex, dull (not shining), $\frac{1}{2}$–1 mm. long, brownish-black, mouthless; texture above of small brown parenchymatous cells, thicker below and brown. Spores fusoid, curved, acute at the lower or both ends, $6–8\frac{1}{2} \times 1–1\frac{1}{2}\ \mu$; sporophores fasciculate, linear-filiform, furcate or branched, colourless, $15–20 \times \frac{3}{4}\ \mu$, rising from the lower thick stratum.

On dead and fragile leaves of *Cornus alba.* Kilwinning, Ayrshire (Boyd). Dec.

Distinguished by its dull opaque appearance, and by its occurrence on leaves, from the polished and shining *L. protuberans* Sacc., which I have found near Birmingham on dead stems of *Epilobium angustifolium*, and Mr. Boyd on dead branches of *Rubus* in Ayrshire. The specimens on *Cornus* appear to be identical with Berkeley's on Rose leaves, named *Ceuthospora concava* Desm. in the Herbarium at Kew, which have exactly similar spores. Saccardo records *L. macrothecium* on leaves of *Potentilla*, *Tormentilla*, *Rosa*, and *Quercus*. Very possibly *L. protuberans* is only the stem-form of the same species, but it is larger and has a shining surface.

Shear and Dodge (*Mycologia*, 1921, xiii. 135–170), show that one of the forms of *L. macrothecium*, which produces a disease on Strawberry fruits, etc., in the United States, has a Discomycetous stage to which they give the name *Pezizella Lythri* (Desm.), with a conidial stage belonging to the genus *Hainesia.* They consider that the same fungus has been recorded under many names and attacks on enormous number of plants (over fifty), including in addition to those mentioned above, *Pelargonium*, *Œnothera*, *Lythrum*, etc., and occurring alike on leaves, stems, and fruits.

354. Leptothyrium melaleucum, nom. nov.

Pycnidiis epiphyllis, $\frac{1}{4}–\frac{1}{3}$ mm. latis, atris, convexis, rotundatis v. angulatis, intus pseudolocellatis, cuticulam tandem rima stelliformi findentibus; parte superiore tenui, olivaceo-brunnea, cellulas epidermicas occupante, inferiore subsimili at crassiore, strato prolifero hyalino, subgelatinoso. Sporulis copiosis, linearibus, rectis, utrinque obtusis v. interdum basi subacutatis, coacervatis etiam achrois, muco tenui obvolutis, $8–9 \times 1\frac{1}{2}–1\frac{3}{4}\ \mu$, sporophoris linearibus, erectis, subæquilongis suffultis.

Hab. in foliis *Vaccinii Vitis-idææ*, Killin, Perthshire (Boyd), Jul., socio *Lophodermio melaleuco* De Not.

The pycnidial wall is pseudoparenchymatous; the subhyaline layer which lines it below is composed of elongated cells running parallel to the wall, and the sporophores arise from these latter cells at right angles. The layer of elongated cells also extends upwards in places, and divides the cavity into pseudoloculi as in many species of *Cytospora.* The upper pycnidial wall which occupies the epidermal cells finally destroys them, so that ultimately the pycnidium is covered only by the persistent cuticle.—On the stems of the same twigs was the thick convex *Lophodermium cladophilum* Rehm (=*Sporomega cladophila* Duby), of which *L. melaleucum* should probably be considered merely the leaf-form. There are now many instances known where the same fungus assumes on the leaves a less-developed and simpler form than on the stems.

(To be continued.)

RHACOPILOPSIS TRINITENSIS E. G. Britt. & Dixon.

By H. N. Dixon, M.A., F.L.S.

(Rhacopilopsis Ren. & Card. in Rev. Bryol. xxviii. 47 (1900)).

Syn. *Dimorphella* (C. M.) Ren. & Card. in Bull. Soc. Roy. bot. Belg. xli. 101 (1902–3), *Hypnum* sect. *Dimorphella* C. M. in *Flora*, 1886, p. 523.

This genus was based on an African moss which later proved to be identical with *Hypnum Pechuelii* C. M. Because C. Mueller referred it to a new section (*Dimorphella*) it was later described as a genus, and it is as *Dimorphella* that Brotherus listed and figured the African species (Engl. & Prantl, Pflanzenfam. ii. 1083; fig. 770).

Subsequently Cardot referred two specimens from French Guiana, collected by Gouverneur Rey in 1906, to *Rhacopilopsis*, as varieties of the African *Dimorphella Pechuelii*. Specimens of these were sent by Mons. I. Thériot to Mrs. Britton, who found on comparison that they were at least very close to the Trinidad plant described in 1851 by C. Mueller as *Hypnum trinitense* (Syn. Musc. ii. 284), subsequently placed by Mitten (in *Musci Austro-americani*) under *Ectropothecium*.

Further examination of the American plants by Mrs. Britton and Mr. R. S. Williams, and of the plants in the British collections by myself has led us to the conclusion that the African plant cannot be separated from the American *H. trinitense*. This, too, was Mitten's opinion, for I find in the Kew Herbarium two West African specimens in Herb. Hooker—viz. "Bagroo R., W. Africa"; and "N. 554; Banks of the Nunn, Sept. 1860; G. Mann"—labelled "*Stereodon trinitensis* (C. Mull.)" by Mitten. Cardot also held a similar view, for he referred the French Guiana specimens already mentioned to the two varieties of *Dimorphella Pechuelii* (as the plant was then known) described by him in Rev. Bryol. xxxvi. 50 (1909), based upon specimens from the Belgian Congo; without of course suspecting any relationship to the already described American species. He repeats the same opinion, viz., that the plants from French Guiana are conspecific with the African species, in the *Mousses de Madagascar*, p. 468.

One character that at first appeared to constitute a difference between the American and African plants was the more constant presence in the former of the pellucid, inflated alar cells appearing on many of the leaves, usually on one side only of the base. These, however, if less constantly present in the African plants, are quite characteristic; I have measured them up to 10 μ, 12 μ, and 14 μ;

and they are figured by Cardot as quite conspicuous on Tab. 130 of the Atlas of the *Mousses de Madagascar*.

The fact is that the species is an extremely variable one, as pointed out by Cardot in his article on Congo mosses already cited.

The difficulty of deciding the question has been increased by the uncertainty as to the fruiting characters of the American *H. trinitense*. On this Mrs. Britton writes: "It is evident from the original description of *Hypnum trinitense* C. M., that Mueller had specimens from three localities in Trinidad; Maraccas, Arima, and Mt. Tocuche, all collected by Crueger in the years 1844 to 1847, which were not all one species! Mitten had a specimen from Tocuche only, and it will be seen from his description of *Ectropothecium trinitense* that he accurately described the dimorphic leaves, for he says: 'inferiora omnia dimidio minore.' His specimens were sterile, but he unfortunately cited portions of Mueller's description of the fruit without quotation marks, and states at the end 'ab *E.* [*H.*] *subsimplice* longe diversum.' Portions of Crueger's plants are referable to *H. subsimplex* Hedw.; the original description of *H. trinitense* shows this by describing the vesicular alar cells, and the fruiting plants evidently were also this species; but that Mueller had both these species confused in his original description is also evident; for the eighth to the fifteenth lines refer to the twisted, falcate, serrate leaves of the Tocuche specimen and agree perfectly with what Mitten called *Ectropothecium*. Therefore I am convinced, from studying Mueller's original description of *H. trinitense* and three other specimens collected by Crueger, that they included *Isopterygium tenerum* (Sw.) Mitt., *Sematophyllum subsimplex* (Hedw.) Mitt., and *Ectropothecium trinitense* Mitt."

This confusion of the fruit was not confined to Mueller. Mitten's description of the fruit of *E. trinitense* consists entirely of extracts from C. Mueller's description in the Synopsis; and there is pretty clear evidence that he had not seen fruit of the true plant. The specimen in his herbarium is sterile, and there are no fruiting specimens which he could have consulted at Kew. Of the five American specimens under the name of *H. trinitense* at Kew, one, the true plant (det. Mitten, c.fr.), is of later date than *Musci Austro-americani*; three are sterile; and the remaining two, from Trinidad, one being part of the original gathering of Crueger's on Mt. Tocuche, are entirely composed of a species of *Isopterygium*, probably *I. tenerum* (Sw.) Mitt. These are in good fruit, and it was no doubt on these that Mitten based his idea of the fruit. Truth to tell, the fruiting characters are very similar to those of the *Rhacopilopsis*, and C. Mueller's diagnosis might apply pretty well to either species.

The fruiting plant mentioned above as having been determined by Mitten at a later date—"*Ectropothecium trinitense* C. Mull. Island of Trinidad. A. Fendler. 1878–1880," is in fairly good fruit, and this shows no difference from the fruit of the African *Rhacopilopsis Pechuelii*.

A further plant that has been placed under *Rhacopilopsis* is *Hypnum chlorizans* Welw. & Duby, collected in Angola by Welwitsch. I have examined the type-gathering of this (Welw. iter

Angol. n. 163), in Herb. Mus. Brit., and can find no difference whatever from the species under discussion. It must certainly be placed under *R. trinitensis.*

The synonymy of a plant that has figured under seven generic names is naturally rather complicated, and I am by no means sure that the following attempt is exhaustive. As regards the correct name, however, it is clear, I think, that it must be that which we have given as the title of this article; and under that name, one may express the hope "requiescat in pace."

Rhacopilopsis trinitensis E. G. Britt. & Dixon, comb. nov.

(Syn. *Hypnum trinitense* C. M., Syn. ii. 284 (1851) *p. p.*)

Ectropothecium trinitense Mitt. in Journ. Linn. Soc. Bot. xii. 514 (1869), *excl. descr. fructus.*

Hypnum chlorizans Welw. & Duby in Mém. Soc. Phys. Genève, xxi. 437 (1872).

Microthamnium chlorizans Jaeg. Adumbr. ii. 491 (1875–6).

Dimorphella chlorizans Broth. in Engl. & Prantl, Pflanzenfam., Musci, ii. 1084 (1908).

Rhacopilopsis chlorizans Card. in Rev. Bryol. xl. 19 (1913).

Hypnum Pechuelii C. M. in Flora, 1886, p. 523.

Rhaphidostegium Pechuelii Par. Ind. p. 1102 (1897).

Rhacopilopsis Pechuelii Card. in Rev. Bryol. xl. 19 (1913).

Dimorphella Pechuelii Ren. & Card. in Bull. Soc. Roy. Bot. Belg. xli. 101 (1905).

Cyathophorum (?) *Dupuisii* Ren. & Card. *op. cit.* xxxviii. 250 (1899).

Rhacopilopsis Dupuisii Ren. & Card. in Rev. Bryol. xxvii. 47 (1900).

REVIEWS.

Oxford Botanical Memoirs.

To the series of Botanical Memoirs, published under the editorship of Dr. A. H. Church, have lately been added *Elementary Notes on the Systematy of Angiosperms* (no. 12; 3*s.* 6*d.*) and an *Introduction to the Systematy of Indian Trees* (no. 12; 2*s.* 6*d.*) for both of which Dr. Church is himself responsible.

With regard to the former, it would have been kind of the author to have given some sort of Introduction. We plunge at once into a number of disjointed paragraphs, teeming with information in a very condensed form on the angiospermous flowering-plants and their systematic arrangement in orders and families. A concluding note, however, informs us that these are schedules representing a course of 24 lectures with practical work, based on a selected list of tree-types, and comprise rough notes on the forest-trees utilized more particularly in British Forestry, together with the associated flora. A few additional schedules have been incorporated in order to give cohesion to a summary of the more important families. The reproduction of the notes in printed form obviates the necessity of the students taking notes at lectures, and furthermore ensures that their notes are correct.

A. B. R.

The Introduction to the Systematy of Indian Trees consists in like manner of notes arranged for the use of a class in Indian Botany for Indian Forest Probationers. The whole of a large subject has to be gone through in sixteen lectures, so that condensation of a ruthless kind has had to be practised.

The Introductory Lecture begins by explaining how India is a vast botanical region "ranging from primary evergreen rain-forest to the limit of alpine plant-life, including sub-equatorial swamps, mountain rain-forest, deciduous monsoon-forest of drier central tracts, the vegetation of grassy plains, estuarine mangrove formation, sandy sea-coast, savannah and park-lands, as well as tracts of dry arid sandy or stony desert." It is pointed out that the area contains about 4400 plants of permanent woody habit, of which about 1450 give appreciable timber, but only about 200 to 300 of economic importance.

It is then explained how the "cataloguing and book-keeping" of the large Flora has led to Systems of Classification, of which there are several, differing only "as they reflect more modern outlooks for regarding the grouping and terminology of the larger sections." The general scheme which Dr. Church has himself advocated in his *Notes on the Systematy of Angiosperms* has, however, not been adopted, as he has recognized that the *Genera Plantarum* of Kew, "though obsolete botanically" is best adhered to generally, as it is still largely official in India and is the basis of the arrangement of most works on Indian Forest Botany.

The remaining fifteen lectures are devoted to notes on the families that chiefly afford important Indian trees, whereof the chief are indicated, with the characters of their flowers and fruits which it is necessary to recognize. Thus among Apocarpous families, the most important are the *Magnoliaceæ* and *Anonaceæ*, and among Cistifloræ the *Guttiferæ* and *Dipterocarpaceæ*. As an example of the method used in the notes, that on *Shorea robusta* (the Sál tree), the most important tree of the deciduous forests of N. India, may be taken: "Inflorescence as terminal and axillary panicles, ultimate monochasia with flowers sessile, sepals with soft grey hairs, petals convolute dull orange-yellow with soft pubescence, andrœcium of about 30 free stamens, gynœcium of 3 carpels, ovary subglobular, 2 anatropous ovules in each loculus; in fruit the 5 sepals increase in size, 1, 2, and 3 much more than the others, to 2–3 in. long with 10–15 parallel main veins, as photosynthetic and protective to green fruit, utilized later for dispersal mechanism, by strong winds." One lecture each is devoted to the Malvales, the Discifloræ, and the Sapindales. and then comes the great family of the *Leguminosæ*, which in India affords such very important forest trees as the species of *Dalbergia*, *Pterocarpus*, *Hardwickia*, *Cassia*, *Acacia*, and *Albizzia*. Then come the Calycifloræ followed by the Gamopetalæ, among which appears the Teak tree, *Tectona grandis*, the most important of those Indian trees which afford export timber. Under the Apetalæ the chief families are the *Lauraceæ* and *Euphorbiaceæ*, grouped as such as there is "some suggestive evidence that the petaloid condition has been lost"; while a further group is made of Monochlamydeæ in which "the floral organization is apparently 'apetalous' in the sense that the essential floral organs are invested by a simple perianth as one contact-cycle of protective leaf-members." The chief family, is, of course, that of the *Moraceæ* containing the Figs and *Artocarpus*. The last two lectures are devoted to the Monocotyledons and the Gymnosperms, the palms and bamboos chiefly being described in the former and the Coniferæ, represented only in the forests of the Himalaya, in the latter.

To one whose botanical studies date from a good many years ago, the modern terms employed by Dr. Church are sometimes a little puzzling, but they are doubtless familiar to students. Dr. Church is clearly consistent in carrying out the dictum of his Introduction, "much of the older literature is expressed in obsolete terminology which reflects antiquated points of view," and it is just the newer points of view which make his Lecture Notes so interesting, and recommend them for study.

J. S. G.

A Report upon the Boreal Flora of the Sierra Nevada of California. By FRANK JASON SMILEY. University of California Publications in Botany, vol. ix. 8vo, pp. 423, with four photographs of the scenery. University of California Press, Berkeley, California. 1921.

IN this Report the author deals with the botany of the region of the Sierra Nevada above the 6500 ft. contour which lies almost entirely within the State of California, except the Carson Range in the East.

There is a long and interesting introduction of 66 pp., including a short preface, followed by remarks on the limits of the region, its petrology, topography, climatology, life-zones, and statistical abstracts of its botany. No portion of the region lies within the limits of perpetual snow, although snow falls on the highest peaks in every month except in July, but it melts quickly and rarely forms a permanent covering before November.

The portion of the Report dealing with the botany is clearly written, and is provided with analytical keys to the Natural Orders—the sequence of which follows the usual American adaptation of Engler and Prantl—genera and species; the two latter respectively are numbered consecutively in each order and genus. The names for the authority of the species are followed by the work in which they were published, with date of publication, synonyms being similarly treated; after this are cited in order the type locality, range, zone, with a list of specimens examined, which serves for a detailed list of its records in the region. This portion of the work, which includes the locality, altitude, collector's name and reference number, is printed in the same type as the rest of the detail and might well have been compressed into smaller space. Varieties of which the types also occur are given undue prominence by being treated on identical lines with their species, except that they bear the species serial number followed by a letter. Save for the analytical keys, there are no helpful remarks towards the identification of the species or varieties, except in the case of the latter where they occur in addition to their types.

It would have been an improvement if the headings to the pages had given the order and genus dealt with thereon instead of a wearisome repetition of the title of the work; the index is to orders and genera only, with the English names of such species as have them. The latter, however, are not included in the body of the work, and their introduction is superfluous, as the Report is written in strictly botanical, not in popular, style.

The printing and paper are clear and good, and the book appeals to the eye, the slight defects pointed out not being of sufficient importance to mar its utility. Four photographs of scenery illustrate the work; there is also a good bibliography and a useful "list of new names and new combinations."

A. H. W.-D.

Sturtevant's Notes on Edible Plants. Edited by N. P. Hedrick. Albany: J. B. Lyon Co., 1919. Large 4to, cloth, pp. 686.

This handsome and well-printed volume, which forms the second part of vol. 2 of the Annual Report of the U.S. Department of Agriculture, was prepared by its editor from the MSS. left by Edward Lewis Sturtevant when he retired in 1887, from the directorate of the New York Agricultural Experiment Station. Born at Boston in January 1842, he graduated M.D. at Harvard in 1866, and in the following year settled at South Framlingham, Mass., where he conducted the series of experiments in agriculture, with which his name has become associated. The biography prefixed to the volume shows that Sturtevant's first experiments were connected with cattle, but from 1883 he devoted himself more particularly to plants, and especially to Maize, the study of which, from both botanical and agricultural points of view, he continued up to his death in 1898. His researches in economic botany found their fullest expression in the series of papers on "The History of Garden Vegetables" published in the *American Naturalist* for 1887–90, to which periodical and to others he also contributed numerous papers of kindred nature.

Sturtevant had for many years collected from all available sources material bearing upon economic botany; the volume before us has been prepared from a MS. bearing the title now used, from "between forty and fifty thousand card-index notes," and from his published writings; it reflects the greatest credit, as it has imposed a vast amount of labour, upon Dr. Hedrick, to whom, indeed, the value of the book is largely due. The number of works quoted is enormous and very varied; Dr. Hedrick gives an admirable bibliography, in which titles, dates, and other details are supplied with unusual fulness: of these a certain number are themselves compilations—*e. g.* the *Treasury of Botany*, *Loudon's Encyclopædia*, and Martyn's Miller's *Gardener's Dictionary*—and can hardly be regarded as original authorities.

The chief value of the book, which is arranged alphabetically under the Latin names, lies in its full and elaborate treatment of plants of agricultural and economic value, such as the Maize, to the investigations concerning which reference has already been made, Examples of this treatment may be found in the Onion, Parsnip, Celery, Bean, and Tomato, among vegetables; among fruits the Red Currant, Strawberry, and Apple receive special attention; in these and other cases the principal cultivated varieties are enumerated and described, especially those grown in the States. One is inclined to think that the volume would have been more useful—it would certainly have been more convenient for reference—had its contents been limited to plants such as these: references like those to the species of *Grewia*, which occupy a page, might, if included at all, have been condensed into one paragraph: the footnote references to books, each occupying a line, might have been compressed in like manner with positive advantage to the consulter of the work.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on Jan. 19 Dr. A. B. Rendle showed a piece of the wood of *Orites excelsa* R. Br., a native of northern New South Wales and Queensland, which is of unique interest from the deposits of aluminium succinate which occur in cavities of the wood. Aluminium is very rarely found in flowering plants and only in small traces; but *O. excelsa* absorbs alumina from the soil in large quantities, as shown by analysis of the ash. Occasionally the amount taken up is excessive, in which case the excess is deposited in cavities as a basic aluminium succinate.

At the same meeting Dr. E. Marion Delf gave an account of research on *Macrocystis* by Miss M. M. Michell and herself. After describing the distribution of the alga, the authors reviewed recent accounts of it, and showed lantern-slides in explanation. The fertile fronds are completely submerged, smooth, dichotomously branched and usually borne on special shoots; they bear sori on both sides of the frond. Exceptional cases were described of discontinuous sori occurring in the grooves of fronds with wrinkled surface and borne on the long swimming shoots, and usually without a swim bladder at the base. The zoospores do not appear to have been previously described. Material brought from the shore in the morning, and examined in the laboratory in the evening, showed swarming zoospores; the next morning swimming actively, and more slowly. Cultures were made from the material in the following way:—About 2 hours after gathering, the alga was placed in a covered glass dish, with a few cover-slips at the bottom, and then sea-water was added. The piece was removed the next day, and 10 days later all the zoospores had come to rest, but showing no sign of germination. Five weeks afterwards short filaments of two different sizes were observed, comparable with the male and female gametophytes in Laminariaceæ reported by Sauvageau and Lloyd Williams. Two months later young stages of the sporophyte were visible on the cover-glasses, a thick-walled empty cell always being at the base of the sporophyte, probably the empty oogonial wall after the escape of the oospore. No sign of the antheridial cells has been noticed. The discovery of the filaments developed from the zoospores and the subsequent growth of the sporophytes from filaments bring it into line with other members of the family.

On the same occasion Mr. J. L. Chaworth Musters made a communication on the flora of Jan Mayen Island. This may be divided into four main groups: the floras of the sea-shore, of the bird-cliffs, of sheltered places in the "tundra," and the mountain flora. The most luxuriant flora, which consists of *Taraxacum* or *Oxyria*, grows either under the bird-cliffs or in places where tuff has been reassorted by water. The limit of flowering plants seems to be about 3000 feet; the total phanerogamic vegetation consists of about 43 species, all of which are common to both Norway and East Greenland. The origin of the flora presents a very complicated problem: seeds have probably been brought there on the feet of wading birds which migrate to and from their breeding-grounds in East Greenland. It is highly improbable that Jan Mayen has ever been connected with either Iceland or Greenland; many plants have probably reached Jan Mayen during very recent years.

At the meeting of the same Society on Feb. 2, Dr. J. C. Willis read a paper on "Some Statistics of Evolution and Geographical Distribution in Plants and Animals and their Significance." The general result seemed to be to show that Evolution and Geographical Distribution have proceeded in a chiefly mechanical way, the effects of the various "other" factors that intervene—climatic, ecological, geological, etc.—being only to bring about deviations this way and that from the dominant plan. Every family and every genus, and in every country, behaves in the same way. Strong evidence is thus given for de Vries's theory of Mutation, and for Guppy's theory of Differentiation. Mrs. E. M. Reid then followed with "Note on the Hollow Curve as shown by Pliocene Floras." The material was that published from Tegelen, Castle Eden, etc., the author concluding that fossil floras take their appropriate place alongside living floras, bringing direct evidence from the host to show the universality of the Law of Hollow Curve Distribution. In an animated discussion on the two papers, Dr. D. H. Scott remarked that he did not see what the curves shown had to do with Evolution. Dr. E. J. Salisbury stated that in studying the Ranales he had found confirmation of the lecturer's theory of the larger the group the greater the age. Prof. R. R. Gates thought that the theory of Age and Area put forward raised difficulties from the point of view of the Mutation theory, for upon the latter theory the floras of islands must have originated by oceanic transportation. The President questioned why a group containing a large number of species should be older than one containing a few, and cited the instances of the numerous species of antelopes and the solitary species of *Hyæmoschus* found in Africa, the latter having been proved by geological evidence to be the older. Mr. A. J.

Wilmott gave his opinion that the monotypic genera were the oldest, because Time was the real factor, allowing the greater number of species in the older genera to be killed off. Dr. Willis replied that his main argument was based upon computations of groups and genera *en masse*, and could not be controverted by an appeal to special instances.

By the death of Dr. John Harley, a native of Ludlow, the Linnean Society loses one of its oldest members. He was elected on June 18, 1863, and the volume of the Society's *Transactions* (xxiv.) of the same year contains a paper by him on the parasitism of the Mistletoe, which he studied in the hope of finding some light on the causes of malignant growths in the human subject. In this Harley gives a detailed description of the anatomy of the parasite and the portion of the host to which it is attached, and demonstrates the very close relation existing between host and parasite. From an examination of the structure of the wood of the different hosts he concluded that the size and number of the medullary rays is the chief cause which determines in any given case the attachment of the Mistletoe. Harley was perhaps better known as a geologist, but he was a man of wide interests, literary and scientific. On retiring from his London practice he built a house at Beedings, near Pulborough, Sussex, on the site of an old British camp which dominates the surrounding country. Here he planned a garden, which he was always pleased to show to one or other of his scientific friends. Except for deafness, he retained remarkable vigour of mind and body until within a few days of his death, on the 9th of December, at the age of 88. A. B. R.

The *Proceedings of the Isle of Wight Natural History Society* for 1920 (vol. i. no. 1) contains a list of Fungi hitherto unrecorded for the island and one of additional localities for species already known there, by Mr. John F. Rayner, with accounts of numerous excursions and exhibitions which indicate great activity on the part of the members. Copies (2*s.* post free) can be obtained from the Hon. Secretary, Mr. Frank Morey, The Mall, Newport.

The number of Dr. Pole-Evans's *Flowering Plants of South Africa* issued in January includes among its ten plates several species hitherto unfigured:—*Ceropegia tristis* Hutchinson, sp. n., *Aloe Wickensii* Pole-Evans, *Hessea Zeyheri* Baker, *Watsonia Galpinii* L. Bolus, *Holmskioldia speciosa* Hutchinson & Corbishley. We note that the name *Kniphofia alooides* Moench. is assigned to the "Red-hot Poker," thus following the *Flora Capensis*; the plant, however, is the *Aloe Uvaria* of Linnæus (Sp. Pl. 323), and Hooker's name, *K. Uvaria* (Bot. Mag. t. 4816) should stand. The drawing of *Hessea Zeyheri* was "kindly *loaned* by the Curator of the Bolus Herbarium"—why not "lent"? It may be noted that "the descriptions are prepared by Dr. E. Percy Phillips, verified at Kew by Mr. J. Hutchinson."

The *Annals of the Royal Botanic Gardens, Peradeniya* (vol. vii. pt. 3, Oct. 1921) is devoted to a continuation of Mr. Petch's "Studies in Entomogenous Fungi." The genera *Hypocrella* and *Aschersonia* are considered; the species, of which there is a clavis, are very carefully described and annotated; the usual and convenient practice of numbering the species has not been followed. There are four plates, two in colour.

In the *Orchid Review* for February, Colonel Godfery calls attention to an instance of alternative self-fertilization in an Australian orchid, in many ways parallel to that of *Ophrys apifera* described by him in this Journal for 1921 (p. 285). The orchid in question is *Prasophyllum gracile* Rogers, described with a figure (reproduced in the *Review*) in Trans. R. Soc. S. Australia, xxxvii. 54. We note that Lieut.-Col. Rogers, the writer of the paper and an acknowledged authority on Australian Orchids, has been elected President of the Royal Society of South Australia.

When referring (p. 64) to Miss Ethel Poulton's paper on a monstrous *Cheiranthus Cheiri*, we omitted to call attention to Mr. F. J. Chittenden's paper on "The Rogue Wallflower" published in Journ. R. Hort. Soc. xl. 83–87 and reprinted in this Journal for 1914, pp. 265–269.

With the view of extending the knowledge of *British Grasses*—the title of the book—Messrs. McGill and Smith, seedsmen, of Ayr, have issued as a small quarto volume an album in which they are represented by sixty-five plates. These are taken from photographs of specimens selected for the purpose by Mr. A. M. Mackie, one of the staff of the firm, and are very well produced; without going so far as to say that by the use of a magnifying glass "the most minute details essential for identification may be clearly seen," the figures are undoubtedly useful, and should go far towards fulfilling the object for which they are produced. A short descriptive phrase accompanies each plate, but for full descriptions the reader is referred to Bentham and Hooker's *Handbook of the British Flora*.

The latest instalment of Father Blatter's *Flora Arabica* (Records Bot. Surv. India, viii. no. 2) is singularly devoid of novelty: its nearly two hundred pages (Leguminosæ-Compositæ) contain only one novelty, *Pulicaria menachensis* Schweinf. MS. in Herb. Kew. (undescribed, but stated to be "very near *P. petiolaris* Jaub. & Sp.") and two new combinations resulting from the reduction of *Pterocephalus* to *Scabiosa*.

Messrs. Charlesworth & Co. of Haywards Heath send us a handsome catalogue which presents some notable features. In the first place it has no title-page; the title—*Orchids*—appears only on the cover. The catalogue proper is preceded by a long paper on "Orchid Mycorrhiza" by Mr. Ramsbottom, illustrated by numerous figures taken from preparations by the late head of the firm, Joseph Charlesworth (1851–1920). It includes five coloured plates of hybrids raised by the firm—among them *Charleswortharа*—a trigeneric hybrid genus "combining *Miltonia*, *Oricideum*, and *Cochlioda* species"—and *Vuylstekeara*, another trigeneric, in which *Odontoglossum* replaces *Oncidium*. The extent of Messrs. Charlesworths' collection may be gathered from the fact that the Catalogue contains 2245 numbers, mostly hybrids of their own raising.

Sir John Kirk, who died last month at his residence at Sevenoaks in his ninetieth year, was born at Barry, near Arbroath, on Dec. 19, 1832, and graduated M.D. at Edinburgh. In 1856, when stationed at Renkioi on the Dardanelles, he made the ascent of Mount Ida and discovered a new *Muscari* (*M. latifolium*). From 1858–64 he was attached as naturalist and medical officer to the Livingstone Expedition; during this time he sent to Kew large collections, accompanied by notes and drawings from Zambesi, Lake Nyasa, and the adjacent country. From 1866 to 1886 Kirk was at Zanzibar, where he held numerous important positions, ending as Consul-general; in 1895 he was special Commissioner on the Niger coast. Kirk is commemorated by Oliver in *Kirkia* (Simarubaceæ) and by Harms in *Kirkophytum* (Araliaceæ).

The third volume of C. A. J. A. Oudemans' *Enumeratio Systematica Fungorum* (M. Nijhoff, The Hague) is to hand. The families treated in this portion of the "host index" include Caryophyllaceæ to Vitaceæ. The list of families and the largest genera are given in a short "Tabula argumentorum"; a "Tabula alphabetica abbreviationum," gives a continuation of, and supplement to (2441–2653), the list of authors, titles, references, and exsiccata of the previous volumes, which were noticed in this Journal for 1921 (p. 117). The present volume contains rather more than 1300 pages; the price is £4 0*s.* 6*d.*—J. R.

At the meeting of the British Mycological Society, held at University College, London, on Jan. 21st, Mr. F. T. Brooks, President, in the chair, the following papers were read:—"The Morphology and Affinities of *Leuconostoc mesenteroides*," by Mr. W. B. Crow; "Obligate Symbiosis in *Calluna*"—a criticism of H. Christoph's negative results—by Dr. M. C. Rayner; "Die-back of Stone-fruits due to *Diaporthe perniciosa* and the Behaviour of Monospore Cultures in Artificial Media," by Miss D. M. Cayley; "The Influence of Volatile Substances on Spore Germination," by Dr. W. Brown; and "Michaelmas Daisy Wilt," by Mr. W. J. Dowson: the last is published in the *Gardeners' Chronicle* for Feb. 11.

By the lapse of time Kew is losing some of the older members of its staff. Sir David Prain's directorate ceased on the 28th of last month; he is succeeded by Captain A. W. Hill, who has been Assistant Director for fourteen years. Dr. Stapf, Keeper of the Herbarium and Library, and Mr. William Watson, Curator of the Gardens, are also on the eve of retirement.

We note that Mr. E. M. Holmes, who was knocked down by a motor car some months ago and had to have a leg amputated, was on Jan. 31 awarded £1000 damages in the King's Bench Division.

We regret to announce the death of the Rev. E. Adrian Woodruffe Peacock, which occurred at Grayingham Rectory, Lincolnshire, on Feb. 3. A fuller notice will follow later.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers.

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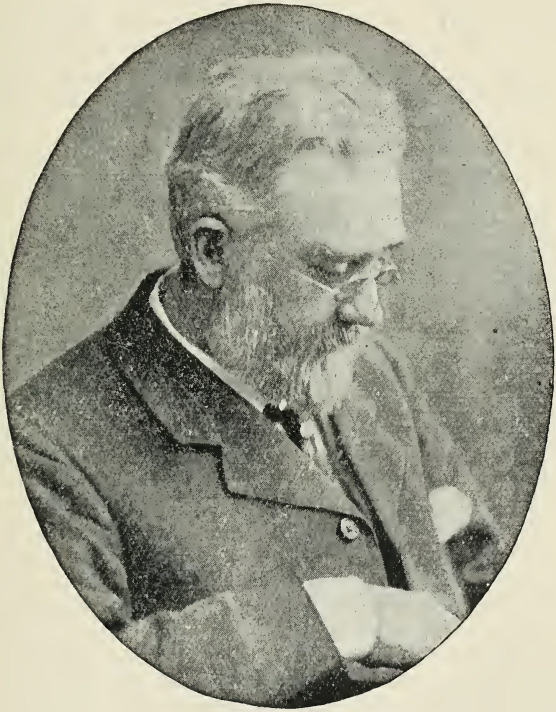
FREDERICK ARNOLD LEES.

(1847–1921.)

Frederick Arnold Lees was born at Burmanstofts Hall, near Leeds, on January 20, 1847; his father, Dr. F. R. Lees, was well known as a temperance lecturer. He was educated at the Leeds Grammar School and at Durham University, and in 1871 qualified as M.R.C.S. and L.R.C.P. Mr. J. V. Pickard, of Headingley, Leeds—his intimate friend for many years, to whom I am indebted for information,—writes that Lees noted in his diary that he owed his first instruction in Botany to an under master (Rev. G. F. Fleay) in the Leeds School, who in the summer of 1865 instituted a course



of natural history teaching; under this master Lees began to collect, and a visit to Wensleydale and later to the Lake district further developed the interest he had acquired.

It was owing to Fleay's "personal flair for the naturalistic, imaginative side of things" that Lees "chose medicine as his *métier*, that career early seeming to him to be the one which conferred most *power* on the individual and allowed the congenial pursuance of chemic and botanic study with least dislocation of the demands of making a livelihood." This characteristic sentence is taken from Lees's largely autobiographical *Description of the Lees Herbarium and Library*, published by the Bradford Public Library (which contains both) in 1910. From this we learn that on leaving school Lees was apprenticed to a surgeon at Headingley, and attended the lectures on Botany at the Leeds Medical School. The presentation of Babington's *Manual* as an extra prize gave "the first decided impulse towards the formation of a herbarium worthy of the name," though it was not until 1872 that he began to "study field-Botany analytically as well as lovingly."

The earlier days of his medical practice gave Lees many opportunities of becoming acquainted with various aspects of the British flora: he was successively stationed at Hartlepool (1873, in which year he visited Italy), Walton-in-Furness, Market Rasen (1877), Warrington (1881), Kidderminster (1882), and Reading (1883). From 1883 to 1887 he was poor-law surgeon in the Hawes district of the Haysgarth Union; he went thence to Heckmondwyke and then returned to Leeds, where, save for a period (1893–4) at Harrogate, he resided until his death on Sept. 21, 1921.

It was during his residence at Hartlepool that the Botanical Locality Record Club—a title subsequently shortened by the omission of the second word—was established with the object of "the verification and re-record, or expunging, of all old stations for rare plants, the publication of an annual record of the exact localities, and the formation of a herbarium." This definition, from the circular proposing the formation of the Club, is taken from a notice (by Trimen) in this Journal for 1873 (p. 160), in which the scheme was criticised with the result that in actual working it was subsequently modified. Specimens were to be sent to Lees, "who, after authentication, will forward them to Mr. T. B. Blow, of Welwyn, Herts, who will act as keeper of the herbarium," and who also undertook the Treasurership: these posts Mr. Blow resigned in 1880, when he was succeeded by Mr. Charles Bailey. From a prefatory note to the Report for 1880 (issued in 1882), we learn that H. C. Watson, "taken from us by the operation of the one immutable decree of Physical Law, took a warm interest in the Club; but for his more than kindly encouragement, the Record Club would probably have had only an ephemeral existence; by his death it has lost its most powerful friend—its kindliest critic." Lees acted as "Recorder" and Editor of the Reports from their first issue (1873) until 1886, when the Club apparently ceased to exist. This is no place for a history of the Club; it may be noted, however, that the voucher-specimens for the records were sent to Kew, whence they were transferred in 1884 to the Department of Botany, where they are incorporated with the British Herbarium. The *Summary of Comital Plant-Distribution*, issued in 1878 under Lees's name as an independent publication, is a textual reprint (repaged) of pp. 259–307 of the Reports of the Club for 1873–77. He also edited (1881) the second edition of *The London Catalogue of British Mosses*, published under the direction of the Club in 1877; to this he added the Hepatics, to which at that time he paid much attention.

In the same year—1873—in which the Club was founded, Lees contributed to this Journal (pp. 67–72) a paper on "The Peculiarities of Plant-distribution in the Leeds District," in which he sums up the observations made during many years with a view towards a Flora of the Riding. This finally took shape in *The Flora of West Yorkshire* (1888)—one of the best of our local floras, of which an appreciative review appeared in this Journal for the same year (p. 219); he had previously collaborated with J. W. Davis in the volume on *West Yorkshire*, published in 1878, which went to a second edition. In 1892 Lees contributed to White's *History and Directory of Lincolnshire* a list of the plants of the county, which superseded and greatly extended the similar list published by the writer of this notice in the same work twenty years before.

From 1875 up to the year of his death Lees was a frequent contributor to *The Naturalist*, in the issue of which for September, 1921, appeared a sketch of his life, with a portrait, which, by permission of the editor, is here reproduced. His articles were mainly connected with the Yorkshire flora and its distribution, but embodied also useful critical notes; he also contributed biographical notices, reviews, and verses—the last even more eccentric in diction, if that were possible, than his prose. A careful and elaborate paper on "The Colonist-Alien Heron-bills of Yorkshire" (*Naturalist*, 1917, 379–386)—in his later years Lees was attracted by the alien flora—includes a variety (var. *pseudo-moschatum*) of *Erodium moschatum* which he—"provisionally and consciously temerarious"—described as new.

The principal contribution of Lees to this Journal (1882, 129–133), apart from that already mentioned, was on *Selinum Carvifolia*, which his friend the late Rev. W. W. Fowler (1835–1912) had recently added to the British Flora. In connection with this paper, which had been somewhat delayed, he wrote to me from Warrington: "If you knew the pleasure it is to me to do aught botanical, and how busy in these bready-and-buttery days I have to be, you would then overlook the delay." The conflicting claims of Botany and his medical practice were sometimes decided, to his temporal disadvantage, in favour of the former, if we may accept the legend which tells how, crossing a moor which promised interesting botanical results, Lees went off in search of them and returned home without visiting the patient whom he started out to see.

Although, owing to his residence in the North, Lees was not personally intimate with British English botanists as a whole, he corresponded with most of them, and those who thus knew him had a high appreciation of his knowledge and ability. His friendship with the Rev. W. W. Fowler has already been noted, and he was in cordial and intimate relations with the late Adrian Woodruffe-Peacock. Lees was an excellent writer, though a somewhat erratic correspondent—indeed, a certain unconventionality in this as in other respects tended to obscure his undoubtedly great capabilities. His stimulating enthusiasm, not only for botany but for other subjects in which he was interested, made him, as Mr. Pickard testifies, a delightful companion on excursions, the last of which was undertaken within a month of his death. His readiness to help was shown by his active association with such local bodies as the Yorkshire Naturalists' Union, in whose meetings and excursions he frequently took part, and with the Leeds Naturalists' Society; he was also always glad to encourage young beginners—a lad at the Leeds School speaks gratefully of his kindness and warm-heartedness, and of the help Lees gave him in collecting.

In 1905 Lees disposed of his herbarium and library to the Bradford Public Libraries Committee; the former, containing 25,000 specimens, was placed in the Cartwright Memorial Hall; the latter, of more than 500 volumes and pamphlets, of which the Committee in 1909 issued an excellent Catalogue, in the Reference Library. In the following year the Committee published Lees's description of the herbarium, to which reference has already been made and which, apart from its autobiographical interest, may be commended to those who collect curiosities of literature: the concluding sentence indicates that additions were in contemplation, "to the End that when the whole has been arranged, mounted, and (as far as possible) fully labelled, it shall be and continue to be an Evergreen although a 'Dried-Garden' for the mind: an exemplary because a Truth-witnessing history of its fair subject—in fine, a befitting Monument to Flora (or Ceres) 'when in sorrow and cultivation was neglected,' crowned with that *Laurus nobilis* which grows in such wise as ever seems to make it the breath of sweetest symbolism and honour."

Mr. Pickard informs me that Lees left in MS. a volume on "The Vegetation of Yorkshire"; arrangements for the publication of this were in progress (see Journ. Bot. 1914, 22) before the outbreak of the War which was responsible for the postponement of so many schemes, and it is greatly to be hoped that it may see the light. Lees also wrote a Flora of Craven in Wharfedale, the MS. of which is in Mr. Pickard's possession, and left a herbarium of considerable extent, formed during his later years.

Although Botany was his chief attraction, Lees devoted some attention to other branches of natural history. He was a man of varied interests, much occupied with questions of the day: an omnivorous reader, he had considerable knowledge of dialects, and formed a collection of rare and obsolete words.

Lees is commemorated in the variety *Leesii* of *Carex pilulifera*, which was described and figured in this Journal for April, 1881 (p. 97, t. 218), by Mr. H. N. Ridley from specimens collected by Lees near Knaresborough in the preceding year and sent by him to the National Herbarium. He had already indicated its distinctness in *Science Gossip* for December, 1880, and proposed for it the name *saxumbra*, in reference to its habitat; his note is reprinted in Journ. Bot. 1881, p. 24; the plant is now regarded as identical with var. *longe-bracteata* Lange.

James Britten.

Del. H. N. Dixon.

NEW GENERA OF MOSSES.

SOME NEW GENERA OF MOSSES.

By H. N. Dixon, M.A., F.L.S.

(Plate 564.)

(The types or—where the type is indicated as elsewhere—co-types of all the plants described below are in my herbarium.)

Dicranaceæ.

Nanobryum Dixon, gen. nov.

Dioicum. Caules ♂ et ♀ annui, in protonemate perenne valde sparsi, minuti. Planta ♂ minutissima, subsessilis. Planta ♀ 2–3 mm. alta, fructifera 5–7 mm. Folia perpauca, inferiora minuta, comalia 2–4, multo majora, 2 mm. longa, e basi late ovata vaginante abrupte subulata, subula longa, filiformi, flexuosa, e costa excurrente plerumque composita. Areolatio angusta, e cellulis linearibus, alaribus nullis, instructa. Seta 3–4 mm. longa, tenuissima. Theca minutissima, circa ·5 mm. longa (deoperculata), horizontalis vel subpendula, curvata, macrostoma, leptodermica; peristomium ei nonnullarum specierum minutarum *Fissidentis* perfecte simile, dentibus siccis valde patentibus, madidis intra thecam fortiter inflexis, lamellis externis dense, humiliter trabeculatis, internis pulchre alte cristatis, cruribus filiformibus, spiraliter incrassatis. Calyptra ignota.

Nanobryum Dummeri Dixon, sp. nov.

Protonema persistens atro-viride, e radiculis ramosis atque filis chlorophyllosis tenerrimis ramosis densissime intertextis instructum. Planta ♂ subsessilis, minutissima, foliis perigonialibus sæpius duabus concavis, amplexantibus, brevicuspidatis, antheridiis numerosis, turgide ovalibus.

Caulis fertilis paucifolius; folia inferiora circa tria, minuta, late ovata, cuspidata, concava, subecostata, integerrima; suprema plerumque tria (aliquando 5–6) multo majora, rigidiuscula, suberecta vel subsecunda, nitida; e basi vaginante late ovata in subulam duplo vel triplice longiorem flexuosam integram filiformem cito angustata. Costa apud basin tenuis, superne valida, excurrens, partem majorem subulæ formans. Areolatio e cellulis ubique angustis, 8–13 μ latis, superioribus linearibus vel rhomboideo-linearibus, chlorophyllosis, parietibus firmis, haud incrassatis, inferne brevioribus, latioribus (10–16 μ latis), parietibus tenuibus instructa; alares nullæ.

Fl. ♀ terminalis, archegoniis circa 10, paraphysibus subnullis. Seta tenuissima, pallida, 3–4 mm. longa. Theca minima, madida horizontalis, sicca subpendula vel pendula (*cf.* descriptio generis); exothecii cellulæ perlaxæ, subregulariter hexagono-rectangulares vel isodiametricæ, angulis rotundatis; circa 60 μ latæ, parietibus tenuibus collenchymaticis; apud orificium seriebus nonnullis rubræ, valde incrassatæ, transverse lineares. Spori magni, circa 50 μ.

(Peristomium; *cf.* descrip. generis.) Operculum pallidum, conico-rostellatum, majusculum.

Hab. On damp earth and in hollows of fallen trees, in forest, Mulange, Uganda; Nov. 1920; *R. A. Dummer* (4080 *a*); and, again, April 1921. Port St. John's, Cape Prov., S. Africa, 1921; *H. A. Wager* (955); Kipayo, Uganda, *R. A. Dummer* (1214).

A very remarkable little plant, combining curiously the gametophyte characters of *Dicranaceæ* with the sporophyte of *Fissidens*.

The protonema evidently persists for some years, and stems of two or more years' standing may be found side by side on it. These are very scattered and very inconspicuous. The peristome teeth with the upper internal lamellæ of the undivided part highly cristate are exactly as they are found in numerous of the smaller species of *Fissidens*, belonging to several sections (mostly tropical), e.g., *F. glauculus* C. M. (*cf.* Brotherus, *Musci*, vol. i. fig. 213, and *F. exsul* Dixon in Journ. Bot. 1910, 145. t. 505 A). When dry the teeth are very widely spreading; on moistening they become strongly inflexed about the middle of the undivided part, the upper part disappearing into the cavity of the capsule entirely. As this, too, is markedly the case with the species of *Fissidens* above referred to, it is probable that the cristate lamellæ play some part in this highly-marked hygroscopic action.

The seta varies greatly in length; it is extremely delicate, yellow at maturity, but later on becoming red.

The taxonomic position of the genus is uncertain. The vegetative characters suggest affinity with the *Seligerieæ* (the leaves somewhat suggest *Trochobryum*) or *Dicranelleæ*; but the fruiting characters, the minute, pendulous or subpendulous capsule, peristome, large spores, &c., are quite distinct.

It is curious that this plant, hitherto undetected, should have been gathered in two so widely distinct localities within a few months, at most, of one another.

Pottiaceæ.

Subfam. Trichostomeæ.

Chionoloma Dixon, gen. nov.

Stirps habitu *Tortellarum* robustiorum, sed rigidior; densifolia, foliis siccis rigide incurvo-flexuosis vel incurvo-contortis, marginibus valde undulatis; e basi latiore subvaginante elongate lineari-lanceolatis acutis, transverse undulatis. Areolatio superior e cellulis densis, obscuris, opacis instructa, limbo albo lato (vetustate aurantiaco) e cellulis hyalinis, linearibus, incrassatis, 3–5 seriatis instructo, medium folium superante; cellulis basilaribus elongatis, linearibus, aurantiacis. Fructus ignotus.

Chionoloma induratum (Mitt.) Dixon, sp. nov.
(*Tortula indurata* Mitt. in Herb.)

Caules 2–3 cm. alti vel supra robusti, ætate rufescentes, parce ramosi. Folia confertissima, erecto-patentia, sicca nonnulla rigide leniter incurvo-flexuosa, alia apice fortiter incurvo-contorta; costa dorso haud nitida; 5–7 mm. longa; e basi semivaginante aurantiaca longe lineari-lanceolata, apice angustata, acuta vel obtusiuscula, concava, subrigida, fragilia, transverse undulata (marginibus siccitate valde undulatis); integra, marginibus erectis, apicem versus solum angustissime incurvis. Costa valida, fusca, basin versus 100–120 μ lata, bene definita, supra dorso carinata, lævis, ad apicem mucrone vel cuspide brevi integra excurrens; sectione biconvexa, duces plures (circa 10) medianos, cellulas stereideas ventrales et dorsales, cellulas externas ac ventrales ac dorsales paullo nec tamen multo majores exhibens.

Cellulæ superiores perobscuræ, longitudinaliter seriatæ, subquadrato-rotundæ, circa 8 μ latæ, parietibus firmis vix incrassatis, perminute sed distincte papillosæ, infra sensim elongatæ, parietibus valde sinuato-porosis (ad instar Grimmiæ vel Rhacomitrii), deinde in cellulas basilares læves sæpe raptim transeuntes; ad marginem medio folio a limbo albo lato 4–5 seriato optime delimitatæ. Cellulæ basilares pulchre aurantiacæ, perangustæ, lineares, parenchymaticæ, parietibus firmis, angustis, valde porosis; infimæ ad alas sæpe laxiores, latiores, pallidiores, oblique ascendentes, inde spatium triangulare pellucidius quoque latere instruentes.

Cetera nulla.

Hab. Mountains, Moulmein, Birmah; *Parish*, 137; herb. Mitten.

Although this plant is unfortunately sterile, the leaf-structure is so distinct that it seems quite impossible to include the species in any known genus. The areolation is in some points perhaps most reminiscent of some species of *Tortella*, but in other ways it differs widely. The broad hyaline border is quite different from the pale narrow extension of the basal cells which is found in many species of that genus, being formed of long, narrow, very incrassate cells, and is continued in 2–4 rows to the insertion of the leaf, usually more or less distinctly differentiated from the inner basal cells. It reaches above the middle of the leaf, usually to two-thirds, and often higher. It is at times finely denticulate at the margin. The transverse undulation, strongly marked when dry, is also a distinct character. The areolation also is very distinct. The upper isodiametric cells are very obscure by reason of cristate, multipartite papillæ on the lumen; towards the lower part of the unexpanded lamina the cells gradually become elongate, and the papillæ sparser and less distinct, while the cell-walls become highly sinuose internally, as in the supra-basal cells of many *Grimmiæ*, or the upper cells of many *Rhacomitria*; contrary, however, to what takes place in *Rhacomitrium*, as the cells elongate more and more, the walls become less sinuose instead of more so; but they remain, at least near the nerve, distinctly porose to the base. The greater part of the base is in the older leaves at least of a bright orange colour, but in many or most of the leaves the linear firm-walled cells do not fill the entire base, but narrow downwards towards the nerve in a cuneiform outline, leaving a triangular alar patch of paler, wider, thin-walled cells on each side, extending a short distance outwards and upwards.

It sometimes happens that the papillæ of the upper cells become lost (in passing into the basal ones) at about the point where the cells themselves begin markedly to elongate, and in this case the point of juncture with the smooth, elongate, orange basal cells is very clearly marked. At other times the papillæ may continue further down until the cells have become decidedly elongate; and in this case the transition appears much more gradual and less clearly defined (the character recalls the different modes of transition of the intralaminal to the basal cells in *Leucoloma*).

Subfam. Pottieæ.

Beddomiella funarioides Dixon, gen. et sp. nov.

Stirps minuta; caules ut videtur gregarie ad terram seu ad rupes crescentes, teneri, 3–4 mm. alti, frondes subcomplanatas, flabellatas perpallidas formantes. Folia inferiora parva, late ovato-lanceolata, superne sensim majora, subcomplanata, 1·5–2 mm. longa, tenera, flaccida, ovato-oblonga vel obovato-lanceolata vel oblongo-lanceolata, breviter acute acuminata, marginibus planis, superne sinuosis vel grossiuscule obtuse denticulatis. Costa debilis, infra apicem vel cum apice desinens. Areolatio perlaxa, perpellucida, e cellulis basilaribus elongate rectangularibus, ad 100 μ longis, 30–40 μ latis, superioribus irregulariter hexagono-rhomboideis, circa 40–50 μ longis, 20–30 μ latis; omnibus lævissimis, parietibus tenuibus; marginalibus vix angustatis.

Dioica videtur. Flos ♂ haud visus. Fl. ♀ terminalis, vaginula cylindrica, seta tenuissima, flavida, 1–1·25 cm. alta; theca minuta, circa 1 mm. longa, valde asymmetrica, e collo defluente subpiriformis, gibbosa, ore valde obliqua; pallida, leptodermica, e cellulis laxis, irregularibus, supra sæpe isodiametricis, infra elongatis, parietibus haud valde tenuibus, sed teneris; ad orificium 1–2 seriebus multo minoribus, transverse rectangularibus, fuscis. Calyptra junior anguste cylindrica, cellulis spiraliter valde tortis. Operculum (thecæ immaturæ) brevirostre. Annulus? Peristomium simplex, e dentibus 16, inferne in membranam basilarem aurantiacam, subpellucidam lævem, 30–35 μ altam cohærentibus, superne in crura bina filiformia, opaca, leniter torquata, circa ·3 mm. longa, densissime papillosa, papillis præaltis, superne spiraliter incrassata. Spori 10–13 μ, læves.

Hab. Nilghiri Mts., India, *Beddome*, No. 650. Herb. Mitten, in herb. N.Y. Bot. Garden.

This very remarkable little moss was sent with a number of unnamed scraps from Mitten's herbarium for determination. The envelope contained principally a tuft of a *Weisia* (*W. viridula* or near it), with immature fruit, and the few stems of the *Beddomiella* were mixed with that, but were quite loose, evidently forming originally no part of the tuft, and may indeed not have been associated with it at the time of growth. The substratum attached to the base of the stems is hard and gritty, and indicates that they were growing on sandy soil or more probably on rock. Only about half-a-dozen stems in all were to be found.

The plant curiously combines characters of *Funariaceæ* and *Pottiaceæ*; the areolation and the general character of the leaves is quite Funarioid (*cf.* the drawing of the areolation, tab. 564. fig. 2 *c*, with that of the Funarioid species, fig. 3 *c*), and the curved and asymmetrical form of the capsule is quite in keeping, and most unlike the typical Pottiaceous fruit, but the spirally-arranged cells of the calyptra, and the peristome characters, leave no doubt as to its affinity being rather with the *Pottiaceæ*, among which, however, it has no near allies, and it may probably have to form the type of a new Family.

The 16 peristome teeth are united below in an orange, subpellucid, smooth basal membrane, rising well above the orifice of the capsule; this is divided into transversely oblong divisions, with rather thin walls, and is very clearly differentiated from the upper part of the peristome; the whole of each tooth above this membrane is cleft into two long filiform branches, quite Barbuloid in their form, and more or less spirally contorted at maturity, though to what extent is not clear from the small material. In their lower part these branches are very densely covered with fine, very high papillæ; above they are less highly papillose, and are very closely spirally thickened as in many species of *Fissidens* and in various Pottiaceous species. The calyptra (only seen in one half-mature capsule) does not reach below the lid, and shows no sign of splitting at that stage at least; it is probable that it may resemble that of *Streptopogon*, with which genus the present plant has some other slight affinities.

I have not been able to ascertain definitely the presence of stomata. I cannot certainly say that they are absent, but if present they are either rudimentary or immersed. The great irregularity of the walls of the spongy tissue of the capsule-base makes observation very difficult, and I have not ventured to dissect the little available material remaining for the purpose.

Œdipodiaceæ.

Œdipodiella Dixon, gen. nov.

Caulis brevis, repens, sæpe subterraneus, rhizomaticus, succulentus, pallidus, ramos emittens perbreves, ad basin sæpe nudos, ad apicem dense, rosulate foliosos. Folia (nisi quoad marginem basilarem nudam, haud ciliatam) atque propagula apicalia gemmiformia, eis *Œdipodii* similia.

Theca cleistocarpa, minuta, subsessilis, e foliis comalibus vix emergens, subsphærica, apiculo brevirostro recto (ad instar operculi, haud tamen dehiscente) coronata, succulenta, maturitate brunnea, ætate lateraliter disrumpens; spori 40–50 μ, badii, læves.

Œdipodiella australis (Wager & Dixon) Dixon, comb. nov.

Syn. *Œdipodium australe* Wager & Dixon in Trans. Roy. Soc. S. Afr. iv. 3.

Hab. Near the sea, Natal, sterile, *H. A. Wager*, 1910 (n. 3): Pirie Forest, King William's Town, Cape Prov., 1919, c.fr.; *Wager* (823).

Only a few capsules of this latter gathering have been received, but sufficient to show that it is entirely different from *Œdipodium Griffithianum*, and must be placed in a separate genus. In the habit, leaf-form, and structure, and especially in the large, lenticular, characteristic apical gemmæ, however, it shows a remarkable likeness to the European species, and I have retained it in that family, although it has some decided affinities with the *Funariaceæ*. The creeping, rhizomatous stems recall *Gigaspermum* and the new genus *Chamæbryum* described below.

The small quantity of fruit available leaves a certain amount of doubt as to the fruiting characters. The lid is very small, forming a minute disk with a comparatively long, straight, needle-like beak; in a nearly mature capsule this is so clearly defined and differentiated, at the rim, from the capsule-wall that it has every appearance of being intended to function as a dehiscent lid. On the other hand, a capsule which has naturally shed its spores appears to have broken up quite irregularly, and a nearly mature capsule when subjected to slight pressure under a cover-glass broke up quite irregularly, leaving the lid *in situ*. The soft succulent texture of the capsule-wall also is strongly suggestive of a cleistocarpous fruit.

Funariaceæ.

Chamæbryum Thér. & Dixon, gen. nov.

Costesiæ Thér., generi chilensi (Rev. Chilena de Hist. Nat. xxi. (1917) p. 12) habitu, thecæ structura atque textura valde affine; sed caulibus repentibus, subterraneis, rhizomaticis, pallidis, ramisque propter folia perconcava, imbricataque gemmiformibus, thecaque erecta, symmetrica, bene notatum.

Chamæbryum pottioides Thér. & Dixon, sp. nov.

Stirps minuta, phascoidea vel pottioidea, terrestris. Caules subterranei, repentes, rhizomatici, pallidi, succulenti, ramos emittentes steriles atque fructiferos. Rami steriles gemmiformes, subglobosi, 1–2 mm. alti, virides vel pallidi, e foliis imbricatis, siccis vix mutatis, perconcavis, spathulato-orbicularibus instructi. Costa tenuis, infra apicem cochleariformem, obtusam vel apiculatam desinens. Margines plani, integerrimi. Cellulæ basilares perlaxæ, late rectangulares, hyalinæ, serie unica marginali breviores, quadratæ; superiores sensim minores, hexagonæ, rotundato-quadratæ, &c., circa 10–15 μ latæ, marginales parum minores, omnes parietibus tenuibus, pellucidæ.

Rami fructiferi similes, sed sæpe minores, foliis plus minusve aristatis, supremis arista piliformi, flexuosa, hyalina, folio subæquilonga, integerrima terminatis.

Theca subglobosa vel globoso-urceolata, 1 mm. longa; seta subæqualis vel paullo longior, pallide rubra, crassiuscula. Vaginula turgida, spongiosa, e basi latiore conica. Operculum majusculum, plano-mamillatum. Exothecii rete perspongiosum, molle, e cellulis laxis mollissimis subhexagonis compositum, infra orificium cellulis seriebus 5–6 minoribus, transverse rectangularibus. Annulus 0. Peristomium nullum. Spori 30–35 μ, haud omnino maturi. Calyptra haud visa.

Dioicum videtur. Flores ♂ haud visi.

Hab. Cape Town, 1917; *Wager* (633) c. fr., (654, 655) st.

This curious little moss has distinct affinity with the recently described Chilian genus *Costesia* Thér., notably in the form and structure of the very spongy capsule, the lid, &c. Apart, however, from the creeping rhizomatous stems in the present plant, which appear to constitute a more than specific difference, the African species differs altogether in size, habit, very concave piliferous leaves, &c.

I have carefully dissected a fruiting stem without finding any trace of ♂ flower or antheridia. It might be supposed that the stems which I have described as sterile were the ♂ stems, but I have not been able to find the ♂ organs on them. The vaginula is remarkable in its turgid onion-shaped form, of spongy texture, with the upper or perichætial leaves densely crowded around it.

Œdipodiella, which has similar creeping stems, differs at once in the leaf-form and structure, and in the sessile or subsessile cleistocarpous capsule; *Goniomitrium* in the sessile capsule and strong nerve of the leaves; *Physcomitrellopsis* (v. infra) in the stems not creeping, the subsessile capsule, long Physcomitrelloid leaves, &c.

Physcomitrellopsis Broth. & Wager, gen. nov.

Stirps parva, habitu foliisque *Physcomitrellæ*; calyptra magna, thecam omnino includens, infra inflata, rostro valido breviore. Theca cleistocarpa.

Physcomitrellopsis africana Broth. & Wager, sp. nov.; Broth. MS. in litt. ad Wager.

Caules gregarii, terrestres, virides, circa ·5 cm. alti. Folia inferiora perpauca, parva, superiora (circa 6) comata, multo majora, flaccida, difficillime madefacta, patula, 3–4 mm. longa, e basi angustiore elongata spathulato-lanceolata, acuminata, acumine longe, subrobuste, acutissime acutata. Costa tenuiuscula, nunc sub acumine soluta, nunc cum acumine terminata, nunc longiuscule excurrens. Margines plani, aliquando integri, sæpius supra medium folium obtuse, raro acute, grosse denticulati, acumine ipso integerrimo. Areolatio perlaxa, cellulis basilaribus magnis, rectangularibus, pellucidis, superioribus elongate hexagonis, 25–40 μ latis, chlorophyllosis, marginalibus magis rectangularibus, nec tamen angustioribus, nec limbum formantibus, omnibus parietibus teneris, facile collapsis.

Autoica. Flos ♂ parvus, ad caulis basin, paucifolius, foliis brevibus, breviter cuspidatis. Vaginula parva. Seta brevissima, circa ·75 mm. longa, tenuis; theca circa 1·5 mm. longa, elliptico-globosa, brevissime obtuse apiculata, sine operculo dehiscente; exothecium valde leptodermicum, e cellulis teneris hexagonis parietibus teneribus instructum. Stomata ad basin sat numerosa, Funarioidea. Spori ad 30 μ. Calyptra immatura solum visum, pro planta majuscula, totam thecam parte inferiore inflata obtegens, rostro breviore recto.

Hab. Natal, *Wager*. Type in herb. Brotherus.

A quite distinct little plant, with very much the habit and gametophyte characters of *Physcomitrella*, and a similar capsule, but with a distinct seta and with quite different calyptra.

Brotherus in the *Musci* describes twelve genera of *Funariaceæ*. Since the publication of that work four new genera (including the two published in this paper) have been added. Several of these are characterized by single and rather elusive generic characters, such as the form of the calyptra and the character of the stomata. I have thought it might be worth while to give a key to the genera, based on that in Brotherus' work, and showing the places occupied by those newly described:—

Key to Genera of Funariaceæ.

Primary stem rhizomatous, creeping. Seta short, gymnostomous	I. Gigaspermeæ.
Minute plants with persistent protonema, almost stemless; capsule sessile or subsessile, mostly cleistocarpous, gymnostomous	II. Ephemereæ.
Stems erect; protonema not persistent; seta usually elongate; capsule always exserted; peristome often present; calyptra usually large, inflated and split at base	III. Funarieæ.

I. Gigaspermeæ.

1	Leaves nerveless	*Gigaspermum.*
	Leaves nerved	2.
2	Lid not separating, capsule subsessile......	*Lorentziella.*
	Lid separating, capsule exserted, with spongy exothecium	*Chamæbryum.*

II. Ephemereæ.

1	Lid not differentiated	2.
	Lid differentiated............................	*Nanobryum.*
2	Calyptra cucullate, reaching nearly to middle of capsule	*Ephemerella.*
	Calyptra mitriform, split at base, usually very small	*Ephemerum.*

III. Funarieæ.

1	Lid not separating	2.
	Lid separating	4.
2	Calyptra small, mitriform, covering only apex of capsule	3.
	Calyptra large, inflated at base, covering all capsule	*Physcomitrellopsis.*
3	Stomata superficial, pore small, elliptic; calyptra usually entire at base	*Physcomitrella.*
	Stomata partially immersed, pore an elongate slit; calyptra split at base	*Physcomitridium.*
4	Capsule immersed............................	5.
	Capsule exserted	8.
5	Calyptra scarcely or not reaching below lid.	6.
	Calyptra covering nearly half the capsule.	7.

6	Paroicous or synoicous........................	*Micropoma.*
	Autoicous	*Physcomitrium*, § *Cryptopyxis.*
7	Nerve weak, ceasing below apex; calyptra smooth	*Aphanorrhegma.*
	Nerve stout, excurrent; calyptra 8-ribbed.	*Goniomitrium.*
8	Capsule-wall spongy..............................	*Costesia.*
	Capsule-wall normal..............................	9.
9	Seta about equal to capsule; calyptra 4-angled..	*Pyramidula.*
	Seta usually longer than capsule; calyptra not or rarely angled	10.
10	Calyptra mitriform; usually deeply 3-fid at base when mature	*Physcomitrium.*
	Calyptra inflated below, split on one side only, and cucullate	*Funaria.*

Hookeriaceæ.

Dimorphocladon Dixon, gen. nov.

Caulis sat robustus, procumbens, ramis dimorphis; aliis foliis percomplanatis, laxiusculis, patentibus, breviusculis, marginibus conferte, bigeminatim denticulatis, foliis apicalibus paucis, similibus, interdum penicillatis; aliis foliis confertioribus, minus complanatis, parum patentibus, suberectis, longioribus, multo magis attenuatis, remotius, indistincte denticulatis, apicalibus præcipue prælongis, penicillum longum, caudiforme, curvatam instruentibus, filis articulatis permultis æquilongis hyalinis intermixtis. Folia sat breviter binervia. Perichætium longum, polyphyllum.

Dimorphocladon bornense Dixon, sp. nov.

Planta depressa, mollis, plumosa, luteo-viridis, robustiuscula; caulis hic illic radiculosus, irregulariter complanate pinnatus; folia lanceolata vel late lanceolata, anguste acuminata, circa 2 mm. longa, leniter curvata vel falcata, pellucida; costæ binæ, tenues, sæpe indistinctæ, cruribus interdum inæqualibus, plerumque tertiam partem folii attingentes, sæpe perbreves. Margines plani, e basi fere regulariter, sat conferte bigeminatim breviter argute denticulati. Areolatio pellucida, e cellulis valde elongatis, linearibus, prosenchymaticis, apice dorso sæpe spiculoso instructa; basilaribus latioribus, infimis, seriebus 1–2 multo laxioribus, ovatis, pellucidis.

Rami nonnulli breves, foliis laxiusculis, percomplanatis, valde patentibus, caulinis similibus, sed brevioribus, brevius acuminatis; alii foliis parum patentibus, confertioribus, longioribus, 3–4 mm. longis, angustioribus, sensim longius angustius piliformiter acuminatis, remotis, multo minus fortiter denticulatis; supremis prælonge penicillatis, caudiformibus, curvatis, filis articulatis foliis æquilongis vel multo longioribus, hyalinis, filiformibus, sed latiusculis (18–22 μ latis) permultis intermixtis.

? Dioicum. Perichætia numerosa, majuscula, 3 mm. longa, polyphylla, foliis erectis, superne in acumen strictiusculum nec multo attenuatum argute condensate bigeminatim denticulatum angustata. Vaginula 1 mm. longa, sat magna. Seta circa 3 cm. longa, crassiuscula, rubra, inferne lævis, apice leniter ruguloso. Calyptra immatura 4 mm. longa, infra lævis, superne setulis brevibus dense hispida. Cetera ignota.

Hab. Upper Sarawak, Borneo; *A. H. Everett*; herb. Mitten (type in herb. N.Y. Bot. Gard.), mixed with *Taxithelium* sp., &c.

The affinity of this plant is clearly with *Chætomitrium*, some of the species of which have somewhat similar brood-filaments; but the dimorphous branches and the bigeminate denticulation of the leaf-margin seem to justify its separation from that genus. The extremely long, hyaline, jointed filaments are very numerous and conspicuous at the tips of the caudiform branches.

The dimorphism of the branches is sometimes extremely marked, though at other times the smaller, complanate, laxly foliate ones end in a short penicillate tuft, and in other ways may approach the more robust caudate-tipped ones. These, however, are very striking, the curved penicillate tips being very conspicuous and characteristic.

Mitten has sketched roughly a perichætium with what appears to be a ♂ flower near its base. I have failed, however, to find ♂ flowers on the fertile stems I possess. The perichætia also are numerous along the stem, which suggests a dioicous inflorescence.

Explanation of Plate 564.

1. *Nanobryum Dummeri.* *a*, plant, nat. size. *b*, do., × 4. *c*, *c'*, upper leaves, × 20. *d*, cells at shoulder, × 200. *e*, two peristome teeth, × 80. *f*, capsule, moist, × 10. *g*, do., dry, × 10.

2. *Beddomiella funarioides.* *a*, plants, nat. size. *b*, leaf, × 20. *c*, upper marginal cells, × 200. *d*, *d'*, capsules, × 10. *e*, part of peristome, × 80. *f*, lower part of a tooth, × 160. *g*, calyptra on immature capsule, × 20.

3. *Physcomitrellopsis africana.* *a*, plant, nat. size. *b*, leaf, × 20. *c*, upper marginal cells, × 200. *d*, young fruit with calyptra, × 15. *e*, stoma, × 200. *f*, capsule, × 5.

4. *Chamæbryum pottioides.* *a*, sterile plant, × 2. *a'*, fruiting do., × 2. *b*, upper leaf, × 20. *c*, fruit, × 4.

5. *Dimorphocladon bornense.* *a*, plant, nat. size. *b*, *b'*, leaves of normal branches, × 20. *c*, leaf of caudiform branch, × 20. *d*, marginal cells at mid-leaf, × 200. *e*, calyptra, × 8. *f*, upper part of inner perichætial leaves, × 20.

6. *Chionoloma induratum.* *a*, stem, nat. size (upper part dry). *b*, leaf, × 5. *c*, leaf-apex, × 20. *d*, margin at mid-leaf, × 200.

PLANT NOMENCLATURE.

(See Journ. Bot. 1921, 153, 289, 345.)

Returning from several months in the Orient, I am much interested to find that a discussion concerning nomenclature is under way in the *Journal of Botany*. With the permission of the Editor I should like to present a few suggestions regarding generic names.

Stability would be greatly favoured by agreement among botanists as to the use and application of generic names. The International Rules provide for the use of the earliest generic name except for an attached list of *nomina conservanda*. But the rules as to the application of generic names are not altogether definite.

A concept of types in the application of names has grown up in America, and about thirty years ago a body of American botanists formulated a code (the so-called American Code) largely based upon this concept. In a recently proposed modification of this code (see *Science*, n. s. liii. 312) the concept of types is taken as the guiding principle on which the rules and recommendations are based, and the proposed code is designated as the Type-basis Code.

This method of applying names is not confined to Americans. European botanists are coming more and more to use the method and are tending to employ the term "type" or "typus." The International Rules as formulated at Vienna ignore the question of types; but by 1910 the idea had made such headway that a recommendation—in addition to Recommendation xviii.—was adopted at the Brussels Congress providing for the indication of types in the future.

The followers of the Type-basis Code believe that this concept applied retroactively would aid greatly in stabilizing generic names, and have suggested rules for selecting the type-species. However a genus is limited, the generic name is applied so as to include the type-species—the type-species is, of course, one of the species included in the genus when originally published. In a few cases, especially among Cryptogams, the genus as now generally accepted does not include any of the original species, and the application of the name so as to include the type-species (or even one of the original species) would cause serious confusion. The Type-basis Code provides for such cases by permitting exceptions (Art. 6) to be validated by a suitable commission. The type concept is independent of the validity of names, and applies to synonyms as well as to valid names, a synonym being referred as its type-species.

I suggest, then, that the International Rules be amended so as to apply the type concept retroactively. It is difficult to select a place in the Rules where such an amendment may be logically inserted; unless there were a radical revision of the Rules it would be necessary to incorporate statements at several places. If botanists favour a modification of the Rules so as to include the concept of types, it would be well to ask the next International Congress to adopt the principle of types and then appoint a committee to incorporate the principle in the Rules. The principle might be stated as follows:—

The application of names is determined by means of nomenclatural types. A generic name is so applied as to include its type-species; a specific name is so applied as to include its type-specimen.

It is clear that in a few cases there will be differences of opinion as to the type-species of a genus, and a few cases where botanists would prefer to retain a generic name now in common use, even though it did not include its type-species. The Congress should act on such cases as it does on *nomina conservanda.*

I would therefore further suggest that each International Congress appoint an international committee to recommend to the succeeding Congress lists of *nomina conservanda*, of validated generic types, and of controlling species or substitute types for the exceptions to rules for generic types, and to recommend action on such other matters as might properly be referred to such a committee. The committee should include representatives from the countries publishing work in systematic botany and might be distributed as follows:—Austria 1, Belgium 1, France 2, Germany 2, Great Britain 2, Holland 1, Italy 1, Scandinavia 1, Switzerland 1, United States 3. This list is suggestive only.

I believe we shall have taken another long step toward stable nomenclature if botanists will adopt the type concept as outlined above, and will adopt the machinery for reaching an agreement on the types of genera and on conserved names. A congress has not the necessary time to deal with details, but should have presented to it for action carefully prepared data such as would come from an international committee.

A. S. Hitchcock.

U.S. Department of Agriculture, Washington.
January 18, 1922.

All botanists, especially those in America, must welcome the discussion of plant nomenclature appearing in the *Journal of Botany*. No aspect of botany is, sadly enough, so conspicuous as is this least scientific phase of the subject. It has been far from a pleasure to many of us to be part of a divergent minority on a matter where ultimate world-wide uniformity is so essential; and our position can only be justified by the belief that there are features in the American Code which are so helpful that they should surely be embodied in the International Code of the future.

Although I believe that the merits of the American procedure have not been fully understood by all European botanists, while our points of divergence from international sanction have been overemphasized, I do not wish to appear as the champion of one system. We want an International Code that shall combine the good points of all present practice. It should be an excellent thing that both the International Rules and the American Code have been used long enough for us to compare their relative efficiency.

Mr. T. A. Sprague (*op. cit.* lix. 153: 1921) has reopened the subject by proposing a series of suggested amendments to the present International Rules. His treatment is candid and generous, and he defines clearly the slightly differing goals of the two codes of nomenclature. But it seems to me that he attaches too great and too permanent a weight to this difference, while his suggestions do not embody the important principle that should be the chief contribution of the American school.

In these remarks I wish to consider first what some of us think should be the chief contribution of the present American Code to the International Code of the future; then to consider a plan of harmony on the much vexed matter of *nomina conservanda*; and, finally, to consider the several suggestions of Mr. Sprague and others on names to be rejected, orthography, etc. It will make the bearing of these remarks on the International Rules most evident if they are grouped, with the changing of one word, under two of the three "essential points in nomenclature" stated so succinctly in Article 4: "1, to aim at fixity of names; 2, to avoid or to reject the use of forms and names which may cause error or ambiguity or throw science into confusion." The principle of types and the subject of *nomina conservanda* will be considered under: (1) Stability of Names, and (2) Accuracy and Applicability of Names.

I. Stability of Names.

As stated by Mr. Sprague, the "stability" which is the goal of the American Code is not identical with the "fixity" sought by the International Rules; hence, in estimating the possible contribution to the future from the American Code, it is but right to ask if its expressed goal is in itself a betterment. Fixity implies "fixing" names in vogue, much as an histologist "fixes"—holds at a certain state of perfection or imperfection—the tissues which he is to study: its tendency is to appeal to separate acts of control rather than to broad working rules. In surveying the present state of taxonomic botany we see some hundreds of thousands of species whose names represent as many distinct or curiously criss-crossed or duplicated terms, the whole forming an intricate terminology through which we need the clearest of guides; and, looking to the future, we can predict that as many more, perhaps several times as many more, species are yet to be named. It seems to us in America that the situation demands rules for the present and future which give stability, definite certainty, to nomenclature. I wish to show that this may be achieved with much more fixity of current names than has been assumed by Mr. Sprague.

The efficiency of the American Code lies in the application throughout of a single rule of procedure. Each species-name is associated as accurately as possible with a single plant, and each genus-name with a single species. The principle of types consistently applied gives definiteness. Of course, it has taken time and considerable experimenting to decide upon the most logical and precise method of selection of "types." Without claiming our present method of "typifying" as ideal, I would ask those unacquainted therewith to consult the recent reports of the American committee on nomenclature, published in *Science*, n. s. xlix. 333, 1919; liii. 312, 1921.

In conformity with this insistence on types, generic names are only recognized when they can be definitely associated with a given species. Obviously only such are capable of typification. However regrettable it may seem to rule out genera so well described as those of Jussieu's *Genera Plantarum*, this course is necessary where the system of types is adopted. Whether, on the other hand, genera undescribed yet accompanied by citation of species (now not recognized by the International Rules though approved by the American Code) should be upheld, may well be subject of debate.

While considering American practice tending towards stability of nomenclature, I must emphasize another point where the Code achieves superior simplicity and definiteness. The American Code prohibits, for the naming of later generic propositions, the use of genus-names which have supposedly lapsed into permanent synonymy; the International Rules permit the re-use of such genus-names as have by universal consent and for a definite period so lapsed. In practice these conditions are difficult to decide and therefore subject to considerable individual interpretation. But, more unfortunate still, they continually require the monographer of any family to pursue scattered researches on other various and remote groups in order to assure himself that some early name, long considered in synonymy, is justly and permanently so treated. Only those who have had occasion to follow such entanglements will appreciate how cross-complicated our nomenclature can become, and what a decisive cutting of the Gordian knot the American custom offers!

It will be asked "Is not such an insistence upon a simple procedure too ruthless an allegiance to rule? Does not the American method imply wholesale changes of long-established and familiar names? What thorough application have its principles had, that we may actually view them in action?" If I may answer from my own experience, I have given the American Code what I think is a fair test. I have, strictly following its usage, typified all generic names of the family *Scrophulariaceæ*. As over two hundred genera are recognized in this family and some four hundred generic names are concerned, my success in the selecting of names should form a valid check upon the system. It was a pleasure to find very few instances wherein the American Rules caused any change from current usage, only two cases involving names for genera of considerable size. *Gerardia* L., typified by *G. tuberosa* L., belongs properly to the *Acanthaceæ*, and the Scrophulariaceous plants become *Agalinis* Raf. and *Aureolaria* Raf., names buried since their first proposal in 1837: *Calceolaria* L., 1770, is antedated by *Calceolaria* Loefl., 1766, and *Calceolaria* (Heister) Fabricius, 1759 [or 1763]. The name *Calceolaria*, in its application from 1770, has been applied to a large genus including several hundred species, and it seems to me that one practical aim of nomenclature—convenience—should lead to its retention.

No subject has proved such a bone of contention between the schools as has that of the retention or non-retention of certain current names, the use or non-use of *nomina conservanda*. Of course, all must grant that a list of later names to be held without concern for priority does introduce something very arbitrary into an otherwise nearly automatic system. Every name which is an exception to rule is a clog in the nomenclature-machine, and is liable to bring about surprising cross-complications. Consequently for small genera, where any change involves the learning of only a few new names, it seems to me that we should agree to discard uniformly all antedated names; but for large genera, practical convenience, including continued quick accessibility to literature for students of many branches of botany, requires, I think, the retention of some widely-used names.

A suggested plan of harmony on this vexed matter is then to maintain a list of *nomina conservanda*, placing thereon such antedated current names as have been applied to genera credited with at least a hundred species—possibly the limit should be fifty. In either case such a list would be small, involving few exceptions to rule, and would be found nevertheless to include the great majority of those species whereon the codes at present disagree.

To test the truth of this contention, and also to prove to ourselves how much less than has been supposed is the present divergence in actual practice between the two codes, let us examine a sample portion of the list of *nomina conservanda* authorized at Vienna in 1907. I assume that the list of New England *nomina conservanda*, published in *Rhodora*, ix. 53, 1907, is a fair specimen of the whole. Let us examine these names and see what proportion, forming a reserved list only for names given to genera of fifty or a hundred species, need be maintained on a restricted list of names to be conserved. To check the size of each genus we will assign it the number of species given it in Dalla Torre et Harms, *Genera Siphonogamarum*; and, as indicating the action of the American Code, we will compare its nomenclature with that of Dr. N. L. Britton in Britton & Brown, *Illustrated Flora*, ed. 2, 1913.

Excluding *Erophila* DC. (not in *Genera Siphonogamarum* as a distinct genus), there are listed 64 names of genera occurring either as native or as introduced in New England. Of these, 18 should be excluded, inasmuch as the American Code, as applied by Dr. Britton, on logical grounds, sustains their use; three other names should be struck out: *Calystegia* R. Br., placed now in *Convolvulus* L.; *Taraxacum* Wiggers, held as against *Hedypnois* Scop. but put by Dr. Britton in *Leontodon* L., of which name it is the historic application; and *Haplopappus* Cass., concerning the delimitation of which is little agreement. This leaves 43 cases of divergence between the usage of the two schools.

Let us inquire next into the size of these 43 genera, whose names have been excepted from the rule of priority. How many are credited with over a hundred species? There are only two—*Tephrosia* Pers. and *Desmodium* Desv. *Tephrosia* is retained as against the Linnean *Cracca*, but surely followers of the International Rules should carefully reconsider the wisdom of replacing a genus-name dating from the first edition of the *Species Plantarum*; *Desmodium*, I agree, is a fit candidate for *nomen conservandum*. There are but three other genera credited each with 50 or more species, so that it becomes obvious what a small list of exceptions to the rule of priority our compromise calls for!

In fact, 38 of the 43 names previously conserved for New England plants belong to small genera, and herein, I believe, has lain the chief stumbling-block in the way of American acceptance of the system of *nomina conservanda*. It has seemed to us that most of the excepted names have meant too trivial a saving of terminology to warrant the violation of procedure and the possibility of complications of nomenclature involved. Actually 28 names of those on the list of New England *nomina conservanda*—about two-thirds of the present divergent cases of usage—pertain to genera each credited with ten species or less, and of these again ten are monotypic! Does it seem worth while, when devising rules for handling thousands of genus-names for some hundreds of thousands of species, to make exceptions for *Symplocarpus* Salisb., *Majanthemum* Web., *Lachnanthes* Ell., *Loisleuria* Desv.—infinitesimal fractions of our plant-life? Surely we can make some ruling, based upon size and, perhaps, economic importance, to govern the selection of names to be reserved as *nomina conservanda*! Also, I may urge that names so selected should be as definitely typified as any others.

As the study of such a series of names shows, divergence of nomenclature due to following or ignoring the list of *nomina conservanda* has happily been but slight, although the matter has unfortunately been over-stressed. In this country our differences in terminology have been due in the main to varying views with regard to the limiting of genera, and such divergence should prove healthful rather than unhealthful to taxonomic botany.

I am aware that Mr. Sprague in his discussion of this question has calculated the number of name-changes which the adoption of the American Code would require as beyond 15,000, over one-ninth of all seed-plants! His calculations are also largely from the *Genera Siphonogamarum*. A chief reason for his high estimate is that he assumes that each name which at Vienna was made a *nomen conservandum* is actually in conflict with our Rules; a considerable number of these, however, especially those earlier proposed, and hence apt to pertain to large genera, were antedated only by prior listing or such other vague mention as neither code sustains. The truth of this is shown by the presence on the New England list of six genus-names pertaining to genera of over a hundred species each, every one of which Dr. Britton, applying the American Code, confirms: they are *Fimbristylis* Vahl, *Rhynchospora* Vahl, *Pilea* Lindl., *Oxytropis* DC., *Vernonia* Schreb., and *Mikania* Willd. If names of this class are omitted, and if a list of *nomina conservanda* be accepted for genera with many species each, Mr. Sprague's "one-ninth of all seed-plants" would dwindle to a very small fraction indeed.

II. Accuracy and Applicability of Names.

Under this heading I wish to consider certain suggestions concerning names to be rejected, orthography, terminology, and practical convenience in accrediting of authorities. These seem to me to be all quite secondary to the deciding of the underlying rules of procedure which we have been considering, although they touch more evidently the obvious purpose of nomenclature—appropriateness of names. To hold that names are mere labels for plants, and that their applicability or lack of applicability is of no importance, is, to my mind, a partial perversion of the original aim of nomenclature.

The International Rules ask us "to avoid or reject the use of forms and names which may cause error or ambiguity or throw science into confusion." In practice the Rules protest also against meaningless names. From the standpoints of convenience, and, more importantly, the expression of truth, I wish to consider briefly the valuable suggestions made by Mr. Sprague.

His first suggestion as to the undesirability of insisting upon Latin diagnoses for new species is one of convenience that seems to be now generally concurred with.

His second suggestion is to prohibit the use both of duplicating and nearly duplicating binomials. Such names are meaningless, and his proposal meets my hearty approval, though in rejecting the names I think that fear of ridicule should influence us less than a positive desire for intelligent terminology.

His third suggestion, that of avoiding misleading geographical names, I should like to see enlarged to include the rejection of any proved misnomer of any kind. Inasmuch as the names historically first, and therefore those selected by priority, were usually based upon less complete knowledge, it is natural that they are sometimes misleading or positively untrue; surely it is crippling to our science not to be permitted to replace such as are proved fallacious? What but "causing error" or "throwing science into confusion" can be the result of maintaining *Pentstemon eriantherus* Pursh for a Beard-tongue with glabrous anthers (the sterile filament, which completely lacks an anther, alone being woolly-bearded); *Pinus palustris* Mill. for the dry-soil long-leaf pine (in no way a swamp-species); or *Asclepias syriaca* L. the American Milkweed? Users of all codes should realize, it seems to me, that method in science ought to give place to the statement of scientific truth.

I approve of Mr. Sprague's fourth, fifth, and sixth suggestions.

For his seventh suggestion, I think that the practice so clearly outlined by Mr. A. S. Hitchcock in *Science*, n. s. lii. 312, 1921, and in the introduction to Hitchcock and Chase's *North American Species of Panicum* (Contrib. U.S. Nat. Herb. xv. 6; 1910) is preferable. This method saves time otherwise spent to little profit, gives convenience, and answers the International aim of preventing ambiguity. Dr. Hitchcock's course is to associate a species-name permanently with the species to which it was first applied, holding that species to be the one actually removed to another genus, even though the transferrer really intended some other plant which he had erroneously confused with it. While open to the accusation of treating names abstractly and independently of descriptions, this rule makes for simplicity in preventing much laborious and unprofitable surmising as to what species the transferrer may have actually seen. Moreover, it prevents duplication of the same binomial according to the application of this or that worker. A species-name, with all transfers based upon it, follows one single species, and if the original identity of the name be clear all subsequent combinations based thereon are equally so.

Mr. Sprague's suggestion 9, A, seems to me to have been well modified by the later suggestion of Mr. F. N. Williams (*op. cit.* 205). Mr. Williams urges that it is pedantic to alter the expected Latin gender because of the classic exception to rule by which names of trees became feminine. This surely involves for botanists to-day a needless and profitless effort of decision; is it not conceivable that, in the face of our present use of Latin in pure science, a conclave of contemporary Roman grammarians would be likely themselves to modify, or standardize, their language? In the absence of such a gathering, cannot we, as nearest representing them, do just this in one trivial point of their tongue? This would be a slight assumption of power compared to the sweeping revisal of the Spanish language carried through by the Spanish Academy. The remaining parts of suggestion 9, as well as suggestions 10, 11, and 12, I fully agree to, although the last two, recommending respectively the writing of small initial letter for all species and the omission of the comma between a technical name and its authority, seem to me matters in which liberty may well be given individual preference.

I think that Mr. Sprague has done an excellent thing in opening again the subject of nomenclature, and the editor of the *Journal of Botany* a like service in welcoming a frank discussion. We must come to universal agreement in this field: however much of compromise may be at last involved, such agreement presupposes a careful analysis of methods, a profiting by the experience of either school, and the joint endeavour to form a system of nomenclature simple in practice and giving results accurate and stable.

Francis W. Pennell.

Academy of Natural Sciences of Philadelphia.

[We have submitted these papers to Mr. Sprague, and hope to publish his comments upon them in our next issue.—Ed. Journ. Bot.]

NEW UMBELLIFERÆ FROM TROPICAL AFRICA.

By Cecil Norman.

All the plants hereunder described were collected by John Gossweiler—four in Angola in 1906–7, and one in Mayumbe, Portuguese Congo, in 1918—and are in the National Herbarium. Portuguese West Africa seems to be rather rich in plants of this order, but in many cases the material to hand does not admit of satisfactory determination.

I gladly take this opportunity of expressing my grateful thanks to my friend Mr. E. G. Baker for much help and advice.

Carum angolense, sp. nov.

Herba rigida, suffruticosa, glabra, robusta: caule in sicco canaliculato; *foliis* ternatis, subsessilibus, lobis linearibus nonnunquam trifidis 3–5½ cm. longis, 1–2 mm. latis, acuminatis: *umbellorum* radiis 8–12 valde inaequalibus, plerumque circa 3–9 cm. longis, vel rarius usque ad 13 cm.; *umbelullorum* pedicellis crassiusculis 10–20, circiter 4–10 mm. longis: *involucri* bracteis plerumque parvis, linearibus, vel rarius longis foliaceisque, *involucellorum* minutis; *calycis* dentibus prominentibus: stylis brevibus: stylopodio parvo: *fructu* oblongo glabro a latere compresso ±5 mm. longo: carpellis subpentagonis: jugis primariis prominentibus æqualibus: *vittis* vallecularibus solitariis, ad commissuram 2, semine subterete, haud excavato; carpophoro bipartito.

Angola; n. 4346. "In short grown thickets at Kaconda, Feb. 1907. Not abundant."

A remarkable plant, with the fruit, though hardly the habit, of *Carum*.

Selinum angolense, sp. nov.

Herba perennis, erecta, circa metralis; *caule* simplice terete, glabro: *foliis*, caulinis, paucis, bracteæformibus; radicalibus, longe petiolatis, basi vaginantibus, bi-ternato-pinnatis, flavo-virentibus ±14 cm. longis in toto: *foliolis* triangularibus, serratis, nunc leviter nunc profunde trisectis $\pm 3\frac{1}{2} \times 2\frac{1}{2}$ cm.; *umbellis* magnis, radiis crassis, ±12; 8–10 cm. longis; *umbellulorum* pedicellis multis, tenuibus, ±5 mm. longis; *involucro* et involucellis plurum bractearum linearum; *calycis* dentibus obsoletis; *stylis* longiusculis; *fructu* oblongo 1 cm. longo, ±6 mm. lato, a dorso valde compresso; jugis primariis in alas papyraceas subæquales prolongatis: *vittis* valecularibus magnis solitariis, ad commissuram 4: carpophoro bipartito: semine angusto, a dorso valde compresso, vix semi-lunato.

Angola; nn. 2727, 3166. Flowers with "purplish petals."

I cannot find that *Selinum* has been previously recorded from Tropical Africa, though there are several species of *Cuidium* in South Africa; but even if *Cuidium* be kept up (see Gen. Plant. i. 914) the much compressed fruit of this plant would remove it from that genus.

N. 3696, without fruit, is closely allied, if not identical; the umbel has 21 rays ±14 cm. long, and is an altogether stouter plant.

Pimpinella robusta, sp. nov.

Herba robusta, perennis, usque ad 3 m. alta; leviter ramosa glabra; *caule* terete, striato; *foliis radicalibus* simplicibus, triangularibus serratis basi, ut videtur, truncatis, ± 6 cm. $\times$ 4·5 cm., petiolo tenui ±9 cm. longo suffultis; *foliis caulinis* numerosis sæpissime oppositis, *inferioribus* trifoliatis serratis, petiolo lato vaginanti usque ad 5 cm. longo suffultis: *foliolis* lateralibus sessilibus anguste oblongis nonnunquam ad basim leviter lobatis ±3–6 cm. longis et ±5–10 mm. latis: foliolo medio semper maximo, anguste oblongo vel lanceolato, nunc sessili nunc in petiolum brevem attenuato, 6–8 cm. $\times$ 1–3 cm.. *superioribus* in bracteas (sæpe trifidas lobis dentatis) reductis: *umbellis* densis; radiis glabris multis, subæqualibus ±1·5 cm. longis; *involucro* et involucello nullo; *petalis* flaviusculis, apice inflexis; *ovario* dense hirsuto.

Mayumbe; n. 7473. The specimen is in young flower, with only one radical leaf.

Although this plant is without fruit, there can be little doubt that it is closely allied to *P. Welwitschii* Engler. It differs from that plant in its much more robust habit, its dense umbels and its large perfectly-developed lower cauline leaves, etc. Both *P. Welwitschii* and *P. robusta* have the ovary densely hairy, while in *P. huillensis* Welw. it is much less so, the mature fruit having only scattered hairs, rather thicker on the ribs. I have not seen the fruit of *P. Welwitschii*.

Peucedanum Gossweileri, sp. nov.

Herba alta perennis, glaberrima, leviter ramosa, caule striato: *foliis* longe petiolatis bi-ternato-pinnatis 14–28 cm. longis; foliolis petiolatulis profunde pinnatisectis, segmentis ultimis angustis brevibusque; *umbellorum* radiis ±12 longissimis usque ad 10 cm. longis, tenuibus; umbellulorum pedicellis 6–12 tenuissimis 1½–3 cm. longis; *involucri* et involucellorum bracteis paucis, subulatis: *calycis* dentibus minimis, stylopodio parvo conico, stylis brevibus; *fructu* pyriformi ±1 cm. longo, ±6 mm. lato; jugis dorsalibus prominulis; lateralibus in alas papyraceas productis; vittis valecularibus 3 ad commissuram sæpissime 6: carpophoro bipartito.

Angola; nn. 3011, 2715. "In woods, principally Mumua, on the right margins of the river Langa: rare."

No flowers have been preserved—many seem to have been males or barren. The large fruit, the many vittæ, and the finely-cut leaves are the outstanding features of this species.

Annesorhiza Gossweileri, sp. nov.

Herba perennis, 4–5 dm. alta, leviter ramosa, caule terete glabro, radice fusiformi ±15 cm. × 1½ cm.: *foliis radicalibus* petiolatis, digitato-trifoliolatis; petiolo ±3 cm., foliolis 3–5 cm. longis late linearibus; *foliis caulinis* simplicibus linearibus usque 5 cm. longis: *umbellorum* radiis ±10 inæqualibus, 2–5 cm. longis; *umbellulorum* pedicellis 10–12, tenuibus, ±4 mm. longis; *involucri* et *involucellorum* bracteis, paucis, linearibus, acuminatis: *calycis* dentibus obsoletis; stylis brevissimis: *fructu* pyriformi ±8 mm. longo; stylopodio parvo; mericarpiis inæqualibus, jugis primariis nunc 3 nunc 4 in alas crassiusculas inæquales productis; *vittis* valecularibus solitariis, ad commissuram 2, semine terete, carpophoro bipartito.

Angola; n. 3405. A fruiting specimen without flowers.

A typically South African genus: the present species is well marked by the relatively large fruits.

HOW ARE PLANTS AWARE OF TIME?

By R. Irwin Lynch, A.L.S.

[Reprinted by permission from the *Gardeners' Chronicle* of Jan. 21.]

The majority of people would, perhaps, reply off-hand to this query that it is a question of season, which plants are compelled to know by physical circumstances, such as conditions of temperature and moisture; but very little reflection will show that this answer is incomplete.

In my garden, as a weed, I have a Cape *Oxalis*, much like *O. versicolor*, and now, in spite of being chilled and discouraged by the worst weather of the year, it insists on growing, evidently with all the vigour it can bring to bear, while in much more favourable weather it is perfectly quiescent. It has no encouragement whatever, and is growing apparently only because it is the time of growth in South Africa. Many would say "of course," and pass the matter over, but I think there is here a mystery that no one has attempted to explain—so far as I remember. It is notorious that plants do flower at the right time according to calendar rather than at the right season according to physical conditions, so much so that none marvel; indeed, it is the sole explanation why we have various plants in flower when they are the most valuable, and growth, too, at a fixed time is often one of the great difficulties of cultivation.

There are, however, various things to observe which require some explanation. It would be thought, for instance, that there would be forgetfulness in the dormant seed, so that a seedling raised in this country would readily accommodate itself to seasons of the English climate, corresponding with those of its natural home. If it does this in some cases, it does not in numerous instances I have in mind. I believe I am correct in stating that seedlings of *Aloe* raised from an imported packet of seed, which may have been sown at any time of the year, would in every case flower when the plant flowers in South Africa, *i. e.*, according to calendar, paying no regard whatever to corresponding seasons in this country. Moreover, I believe that English-grown seed would result in the same way. I have had various experiences of this kind, but, obviously, it is not the kind of thing that one could carry very far in experiment.

For many years I have had my mind upon this subject, but I cannot say that I have any fixed theory, though, as shown by Sir Francis Darwin, rhythmic action can sometimes be very wonderful in plant life. As an example, the case of Dandelion stalk just now occurs to me. If laid horizontally it naturally turns up; if, however, it is turned the other way after a sufficient interval of time by a klinostat it reverses, and if then the klinostat is made to turn at the same interval of time, the turning first one way and then the other by this Dandelion stem becomes automatic, and if the klinostat is finally stopped, nevertheless the Dandelion stem continues to turn first one way and then the other at the correct interval of time. What then may not be induced in the habit of a plant if ages of repeating seasons take the place of the klinostat? I am aware, of course, that there are instances of accommodation to climate, as, for instance, I believe, the change of the flowering season in the case of Australian Acacias planted in India.

SHORT NOTES.

Coleosporium Narcissi, sp. n.

II. Soris uredosporiferis amphigenis, parcis, ovalibus, planis, $\frac{1}{2}$–1 mm. (vel amplius) longis, sparsis v. in greges parvos digestis, pallidis, marginatis, diu epidermide tectis; uredosporis ovali-oblongis vel subinde obovoideis, pallide luteis, dense verruculosis, $25–30 \times 15–18\ \mu$, in catenas breves pedicello clavato suffultas compositis.

Hab. in foliis *Narcissi poetici*, Crown Colony, Holbeach, Lincs, Jun.–Jul. 1920–1 (F. Glover leg.).

The bulbs had been obtained two years previously from Spalding. The parasite was found only in small quantity. In the spores and in the pedicel the two usual conjugate nuclei can be observed in a stained section. This seems to be the first record of a *Coleosporium* on the Amaryllidaceæ; I owe the opportunity of seeing it to the kindness of Mr. A. D. Cotton. It was collected by Mr. F. Glover.—W. B. Grove.

Juncus compressus in S.E. Yorkshire. No mention is made of this species in J. F. Robinson's *Flora of the East Riding*. Mr. C. Waterfall reminds me that I so named an example of *Juncus* that he sent me, gathered in 1910 at the edge of Hornsea Mere in vice-county 61. It was a small form of this species, which sometimes attains the height of two feet in congenial surroundings.—C. E. Salmon.

REVIEWS.

The Somatic Organization of the Phæophyceæ. By A. H. Church. Oxford University Press. Botanical Memoirs, No. 10, 1920. 110 pp. Price 5*s*. net.

The Brown Seaweeds have a world-wide distribution, and represent one of the oldest groups of marine plants. They display a range of vegetative and reproductive organization beyond that of any other plant-series. Among them is found every stage of development from the short simple filament up to the giant *Macrocystis* or the dendroid *Lessonia*, and it is somewhat surprising that so comprehensive an evolutionary series should have failed hitherto to receive adequate investigation.

It is therefore with pleasure that Dr. Church's memoir on the Somatic Organization of the Phæophyceæ will be welcomed by all who are interested in the genesis of plant-structure. It is, as would be expected, an able contribution to the theory of the subject; and, though in appearance but a modest-looking pamphlet, it yet contains compressed within its paper cover what amounts to a text-book of some 70,000 words—an epitome of the whole matter.

It is written in the author's most condensed style; yet it cannot be described as the skeleton of a text-book; for it is more than mere bones, being meat all through, but in a most concentrated form—or, let us say, tough pemmican, which, taken dry, needs an infinity of chewing. In other words, the reading of this memoir is no light undertaking; nor should too much of it be read at any one sitting; for so full is it of facts, details, and new ideas that the mind cannot digest and absorb them readily, neither the memory retain them. No figures relieve the austerity of the text; the student is, however, aided by frequent references to illustrations in the works of well-known authors.

In the present notice it is impossible to do more than indicate briefly the trend of Dr. Church's argument. He claims that "the

Phæophyceæ have undoubtedly originated directly from free-floating autotrophic plankton," the factors in the life of which have been set forth in detail in a previous memoir (*The Building of an Autotrophic Flagellate*). The next stage to be postulated is the genesis of marine benthon, when the rising sea-bottom of the primæval ocean at last made it possible for sunken flagellates to attach themselves by their flagella upon a rocky stratum within range of sufficient illumination for the maintenance of continued existence, and so acquiring an increased supply of gases and salts from the ever-flowing water. The anchored organisms became encysted and gradually adapted themselves to the new benthic conditions. The products of cell-division, instead of separating like plankton units, began to hold together and form associations. Dr. Church shows why the uniseriate filament would have by far the best chance in the struggle for existence, and adopts the filamentous soma as indicating the main line of progression. He then discusses the question of apical growth, the origin of ramification, and the meaning of the branch, also the strengthening of the filament to resist the tug of the moving water. We have now reached the stage of Ectocarpoid Benthon, and then pass through several chapters which treat of adaptations evolved to meet the violence of wave-action, as the rocky bottom was elevated towards the surface—the Cable type of axis (*Chordaria*), the Multiseptate Cable (*Chorda Filum*), Corticated types, Parenchymatous types (*Laminaria* and *Fucus*). This leads on to a consideration of the evolution of growing points and of systems of ramification, the meaning of symmetry, phyllotaxis, differentiation of space-form, bilateral symmetry, and the theory of members. The evolution of the leaf-member of higher plants is neatly displayed in twelve successive phyletic stages, in the first five of which the Phæophyceæ figure. Haptera or Crampons (foreshadowing the *root* of higher plants), Pneumatocysts, Gametophores, and the elaboration of differentiated shoot-systems, next come under consideration, and are followed by tissue-differentiation, mucilage-hairs, and ducts. After a few brief chapters on the Pulvinate thallus, the Disc-type, the Palmelloid type, and on epiphytes, parasites, and endophytes, we come to the final chapter. This affords a stimulating account of the author's broad views on the algæ in general, and of their structure in relation to that of the higher plants of the dry land, and on the geological history of the algæ paralleled by that of zoological organisms. Dr. Church possesses a remarkable gift for appreciating and realising the conditions in which the evolution of the marine flora took place; and this has enabled him to construct a closely reasoned account of how the algæ adapted themselves to the gradually changing conditions of their oceanic environment. He sets forth innumerable facts and cogent deductions which prepare the way for his brilliant conception of a Land Flora derived from Oceanic migrants equipped with all the potentialities of stem, leaf, and root, as described in a previous memoir, *Thalassiophyta and the Subaerial Transmigration*.

A. G.

Iconographie des Orchidées d'Europe et du Bassin Méditerranéen. E. C. AND A. CAMUS, 1921. Folio atlas of 122 plates, with explanatory handbook. With hand-coloured plates, 300 francs; plain, 100 fr. (Paul Lechavalier, Paris.)

IN this fine work the 122 plates comprise over 1700 figures of species, varieties, and numerous hybrids never before figured; twelve of the plates give details of the internal structure generally. In the explanatory handbook some new varieties and hybrids are described, and an alphabetical index follows the descriptions of the plates; the latter include a large number of hybrids figured for the first time. In a short notice it is impossible to go into details. The crosses into which *Serapias* and *Orchis morio* enter furnish a fine series of handsome plants, and the *Ophrys* hybrids are numerous and most interesting. Each plate has the figures of several full-sized plants and numerous details, usually enlarged. The drawing and colouring are diagrammatic; the figures will be a valuable guide to the identification of the forms, especially of the hybrids, although from an artistic standpoint they leave something to be desired.

The notes which follow are suggested by a comparison of the plates with the forms familiar to us as British. *Anacamptis pyramidalis* has much broader leaves and paler flowers than we have ever seen in this country. An interesting form of *Orchis mascula* is figured, with very numerous tiny marks on both sides of the leaves. *Bicchia albida* has a more pyramidal spike and more pointed leaves than any forms known to us. The figure of *Epipactis viridiflora* shows a well-marked rostellum, and its affinity to *E. latifolia* is plain, in accordance with Col. Godfery's recent papers in this Journal.

Turning to the Marsh and Spotted Orchids, the details of which are at times somewhat inadequate, we see no figure that could be assigned to *Orchis prætermissa* Druce; the nearest form is named as a robust form of *O. incarnata*, but to us the lip suggests rather *O. latifolia*. The figure of *O. elodes* Griseb. is that of a slender plant of 21 cm., with erect sepals and a stout spur, and very small centre-lobe of the lip; the habit and lip-form suggest a variety of *O. ericetorum* Linton, but the stout spur and erect sepals certainly do not. Strangely enough, no figure is given of typical *O. maculata*, but some varieties are represented. Of these, var. *palustris* G. Camus is a robust form with large flowers and very small centre-lobe of the lip; var. *media* G. Camus is short and stout, with a rather larger centre-lobe. The only forms in this plate which approach the British *O. Fuchsii* Druce are var. *trilobata* Breb., which has an exceedingly long centre-lobe, and var. *brachystachys* A. Camus. It is to be noted that most of the forms figured, including *O. elodes*, are shown with fully erect sepals; whereas the rule for British forms is that in *O. Fuchsii* they are half-erect, and in *O. ericetorum* drooping or not very stiff. A good deal remains to be done in careful collation of the British and Continental forms of this group.

The hybrids of *Gymnadenia conopsea* are interesting; one given of *G. conopsea* × *O. maculata* is very like what we find here in the case of *O. ericetorum*, and a cross with var. *brachystachys* is more like what we have with *O. Fuchsii.* There is no example of a cross between *G. conopsea* and *Cœloglossum viride*, of which at least three types have been found with us. There are several other British hybrids not represented, which suggests what a great range of them must actually exist.

In these days of high prices it requires a good deal of courage to produce a great work of this kind; and we can only express our gratitude to the authors and the publisher who have made it available for us.

T. & T. A. S.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on 16th February, Prof. R. R. Gates read a paper on "The Inheritance of Flower Size in Plants." He stated that reciprocal crosses were made at Merton in 1912 between *Œnothera rubricalyx* and *Œ. biennis*, the former having petals about 40 mm. in length and the latter about 20 mm. in length. The size of flowers in F_1 was intermediate and relatively uniform. In F_2 there was a marked difference in size of flowers, (1) on different plants, (2) in different flowers of the same plant, and (3) sometimes even in the different petals of a flower. More extensive measurements were made on F_3 and F_4 plants. The results show that the hypothesis of several Mendelian factors for length of petal is an insufficient explanation. Variation curves show a tendency to segregation in flower-size between different plants, but also a tendency for the occurrence of smaller flowers, some of the smallest petals being only 7 mm. in length. The disorderly nature of the variation, and the fact that the petals of one flower may be of different lengths, shows that this segregation is not confined to germ-cell formation, and is not Mendelian. Probably cytoplasmic differences are involved in this type of inheritance and variation.

At the same meeting Mr. William Dallimore introduced the subject of the effect produced by wind at Llandudno in causing remarkable dwarfing of trees and shrubs growing on the exposed rocks of the Great Orme's Head, illustrating his remarks by actual specimens and lantern-slides. Mr. Lacaita stated that similar dwarf trees were met with in many places. He had seen them in Spain at an elevation of 6000 feet, and dwarfed Beech-trees were plentiful in Sicily, the chief agent in both instances apparently being the strong winds. It would be very surprising and exceedingly important if it could be proved that such dwarfing was due to climatic conditions. Mr. Dallimore replied that one important cause was the poverty of the soil.

At the meeting of the Linnean Society on March 2, Mr. R. E. Holttum discussed the Flora of Greenland. The writer, who accompanied Professor Seward during the summer of 1921 on a visit to Disco Island and the neighbouring parts of the west coast of Greenland, spoke on the flora of the region visited. The most widely-spread vegetation consists of a low heath, the most important species being

Empetrum nigrum, *Cassiope tetragona*, and other ericaceous plants. In specially protected localities a scrub of *Salix glauca* may be found, which may reach eight feet in height, and accompanying this a luxuriant vegetation of herbaceous plants of southern type. In unfavourable situations the ground is not covered by the vegetation, which consists of isolated plants of resistant herbaceous and woody species. The total flora of the whole of Greenland consists of 416 species of vascular plants, of which 18 per cent. are high arctic in type, 22 per cent. widely distributed, and 60 per cent. of southern type. The problem of the means of arrival of the last-named group after the glacial period is an interesting one. Mr. John Walton followed with remarks on the ecology of the flora of Spitzbergen. From the point of view of numbers of species, the richest flora in Spitzbergen occurs in those places where the nearest approach to continental conditions is found. Blytt pointed out that arctic plants tend to avoid an oceanic climate. The head of Klaas Billen Bay, one of the branches of the fiord, is situated near the centre of West Spitzbergen, and is included in a small elliptical area of about 5000 sq. kilometres, which Nathorst has shown to contain 90 per cent. of the species of vascular plants occurring in Spitzbergen. The area around Bruce City, at the head of Klaas Billen Bay, can be divided roughly into three vegetational zones:—Raised Shingle Beach, Alluvial Land between mountain and beach, and Scree Slopes. The land is rising relatively fast from the sea, and the development of the flora of Alluvial Land and Raised Shingle Beach can be traced from initial stages in an intertidal zone. The intertidal zone shows many points of resemblance to the salt-marsh formation of lower latitudes. Both papers were illustrated by admirable lantern-slides from photographs, showing some of the vegetation types observed. An interesting discussion ensued, in the course of which the absence of *Leguminosæ* was commented on. Mr. Walton said that the reason appeared to be that the summer temperature was rather low, ground ice being found only 18 inches below the surface; this having the effect of preventing the existence of the bacteria that inhabit the tubercles of leguminous plants.

The publication or transmission of many of the parts of *Das Pflanzenreich* having been held up during the War, it may be useful to give a list of those which were received at the end of last month by the Department of Botany, with the dates of publication as these appear on the wrappers:—

Araceæ: Philodendroideæ, etc., A. Engler (Heft 64, 15 June, 1915); Araceæ Colocasioideæ, A. Engler & K. Krause (Heft 71, 14 May, 1920); Aroideæ et Pistioideæ, A. Engler (Heft 73, 6 July, 1920); Pars generalis et Index, A. Engler (Heft 74, 9 July, 1920).

Compositæ: Hieracium, K. H. Zahn (Heft 75, Feb. 4, 1921).

Cruciferæ: Brassiceæ, O. E. Schulz (Heft 70, 30 Dec., 1919).

Cucurbitaceæ: Fevilleæ et Melothrieæ, A. Cogniaux (Heft 66, 26 Sept., 1916).

Daphniphyllaceæ: K. Rosenthal (Heft 68, 6 June, 1919).

Euphorbiaceæ: Acalypheæ-Mercurialineæ, 63, F. Pax (Heft 63, 10 Nov. 1914; Phyllanthoideæ et Bridelieæ, E. Jablonszky (Heft 65, 22 June, 1915); Acalypheæ, Dalechampieæ et Pereæ, F. Pax et K. Hoffmann (Heft 68, 6 June, 1919).

Myzodendraceæ: C. Skottsberg (Heft 62, 10 Nov. 1914).

Oleaceæ: Oleoideæ, Fraxineæ et Syringeæ, A. Lingelsheim (Heft 72, 29 June, 1920).

Saxifragaceæ: Saxifraga, A. Engler (Heft 67, 26 Sept., 1916; Heft 69, 6 June, 1919).

The Thirteenth Report of the Devonshire Botany Committee (Trans. Devon. Assoc. liii. 89–97), edited by the Secretary, Miss C. E. Larter, contains additions to the flora of the various districts into which the country is divided and a long list of Bryophytes of the Totnes neighbourhood by Prof. C. V. B. Marquand. The following note on *Cosmarium læve* Rabenh. may be quoted: "This desmid was collected on the face of a perpendicular cliff in the form of masses of jelly. It was present in extraordinary quantity, the masses being composed of pure gatherings of the desmid. So much calcareous matter was present that it had to be dissolved with H.Cl. to obtain the desmids free. This is noteworthy, as the late Prof. G. S. West always insisted that calcareous conditions were inimical to the growth of desmids."

By the appointment of Mr. Arthur Disbrow Cotton to succeed Dr. Stapf as Keeper of the Kew Herbarium, the precedent established in Dr. Stapf's case of appointing a Keeper from outside the establishment has been followed, somewhat to the surprise of those who are acquainted with the existing Herbarium staff. Mr. Cotton, however, is no stranger to Kew, having been an assistant in the Herbarium and subsequently connected with the Pathological Laboratory there, previous to his appointment as Mycologist to the Ministry of Agriculture and Fisheries. The *Gardeners' Chronicle* of Feb. 25 prints a well-deserved tribute to the late Director of the Gardens, Sir David Prain.

In an article on "National Botanic Gardens," the *Times* (March 28), referring to the almost simultaneous retirement of Sir David Prain, Sir Frederick Moore (of Glasnevin), and Sir Isaac Bayley Balfour, devoted special attention to the Royal Botanic Garden at Edinburgh, of which the last-named has been "Regius Keeper" since 1888. "For many years," says the *Times*, "the Botanic Garden at Inverleith has been the Mecca alike of the expert of the plant world and the student, for the methods adopted for the cultivation of plants which do not commonly flourish in Great Britain have been singularly successful, while the propagation of plants on scientific lines advocated by Sir I. Balfour has been brought to a fine point. The herbarium of the Garden, too, has become the centre for the classification of a mass of botanical material in the shape of new trees, shrubs, and plants—the spoil of collectors who for many years have been exploring the mountain regions of Yunnan, Szechuen, Kansu, and the south-eastern confines of Tibet, where the vegetation is exceptionally rich. The fact that there are over 20,000 specimens of rhododendron alone from one explorer (Forrest), and many entirely new genera of plants, is some indication of the monumental task dealt with of late years at the Edinburgh Botanic Garden. In retiring from the post of Regius Keeper, Sir I. Balfour also relinquishes the office of King's Botanist for Scotland and the Chair of Botany in the University of Edinburgh, to both of which he was appointed in the same year."

The *Kew Bulletin* (1922, no. 1) contains an account of the effects of last year's drought on the lawns and gardens of Kew; Miss D. K. Hughes contributes "Further Notes on the Australian Species of *Stipa*," with descriptions and figures of two new species; there is a Decade of New Orchids, left by the late R. A. Rolfe; and another instalment of "Diagnoses Africanæ"—we notice that Dr. Stapf has "adopted Endlicher's spelling of *Acocanthera* in the place of the absurd and barbarous form found in G. Don's Generum Systema [*i. e.* his *General System of Dichlamydeous Plants*], which is evidently due to a printer's error: Don himself gives the derivation of the name as from ακωκη, *acoce*, a mucrone."

The Board of Trade have issued an Order—the German Reparation Recovery (No. 1) Order, 1922—exempting certain German scientific and other periodicals from the provisions of the German Reparation (Recovery) Act, 1921. Any article is exempted "being a publication in the German language which is proved to the satisfaction of the Commissioners of Customs and Excise to be a periodical publication of a German learned society, or other scientific or philosophical periodical publication."

The *Journal of Ecology* (24 Feb.) contains papers on "The Woodlands of Ditcham Park, Hampshire (Studies on the Vegetation of the English Chalk," by R. S. Adamson (6 plates); "Stratification and Hydrogen-ion Concentration of the Soil in relation to Leaching and Plant Succession, with special reference to Woodlands," by E. J. Salisbury; "A Suggestion as to Factors influencing the Distribution of free floating Vegetation," by W. H. Pearsall; "On the Mycorrhizas of *Pinus silvestris* and *Picea Abies*," by Elias Melin.

Mr. William A. Lee contributes to the *Irish Naturalist* for February a list of "Irish Sphagna"; no separate list, named as this is, on the Warnstorfian system, has hitherto been published.

We note that the name of Dr. A. J. Ewart, of Melbourne, appears in the list of those selected by the Council of the Royal Society for election into that body.

We have received from the Royal Horticultural Society the *Report of the International Potato Conference* held at the Society's Hall in November last, of which we hope to give some account in an early issue.

The Rev. H. J. Riddelsdell is leaving Wigginton for Bloxham, Banbury.

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JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers.

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PLANT NOMENCLATURE: A REPLY.

By T. A. Sprague, B.Sc., F.L.S.

The publication of my "Suggestions" (Journ. Bot. 1921, 153–160) has elicited criticism from various sources. Dr. N. L. Britton, on the one side, regards those suggestions which are in accordance with the American Code as "quite in the line of progress," and those which conflict with it as "not in line of progress towards nomenclatorial stability" (*op. cit.* 296). Drs. Schinz and Thellung, on the other side, consider that no definite decision of the Vienna Congress should be reversed, whatever may be the merits of the case, as to do so might, in their opinion, lead to a return of anarchic conditions in nomenclature (Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 311; 1921). But disregard of the International Rules would be more likely to result from the retention of unwise Articles (such as Art. 36) than from their revocation or modification in accordance with prevailing opinion.

The impersonal character of the discussion and the desire generally shown to combine the best features of both nomenclatural systems are encouraging. No permanent agreement can be attained without dispassionate comparison of rules, and adequate tests of their effects in practice. It is of primary importance that we should be agreed as to the facts, and as Dr. F. W. Pennell's article (Journ. Bot. 1922, 112) may convey a wrong impression of the amount of difference in nomenclature under the two systems, it seems desirable to deal with it in the first place.

Name-changes required under the American Code.

Dr. Pennell challenges my estimate of the number of name-changes which the adoption of the American Code would require. To make matters clear, I quote my original statement: "A rough idea of the number of name-changes required under the Code may be gained from the total number of species affected by the 'nomina conservanda' of the Rules. These amount to more than 15,000 out of a total of 136,000 Seed-Plants; that is to say, one species out of every nine. The figures are taken from Dalla Torre & Harms, Gen. Siphonog. (1900–7); and Thonner, Blütenpfl. Afr. 623 (1908)."

He states that I assumed that all the "nomina conservanda" adopted by the Vienna Congress were invalid according to the American Code. In this he is mistaken. The underlying assumption was that the deductions which must be made in respect of "nomina conservanda" that are valid under the Code are counter-balanced by additions due to various causes. Has he forgotten that the recognition of "nomina conservanda" is only one—though admittedly the most important—of the sources of difference in nomenclature? Among other causes of difference I may mention the following:—

(1) The rejection under the Code of untypified genera (hyponyms).

(2) The rejection under the Code of homonyms, generic and specific.

(3) The treatment as homonyms, under the Code, of names which are regarded as different under the Rules, e. g. *Chamissoa* and *Chamissonia*; *Lomatia* and *Lomatium*; *Festuca Kingii* and *F. Kingiana*.

(4) The recognition as valid, under the Code, of generic names published without generic description but with citation of species, e. g., *Peramium* Salisb.

(5) The recognition, under the Code, of "priority of place." As examples *Stellaria* Linn. is replaced by *Alsine* Linn.; and *Rinorea* Aubl. by *Riana* Aubl.

(6) The different method of selecting the type-species of a genus.

(7) The rejection, under the Rules, of specific names in which the trivial merely repeats the generic name. (These tautological names may for the sake of brevity be called *tautonyms.*)

The first six causes, in so far as they relate to genera, cut both ways. It will be found that most of the "nomina conservanda" which are valid under the Code, are valid because the prior names are either homonyms or hyponyms. Let us assume, for the sake of argument, that owing to the operation of the six causes the number of name-changes in respect of "nomina conservanda" is reduced from 15,000 to 10,000. If these six causes operating in one direction on the 458 genera included in the list of "nomina conservanda" produce a *deduction* of 5000 name-changes, may they not be expected to produce an *addition* of at least as many changes, operating in the reverse direction in the case of the 9149 genera (nearly twenty times as many) not on the list? Further name-changes are necessitated by specific names which are homonyms or tautonyms.

The question, however, is one of facts, and it is therefore desirable to test the accuracy of my estimate of 15,000. It is obviously impracticable to count the total changes required in all genera. What may be done is to ascertain the approximate number of changes in a large and fairly representative body of genera, and to see how far it agrees with an estimate based on the "nomina conservanda" in that body of genera. The test which I have applied is to take the whole of the genera included in Britton and Brown's *Illustrated Flora*, ed. 2 (1913), and to calculate the approximate number of name-changes of species required by the American Code. The task has been laborious, but I do not regret having undertaken it, since it has supplied a basis of facts for consideration. It has given some indication of the relative importance of the various causes of difference, and enables us to estimate the effect, for example, of Dr. Pennell's proposal to limit "nomina conservanda" to genera containing at least 100 (or 50) species.

The number of name-changes consequent on the acceptance of the American Code depends of course on the taxonomic basis which is adopted, and particularly on the generic concept. There exists in the United States an influential body of systematists, headed by Dr. N. L. Britton, who treat as genera what a majority of botanists at the present time regard as subgenera or sections. As this is purely a taxonomic question, any discussion of it in the present connection would be out of place. But it is self-evident that for those who recognize such small genera, the differences in nomenclature between one code and another are considerably lessened. If, for example, a genus has been reduced by segregation to one half of its former size, a change of generic name will affect only half the number of species. The calculations which follow are based on the genera as defined by Dalla Torre and Harms, with such modifications as are indicated in the lists of "nomina conservanda," *e.g.*, the treatment of *Mahonia* as a separate genus.

The phanerogamic genera contained in Britton and Brown's *Illustrated Flora*, ed. 2, include 101 which are among the "nomina conservanda." These 101 genera are together credited with 3477 species by Dalla Torre and Harms. The number of name-changes of species in the whole body of genera included in the *Illustrated Flora* should therefore be about 3477, according to my rough estimate. How far is this realized? Let us deal first with the "nomina conservanda": 75 genera, comprising 1900 species, are invalid under the Code, the remaining 26 genera and 1577 species being valid, owing to the invalidity (under the Code) of the prior names. So far there is a deficiency of 1577 changes. This deficiency is, however, more than counterbalanced by name-changes in genera which are not on the list of "nomina conservanda," and in individual species. Forty-three of these genera, comprising 1068 species, bear different names under the Rules and the Code. A further cause of name-change is the non-validity of specific homonyms. The number of homonyms which are valid under International Rules is difficult to estimate. In *Carex* alone there are at least 56 valid homonyms, and in *Astragalus* perhaps twice as many. The whole body of genera contained in the *Illustrated Flora* probably includes at least 1000 valid homonyms. Even if we take the number as 500, which is certainly an under-estimate, the total name-changes will amount to at least 3501, made up as follows:—"nomina conservanda," 1900; genera not on list, 1068; specific homonyms valid under International Rules, say 500; tautonyms, 33. Changes estimated, 101 genera, 3477 species—changes ascertained, 118 genera, 3501 species.

Thus in a test including between $\frac{1}{5}$ and $\frac{1}{4}$ of the total estimated name-changes the actual changes are at any rate not less than the estimated; and this in spite of the fact that the estimate was swollen by the inclusion of *Fimbristylis*, *Rhynchospora*, and *Halenia*, which should not have been placed on the list of "nomina conservanda," inasmuch as the prior names for these genera are invalid under International Rules, having been published either as subgenera or in synonymy. But for the presence of these three genera in the test group, the actual changes would have exceeded the estimate by several hundred.

Out of 3501 name-changes of species in the test-group of genera 1900 (54·3 per cent.) are in respect of "nomina conservanda"; 500 (14·3 per cent.) are attributable to specific homonyms; 448 (12·8 per cent.) are due to the different method of typifying genera; 233 (6·7 per cent.) to hyponyms; 231 (6·6 per cent.) to generic homonyms; 131 (3·7 per cent.) to "priority of place" of genera; 33 (0·9 per cent.) to tautonyms; and 25 (0·7 per cent.) to genera published without description but with citation of species.

Lack of space prevents the publication of the list of name-changes; if Dr. Pennell desires to see it, I shall be pleased to send him a copy.

The following examples illustrate the influence of the generic concept on the amount of name-change required :—*Mertensia* (1797) is a genus kept up in Britton and Brown, ed. 2, but is here counted as invalid under the American Code. The explanation is simple: *Pneumaria* (1764) is treated by Britton as an independent monotypic genus, but by Dalla Torre and Harms as congeneric with *Mertensia*. This is a case in which generic segregation would diminish the number of name-changes required under the American Code. On the other hand, *Digitaria* Scop., non Heist., which Britton and Brown replace by *Syntherisma* Walt., has not been counted above, owing to the fact that Dalla Torre and Harms regard it as a section of *Panicum*. In this instance, generic segregation would increase the number of name-changes required under the Code.

It may be mentioned that *Rhinanthus* is included among the generic names not on the list of "nomina conservanda" which are invalid or differently applied under the American Code. This is because the type of *Rhinanthus*, as is evident from the meaning of the generic name, is *R. Elephas* (*Rhynchocorys Elephas*), and not *R. Crista-galli*, as stated by Britton. But *Rhynchocorys* is a "nomen conservandum," and hence the name *Rhinanthus* may be used under International Rules, though not under the American Code, for the genus typified by *R. Crista-galli*.

An examination of Dr. Pennell's arguments shows that what he has had under consideration—he has given no estimate—is the number of name-changes which adherents of the American Code with the generic concept of Britton and Brown would have to adopt if they accepted the International Rules. This is doubtless smaller than the number of changes which adherents of the International Rules with the generic concept of Dalla Torre and Harms would have to adopt if they accepted the American Code. But this is surely an argument in favour of accepting the International Rules.

It will be noticed that Dr. Pennell strikes out *Taraxacum* from the list of New England "nomina conservanda" which cause divergence between the usage of the two schools. This is on the ground that it is "put by Dr. Britton in *Leontodon* L., of which name it is the historic application." He apparently thinks that "nomina conservanda" are maintained merely against the "nomina rejicienda" cited, having overlooked the significance of the words "nomina generica *utique* conservanda" and "une liste de noms qui doivent être conservés *en tous cas*" (see Journ. Arn. Arb. ii. 158; 1921: Kew Bull. 1921, 175; Journ. Bot. 1922, 52). The presence of *Taraxacum* on the list of "nomina conservanda" precludes the use of the name *Leontodon* for the genus typified by *L. Taraxacum*.

Dr. Pennell suggests the following compromise between the International Rules and the American Code :—

1. Untypified generic names (hyponyms) to be rejected.
2. Homonyms, generic and specific, to be rejected.
3. The American method of typifying genera to be accepted in its general outlines.

In return for these concessions he would be prepared :—

4. To recognize as "nomina conservanda" such antedated current names as have been applied to genera credited with at least 100 (or possibly 50) species.

5. To discuss whether genera undescribed yet accompanied by citation of species should be rejected.

Let us now estimate the number of name-changes which on this basis would have to be accepted by adherents of the International Rules. Among the "nomina conservanda" 41 genera including 7580 species are credited by Dalla Torre and Harms with 100 species or more, and 50 genera comprising 3257 species are credited with 50–90 species each. Assuming that 100 species were taken as the minimum for "nomina conservanda" there would be a gross saving of 7580 name-changes. The net saving would be considerably less, as all "nomina conservanda" (with at least 100 species) which are valid under the American Code would have to be deducted. Among these are *Fimbristylis*, *Rhynchospora*, *Eulophia*, *Bulbophyllum*, *Pilea*, *Oxytropis*, *Vernonia*, *Mikania*, and probably others. Those mentioned comprise altogether 1560 species, so that the net saving would, at the most, amount to about 6000. Deducting this from the total of 15,000 changes entailed by the adoption of the American Code unaltered, we find that the acceptance of Dr. Pennell's suggested compromise would involve about 9,000 name-changes of species, if "nomina conservanda" were restricted to genera credited with at least 100 species by Dalla Torre and Harms. Even if genera credited with at least 50 species were included, about 6000 name-changes would be required. The figures speak for themselves. It will be noticed that I have not taken into consideration No. 5, the rejection of typified but undescribed genera, which is not definitely conceded by Dr. Pennell. The number of changes which would be saved were this conceded would, however, be relatively insignificant.

Generic homonyms.

I entirely agree with Dr. Pennell that the monographer of one group of plants should not be required to pursue scattered researches on other groups in order to satisfy himself that some early name long considered a synonym is justly and permanently so treated. The validity or non-validity of the early name often depends on the generic concept adopted, and may, therefore, be a matter of opinion. Thus those who consider *Kickxia* Dum. (1827) a synonym of *Linaria* will, under International Rules, adopt *Kickxia* Blume (1828) for the apocynaceous genus afterwards named *Kibatalia* by G. Don. Those who regard *Kickxia* Dum. and *Linaria* as separate genera will, on the other hand, call the apocynaceous genus *Kibatalia*. Thus in this and similar cases the International Rules make the nomenclatural validity of a generic name dependent on the taxonomic validity of a genus belonging to another family. Instead, however, of treating all generic homonyms as invalid, as Dr. Pennell suggests, the Gordian knot may be cut just as decisively and more satisfactorily by placing such generic homonyms as are in current use on the list of "nomina conservanda," and treating the remainder as invalid.

Typification of Genera.

Most botanists will probably agree with Dr. Pennell that all generic names should be typified. It seems to show a lack of resource, however, "to rule out genera so well described as those of Jussieu's *Genera Plantarum*" on the ground that they cannot be associated definitely with a given species. Surely the obvious course to follow is to choose a type-species for each current but untypified generic name. As Mr. A. S. Hitchcock has pointed out in his admirable article on "The Type Concept in Systematic Botany" (Amer. Journ. Bot. viii. 251; 1921), "in the early days of taxonomy a name was applied to a concept rather than to an entity. A generic name was based upon all the known species of the genus; a specific name was based upon all the known specimens of the species." Since many genera, therefore, actually had no type-species, the retroactive fixation of generic types is largely a matter of convenience. This is virtually recognized in the Type-basis Code, Article 6, which permits such exceptions as may be validated by an International Nomenclature Commission. Thus although, according to the Code, the historic type of the genus *Panicum* is *P. italicum*, which is a *Setaria*, Mr. Hitchcock suggests that *P. miliaceum* should be selected as the type-species in order that the current usage of the generic name may be retained (l. c. 253).

The far-reaching consequences which the adoption of the Type-basis Code might entail have been briefly indicated by Dr. Schinz (Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 916; 1921), but have perhaps not been generally appreciated. The fixation of generic types is still in its infancy, yet nearly 13 per cent. of all changes in the test group of genera (*vide supra*) is due to this cause. According to Dr. Britton, the type-species of *Sisymbrium* and *Erysimum* are *Sisymbrium Nasturtium-aquaticum* and *Erysimum officinale* respectively. The result is that *Nasturtium* becomes *Sisymbrium*, *Sisymbrium* becomes *Erysimum*, and *Erysimum* becomes *Cheirinia* (Ill. Fl. ed. 2, ii. 162, 172, 173). Such revolutionary changes might, however, be avoided by the validation of "substitute types" under Article 6, as suggested by Mr. Hitchcock. I have therefore great pleasure in supporting his proposal for the appointment of an International Committee for the purpose of fixing generic types and "substitute types," recommending new "nomina conservanda" etc. Possibly a smaller committee than that suggested might be desirable.

My twelve suggestions may now be reviewed in the light of the criticism which has been offered. Drs. Schinz and Thellung consider that no definite decision of the Vienna Congress should be reversed, and therefore regard suggestions 1, 2 B, 2 C, 3, 4, and 6 as inadmissible. It seems preferable, however, to consider each suggestion on its own merits.

1. *Revocation of Art.* 36.—I agree with Mr. Rehder (Journ. Arn. Arb. i. 51; 1919) that Art. 36 should be made a Recommendation. Mr. Groves has suggested that it should be amended by substituting for the words "valid only when accompanied by a Latin diagnosis," the words "valid only when accompanied by a diagnosis in Latin or in one of the modern languages which employs Roman Characters"

(Journ. Bot. 1921, 295). This would exclude Russian, while admitting less known languages such as Hungarian, Czech, and Polish, and judging from the experience of past Botanical Congresses, it would hardly meet with general acceptance (see Act. Congr. Bot. Vienne, 129; 1906).

2. *Rejection of names which are apt to excite ridicule.*—Endorsed by Messrs. Rehder and Groves. Drs. Schinz and Thellung object to suggestions 2 B and 2 C not only on the ground that they are contrary to decisions of the Vienna Congress, but also because it is hard to draw a line between ridiculous and sensible names. But it is inconsistent to reject names such as *Linaria Linaria* on the ground that they are apt to excite ridicule (Actes Congr. Bot. Vienne, 126), and at the same time to accept equally ridiculous names such as *Cerastium cerastioides*. It is common ground that the Rules should be as consistent as is compatible with convenience, and it seems hardly worth while to suspend the operation of priority in the case of trivials solely to exclude a small class of ridiculous names—those in which the trivial merely repeats the generic name (Art. 55, 2°). There would be no more difficulty in determining what names should be rejected under suggestions 2 B and 2 C than at present exists in regard to Art. 55, 2°. Dr. Rendle and Mr. Fawcett, for example, accept *Sesbania sesban* Merr., which Mr. Britten regards as coming "dangerously near the duplication which has been generally condemned" (Journ. Bot. 1920, 276).

3. *Rejection of seriously misleading geographical names.*—In view of the criticisms offered by Mr. Rehder and Dr. Schinz, I now withdraw this suggestion (see also Act. Congr. Bot. Vienne, 120, 121). Although it appears theoretically desirable, it would probably prove to be unworkable in practice, owing to the difficulty of deciding where to draw the line.

6. *Rejection of all specific homonyms.*—I accept Mr. Rehder's suggestion that a specific name should be allowed to stand if its earlier homonyms are nomenclaturally non-valid (Journ. Arn. Arb. i. 45; 1919). Article 50 might be amended by substituting for the words "or because of the existence of an earlier homonym which is universally regarded as non-valid," the words "or because of the existence of an earlier homonym which is nomenclaturally non-valid." As Mr. Rehder has pointed out, taxonomic validity may be a matter of opinion, whereas nomenclatural validity is a question of facts.

7. *Treatment as a "nomen delendum" of a new combination associated by its authors in the original place of publication with specimens belonging to a different species.*—Accepted by Mr. Rehder. The opposite view is taken in the American Type-basis Code, Art. 3 (*c*): "A species transferred without change of name from one genus to another retains the original type even though the description under the new genus was drawn from a different species" (*Science*, 1921, n. s. liii. 313). Dr. Schinz suggests as a compromise that such species should be quoted as follows: "*Mœrua nervosa* (Hochst.) Oliver (pro. p., ex syn.) em. Gilg et Bened." But in practice this would be shortened to *Mœrua nervosa* Oliver, and confusion would arise from the fact that Oliver's description was mainly drawn from a different species. I therefore adhere to my suggestion.

9. *Rules for determining the gender of generic names.*—Approved by Dr. Schinz, and by Mr. Rehder except with regard to 9 C, which provides that indeclinable names borrowed from non-classical languages should be treated as neuter. Mr. Rehder would prefer "to accept the gender as used by the author who introduced them as generic names." But it is often impossible to ascertain what gender was assigned to a generic name by its author. Many Latin adjectives have a common form for the masculine and feminine, and others are the same in the nominative singular in all three genders. Take the genera *Conami*, *Courimari*, and *Couratari*, for example; it may be surmised that Aublet regarded them as feminine, as he undoubtedly did *Coupoui* and *Saouari*, but it cannot be proved. *Conami brasiliensis*, *Courimari guianensis*, and *Couratari guianensis* might be either masculine or feminine as far as the trivials are concerned.

Nor would it be satisfactory in such cases to take the gender assigned by the next author in chronological sequence, even when that gender can be ascertained. There would be no difficulty in the case of *Couratari*, which was treated as feminine by Martius in 1836 (*C. domestica*), but what about *Rouhamon*? Aublet's species was *Rouhamon guianensis*, which was either masculine or feminine; but De Candolle made the genus neuter (DC. Prodr. ix. 17; 1845), doubtless because it had the appearance of a Greek noun in -*ον*.

Amelanchier is another good example. The genus was founded by Medikus on *Mespilus Amelanchier* Linn., "Amelanchier" or "Amelancher," being the Provençal name for this species (Lobel, Hist. 608; Advers. 441; 1676). The two species named by Medikus were *A. canadensis* and *A. ovalis*. The genus is generally treated as feminine, but Ascherson and Graebner (Syn. Mitteleur. Fl. vi. Abth. 2, 48, footnote) suggest that it ought probably to be masculine; and the same view was put forward by A. Voss (Mitteil. Gartenbau-Ges. Steiermark, 1912, No. 9). No finality is ever attained in such discussions, and it seems better to have a definite rule that names of this kind should be neuter. This is in accordance with the rule of Latin grammar, that indeclinable nouns are neuter.

Where the original author added to the vernacular name the termination *-us*, *-a*, or *-um*, the name should be treated as masc., fem., or neut. respectively. Thus *Aberemoa* (from "Aberemou") and *Vouacapoua* (from "Voicapou") are feminine by termination. Similarly, *Cajan* is neuter, but the form *Cajanus* is masculine.

9 E. *Greek and Latin neuter plurals used as generic names should be treated as feminine singulars.*—Example: *Trianthema* (*τρία ἄνθεμα*, three flowers) should be feminine.

Classical precedents may be cited: the feminine singulars arma, -æ, and opera, -æ, were derived from the neuter plurals arma, -orum, and opera, -um respectively. In a similar way many Latin neuter plurals gave rise in the Romance languages to feminine singulars: from the Latin plural folia arose the feminine singulars feuille (Fr.), foglia (It.), folha (Port.), hoja (Span.).

Some further suggestions are now put forward for consideration. For convenience of reference they are numbered consecutively.

13. *The types of all genera should be fixed by an International Nomenclature Commission* (see pp. 112, 134).

14. *Such generic homonyms as are in current use should be placed on the list of "nomina conservanda." All other generic homonyms should be treated as invalid.*—According to the International Rules, Art. 15, each natural group of plants can bear only *one* valid designation. Yet as the Rules stand at present, *two* different names may be used for precisely the same genus in cases where its earliest name is a homonym (see p. 133). Under the Rule now proposed, each genus would have only one possible valid name; and the provision for treating current generic homonyms as "nomina conservanda" would obviate the necessity for the extensive changes of generic names required by the American homonym rule.

15. *A new name should not be regarded as valid unless it is proposed unequivocally and unconditionally.*—Examples:

The valid publication of the generic name *Atropis* dates from 1853 (Griseb. in Ledeb. Fl. Ross. iv. 388). It is commonly attributed to Ruprecht (1845), but he, following Trinius (Gram. Suppl. 68; 1836), treated the group as a section of *Poa*. Ruprecht merely indicated the possibility of regarding *Atropis* as a distinct genus: "E conditione glumarum generum series fortasse sequens: *Dupontia*, *Arctophila*, *Poa*, *Atropis*, *Catabrosa*, *Phippsia*, *Coleanthus*" (Beitr. Pflanzenk. Russ. Reich. ii. 61; 1845). This is equivalent to publication in synonymy (Fernald and Weatherby in *Rhodora* 1916, xviii. 1; Schinz und Thell. in Mitteil. Nat. Ges. Zürich, 1921, lxvi. 264).

The publication of the generic names *Conophyton* and *Cephalophyllum* by Haworth, for two groups which he treated as subdivisions of the genus *Mesembryanthemum* is invalid (Rev. Pl. Succ. 82, 108; 1821). Haworth merely suggested that the generic names *Conophyton* and *Cephalophyllum* should be used if the two groups should prove to be genera (see Journ. Bot. 1921, 346).

F. Mueller described a plant collected by H. O. Forbes (n. 759) in New Guinea, as a new species, *Eupomatia Belgraveana* (Australas. Journ. Pharm., Jan. 1887; Bot. Centralbl. xxx. 325). He added the following remarks: "The anther-appendage is analogous to that of *Doryphora*; consequently this *Eupomatia* might subgenerically or perhaps even generically be separated (as *Himantandra*)." He himself, however, did not venture to propose either a new subgenus or a new genus for Forbes's plant—for the very good reason that "the operculum and fruit are not yet known." What he actually did was (1) to publish the species as *Eupomatia Belgraveana*; (2) to indicate the possibility of treating it as the type of a new subgenus; (3) to indicate a more remote possibility of treating it as a new genus; (4) to suggest that the name *Himantandra* might be used in the event of a new subgenus or genus being recognized. This is tantamount to publication in synonymy. Even if Mueller had definitely proposed a new subgenus or genus *Himantandra*, surely the statement that "the anther-appendage is analogous to that of *Doryphora*" could not be accepted as an effective description of the group. It is no answer to say that other generic characters may be extracted from the specific description. The same might be said of many genera published with citation of species, but without generic description. Yet these are invalid according to International Rules. Diels (Engl. Jahrb. lv. 127; 1917) has reduced *Galbulimima* F. M. Bailey to *Himantandra*

Muell. but as *Himantandra* is invalid, the genus should be known as *Galbulimima*. The synonymy and distribution of the species hitherto described are as follows:—

GALBULIMIMA BACCATA. F. M. Bailey in Queensl. Dep. Agric., Bot. Bull. ix. 5 (1894); Queensl. Fl. 19; Compr. Cat. Queensl. Pl. 25. fig. 8; Sprague in Hook. Ic. Pl. t. 3001. *Himantandra baccata* Diels in Engl. Jahrb. lv. 128 (1917).—*Hab.* Queensland.

G. BELGRAVEANA (comb. nov.). *Eupomatia Belgraveana* F. Muell. in Australas. Journ. Pharm., Jan. 1887. *Himantandra Belgraveana* Diels in Engl. Jahrb. xlix. 165 (1912).—*Hab.* New Guinea.

Names which are suggested in advance for groups which might possibly be recognized in the future may be known as "nomina provisoria." The publication of similar names is deprecated in Recommendation XIX: "Botanists will do well to avoid publishing or mentioning in their publications unpublished names which they do not accept."

16. *A wrong determination cannot be treated as a valid name, nor serve as the basis for a new combination.*—A similar Rule has been proposed by Schinz and Thellung: "Ein Name soll nicht als gültig (oder zur Bildung neuer Kombinationen prioritätsberechtigt) anerkannt werden, wenn er sich auf die unrichtige Verwendung eines bereits bestehenden, für die Nomenklatur der betreffenden Gruppe massgebenden Namens bezw. auf eine falsche Bestimmung grundet, selbst wenn jener ältere homonyme Name heute nicht mehr als gültig verwendet wird" (Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 513).

Numerous instances of wrongly-applied names of species are cited by Schinz and Thellung. Some examples of incorrect application of generic names may be given.

Munro erroneously referred seven South African species to *Achneria* Beauv. (Harv. Gen. S. Afr. Pl. ed. 2, 449; 1868). Bentham reduced *Achneria* Beauv. to *Eriachne* R. Br., from which it had originally been segregated, and treated the South African species as constituting an independent genus, for which he unfortunately retained the name *Achneria*, attributing it to Munro. "*Achneria*" in this sense has been accepted in the *Flora Capensis*, and by Dalla Torre et Harms. But Munro did not propose a new genus; had he done so he would have given it a new name. What he did was to identify the group with *Achneria* Beauv. As this identification is admittedly incorrect, the genus must be re-named, and may be known as AFRACHNERIA (nom. nov.).

J. D. Hooker erroneously referred to *Alepyrum* R. Br. a New Zealand plant which he had previously described as *Gaimardia pallida* (Fl. N. Zeal. i. 268; 1855). When Hieronymus monographed the family *Centrolepidaceæ*, he treated *Alepyrum* R. Br. as a synonym of *Centrolepis*, and based a new genus on *Gaimardia pallida*. Instead, however, of proposing a new name for the genus he called it *Alepyrum* Hook. f. ex parte, non R. Br. (Abh. Nat. Ges. Halle, xii. 217; 1873). Baillon replaced *Alepyrum pallidum* in *Gaimardia*, and made it the type of a new section, *Alepyria*, so-named to avoid confusion with *Alepyrum* R. Br. (Bull. Soc. Linn.

Par. ii. 1021; 1892). Cheeseman, on the other hand, transferred *Alepyrum pallidum* to *Centrolepis* (Man. N. Zeal. Fl. 757; 1906). Dalla Torre and Harms followed Hieronymus in treating *Gaimardia pallida* as the type of an independent genus which they cited as *Alepyrum* Hieron., non R. Br. (Gen. Siphonog. 52; 1900). Those who accept the classification proposed by Hieronymus should, however, use a new name for the genus in question. Baillon's sectional name *Alepyria* has the merit of being unambiguous.

17. *The priority of the name of a family is not affected by the fact that the name as published did not end in* -aceæ. *The replacement of other terminations by* -aceæ *is to be regarded as an orthographic correction* (see Journ. Bot. 1922, 69).—Example:

For purposes of priority the family name *Dioscoreaceæ* is considered as dating from 1810—given on p. 69, by a typographical error, as 1813—when Robert Brown proposed the new family *Dioscoreæ* (Prodr. i. 294), although the form *Dioscoreaceæ* was not used until 1836 (Lindl. Nat. Syst. ed. 2, 359). In such cases the name of the author who originally published the family name should be quoted in parenthesis: *Dioscoreaceæ* (R. Br.) Lindl.

A NEW VARIETY OF ORTHODONTIUM GRACILE Schwaegr.

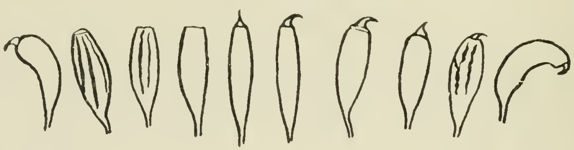
By W. Watson, B.Sc.

In September 1920, Mr. Broome of Failsworth accompanied me on a visit to some rocks between Greenfield and Crowden. They are known as Laddy Rocks, are formed of millstone grit, and are on the Cheshire side of the watershed, at an altitude of 1700–1800 ft. They form a precipitous escarpment, below which are numerous and large boulders which have fallen from the heights above. On the rock-ledges and among the boulders, many plants which are rare in the district find suitable homes, since they are partially protected from the smoke-laden winds travelling from the industrial districts on the boundaries of Lancashire, Yorkshire, and Cheshire. A number of vascular plants which are unknown or rare on the other side of the watershed still survive, and a few lichens, bearing apothecia freely, show the less impure condition of the atmosphere. The blackened rocks and the dirtiness of the heather give evidence showing that much smoke filters here, and the present vegetation is merely a remnant of that which existed a hundred years ago.

Amongst other interesting bryophytes we found *Orthodontium gracile*, which my companion had noted, several years previously, on the rock-ledges and on the faces of the boulders. This seemed so different from the ordinary *O. gracile* that I queried its identity with the typical plant, but was informed that it had been passed as correct by a well-known bryologist. Microscopical examination convinced me that the plant was certainly *Orthodontium*, but that it differs in so many respects from the normal form of *O. gracile* as to deserve at least a varietal name, and might even be worth specific status.

Mr. Wheldon, who kindly examined a specimen, confirmed my views and wrote about it as follows:—"A remarkable form—perhaps a distinct species, and certainly a good variety. From all my examples it differs in being more rigid; in its sub-falcate, secund leaves, which are less flexuose and shorter, and have mostly much shorter and broader points; and in its shorter, broader, often sub-pyriform capsule, which in age is sometimes markedly asymmetrical. The male flowers are very numerous and gemmiform. The processes of the endostome show under a high power minute punctate markings, which I could not see in any of my ordinary gatherings with which I compared it, and there are other differences in the processes. The spores are as in the typical plant. It could be passed in the field very easily as a *Dicranella*." Mr. D. A. Jones of Harlech, who also examined the plant, reported on it as follows:—"This is an interesting plant and differs from the type in its heteroicous inflorescence and gibbous capsule. On some of the stems the inflorescence is normally paroicous, while gemmiform male flowers occur among the ordinary leaves lower down. Plants with terminal male flowers also occur. I have not been able to find any abortive archegonia among the antheridia in these as is the case in *Leptobryum pyriforme*. Mr. Dixon thinks it deserves a varietal name."

There is no doubt about the distinctness of the plant from the normal *O. gracile*, but the question of its varietal or specific value is



The two middle figures represent capsules of ths type, the four on each side, of the variety. ×7.

a more difficult matter. In the family *Bryaceæ*, to which *Orthodontium* belongs, the distribution of the sexual organs is very variable, and though this character has been used as of specific value—e. g. *Bryum pseudotriquetrum* differs from *B. bimum* in being dioicous instead of synoicous—the specific distinctness of species founded on such a variable character is more than doubtful. If the characters given above were constant the status would be specific. *O. gracile*, however, is a variable species in regard to its leaves, and in the distribution of the sexual organs, and the Crowden plant also shows great variability. In some barren plants, taken from damper and soil-capped rocks, the leaf-points were quite as long and as flexuose as in the type. and the tufts, vivid-green above and reddish-brown below, mimicked those of *Zygodon Mougeotii*; the only constant characters in which the plant is undoubtedly distinct from *O. gracile* are found in the sporogonium. I propose to name it a variety:—

Orthodontium gracile Schwaegr. var. heterocarpa, mihi. Differs from the type in the shorter, broader, often more or less gibbous capsule, which may be smooth or deeply sulcate, straight or curved (sometimes very strongly so). Teeth of the inner peristome minutely punctate. Antheridia usually in separate gemmiform groups. Leaves often less flexuose and shorter.

In September 1921 I found the same plant on the Yorkshire side at a much lower altitude, about 1000 ft. It occurred on the vertical faces of millstone grit boulders which were surmounted by peat. Though I had previously passed this spot scores of times, I had never noticed the moss with capsules, and had regarded it as a barren *Dicranella*. It is probable that the remarkably clear weather of 1921, coupled with the fact that, owing to the coal strike, the atmosphere was freer from smoke, enabled capsules to be formed. The plant is probably fairly common on the millstone grits of the Pennines, but has been overlooked because of its general barrenness and its resemblance to a *Dicranella*.

FURTHER NOTES ON ELM FLOWERING.

By Eleonora Armitage.

Mr. Miller Christy's interesting notes on the flowering of Elms (pp. 36–41) led me to send him some of my own data, and he has asked me to send them to the Journal; they are arranged in tabular form for easy comparison. Taken with his, it will be seen that there is a marked correspondence of flowering date for the same years, allowing for the generally earlier incidence of the renewal of vital activities in plants in the West Midlands (Herefordshire in this case) over that of the Eastern counties.

Thus it is seen that the climate of the flowering-months (January to March) has a direct influence on the date, and short weather notes from my own observations are added to the Table.

Elm flowering, Herefordshire.

Date.	English Elm.	Wych Elm.	Winter weather.
1898......	Jan. 29	Jan. 31	Unusually mild.
1899......	Feb. 24	Mar. 13	Cold, late spring.
1900......	Mar. 15	Mar. 28	Cold.
1901......	Mar. 18	Mar. 24	Variable.
1902......	Feb. 4	Mar. 8	Variable, frosty February.
1903......	Feb. 15	Feb. 17	Wet, mild.
1904......	Mar. 9	Mar. 9	Cold, late spring.
1905......	Feb. 26	Feb. 20	Cold, late spring.
1906......	Jan. 28	Feb. 8	Mild January.
1907......	Feb. 25	Mar. 6	Cold January.
1908......	Mar. 2	Mar. 5	Cold January.
1909......	Mar. 21	Mar. 31	Variable.
1910......	Feb. 27	Mar. 10	Cold, wet.
1911......	Feb. 18	Feb. 18	Mild.
1912......	Jan. 16	Feb. 25	Mild January.
1913......	Jan. 24	Feb. 5	Mild January.
1914......	Feb. 12	Feb. 27	Cold January.
1915......	Feb. 6	Feb. 26	Variable.

Date.	English Elm	Wych Elm.	Winter weather.
1916......	Jan. 16	Jan. 25	Warm January, terrible gales.
1917......	Apr. 4	Apr. 3	Coldest winter for 20 years, 0° F. early February.
1918......	Feb. 6	Feb. 10	Heavy snow, January.
1919......	Mar. 30	Apr. 4	Frosty February.
1920......	Jan. 24	Jan. 25	Mild, windy January.
1921......	Feb. 5	Feb. 3	Mild January.
1922......	Feb. 10	Feb. 18	Variable, late spring.

Mr. Turner's January date for 1905 does not correspond with mine, Feb. 26, but his March dates of 1904 and 1909 do—March 9 and 21 respectively. Mr. Miller Christy's English Elm dates for 1911, Feb. 19, compare with mine, Feb. 18; 1912, Feb. 4, with Jan. 16; but in 1913 the unusually early date, Jan. 4, does not tally with mine of Jan. 24. The years of 1914–1919 are in close correspondence.

With regard to the fruiting of the English Elm, I have in my Herbarium fruiting specimens gathered by the Rev. A. Ley in 1887; of my own gathering I have fruits dated 1899, which was a cold late spring; 1902, weather variable, cold February; 1909, variable, flowers Mar. 21 (data kept for me as I was in Madeira); and 1917, which was a bitterly cold, long winter, when neither species of Elm flowered till April. The quantity of fruit was most striking this year (see my note in Journ. Bot. 1917, 162), but I did not observe a similar occurrence here in 1914 as related by Mr. Miller Christy.

I am led to think that as this Elm is a southern and western species, when it flowers early in this country the colder weather supervening later destroys the incipient fruits; but that when, owing to very cold winter weather, flowering is greatly retarded, the warmer weather following encourages rapid development and maturation of the fruits. I think it will be found that the dates in the Table uphold this theory.

The Wych Elm is very common in Herefordshire and fruits abundantly. It begins to flower almost always about ten days later than the English Elm, though occasionally tha dates almost synchronise, as in 1898, 1903, 1904, 1908, 1911, 1917, 1920, 1921, and these years were either unusually mild or unusually cold.

The records are all from native trees, not from planted forms or varieties.

NEW OR NOTEWORTHY FUNGI.—IX.

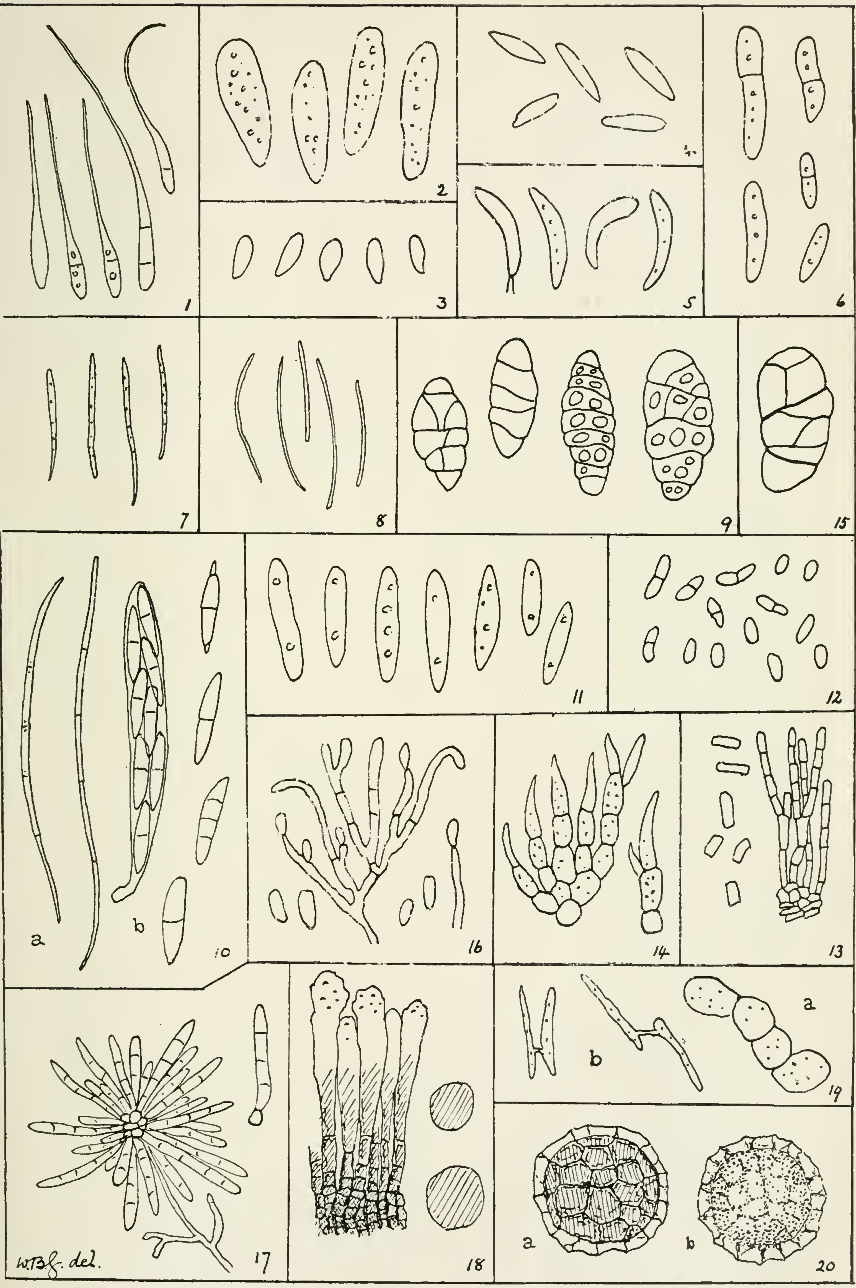
By W. B. Grove, M.A.

(Plate 563.)

(Continued from p. 86.)

355. **Leptothyrium Osmanthi**, sp. n.

Pycnidiis amphigenis, stipatis, subglobosis v. lenticularibus, crassis, nitenti-aterrimis, usque 200 μ diam., halone nigro cinctis, postremo cuticulam elevantibus poroque centrali erumpentibus. Sporulis linearibus, utrinque rotundatis, plerumque rectis, $12–13 \times 2–2\frac{1}{2}\ \mu$, sporo-



NEW OR NOTEWORTHY FUNGI

phoris brevioribus, ca. $5 \times 1\ \mu$, e strato crasso atro-olivaceo oriundis suffultis.

Hab. in foliis emortuis *Osmanthi aquifolii* var. *ilicifolia*, West Kilbride, Ayrshire (Boyd), Sept.

Belongs to Diedicke's § D, as do *L. medium* and *L. acerinum*. The mycelium, after destroying the epidermal cells, penetrates deeply into the underlying tissue; the pycnidial wall above is thick and formed of a dark mass of brownish-black hyphæ, which at maturity is covered only by the cuticle.

356. Leptothyrium Phormii Grove in Kew Bull. 1921, p. 148, f. 7.

Coniothyrium Phormium Cooke in Grevill. 1879, vii. 96. *Phoma Phormii* Sacc. Syll. iii. 166.

Pycnidia densely aggregated, 200–300 μ diam., black, lens-shaped, subcuticular, raising the cuticle in a little ridge which at length splits away in various forms, mouthless, but the upper part at length disappearing. Spores very numerous, embedded in mucus, singly colourless, hardly coloured in mass, ovoid in face-view, oblong in profile, often more or less flattened, faintly guttulate, $3–4 \times 1–2\ \mu$; no visible sporophores.

On decaying leaves of *Phormium tenax*. Hunterston, Ayrshire, and Stranraer, Wigtonshire (Boyd). Aug.–Nov.

The original specimens described by Cooke were said to have occurred, on dead leaves of the same host, in the Botanic Gardens at Brussels. Probably the fungus accompanies the host wherever it is cultivated, just as *Coniothyrium concentricum* accompanies the species of *Yucca*. The structure and growth of the pycnidium is fully explained in the Kew Bulletin (*l. c.*); it belongs to Diedicke's § D.

Pycnothyrium Died. in Annal. Mycol. 1913, xi. 175.

Pycnidium shield-shaped, of radiating texture, opening by a pore. Hymenium inverted, spores borne on the under side of the shield, continuous, free (not in chains), seated on a hyaline stratum of swollen sporophores. A genus of the Leptostromaceæ.

357. Pycnothyrium gentianicolum, comb. nov. *Leptothyrium gentianicolum* Bäuml. Myc. Not. p. 1. Sacc. Syll. x. 415. Allesch. vii. 333. Cf. *Depazea gentianicola* Fr. Syst. Myc. ii. 531. Sacc. Syll. iii. 62.

Spots roundish or irregular, grey, then brown. Pycnidia amphigenous, round, flat, 60–100 μ diam., subcuticular, then erumpent, shining black, minutely parenchymatous. Spores linear, elongate, rounded at both ends, straight or curvulous, $14–16 \times 3\ \mu$ ($12–15 \times 2\frac{1}{2}–3\ \mu$); sporophores short, papilliform, hanging downwards.

On dying leaves of *Gentiana acaulis*. Saltcoats, Ayrshire (Boyd).

The description given by Fries of his *Depazea* does not seem to agree entirely with the *Pycnothyrium*. *Leptothyrium litigiosum* Sacc. (*Leptostroma litigiosum* Cooke, Handb. p. 417) is another British *Pycnothyrium*=*P. litigiosum* Died.

358. Leptostromella pteridina Sacc. & Roum. Syll. iii. 660. Trans. Brit. Myc. Soc. vi. 51. *L. aquilina* Massal. (an immature form). Sacc. Syll. x. 431. Allesch. vii. 391.

This fungus was found in considerable quantity by Mr. Boyd at Dalry, Ayrshire, in July 1919, on *Pteris aquilina*. It forms small oblong greyish spots, running lengthwise of the petioles, and has very much the look of *Leptostroma spirœinum* Vest. The spores measure up to 80 or even 90 μ, and are 4–6-septate. (Fig. 10.)

The interesting point is that, although it is formed, as usual in the group, beneath the cuticle, it shows here and there the appearance which Saccardo attributed to it of "becoming superficial"; but, in every case, when *that* part was examined microscopically, it resolved itself into "*Didymella Hyphenis* (Cooke) Sacc." It seems from the records that, in the localities in which the *Leptostromella* has been found, the "*Didymella*" has been associated with it. But there seems here to be a possibility of misconception; for, in these Scottish specimens, the ascophores are actually *immersed in rows* in the *Leptostromella*, which would seem to suggest that they belong, not to a *Didymella*, but to the Dothideaceæ. This must be a false suggestion, however, for the spores and asci are, for the most part, exactly those ascribed to *Didymella Hyphenis*.

Further examination disclosed another unexpected fact, viz.: that about 5 per cent. of the ascospores were 3-septate, still remaining quite colourless, a few others being in the intermediate state of having two septa. Also an occasional spore was appendiculate at each end, the mucro being about 2 μ long (cf. *Didymella lophospora* Sacc. & Speg. Syll. i. 561); but in both these cases the asci and the size of the spores were all but unaltered. These 3-septate spores might pass as those of *Metasphœria epipteridea* (Cooke & Hark.) Sacc. Syll. ii. 183, which has 3–5-septate spores. *Didymella Hyphenis* would then seem to be merely the younger state of *M. epipteridea*.

The apparently dothideaceous condition of Mr. Boyd's specimens contradicts this idea. But *Didymella pteridicola* (B. & C.) Sacc. may perhaps be the connecting-link, for that is described as arranged in "little grey parallel lines, covered with the cuticle" (Grevill. iv. 145)—a description which at once calls to mind the appearance presented by the *Leptostromella* when it has the rows of immersed perithecia. It will be noticed that all the fungi so far mentioned are on petioles of *Pteris aquilina*. It may seem bold to suggest that all the six are states or stages of one and the same fungus, yet that is the conclusion which I think will ultimately be drawn.

A similar increase in septation is now known to occur in many cases. An instance is seen in some specimens of *Rhopographus filicinus* Fckl. which I gathered at Dolgelley in 1887 *. In these, spores having three, four, five, six, or seven septa all occur in the asci indiscriminately, although the normal number is only three (rarely five). The more the matter is examined, the greater number of such cases will undoubtedly be found.

359. **Leptostromella Polypodii**, sp. n.

Pycnidiis angustis, linearibus, rectis, $\pm$seriatis, usque 500 μ longis, 50 μ latis, sed sæpe confluentibus, atris, rima apertis. Sporulis linearibus, curvulis, inconspicue guttulatis, hyalinis, $17–25 \times 1\ \mu$, sporophoris brevibus, digitaliformibus, ca. $5 \times 1\frac{1}{4}\ \mu$, suffultis.

* *Rhopographus filicinus* var. *cambricus* Grove in herb.—Sporidiis 3–7-septatis, cætera typi.

Hab. in petiolis foliorum *Polypodii Phegopteridis*, socia *Septoria Polypodii*, Glen Falloch, Perthshire (Boyd), Maio.

Whether this = *Leptostromella filicina* (B. & C.) Sacc. must be uncertain, since the spores of that are unknown; but it does not agree even in the other characters. Though the similarity of the spores of this and the *Septoria* (see no. 349) is so great that one cannot help suspecting (since they occur on different parts of the same leaf) that they are stages of one and the same species, yet, in view of the great difference in their pycnidia, it is impossible to do otherwise at present than consider them to be distinct. The *Septoria* has the normal complete all-round subglobose pycnidium of its type, entirely enclosing the proliferous stratum except for a minute round pore; the *Leptostromella* has an incomplete linear pycnidium, opening by a slit, and the texture of the upper part, instead of being pseudo-parenchymatous, is made up of loose mealy roundish cells, as in a normal *Leptothyrium*. The sporophores spring from the lower level, which is a proliferous stratum only, having no distinct pycnidial wall.

360. **Glœosporium Diervillæ**, sp. n.

Maculis rotundatis, 3–4 mm. diam., pallidis, dein albicantibus, margine lato rubescente cinctis. Acervulis epiphyllis, circularibus, depressis, nigrescentibus, usque 100–125 μ diam. Sporulis oblongis, curvulis v. arcuatis, utrinque obtusis, 2–pluri-guttulatis, achrois, $15–20 \times 2\frac{1}{2}–3\ \mu$.

Hab. in foliis vivis *Diervillæ floridæ*, West Kilbride, Ayrshire (Boyd), Sept. Sporulæ iis *Gl. frigidi* Sacc. simillimæ.

361. Myxosporium corticolum Edgerton in Annal. Mycol. 1908, vi. 48, fig. Sacc. Syll. xxii. 1195. Stevens, p. 546. See Bulletin New York Agric. Expt. Station, nos. 163, 191.

Pustules erumpent, originating under several layers of cortex, $\frac{1}{2}$–2 mm. diam., scattered rather densely over the diseased area, at length blackish. Spores straight or curved, cylindrical, very densely granular, $18–32 \times 6–9\ \mu$, oozing out in creamy-white tendrils; sporophores very short, rising from a greenish-yellow parenchymatous stratum.

On branches of Apple, causing a serious die-back. Long Ashton, Oct.–Feb. (Comm. A. D. Cotton.)

This disease was first met with in New York State in 1898, where it caused a canker of the bark. It was at first wrongly named *Macrophoma malorum* B. & V., but it was noted that it was not the same as *Diplodia malorum* Fckl. (which = the *Macrophoma*), for there is no pycnidial wall, while the spores remain always colourless and do not turn brown with age.—Accompanying *M. corticolum* at Long Ashton is a similar fungus with ovoid spores measuring $7–8 \times 2\ \mu$. ? *M. Mali* Bres.

362. Myxosporium incarnatum Bon. Handb. p. 56. Sacc. Syll. iii. 722; Fung. Ital. pl. 1073. Allesch. vii. 520.

Var. Roumegueri Sacc. *ibid.* pl. 1074. f. *Corni* nov. f.

Pustules scattered or here and there aggregated, small (up to $\frac{1}{2}$ mm. diam.), black, conico-convex, raising the epidermis, which is at length pierced at the summit by a minute round hole. Spores oblong, rarely ovoid, occasionally curvulous, often regular and equilateral, very obtusely rounded at both ends, colourless, granular and clouded within, 18–27 × 7–9 μ; sporophores linear-oblong, rather stout, obtuse or sometimes tapering above, about 15 × 2–3 μ.

On dead twigs of *Cornus sibirica*. Edgbaston Botanic Gardens. Apr.

Dr. J. W. Ellis found the var. on Laburnum, on which it was recorded by Saccardo, and I have found another form on *Fraxinus excelsior* at Northfield, with spores about 28–32 × 10 μ. All these differ in external appearance, but the spores are all of the same character. Mr. Boyd has sent me beautiful pinkish specimens, on *Carpinus* from Ayrshire, which agree exactly in external appearance with Saccardo's type, but have larger spores, 22–27 × 9–12 μ. It seems that the spores of *M. incarnatum* vary much; perhaps a wider acquaintance will lead to its subdivision into several species, but the variety *Roumegueri* does not seem to be tenable; rather should there be varieties *Corni*, *Laburni*, *Fraxini*, *Carpini*, etc.

363. Myxosporium sticticum (Karst.) Grove. *M. carneum* Lib. var. *sticticum* Karst. Sacc. Syll. iii. 726.

Pustules scattered, ±elliptical, rarely roundish, ½–1 mm. long, soon erumpent by a longitudinal slit, convex, black. Spores ellipsoid, rather acute at the ends, especially below, hyaline or granular, rarely guttulate, 9–11 × 2–3 μ; sporophores erect, linear, straight, 20–24 × 2–3 μ.

On dead twigs of *Fraxinus excelsior*. Quinton (Ws.). Apr.

It is misleading to place this as a variety of *M. carneum*, since it is not erumpent in the same manner, the contents are not pink, the spores are not of similar form or size, and the sporophores are very different in shape.

364. **Trullula (Cesatia) Silphii**, n. sp.

Acervulis subepidermicis, conico-erumpentibus, ¼–½ mm. diam., nigrescentibus, denique globulo succineo coronatis. Sporulis longe catenatis, breviter cylindraceis, utrinque truncatis et obsolete guttulatis, hyalinis, 5–7 × 2 μ, sporophoris brevibus, stipatis, cylindricis, paliformibus, achrois, rarissime furcatis, 10–12 × 2 μ, e strato parenchymatico pallide olivaceo oriundis suffultis. (Fig. 13.)

Hab. in stipitibus emortuis *Silphii perfoliati*, in horto botanico, Edgbaston, Mart. *T. Spartii*, ut videtur, affinis, at acervulis non "tenuissime membranaceis."

MYRIOCONIUM.

Syd. in Annal. Mycol. 1912, x. 448.

Pustules subcutaneous, rounded or elongated, dehiscing by fissures, more or less erumpent, becoming hard when dry. Spores acrogenous, catenulate, globose, minute, hyaline, soon separating; sporophores fasciculate, often arranged as in *Penicillium*.

365. Myrioconium Scirpi Syd. *l. c.* p. 449. Mycoth. Germ. no. 1136! *M. Scirpicolum* Died. Annal. Mycol. xi. 21.

Pustules scattered or seriate, roundish or oblong, ½–1 mm. long, sometimes confluent, at first flat and completely covered by the darkened epidermis which is afterwards rimosely split, at length erumpent, when moist cinereous, when dry blackish, somewhat locellate within. Spores very numerous, globose, hyaline, 2–2½ μ diam., formed in chains, but separating; sporophores ±filiform, about 10 × 2 μ.

On dead culms of *Scirpus lacustris*. Ashgrove Loch, Stevenston, 26th Feb., and Kilwinning, Ayrshire, Aug. 15th, 1921 (Boyd).

This curious fungus belongs to a novel group of the Melanconiales, differing from all hitherto known in its chains of spherical spores, and in the arrangement of its conidiophores, which in certain cases are said to resemble those of *Penicillium*. The spores are exceedingly numerous, and form dense masses which make it difficult to see the conidiophores, but after washing them away one perceives long delicate branched hyaline hyphæ, on which are dense fascicles of conidiophores in the form of spherical heads scattered here and there.

366. **Cryptosporium Tami**, sp. n.

Acervulis rotundatis, planis, laxe aggregatis, 150–250 μ diam., epidermide tectis, mollibus, tenerrimis, primo melleo-fuscis, dein centro pallidis, margine atro-brunneo translucido cinctis. Sporulis allantoideis, curvis, utrinque obtusis, sed interdum basi subattenuatis, leviter granulosis v. minute guttulatis, subinde hyalinis, $18–24 \times 2–3\ \mu$, sporophoris linearibus, plerumque rectis, sporam subæquantibus v. brevioribus, e strato molli tenui pallide olivaceo oriundis suffultis. (Fig. 5.)

Hab. in aridis stipitibus emortuis *Tami communis*, Bromsgrove; Oversley Wood, Alcester. Apr., May.

Very similar to *C. Vincæ*, var. *ramulorum*, but smaller, paler in colour, and with larger spores and sporophores. On the same stems, but not intermixed, were *Phomopsis tamicola* and *Phoma oleracea*, var.

367. Cryptosporium hypodermium Auersw. in Willk. Sert. Fl. Hisp. p. 170. Sacc. Syll. iii. 742. Allesch. vii. 749.

Var. nov. Silphii.

Maculis nullis. Acervulis gregariis, oblongis v. rotundatis, 200–250 μ diam., planis, nigrescentibus, centro pallidioribus, subepidermicis, postremo apertis. Sporulis lunatis, utrinque obtusatis, sæpe apicem versus latioribus, hyalinis, indistincte et irregulariter guttulatis, $12–15 \times 2\frac{1}{2}–3\ \mu$, sporophoris brevibus, linearibus, obtusis, ca. $5 \times 1\frac{1}{2}\ \mu$, e strato pallide olivaceo parenchymatico oriundis suffultis.

Hab. in aridis stipitibus emortuis *Silphii perfoliati*, in Horto botanico, Edgbaston, Mart.

368. Næmospora croceola Sacc. Syll. iii. 746; Fung. Ital. pl. 1086. Allesch. vii. 537.

Pustules subepidermal, pulvinate, up to nearly $\frac{3}{4}$ mm. diam., covered, then opening and disclosing a rich orange-coloured or saffron flattish disc, surrounded by the upturned edges of the bark. Spores ellipsoid or sausage-shaped, rounded at the ends, singly colourless, $5–7 \times 1\frac{1}{2}–2\ \mu$.

On a dead twig of *Acer Pseudoplatanus*. Harborne, Birmingham. Dec.

369. **Septomyxa Salicis**, sp. n.

Acervulis dense sparsis, primo nigrescentibus, peridermio tectis, dein erumpentibus, $\frac{1}{2}$–1 mm. latis, postremo late apertis discumque amœne carneum laciniis peridermii cinctum detegentibus. Sporulis oblongo-fusoideis, utrinque attenuatis, singulis ferme achrois, coacervatis carneis, diu esceptatis, deinde 1-septatis, $12–15 \times 4–5\ \mu$, sporophoris bacillaribus v. irregularibus, ca. 2 μ latis et longitudine sporam æquantibus, e strato prolifero fuliginoso oriundis suffultis.

Hab. in cortice *Salicis cinereæ*, Kew, May–Aug.; in cortice *S. fragilis*, Wood End prope Tanworth-in-Arden, Oct.

The pustules look very different when old from their appearance when young. At first they are convex, covered, and blackish; then the epidermis splits, and a few spores ooze out in a whitish mass; finally the spore-mass forms a broad, flat, rounded, or angular or even sinuous disc, bright pink in colour when fresh, and surrounded by the upturned edges of the bark. The spores of the Warwickshire specimens are exactly the same as those found at Kew in 1921.

(To be continued.)

NOTES ON CHAROPHYTES.

By Canon G. R. Bullock-Webster, M.A., F.L.S.

To those who study the Charophyta, the recent discovery by Dr. Claridge Druce and Colonel Johnson of *Tolypella nidifica* Leonh. and *Chara canescens* Lois. in Orkney is of the greatest interest. The former species was not known with certainty to occur in the British Isles till 1896, when the late E. S. Marshall collected it in a lagoon north of Wexford harbour, Co. Wexford; during subsequent years no further occurrence has been recorded. In August 1920 Dr. Druce and Colonel Johnson found excellent specimens over a considerable area in the brackish waters of Loch Stenniss, Orkney. This gives a very remarkable enlargement to the area of its distribution. The plant is found in many of the northern countries of Europe in brackish waters and occurs even in the sea-water of the Baltic.

In the same loch on the same occasion *Chara canescens* was also collected. Hitherto this plant has only been recorded from Cornwall, Dorset, Suffolk, Norfolk, and N. Kerry, and from County Wexford, where Mr. Marshall found it in the same lagoon which yielded *T. nidifica*, all these stations being in the south and south-west districts of the British Isles. Its discovery therefore in Orkney affords an immense extension of its range and gives good ground for expecting its occurrence in many new localities between these two limits. Outside the British Isles *C. canescens*, though by no means a common plant has, in Europe, a wide distribution.

The male plant has been found in a very few localities throughout the world, and has not hitherto been discovered in the British Isles. The reproduction is parthenogenetic, the unfertilized oospore germinating very freely. When this species is found, careful search should be made for the male plant.

The record of *Nitella batrachosperma* Braun is somewhat similar to that of *T. nidifica*. First discovered in 1888 in a loch near Obbe, Isle of Harris, Outer Hebrides, it was found in the following year in S. Kerry, and in 1890 in N. Kerry by Mr. Scully. But in this case there has been a linking-up of these two extreme localities; I collected some few plants at Kindrum, West Donegal, in August 1916, and in August 1919 in Achill Island, Co. Mayo. There can be little doubt that this plant occurs in other of the many lakes which abound along the west coast of Ireland. Its diminutive size, being the smallest of the British Charophytes, coupled with its usual habit of growing in deep water, renders it liable to be easily overlooked.

New localities have also to be recorded for *Nitella spanioclema*, which was published as a new species in this Journal for January 1919, and was collected by me in Lough Shannagh, W. Donegal, in August 1916. In the following year I found the plant still growing in abundance in its original station; in August 1919 I could discover no trace of it in Lough Shannagh, but in Lough Kindrum, some two miles west, I found it growing sparsely in one small area. Last autumn I received a parcel of Charophytes from Scotland from Mr. N. G. J. Smith, collected by him in company with Dr. Annandale in the deeper waters of various lakes. Among these gatherings was a sheet containing good specimens of *N. spanioclema*, collected in Loch Lubnaig, South Central Perthshire, in July 1921. The plant was growing in some ten feet of water, about the same depth as the Lough Shannagh plant. It may be a deep-water species requiring a boat and a drag for its discovery, and for that reason not easily found. Mr. James Groves and I are hoping to issue next year a fasciculus containing specimens of this plant and of other newly-found or newly-determined varieties of Charophytes as well as of certain rarer and more critical species.

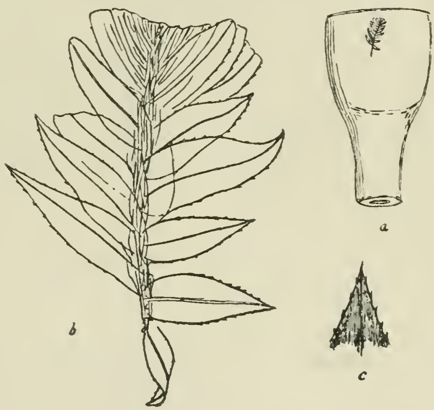
NOTE ON A MOSS IN AMBER.

By H. N. Dixon, M.A., F.L.S.

Through the kindness of Mr. W. N. Edwards, of the Dept. of Geology, British Museum, I have had the opportunity of examining an interesting fragment of moss, embedded in a mouth-piece made out of a piece of Burmese amber. I am indebted to Mr. Edwards for some of the following particulars:—

The amber came from the Hukong Valley, in a district lying quite in the north of Upper Burmah, and occurs in beds which are considered to be of Lower Miocene age. It has long been known to geologists (see Noetling, Rec. Geol. Surv. India, xxv. pt. 3, 1892, p. 130; and xxvi. pt. 1, 1893, p. 31), but apparently the *inclusa* remained unknown or unstudied until in recent years some insects were described in a series of papers by Prof. T. D. A. Cockerell. These insects formed part of a collection, which included the mouth-piece with the moss-fragment, presented to the British Museum (Natural History) by Mr. R. C. J. Swinhoe, of Mandalay, in 1921. Apparently no plant-remains have previously been recorded from Burmese amber, and there do not appear to be any other recognizable plants in the Swinhoe collection.

The moss is a fragment of a branch, about 5 mm. in length, and retaining a considerable number of leaves, some 7 or 8 of which are perfect, the rest being more or less truncated. The cell-structure is to a great extent obliterated, but sufficient indication remains to show that the cells are very narrow and more or less elongate. The form, nerving, and marginal armature, however, show clearly that it belongs to the Hypnodendraceæ. The leaves are ovate-lanceolate, broadly but acutely acuminate; the rather strong nerve runs up to the apex, but is probably not excurrent. The whole margin of the leaf, almost from the base, is somewhat closely set with short but acute, spinulose teeth, which are very frequently, if not generally, bigeminate. The margin of the leaf between the teeth or pairs of teeth is dark in colour, giving the appearance of a thickened border (see fig. *c*); but it is not constant, and is probably an effect of discolouration; it is often observable, to some extent, in the living plant. I have not been able to ascertain whether or not the nerve is spinulose at back. This bigeminate arrangement of the teeth is an infrequent feature among mosses, and characteristic of a comparatively few families, notably Mniaceæ, Rhizogoniaceæ, Bartramiaceæ, and Hypnoden-



a. Amber mouth-piece, nat. size. *b*. Moss-fragment, ×10.
c. Apex of leaf, ×20.

draceæ. The form of the leaves, the nerve, and the narrow linear areolation restrict the possibilities to the last-mentioned family. Among these there are only two existing species of Indo-Malay distribution exhibiting the leaf-form and structure above described; these are *Hypnodendron Reinwardtii* (Hornsch.) and *H. arborescens* (Mitt.) Lindb. Neither of these species, which are, I believe, indistinguishable from one another by the branch-leaves alone, has, I think, been recorded from Burmah, or indeed from continental Asia; but I have a specimen of *H. arborescens* in my herbarium from Penang, in the Straits Settlements, and the distribution of the two species would render the occurrence of either of them in Burmah not at all unexpected. The specimen may very well belong to one or other of these two.

The authentic records of fossil mosses—earlier than the Pleistocene—are scanty. Fleischer (*Hedwigia*, lxix. (1920) p. 100) refers to a recent discovery of the sporogonium of *Andreæa* with spores, from the Devonian of Röros in Norway, showing a structure almost identical with that of the existing plant; I have not seen the original account of this, and Fleischer gives no hint of the nature of the supporting evidence, though expressing no doubt as to the accuracy of the record. A certain number of records of mosses from the Tertiary have been announced, but the evidence on which several of these rest is by no means above suspicion. Thus in a paper on American Fossil Mosses by Eliz. G. Britton and Arthur Hollick (Bull. Torr. Bot. Club, xxxiv. 39; 1907) the authors discuss the records of mosses from the various Tertiary deposits, and show pretty conclusively that out of five such records three in all probability are not mosses at all, and a fourth is doubtful, leaving only one, *Rhynchostegium Knowltoni* E. G. Brit., from the Upper Eocene or Miocene beds, undoubted; and to this must be added *Glyphomitrium Cockerelleæ* described by the authors in the same paper, based on an unquestionable fruiting specimen from the Tertiary shales of Florissant, Colorado. This shows the uncertainty attaching to some of the earlier records. It would seem, however, that there are some half-dozen or more well-established records of mosses from the Baltic amber of the Oligocene (see Brotherus in Engl. & Prantl, Pflanzenfam., Musci, ii. 1239), and an equal number from various Tertiary deposits in Europe. Goeppert (Monatsber. d. Berlin Akad. 1853) enumerated 19 species from the Baltic amber, but a large proportion of these rest on very dubious authority. Mention may also be made of the recent discovery of an extinct species of moss (*Mnium antiquorum* Card. & Dixon in *Bryologist*, xix. 51) from the Reuverian (Lower Pliocene) beds or the Dutch-Prussian Border.

JOHN FIRMINGER DUTHIE

(1845–1922).

John Firminger Duthie, who died at Worthing on the 23rd of February, was born on the 12th May, 1845, the son of the Rev. A. H. Duthie, rector successively of Sittingbourne and Deal. He was educated at Marlborough College and at Jesus College, Cambridge, where he took the B.A. degree in 1867 with a 3rd Class in the Natural Science Tripos. After leaving college he spent some time as a tutor in Somersetshire—notes on British plants from his pen appeared in this Journal for 1871, where he is associated (p. 212) with the discovery of *Polygala austriaca* in Kent,—and then travelled with his mother and sister in Italy, living chiefly at Florence. He collected largely, both in Italy and also in the islands of Malta and Gozo, and published, chiefly in this Journal for 1872–74, accounts of the flora of those islands and of that of Tuscany and Monte Generoso in the Italian Lake country; his collections were unfortunately lost in a fire at a repository in Scotland where they had been stored.

In 1875, in which year he became a Fellow of the Linnean Society, Duthie was appointed Professor of Natural History at the Royal Agricultural College at Cirencester; in 1876 he was Superintendant of the Botanic Garden at Saharanpur in the North-Western Province of India, vacant by the retirement of Dr. W. Jameson. In those days the garden of Saharanpur was for the Upper Gangetic Plain what that at Calcutta was for the Lower country and the region bordering the Bay of Bengal; and Duthie at once set to work to carry on the labour of distinguished predecessors such as Doctors Royle, Falconer, King, and Jameson. This post he occupied for twenty-seven years, retiring in 1903; during his service he travelled over nearly the whole of the North-Western Province, the Punjab, and Central Provinces, and especially explored the Himalayan regions of Kumaon (with Mr. J. R. Reid), Garhwal, Simla, and Kashmir, making everywhere large and well-preserved collections for the Herbarium at Saharanpur and for distribution to Kew, the British Museum, Edinburgh, Calcutta, and elsewhere.

Duthie paid special attention to the grasses of North-Western India, both in their scientific and economic aspect; he published lists of these at Roorkee in 1883 and 1886, and is commemorated by Hackel in the genus *Duthiea*, established on a Kashmir grass in 1895. Much was done in the Saharanpur Garden in cultivating from seed and improving the varieties of edible vegetables; the results of these experiments are largely embodied in *Field and Garden Plants of the North-Western Provinces*, issued in conjunction with Mr. J. B. (now Sir J. Bampfylde) Fuller in three parts in 1882–93.

In addition to his work on Saharanpur, Duthie lectured every year on the Systematic Botany of India at the Forest School at Dehra Dún, and usually accompanied the students on their annual tour in the hills of Jaunsar and Jehri-Garhwal, where the forests were under management by the Government.

On his retirement in 1903 Duthie returned to England, and in September of that year was appointed Assistant for India in the Herbarium at Kew, a post which he was obliged to relinquish in 1907 owing to illness. During his time at Kew, his wide knowledge of Indian plants was always at the disposal of those who were working on them, and he described and published—in the *Kew Bulletin*, the *Journal of Botany*, the *Gardeners' Chronicle*, and elsewhere—many important new species sent from India and neighbouring regions. At the request of Sir Richard Strachey he revised the List of the great collection of the plants of Kumaon and neighbouring Himalayan regions known as the "Strachey and Winterbottom" collection, the first edition of which was published in 1882, and the revision in 1906. He also began and carried on from 1903 onwards the *Flora of the Upper Gangetic Plain*, which at the time of his death was nearly completed. Before leaving England he had undertaken the *Myrtaceæ* for the *Flora of British India*, in which work his monograph appeared in 1878.

Duthie married in 1879 Miss Coape-Smith, daughter of Col. Coape-Smith, then in charge of the Army Remount Establishment at Saharanpur, and we are indebted to Mrs. Duthie for much information about him. During the whole of his service in India, he was in constant and regular correspondence with Sir Joseph Hooker. Sir Joseph's letters were presented by Duthie to the Kew Herbarium Library: many are quoted or referred to in the 'Life' of Sir Joseph, and show how much the writer appreciated Duthie's work and the warm regard he always felt for him.

Duthie was a slow worker and very cautious, so that he was often unable quickly to make up his mind on systematic questions, but he always came to a decision in the end and the result was the more valuable in consequence. He was always extremely anxious to avoid inaccuracy, and used to polish up his work and descriptions over and over again. The most unassuming of men, he never put himself forward in the least, leaving it to his friends to estimate the value of what he did. He was a delightful travelling companion and an excellent climber, and many Indian forest officers and other friends will long remember the kindly good-natured botanist who accompanied them on their marches over the plains or mountains of Western India.

[For the greater part of the foregoing memoir, which will appear in extended form in the *Kew Bulletin*, we are indebted to the kindness of the writer, Mr. J. S. Gamble.—Ed. Journ. Bot.]

REVIEW.

Fungi: Ascomycetes, Ustilaginales, Uredinales. By Dame Helen Gwynne-Vaughan (formerly H. C. L. Fraser), D.B.E., LL.D., D.Sc., F.L.S., Professor of Botany in the University of London. (Cambridge Botanical Handbooks.) Demy 8vo, cloth, pp. xi + 232, with 196 figures in text. Price £1 15*s*. net. Cambridge University Press.

When taking up the study of Fungi a student soon learns of systematic works in his own or other languages which will take him all, or almost all, the distance he wishes to go. From the plant disease standpoint there are also many books, good and otherwise, which give him a mass of information concerning plant pathology. When, however, a student in the university sense of the term wishes to supplement the type of lecture it has been customary to give during the comparatively short period that Fungi have been regarded as worthy of consideration, he has been compelled to read original papers, supplemented by de Bary's classical *Comparative Morphology of the Fungi, Mycetoza and Bacteria* (1887), or Massee's very inferior *Text-book of Fungi* (1906). Few mycologists, even, are aware of the tremendous ramifications of their subject; most of us work in somewhat watertight compartments, and are apparently unable to realise the inter-relations revealed by advances in the various branches. It rests, therefore, with university lecturers so to train students that when they are academically qualified to begin research work on Fungi they should have sufficient knowledge of the intricacies of their subject to assume a philosophical attitude towards it as a whole. It is mainly to supply the needs of university students that the present book has been written and from that standpoint it is to be judged: "The intention of the following pages is to present the fungus as a living individual: the scope is mainly morphological, but, in dealing with objects so minute, morphology passes insensibly into cytology." There can be no doubt that the morphological side of the subject should be one for the student first to tackle; with morphology as a centre, cytology, physiology, classification and pathogenic fungi can be best approached.

An introduction of thirty-three pages gives a condensed account of some of the most interesting general facts concerning Fungi. After a brief introductory description of the group as a whole and its general reproduction, chapters are devoted to saprophytism, parasitism, and symbiosis—specialisation of saprophytism and parasitism—and reactions to stimuli, each of which might easily provide material for a separate treatise. Following the introduction there is a general account of the Ascomycetes: the various structures present in this group are treated in detail, as is also the question of the cytology of the ascus and sexual reproduction. Probably most readers who are conversant with the cytological researches of the last two decades will first look up what the author has to say about the nuclear divisions in the ascus, having regard to her well-known views as to the reducing character (brachymeiosis) of the third division. The account is not unduly coloured nor dogmatic, but the subtle introduction of a figure by Dangeard showing chromosome reductions in the divisions in *Ascobolus furfuraceus* has its humour. Another controversial matter in which the author has taken a leading part is treated in this chapter—*i. e.* the question as to the number of nuclear fusions which occur in the process of fertilization in the Ascomycetes. There has never been any discussion as to the occurrence of the fusion in the cell of the ascogenous hypha which gives rise to the ascus since Dangeard described it in 1894. Dangeard held that this was the only nuclear fusion; but Harper, and after him Blackman and Fraser, reported a previous fusion in the ascogonium either of male and female nucleus or of sister nuclei. The ground has shifted somewhat since the work of Claussen (1907, 1912), who, working with *Pyronema*, denies the fusion in the ascogonium; the male nuclei pass into the ascogonium, pair with the female nuclei, and they, or their descendants, remain in association, the fusion in the ascogenous hypha being between the members of one of these pairs. On theoretical grounds Claussen's "theory" is the most attractive: two nuclear fusions and two reductions would be anomalous in the Fungi, and, moreover, the pairing of nuclei agrees on the whole with what we know in the Uredineæ, Ustilagineæ, and Eubasidiomycetes. This no doubt is leading to its general adoption, and it is therefore essential that such criticisms as those put forward in the present work by one who understands the difficulty of interpretation should be given their proper weight. The pairing of nuclei in the ascogenous hyphæ, which is at present the crux of the question, is regarded by Dame Gwynne-Vaughan as a sign of rapid growth and division, as suggested by Welsford. Another point of much academic interest treated in the same chapter is that of phylogeny, as to which various theories are discussed; the author seems to favour the primitiveness of the Endomycetaceæ, which, on our present knowledge, is the view which appears able to withstand serious criticism.

Following this chapter full of controversy, we reach less troubled seas; chapters are devoted to Plectomycetes, Discomycetes, and Pyrenomycetes: "The group Plectomycetes is constituted to include those relatively simple forms which possess neither the cup-shaped apothecium of the Discomycetes nor the flask-shaped perithecium opening by a definite ostiole which characterizes the Pyrenomycetes. In the majority of the remaining Ascomycetes a rounded ascocarp is produced, but it opens either by the decay of its walls or by an irregular split or tear. The asci may arise from the floor of this fructification, and stand parallel one to another, or they may be irregularly disposed, the fertile hyphæ forming a tangled weft. In other families the asci are naked; they stand parallel in the Exoascaceæ, but in these parasitic forms their position is probably determined by the fact that they grow up between the epidermal cells or under the cuticle of the host, and may be without phylogenetic significance. In the Endomycetaceæ they are irregularly disposed on the mycelium, and in the Saccharomycetaceæ a mycelium is not developed." The group includes Plectascales (Plectascineæ, Protascineæ, and some Hemiasci of the *Pflanzenfamilien*), Erysiphales, and Exoascales. It is probably a very unnatural group, but brings together a series of detached ends, for which many will be devoutly thankful.

The detailed study of each family really amounts to the consideration of a series of types, the types being those of which sufficiently clear details are known. Here, as throughout the book, there are suggestions as to special points which still require elucidation. The relation of these types to one another is shown in a series of not too detailed keys. In the Pyrenomycetes especial stress is laid on the wonderful Laboulbeniales. This very full and critical description will be much appreciated by those who have difficulty in consulting Thaxter's monographs on this group which he has made so much his own.

The last section of the book deals with Basidiomycetes, but only with Ustilaginales and Uredinales. These two groups make an ideal subject for text-book treatment and most of the points they raise are treated more or less fully. It is suggested that the life-cycle of the Ustilaginales appears to be reduced rather than primitive, the conjugation of the spores replacing some ordinary sexual process; "but the present state of our knowledge scarcely permits speculation as to what the earlier alternation of generations may have been." Whereas for the progenitor of the Uredinales a species must be sought "with a cæoma from the æcidiospores of which promycelia are produced. Such a form has been recognised in *Kunkelia nitens*."

It is to be regretted that the work does not include the whole of the Fungi. It is stated in the preface that "The manuscript was completed early in 1917, but an endeavour has been made to bring it up to date." It may be that the more or less compulsory completion of the manuscript then precluded the author from continuing with the Phycomycetes and Basidiomycetes. As the main cause has been removed, we may perhaps hope for a supplementary volume.

Sufficient has doubtless been said to indicate that the book is one which no student of Fungi should fail to possess. Certainly no university student can afford to be without it, though thirty-five shillings is a high price for a volume of this size. The book is exceedingly attractive in every way: paper, printing, and general get-up are a tribute to the publishers. The wealth, beauty, and usefulness of the illustrations will appeal to all; with a not inconsiderable acquaintance with mycological literature, we can safely say that we know of no work which contains so wide a range of figures. These are taken from the authorities cited—C. Tulasne's wonderful drawings have never been better reproduced—and include a number of original drawings and photographs, many of the former illustrating observations by the author, hitherto unpublished.

J. Ramsbottom.

BOOK-NOTES, NEWS, etc.

Continental peoples for many years past have been far more addicted to sampling toadstools than have the inhabitants of these islands, where it is almost unsafe to be seen taking interest in any genus except *Psalliota*; and even mycophagists have been wont to regard edible species as falling into two categories—those fit to eat and those eaten on the Continent. During the War, fungi received even greater consideration than formerly on account of the shortage of food. This seems to have been particularly the case with the nations of central Europe, and it might safely be said that far more attention has recently been paid to this aspect of the subject than to the purely scientific one. In *Welche Pilze sind essbar?* by Emil Hermann (Georg Kropp, Heilbronn a. N., 18 marks) are listed 515 species of fungi which may be eaten with safety, though in certain cases preliminary operations are necessary. The genera are arranged in the usual order, and in most cases their salient features are given. The "spot" characters of the species are frequently noted, and where there are illustrations in any of the better-known German works they are referred to and criticised. As Hermann is also the author of a well-known fungus cookery-book, he may be regarded as understanding the requirements of his countrymen. Many species are indicated as being only fit for salad, others as "make-weight." The mycological portion of the book appears to be quite sound.—J. R.

Attention of those interested in the economic aspects of Mycology may be called to *The Review of Applied Mycology*, published by the recently-established Imperial Bureau of Mycology, Kew. This is "intended to afford a monthly survey of the more recent literature dealing with the diseases of plants except those caused by animal parasites, and also to contain references to work on other aspects of applied mycology." The Review does not aim at a complete citation of all mycological and phytopathological literature, but is to supply economic mycologists who suffer from restricted library facilities with sufficiently full abstracts to keep them informed of current work. By many, the issuing of the Review will be regarded as by far the most important of the Bureau's proper functions. It is too early to judge as to how efficiently the work will be conducted, but in the first three numbers to hand the abstracts seem highly satisfactory. The "Honorary Committee of Management" is remarkable for the almost complete absence of mycologists, but it is to be congratulated on being able to produce a monthly abstract journal of 32 pages at the remarkably cheap price of 12*s.* per annum post free.—J. R.

The *Journal of the Linnean Society* (*Botany*, vol. xlv. no. 304: March 31) contains an account of the Gymnosperms (*Austrotaxus*, gen. nov.), Ferns, and Mosses collected in New Caledonia in 1914 by Mr. R. H. Compton; a paper "On the Leaf-tips of certain Monocotyledons" by Mrs. Arber; an account of the mosses of the Wollaston expedition to Dutch New Guinea, 1912–13, with others from British New Guinea, by Mr. H. N. Dixon; and a note on the fertilization of *Cephalanthera* by Colonel Godfery. In this the author thus modifies the conclusions which he published in this Journal for 1920, in a paper entitled "*Cephalanthera* Richard or *Epipactis* Crantz?": "I then," he writes (p. 71), "adopted Darwin's view and said: '*Cephalanthera* is a decadent genus which has fallen from its high estate, assuming that it is really the case that it is entirely self-fertilized, and that we have not simply so far failed to understand the mechanism of the flower.' I had then had no opportunity of studying the fertilization of *ensifolia* and *rubra*. Now that I have done so, I am convinced that both these species are wholly cross-pollinated by insects, and that this is also the case occasionally with *grandiflora*, though its subsequently acquired faculty of self-fertilization has now become the dominant factor in its reproduction. I do not now believe there has been any decadence or degeneration in *Cephalanthera*, but that it presents a case of persistence to the present day of an extremely ancient method of cross-pollination which possibly prevailed universally in the Orchidaceæ (except in Diandræ) in the remote period before a rostellum had been evolved in that Order."

We take from the *Times* the following account of the late William Beechcroft Bottomley, until recently Professor of Botany at King's College, who died at Huddersfield on March 31, at the age of fifty-eight: "The only son of Mr. J. Bottomley, of Fern Cliffe, Morecambe, he was educated at the Royal Grammar School, Lancaster, and King's College, Cambridge. Appointed science tutor and lecturer on biology at St. Mary's Hospital Medical School in 1886 at the age of 23, Mr. Bottomley continued in that office until 1891, when he succeeded to the professorial chair of biology at the Royal Veterinary College, London. Two years later, on the retirement of Professor Bentley, he became Professor of Botany at King's College, London, an office which he held until ill-health caused his retirement last year. Intensely interested in agricultural co-operation, Professor Bottomley was the founder of the South-Eastern Co-operative Agricultural Society, but it was by his experimental research in the use of 'bacterized' peat as a stimulant and fertiliser that he has added a noteworthy contribution to the sum of useful human knowledge. With a view to increasing the productivity of the soil, and particularly of poor land, he turned his attention to the investigation of nitrogen-fixing organisms which would enable plants to obtain the all essential nitrogen from the air by means of bacteria. Taking peat as the basis for his experiments, he subjected it to a process of decomposition, and found that as a result other bacteria were produced and led to the growth of nitrogen-fixing organisms. A fact established as a result of these experiments, and one which created no little sensation in the scientific world at the time, was that just as human beings and animals required vitamines, so in the case of plants and vegetable crops accessory food bodies were required."

Vol. ix. no 1 (issued Nov. 1921) of the *Records of the Botanical Survey of India* is devoted to a "Survey of the Flora of the Anaimalai Hills in the Coimbatore District, Madras Presidency," by C. E. C. Fischer, I.F.S. The list itself, which is very extravagantly printed, contains little of note, a variety of *Barleria cuspidata* presenting the only novelty; there is, however, an interesting introduction, in which the character of the flora is summarised, with an excellent map. No. 2 of the volume contains descriptions (at great length) of new Malayan Euphorbiaceæ by Mr. A. T. Gage. In vol. viii. Father Blatter's careful Flora Arabica is continued in no. 3 (Dec. 1921); the enumeration has proceeded as far as Verbenaceæ, but, save for an occasional "comb. nov.," the part contains no novelties. The fact that page-headings may be turned to useful account has not penetrated to those responsible for the production of the *Records*.

The Trustees of the British Museum will shortly publish a *Guide to the Larger British Fungi* which will replace the *Guide to Sowerby's Models of British Fungi* by the late Worthington G. Smith. The new Guide, which has been prepared by Mr. J. Ramsbottom, deals more fully with questions of general interest, and includes a larger number of species than the previous one, and is so arranged that it will form a useful introduction to the study of the larger fungi.

In the *New Phytologist* (March 22: vol. xxi. no. 1) Professor W. Stiles continues his critical articles on Permeability, and Mr. W. J. Hodgetts concludes his "Study of the Factors controlling the Periodicity of Fresh-water Algæ." Sir Francis Darwin has two papers, one "Studies in Phænology, No. 3, 1921," which shows that the most obvious feature of the dates of flowering last year was their remarkable earliness; the second—in conjunction with another well-known Cambridge botanist, Mr. A. Shrubbs—on "Records of Autumnal or Second Flowerings of Plants," gives further details of a remarkable floristic year. The very healthy controversial articles for which this periodical is becoming noteworthy are represented by Professor J. H. Priestley's "Further Observations upon the Mechanism of Root Pressure."

Science Progress for April contains a long and interesting paper on "Spitsbergen, its Natural History and Resources," by Mr. V. S.

Summerhayes: the observations on plants occupy five pages and confirm those lately placed before the Linnean Society by Mr. John Walton (see p. 126).

We have received the first volume (March) of *Empire Forestry* (Macmillan: 4*s.* n.), the Journal of the Empire Forestry Association, which was inaugurated at the Guildhall in November last. It is a well-printed illustrated book of 124 pages, containing papers on Forestry in various parts of the Empire, including Canada, Australia, and India. Mr. F. R. S. Balfour writes on the Douglas Fir Flagstaff at Kew, of which he suggested the sending; Mr. S. M. Edwardes discusses "Tree Worship in India"; there are numerous editorial notes, and a bibliography of Forestry for 1920–21—altogether an interesting volume.

Notes from the Botanical School of Trinity College, Dublin (iii. no. 3: March), include papers on "Heat produced during Inversion of Sucrose" and "Phytosynthesis and the Electronic Theory," by H. H. Dixon and N. G. Ball; "Factors affecting Hydrogen Ion Concentration of Soil" and "The Hydrogen Ion Concentration of Plant Cells," by W. R. G. Atkins.

The Hundred of Wirral, occupying a peninsula between the estuaries of the Mersey and the Dee, merits treatment as a floristic area separate from the Liverpool district. In *The Muscineæ of the Wirral*, by W. A. Lee and W. G. Travis (Lanc. and Ches. Naturalist, xiv. 1921), is to be found a history of all the local bryophytes. The physical geography of the area is discussed, and lists are given of the principal species found on peaty heaths, shore clay banks, and dune tracts. Important changes have occurred since F. P. Marrat made his records seventy years ago: the dune slacks have dried up, causing the disappearance of aquatic species; the resident population has vastly increased, and the smoke nuisance has exterminated many species, especially corticolous. In the list 183 mosses and 47 hepatics (exclusive of varieties and forms) are recorded; and, of these, 45 mosses and 9 hepatics are already extinct.—A. G.

A meeting of the British Mycological Society was held at Cambridge on Saturday, March 18th. The papers were:—Mrs. M. N. Kidd, "Diseases of Apples in Storage"; Mr. J. Line, "The Parasitism of *Nectria cinnabarina*"; Mr. K. C. Mehta, "Observations on the Occurrence of Wheat Rusts near Cambridge"; and Messrs. F. T. Brooks and G. Hansford, "Mould Growths on Cold Store Meat." All the papers described investigations which have been carried out in the very active Mycological Department of the Botany School at Cambridge.

The vacancy in the Professorship of Botany at Edinburgh and the offices connected therewith has been filled by the appointment of Mr. William Wright Smith, who has for some years occupied the post of Assistant Keeper. Born in Dumfriesshire in 1875, he graduated as M.A. at Edinburgh, and in 1902 joined the botanical staff of the University. In 1907 Mr. Wright Smith was appointed to the charge of the Government Herbarium at Calcutta; in 1908 he acted as Director of the Botanical Survey of India, and in 1911 became acting superintendent of the Calcutta Gardens; shortly after this he returned to Edinburgh. Mr. Wright Smith has been for several years secretary of the Botanical Society of Edinburgh.

In the reprint of her paper on "Homothallism and the Production of Fruit-bodies by Monosporous Mycelia in the Genus *Coprinus*," which appeared in the last number of the *Transactions of the British Mycological Society*, Miss I. Mounce inserts a slip stating that since the paper was sent to press she has isolated and experimented with *heterothallic* strains of *Coprinus lagobus* and *C. niveus*.

We regret to learn from the Jan.–Feb. issue of the *Lancashire & Cheshire Naturalist* that unless further support be forthcoming, the journal will probably cease to exist. The number contains a notice of the Rev. H. H. Higgins (1814–1893) and a list of the Lichens of the Wirral, by W. G. Travis.

The *Orchid Review* for April contains an interesting paper by the Messrs. Stephenson on "Hybrids of *Gymnadenia conopsea* and *Cœloglossum viride*." Of the three characterised, two have been figured and described in the Reports of the Winchester College Natural History Society; the third, of which a figure is given, was found in Shropshire by the late R. F. Burton.

The recently published volume of the *Transactions of the Royal Historical Society* (4th series, vol. iv.) contains an interesting paper on "The Extent of the English Forest in the Thirteenth Century," by Margaret Ley Bazeley, M.A.

The *Annales des Sciences Naturelles* (*Botanique*)—vol. iii. nos. 5–6: Dec. 1921—contains "Recherches sur les Lichens de la famille des Stictacées" (4 pl.), by F. Moreau; "Les Chênes d'Indo-Chine," by Hickel & A. Camus (many new species); "Mutantes et Hybrides," by L. Blaringhem; "Sexualité expérimentale des Basidiomycètes," by Plantefol; "La Flagellose ou Leptomoniate des Euphorbes et des Asclépiadacées," by F. Mesnil.

The *Annales du Musée Colonial de Marseille* (sér. 3, vol. 9) is devoted to a study of "La Végétation Malgache," by M. H. Perrier de la Bathe, illustrated by maps and figures from photographs of aspects of the vegetation.

A fourth part containing *Pholiota*, *Marasmius*, and *Rhodophyllus* of Jakob E. Lange's "Studies in the Agarics of Denmark" occupies no. 11, bind 2, of *Dansk* Botanisk Arkiv. (1921). In bind 4, no. 1, Erik J. Petersen figures and describes a new sapropelic micro-organism (*Coniothrix sulphurea*).

The *Essex Naturalist* (March: vol. xx. pt. 1) contains an account of the Fungus Foray in Epping Forest, 15 Oct., 1921, with a list of the Myxomycetes found, seventeen in number.

We announce with great regret the death of Mrs. Antony Gepp, which occurred, after a long illness, at Torquay on the 6th of last month. Under her maiden name—Ethel Sarel Barton—Mrs. Gepp was for many years a valued contributor to this Journal, in which she published important algological papers. We hope to give some account of her work in an early issue.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers

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BRITISH AND FOREIGN

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

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EDWARD ADRIAN WOODRUFFE-PEACOCK (1858–1922).

Edward Adrian Peacock (who added his mother's name to his patronymic, and who is best known by the combination) was born at Bottesford Manor, Brigg, Lincolnshire, on July 23, 1858. His father, Edward Peacock, F.S.A., was an antiquary of distinction and an authority on Lincolnshire dialect, and especially interested in the folk-lore and popular names of plants; by a curious coincidence he had an extraordinarily harsh voice—I remember that when he came to see me at Bloomsbury, in pre-South-Kensington days, Trimen said when he left, "Who was that man with the terrible voice?" and when I replied, "You won't believe me when I tell you his name is Peacock," he said, "Of course I don't!"

Adrian Peacock was educated at Edinburgh Academy, then at St. John's College, Cambridge, and Bishop Hatfield Hall, Durham, where he took the degree of Licentiate in Theology in 1880. After holding various curacies, he became Vicar of Cadney, near Brigg, in 1891; here he remained until 1920, when he became Vicar of Grayingham, at which place he died on February 3.

For a general summary of his work I cannot do better than quote the account prepared by Mr. Richard W. Goulding, Librarian to the Duke of Portland at Welbeck Abbey, of which he was kind enough to send me a copy. Mr. Goulding writes:—

"Mr. Peacock was a man of many attainments and activities, but he was best known as a capable and experienced field naturalist. He will be greatly missed, particularly by those who are interested in the natural history of Lincolnshire, for he accomplished probably more than any other single worker in the accumulation of facts relating to the distribution of plants and animals in the county in which he was born, and in which he spent the greater part of his life. He was one of the founders of the Lincolnshire Naturalists' Union in 1893; for ten years he was its Organizing Secretary; he was its President in 1905–6; during the entire period of its existence he has been its moving spirit, and he was once aptly described by the late Canon William Fowler as its 'nursing father.' He was an all-round naturalist. Full of enthusiasm himself, he inspired enthusiasm in others, and he was ever ready to help and encourage fellow-workers and junior students. From his youth up he was an indefatigable observer and note-taker—'a humble recorder of trifling every-day facts' is the description he gave of himself in the preface to his *Check-List of Lincolnshire Plants* published in 1909.

"Mr. Peacock was thorough in everything he undertook. In his preaching he always made it his aim to get a series of correlated ideas for every address, and he then endeavoured to give expression to his thoughts in plain, simple, forcible language."

In his Check-List published by the Lincolnshire Naturalists' Union in its *Transactions* in 1909 (ii. 1–66) and continued up to 1911 in the same volume (pp. 290–299) Peacock presented "an analysis of some 500,000 observations" that he had accumulated in his work on the plants of the county. The List, which is arranged alphabetically, was noticed at some length in this Journal for 1910 (p. 166): here it may suffice to say that in the single line devoted to each species is given the date and authority for first observation and an indication of the distribution through the 18 artificial divisions of county—these in accordance with the map published by Peacock in the *Naturalist* for 1895, which has been accepted by the Union as the basis of its work dealing with the distribution of species. The List includes names of two varieties of *Veronica agrestis* and *V. Beccabunga*: we suggested that descriptions of these should be published in this Journal, but the suggestion was not adopted; they were doubtless of little importance, for Peacock was not a critical botanist, as his note on *Primula elatior* (Journ. Bot. 1906, 243) shows.

As an ecologist, however, Peacock, so far as his limited scope of observation went, stood in the first rank; his Flora was to have been produced on these lines, and Dr. Tansley, with whom he corresponded on the subject, was so much impressed by the perusal of the portion sent to him that he offered to defray the cost of publication, if the MS. could be reduced to reasonable compass. Of this Peacock was unfortunately entirely incapable; he however accepted with gratitude Dr. Tansley's offer to edit and condense the MS., but shortly after this he became seriously ill, and nothing was done. In his letter to me Dr. Tansley writes: "The observations I should put first in value are those on methods of dispersal; his collection of these, if published in convenient and accessible form, would add enormously to our knowledge of the actual means of dispersal of British species. Second, I should put his observations, for each species, of the soils on which it actually occurs. The publication of these two sets of data, in systematic form, would make a work which would be unique, and of the highest interest and value." Few, if any, floras have been produced under circumstances so favourable for observation; Peacock had always lived in the county, and began his work in 1873. The MS. of the Flora has been left to the University of Cambridge.

Of the value of his observations, Peacock's numerous contributions to this Journal—to which, with his consent and even approval, the Procrustean method was somewhat freely applied—sufficiently show: those on "Natives and Aliens" (1908), "Followers and Shunners of Man" (1909), "The Shepherd's Purse and Cultivation," "The Mallow" and "Change of Climate and Woodland Succession" (1912), "Index Species in a Flora" (1914), may be cited as examples. Other papers of like nature are published in the *Transactions* already mentioned—an especially interesting one is that on Seed-dispersal by birds (1919, 14–37); and he contributed two pamphlets—*How to make a Rock-soil Flora* (1904) and *Frequency in Floral Analysis* (1912)—to the "Rural Studies Series" of pamphlets published at Louth (Gould). Peacock's first communication to this Journal was a note on *Limnanthemum* in South Lincolnshire (1896, 229); his last, a summary of fifty years' observations on the soils and habitats of *Hypericum humifusum* in the county (1919, 225)

James Britten.

TWO ALCHEMILLAS NEW TO BRITAIN.

By A. J. Wilmott, B.A., F.L.S.

Alchemilla glomerulans Buser is one of the many small species discovered to have been hidden in the composite *A. vulgaris* L. It agrees with *A. alpestris* Schmidt (*sensu* Lindberg) in having its indumentum formed of subappressed silky hairs, with which a few slightly spreading ones are mingled, but is easily recognisable from both that and *A. acutidens* Buser by many characters. The lobes of the large leaves are broader and shallower, making the leaf rounder, and, though at first sight they look glabrous, a moderate lens shows that both surfaces are hairy all over, although the hairs are sparse and fine. The petioles are densely silky-hairy throughout and the hairs on the stem reach right up into the inflorescence. It also has such a characteristic look that I picked out the first specimen I saw as something distinct after a very cursory glance, and recognised the second as probably identical before examining it.

Since Lindberg's description in his monograph, *Die Nordische Alchemilla vulgaris-formen*, p. 105 (1909), is so detailed, and I have seen no series of British plants, I will translate it, italicising distinguishing characters:—

A. glomerulans Buser; plant usually moderately large, light- or yellow-green, more or less clad with appressed hairs. Rhizome stout. Stipules at the base of the plant brownish with greenish, colourless, or somewhat wine-red auricles. Stem as a rule moderately stout, arcuate-erect or decumbent, rarely more erect, (5) 20–30 (50) cm. high, more or less richly clad *with appressed hairs throughout*, hairiness often (f. *dasycalyx* Westerlund) reaching to pedicels and urceoles of the lowest flower, rarely (f. *glabrior* Westerlund) stem almost glabrous or sparingly hairy in the lower part. Leaves *large*, bright-, yellow-, or somewhat blue-green; *petioles* 1·5–30 cm., more or less thickly *appressed hairy* and often somewhat shimmering, [laminæ] strongly undulate, thin, later usually on the margins more or less brown-red coloured; *upperside usually* more or less richly clad *with moderately long appressed hairs over the whole surface*, less often only hairy in the folds, rarely (f. *glabrior*) almost or quite glabrous; underside more sparsely hairy, often only on the veins appressed hairy (the young spring leaves often almost or quite glabrous, only somewhat hairy on the veins below); general outline reniform, rarely more roundish, 3–14 cm. broad and 2·5–12 cm. long, usually c. 10 cm. broad and c. 8 cm. long; *lobes* 9 (or 11 incomplete, in small leaves 7), *broad*, usually *short and rounded*, each side *with* (6) 7–9 (10) *short*, broad, usually *blunt*, and somewhat irregular and extended *teeth*, or (on leaves with especially short lobes) more acute, narrower, and somewhat connivent, terminal tooth smaller than the subjacent ones; stem leaves usually well developed, stipules large, especially the upper deeply toothed. Inflorescence usually moderately narrow, somewhat broader above, corymbose with moderately *dense and spherical flower clusters*. Pedicels 1–2 (3) mm. long, glabrous, or the very lowest often more or less with long appressed hairs. Flowers yellow-green or yellowish, 3·5–4 mm. broad; urceoles with short usually somewhat rounded base, 3–3·5 mm. long, glabrous or in the lowest flowers with solitary or few long erect spreading hairs; calyx- and epicalyx-segments of the lower or lowest flowers with some apical hairs, those of the upper flowers glabrous. [Damp places or new springs: Greenland; Iceland; Scandinavia; Finland; N.E. Russia.]

There should be no difficulty in distinguishing this from its allies. *A. filicaulis* Buser, the northern relative of *A. minor* Huds., may, in some of its forms, have a distribution of hairs very similar, but the hairs are widespreading on stem and petiole, and it is a smaller plant than the specimens of *A. glomerulans* which I have seen.

The first British specimen noticed was brought to me in 1917 by Mr. Roffey among a parcel of Scotch plants, labelled "Glen Eunach, Inverness-sh., Aug. 1916." I immediately named it as probably *A. glomerulans*, but had no specimens of that species with which to compare it. Mr. C. E. Salmon has since kindly compared it with specimens in his herbarium sent him by Mr. Lindberg, and confirms my identification.

Examination of the herbarium of the late E. S. Marshall (at Cambridge) disclosed a second specimen labelled: "Ref. no. 3885, see Wats. E. C. Rep. 1913. Abundant (from about 1800 to nearly 3000 feet) by a streamlet on the south side of Ben Lawers, Sept. 4, 1913 . . . . much more plentiful than our ordinary form of *A. alpestris* Schmidt, and easily separable from it, when growing. Dr. C. E. Moss pointed it out as the plant discovered by Ostenfeld (August 1911) in this station, and named by him as *A. acutidens* Buser. *Proved*, by cultivation, to be only *A. alpestris*, E. S. M. 1918." This specimen puzzled me, since I remembered agreeing that the specimen sent under this number to the National Herbarium was *A. alpestris*. On the next sheet I found it to contain further specimens of 3885 with the same locality-label, and a similar observation about *A. acutidens*, except that "cultivation proved this to be *good A. alpestris*!" This sheet was indeed *A. alpestris*: evidently Marshall did not separate the two in the field as clearly as he imagined. On this sheet he notes "it was associated with ordinary *A. alpestris* Schmidt . . . . unusually large." As these specimens are small for *A. alpestris* and smaller than that of *A. glomerulans*, the latter note presumably refers to the other sheet.

Careful search will probably show that this form is fairly widely spread in Scotland. The species grows in Iceland and has a wide distribution, whereas the remaining segregate species which occur in Scandinavia are not so widespread, and are less likely to occur here.

Since writing the above, I have found among some duplicates received at the National Herbarium from the South London Botanical Institute a specimen of another of these small species, *A. pastoralis* Buser. This is the plant which must retain the name *vulgaris* in the most restricted sense, as *A. vulgaris* L. emend., "Buser in Dörfler, Herb. Norm. 3633 (1898)" (Lindberg). This is a plant which at first sight looks like *A. pratensis*, having dense spreading hairs on stems and petioles and becoming glabrescent at the apex, but the leaves also are here rather densely covered with longish and sub-appressed hairs throughout both surfaces. It was from "near Langdon Beck Inn, Upper Teesdale, Durham, 7.6.1903, A. O. Hume," and was labelled *A. vulgaris* L. I have examined the remaining specimens of this gathering at the Institute, and find that they are all either *A. alpestris* or *A. pratensis*. I again translate Lindberg's description (p. 57):—

A. VULGARIS L. emend. Buser, 1898; *A. pastoralis* Buser; Lindberg. Plant m·dium-sized, grey-green, very thickly hairy. Rhizome stout. Stipules at the base of the plant brownish with green or somewhat reddish auricles ("Oehrchen": but *cf.* p. 40 "stipulæ non coloratæ"). Stem moderately stout, almost stiffly erect or somewhat arcuate-ascending, 10–35 cm. high, very densely [in British specimen weakly in upper half] clad *throughout its whole length with* perpendicularly *spreading hairs* 1 mm. long. Leaves grey-green, petioles moderately equilong, 2–20 cm., thickly spreading, hairy; [laminæ] flat or almost flat, thickly *hairy all over both sides* (the hairs almost spreading); veins below only in young state weakly silky shining, general outline reniform or more rarely almost circular, 3·5–10 cm. broad and 2·5–9 cm. long, as a rule 1 cm. broader than long; lobes 9 half ovate to roundish, more or less contiguous laterally, each side with 7–9 similar, moderately small, and narrow, bluntish, somewhat connivent teeth, terminal tooth smaller and shorter; stem-leaves small with moderately large-toothed to cut stipules. Inflorescence with erect spreading branches with moderately dense flower-clusters. *Pedicels* 1–2·5 mm. long, *glabrous*. Flowers yellowish green, 3–4 mm. broad; urceoles as a rule a little rounded at base, obconical, later spherical, 3–3·5 mm. (2·5–3 when dry) long, *more or less* sparingly spreading *hairy*, rarely richly hairy, *often* [British specimen] most of them *glabrous* and only few or solitary ones with quite solitary hairs very rarely all quite glabrous; *calyx segments* more or less sparsely (rarely more richly) *hairy below*, epicalyx segments ciliate only on the margin or with solitary hairs near the apex. [Dry meadows; Denmark; Scandinavia; Finland; Baltic Provinces; Russia.]

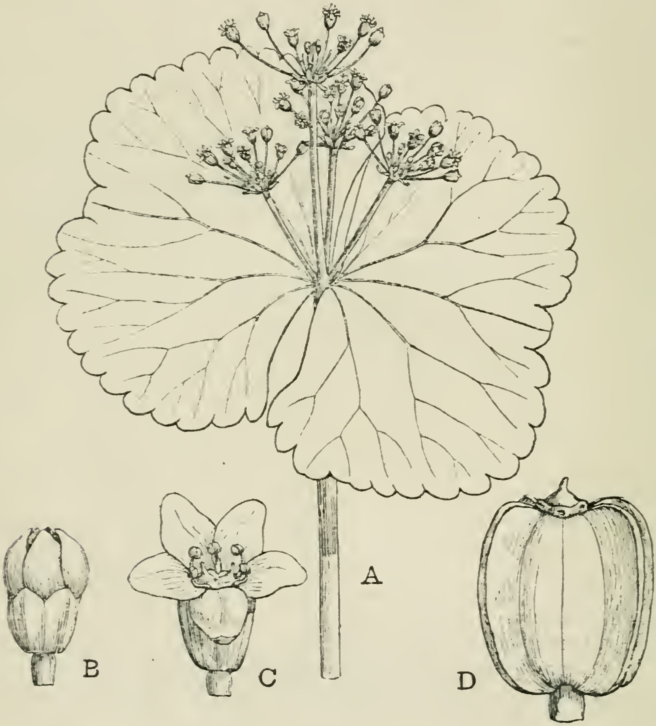
There remains to record an extension of range of the true *A. filicaulis*. There are specimens of this in Herb. A. Ley in Herb. Univ. Birmingham, from "Monmouthshire, in the 1st Daren, Henddr (?) valley, H. D. 14, 7 July, 1898," as "*A. vulgaris* L., *pratensis* Schmidt."

ON COTYLONIA, A NEW GENUS OF UMBELLIFERÆ.

By Cecil Norman.

Cotylonia, e tribu *Hydrocotylearum* novum genus.

Calycis dentes obsoleti; petala integra, obtusa, plana, imbricata. *Discus* in stylopodiis parvis conicis productus; *styli* breves: *fructus* a dorso compressus; carpella a dorso compressa: margines alæformes (juga filiformia indistincta; vittæ nullæ): *carpophorum* indivisum crassum; *semen* a dorso compressum, haud excavatum.



A, part of plant: $\frac{3}{4}$ nat. size. B, bud; C, flower; D, fruit: × 7.

Herba annua, suberecta: *folia* integra, rotunda, crenata, palminervia; *stipulæ nullæ*; petiolus ad basim scarioso-dilatatus; *umbellæ* simplices; *bracteæ* inflorescentiæ magnæ conspicuæque foliis similes, umbellulorum multæ lineares; flores albi.

Closely allied to *Hydrocotyle* and *Micropleura*, differing from both in the very large bracts to the inflorescence, and in the dorsally, not laterally, compressed fruit. Unfortunately the fruit is not ripe enough to make quite certain of the other details. I have followed the collector in calling the flowers white: they do not seem so in the dried state.

Cotylonia bracteata, sp. unica. Herba annua, suberecta, *radice* fibrosa, caule nudo glabro simplice; *foliis* rotundis, basi profunde cordatis, marginibus argute crenatis, inferne glaucis, nervis utrinque sparsissime pilosis; petiolo longo, glabro ad basim scarioso et breviter vaginante: *umbellis* simplicibus paucis ±3, quarum media terminalis, ceteræ laterales, ex axillis bractearum foliacearum crescentes; *umbellulorum* pedicellis paucis valde inæqualibus crassis; bracteis inflorescentiæ 2, magnis, oppositis, sessilibus, sub-reniformibus, cætero foliis exacte similibus; *involucellorum* numerosis, late linearibus obtusis: *petalis* albis, lanceolatis, obtusis.

Western China: roadside: *E. H. Wilson*, No. 3666 (in Herb. Brit. Mus. and Herb. Kew) and No. 2011 (Herb. Kew) from S. Wushan.

A lax herb: the measurements are:—*leaves* 4–8·5 × 6–10 cm.; *petiole* 12–28 cm.; *bracts of inflor.* 4–5·5 × 5·5–10 cm.; bracts of *involucel* ±4 mm.; peduncles 2–3·5 cm.; pedicels 7–15 mm.; fruit 3 × 2 mm.

A remarkable plant. The long stem is without leaves, having only the large bracts at the top. The inflorescence is noteworthy, apart from the bracts: at first sight it appears to be a compound umbel of few rays, but it is in fact a terminal simple umbel—always the oldest—with one lateral umbel (sometimes two) springing from the axil of each bract.

Wilson No. 4930 (Herb. Brit. Mus. and Kew) is an exactly similar plant on a small scale, from Mt. Omi. For the present it seems best to look upon this as a mountain form of the above species, though it is possible that further material may prove it distinct. It has certainly no appearance of being starved or stunted.

NEW OR NOTEWORTHY FUNGI.

By W. B. Grove, M.A.

(Concluded from p. 148.)

370. Marssonia Sambuci Rostr. in Bot. Tidsskr. 1899, p. 270. Sacc. Syll. xvi. 1011. Allesch. vii. 609. *Ascochyta Rostrupii* Died. Pilz. Brand. p. 395.

Spots roundish or angular, up to 1 cm. wide or more, visible on both sides, above fuscous, paler and almost ochraceous in the middle, concentrically zoned at times, below dusky and olive-brown. Pustules clustered in the middle of the spots, lens-shaped, brown or blackish, prominent, amphigenous, 80–100 μ diam. Spores oblong-cylindrical, rounded at the ends, at length 1-septate, scarcely constricted, colourless, 7–8 × 3 μ (8–13 × 3–4 μ, Died.).

On living leaves of *Sambucus nigra*. Richmond, Surrey. Aug.

Diedicke places this in *Ascochyta*, on the ground that there is a distinct but thin pycnidium; the spots in the Richmond specimens agreed very closely with his and Rostrup's descriptions, but no pycnidial wall could be detected.

371. MARSSONIA SECALIS Oud. in Hedwig. 1898, p. 181. Sacc. Syll. xvi. 1011.

Spots indefinite, up to 1 cm. long, pallid, often bordered with purple, visible on both sides of the leaf. Pustules almost imperceptible, even with a lens, pale, more translucent than the leaf-tissue, roundish, flat, about 200 μ diam., totally immersed. Spores oblong-fusoid, hyaline, curved in profile, at times almost beaked at the apex and terminated by a rather obtuse mucro, 15–20 × 3–4 μ, the lower cell narrower than the upper; sporophores very short.

On fading leaves of Rye (*Secale Cereale*). Newton Abbot. May, June (Comm. A. D. Cotton).

PSAMMINA Rouss. & Sacc. Contr. Myc. Belg. iv. 295.
Sacc. Syll. x. 498.

Pustules subepidermal, thin, subgelatinous. Spores cylindrical, septate, hyaline, numerous, persistently cohering at the base, and radiately diverging so as to form a subhemispherical head.

As it were, a dwarf form of *Prosthemiella*.

372. PSAMMINA BOMMERLÆ R. & S. *l. c.*

Pustules scattered, gelatinous, somewhat olivaceous, immersed. Spores cylindrical, hyaline, 2–5-septate, 20–30 μ long, united together at the base to the number of 15–25 and forming a distinct head, at length emerging and clinging together to form little fugacious pallid granules. (Fig. 17.)

On dead leaves of *Psamma arenaria*. Aug. Dundonald and Stevenston, Ayrshire, and Cumbrae, Buteshire (Boyd), accompanied in the latter case by *Anthostomella ammophila*. Sacc. Syll. i. 763=*Sphæria ammophila* Ph. & Pl. in Grevill. x. 73, pl. 158, f. 5.

USTILAGINEÆ.

373. CINTRACTIA SUBINCLUSA Magnus, Ustil. 1896, p. 79.

Ustilago subinclusa Körn. in Hedwig. 1874, p. 159. Winter, Die Pilze, i. 97. Schröt. Pilz. Schles. iii. 271. Fisch. Waldh. Aperç. Syst. Ust. p. 26. Sacc. Syll. vii. 472. *Anthracoidea subinclusa* Bref. Untersuch. 1895, xii. 146, pl. 9, figs. 1–3.

Sori black, then olive-brown, at first rather firm, at length broken and deformed, destitute of filaments, filling the ovary and finally bursting its coat. Spores globose or ellipsoid, or even angular, 13–20 × 11–18 μ; epispore dark blackish brown, rather opaque, beset with hyaline, obtuse, thick, irregular, wart-like spines.

In the ovaries of *Carex riparia*, Bradnock's Marsh (Mr. E. W. Mason). In the same, Wood End, near Tanworth. June–Oct.

This parasite often attacks only a few ovaries in each spikelet; the others, according to Brefeld, may at the same time be occupied by *Ustilago olivacea*. It has been recorded on five species of *Carex* in Germany. The genus *Cintractia* differs from *Ustilago* in having the spores agglutinated into a firm, long coherent mass by the gelatinised tissues, and surrounding a central columella from which the spores are basipetally differentiated. A species of the genus (*C. cingens* De Toni) has already been recorded on *Linaria vulgaris*, from near Llangollen, 1903.

374. Tilletia Holci Sacc. Syll. vii. 484, note. Rostr. in Bot. Tids. xxii. 256. Jackson in Mycologia, xii. 150.

Polycystis Holci Westd. in Bull. Acad. Roy. Belg. 1861, vol. xi. p. 651, no. 40, fig. 1. *Tilletia Rauwenhoffii* Fisch. Waldh. Aperç. Syst. Ust. 1877, p. 50. Massee, Mild. Rusts & Smuts, p. 195. McAlpine, Smuts of Australia, p. 192, pl. 49, figs. 178–9.

On *Holcus mollis*, Walton Heath, Surrey, Aug. 1919 (Mr. E. W. Mason).

This species was described and accurately figured (on a small scale) by Westendorp in 1861, but no figure seems to have been published in Europe since his time. His figure, for its size, is very good, and his description, taken in conjunction with his figure, is even better than the description given fifty-three years later in the English work, in which there are two very inconsistent misleading statements:—(1) that the meshes of the network average 3–4 μ across (this should be 6 μ), and (2) that there are only 4–6 areolæ present on a hemisphere (this should be 16–24). The sketches given here (fig. 20) are taken from the specimens in Herb. Kew, collected in Ireland by G. H. Pethybridge in 1919; these agree with those of Dr. McWeeney, collected in 1896, which Massee himself examined. This species was found in 1914–5, by Mr. H. S. Jackson, on *Holcus lanatus* in Oregon (first time in North America).

375. Doassansia Limosellæ Schröt. Krypt. Flor. Schles. iii. 287.

Protomyces Limosellæ Kunz. in Rabenh. Fung. Eur. no. 1694 (1873). *Entyloma Limosellæ* Wint.

Pustules of spore-balls blackish brown, amphigenous, roundish, 150–300 μ wide, densely scattered, sometimes collected into larger heaps on discoloured spots 1–2 mm. wide, at first covered by the epidermis, then erumpent. Spore-balls oval, brown, 60–100 μ long, surrounded by a thin indistinct brownish membrane; spores oval or roundish, clear transparent pallid-brown, 9–11 μ diam., sometimes granular within. (Fig. 19.)

On leaves and petioles of *Limosella aquatica*, on dried-up mud of Earlswood Reservoir, Oct. 1921.

This parasite occurred in considerable quantity on the plants of *Limosella* which sprang up all over the expanse of dried mud, exposed in the bed of Earlswood Reservoir after the great drought of 1921. In October there was very little water left in the Reservoir, and the mud-surface on which the *Limosella* grew was about 10–12 feet below the ordinary level of the water. The spores of the *Doassansia* were in active germination, giving off a promycelium which bore at the summit a whorl of (usually) four basidiospores. These were conjugating freely with one another in pairs. There were also great numbers of elongated filiform secondary spores in the same pustules.

Tremellineæ.

Achroomyces Bon.

A genus of the Tremellineæ, growing on bark, erumpent and simulating a *Myxosporium*. Hyphæ very long and branched; conidia one-celled, pallid or colourless.

Though looking, when dry, exactly like a *Myxosporium*, it is easily distinguished not only by its long hyphæ, but also by the fact that, when soaked in water, it swells up enormously and becomes tremelloid.

376. Achroomyces carpineus, sp. n.

Pustulis madidis maxime intumescentibus, albidis, dein luteo-aurantiacis, arescentibus nigris, pulvinatis, $\frac{1}{2}$–$1\frac{1}{2}$ mm. latis, erumpentibus, peridermii laciniis cinctis; strato basali obscurato, proliferali luteolo, ex hyphis prælongis copiosissimis fasciculatis valde ramosis oleosis vel guttulatis con-tante; ramulis ca. $2\frac{1}{2}$ μ crassis, specie saltem septatis, raro dichotomis, superne obtusatis v. acutatis, sporas et apice et ad latera gerentibus. Sporis (conidiis) maxime ludentibus, globulosis vel ovalibus vel oblongatis, rectis v. subinde curvulis, raro guttulatis, utrinque rotundatis, usque 7–$8 \times 2\frac{1}{2}$–3 μ. (Fig. 16.)

Hab. in ramis emortius *Carpini Betuli*, Edgbaston, Apr.–Jun. 1921.

Mixed with these pustules were smaller (? younger) ones in which the colourless spores were acute at the ends, subfusoid, 6–7×2 μ; sporophores narrower, less branched, more guttulate, and acute at the tips.

This species is evidently a close ally of *Achroomyces tumidus* Bon. and *A. pubescens* Riess. The size of the spores of *A. pubescens* is given as about 25–32×5 μ, those of *A. tumidus* as 16–20×3–$3\frac{1}{2}$ μ. All three belong to the Tremellineæ as conidial stages, possibly of *Platyglœa*. *Platyglœa effusa* has been recorded as British by Miss E. M. Wakefield in Trans. Brit. Myc. Soc. vi. 138, on "a fallen branch," Weybridge.

Saccardo listed under *Myxosporium* (though with hesitation) both the species of *Achroomyces* mentioned. *A. pubescens*, on *Tilia*, is now considered to be = *Platyglœa nigricans* Schröt. (Pilz. Schles. i. 384) = *Tachaphantium Tiliæ* Bref. (Untersuch. vii. 78, plate); von Höhnel (Annal. Mycol. 1904, ii. 271) called it *Achroomyces Tiliæ* (Lasch) v. Höhn., because he considered it to be what Lasch named *Stictis Tiliæ* (Bot. Zeit. 1845, iii. 66). Now there is a *Stictis Betuli* Fr. (Syst. Myc. p. 193) which was supposed to have a variety *nigrescens* on *Tilia*; it is conceivable, though hardly likely, that this species of Fries is, in part, *A. carpineus*. In passing, it may be remarked that continental authors continually refer to Greville (Scott. Crypt. Flor. t. 206) as figuring this fungus of Fries under the name *Cryptomyces Betuli* (*cf.* Rehm, Discom. p. 136), whereas the fungus on t. 206 is there called *Cryptomyces Wauchii* and is on willow! Greville never figured *C. Betuli*.

Ascomycetes.

377. Ctenomyces serratus Eidam in Cohn's Beitr. z. Biol. 1880, iii. 274.

Peridia pale yellow, $\frac{1}{4}$–$\frac{1}{2}$ mm. diam., globose, somewhat scattered or occasionally aggregated in a loose cluster, sessile, composed of loosely interwoven septate torulose pale yellow threads, the separate cells of which are usually shaped like those of a *Sphærozosma* (e. g. *S. excavatum*); a few spiral or irregularly flexuose hyphæ project beyond the boundary of the sphere. Within is an enormous number of globose asci, forming a deeper yellow central mass, permeated by a few slender septate hyphæ, each ascus containing 8 spores. Ascospores lens-shaped, circular in front view, 2–3 μ diam., elliptic in side view, $1\frac{1}{2}$ μ thick, at length faintly verruculose.

On feathers buried in soil, and on fragments of the soil itself. Birmingham. June, July 1919.

These are on the same feathers on which, in March 1914, I found *Dactylella plumicola*, described in this Journal for 1916, p. 220 (pl. 543. f. 7). They were left in the same closed tin box, to which a few drops of distilled water were added every twelve months or so. At the end of the five years, on the decayed remnants of the feathers, the *Ctenomyces* was observed, but the *Dactylella* had disappeared. No comb-like structures had been seen. No conidia had been formed on separate hyphæ, nor were any found on the torulose hyphæ of the peridium. The asci are very delicate and easily diffluent, but, just as in *Eurotium herbariorum* and its allies, their presence is shown by the fact that large numbers of the spores remain in globose crowded masses, in which for the most part seven spores can easily be counted, the eighth being hidden behind the others.

In a few cases, the torulose hyphæ of the peridium have the protuberance almost wholly on one side. The "hakenförmig" or "krallenförmig" hyphæ, from which the name *Ctenomyces* is derived, is only an exaggeration of that arrangement, and its absence can scarcely be regarded as a specific difference.

This fungus has been previously recorded as British by Miss A. L. Smith (Journ. Bot. 1903, p. 257); the ascospores are, however, described by her as "cylindrical, about 2×1 μ." It has also been found by Dr. Jessie Bayliss Elliott, who in addition met with the supposed conidia.

378. Valsa germanica Nits. Pyr. Germ. p. 215. Sacc. Syll. i. 133.

Stroma (distinct from the matrix) none. Perithecia immersed in the unchanged parenchyma of the cortex, and entirely covered by the periderm, placed in a circle (more or less) round a disc which is at first cinereous then pallid-brown, or round a pycnidium (*Cytospora*), minute, globose, erect, with a short neck ending in a round smooth black ostiole, which at length pierces the epidermis at some distance ($\frac{1}{2}$–1 mm.) from the disc or spermogone. Asci clavate or oblong, attenuated below, wall rather thick especially at the apex, 8-spored, 72×8 μ (average). Spores cylindrical, straight, or curved in profile, subdistichous or conglobated, 10–20×3–4 μ (average 16 μ).

On twigs of *Salix*, Sutton Coldfield. Apr.

These specimens exactly resemble the German ones. They are easily distinguished by the fact that the more or less irregular circle of perithecial necks pierces the epidermis directly upwards, and emerges at a distinct distance from the pycnidium or disc which occupies the centre. For the *Cytospora*, see no. 326.

379. **Phomatospora Sphærulina**, sp. n.

Spermogonium—Pycnidiis vere phomatoideis, pariete 1–2 cellularum crassitudine, subglobosis, brunneis, parenchymaticis, 120–200 μ diam., epidermide tectis, dein erumpentibus. Sporulis iis *Phomæ herbarum* similibus, copiosis, oblongo-ovalibus, utrinque rotundatis, biguttulatis, 5–8 × 3 μ, muco tenui obvolutis.

Status ascophorus—Peritheciis pycnidiis subsimilibus, sed plerumque obscurioribus. Ascis velut in *Sphærulina abbreviata* fasciculatis, junioribus oblongis, 20–25 × 10–12 μ, apice rotundatis, basi obtuse sessilibus, superne tunica crassissima alte unifoveolata instructis, maturis oblongo-cylindricis, ca. 90 × 7 μ, superne tenuissime tunicatis. Sporidiis oblique uniseriatis, ovalibus, primo utrinque rotundatis, dein quasi fusoideo-attenuatis, continuis, hyalinis, 12–15 × 5 μ.

Hab. in stipitibus emortuis *Asclepiadis incarnatæ*, in Horto botanico, Edgbaston, Mart., 1921. Perithecia confertim pycnidiis intermixta, subinde ambobus generibus sporarum in eodem conceptaculo inclusis.

380. **Didymella Cortadeniæ**, sp. n.

Status pycnidicus—Pycnidiis peritheciorum simillimis et conjunctissime intermixtis, etsi interdum majoribus. Sporulis copiosis, fusoideis, utrinque acutis, hyalinis, eguttulatis, crassiuscule tunicatis, subinde pseudo-uniseptatis (?), 11–12 × 2½–3 μ.

Status ascophorus—Peritheciis longitudinem secus folii in serias longas digestis, atris, subglobosis, 200–250 μ diam., membranaceis, tectis, epidermide supra verticem poro rotundo latiuscule pertusa; contextu tenui laxe parenchymatico umbrino. Ascis clavato-cylindricis, paraphysibus parcis deliquescentibus cinctis, ca. 70–75 × 10 μ; sporidiis subfusoideis, basi magis attenuatis, biseriatis, plane 1-septatis, hyalinis, eguttulatis, 15–20 × 4–5 μ.

Hab. in foliis emortuis *Cortadeniæ* (*Gynerii*) *argenteæ*, Hunterston, Ayrshire (Boyd). Aug.

Immature asci were found among the pycnospores, in the pycnidia. In some of the perithecia (but not in asci) were larger 3-septate spores, about 32 × 9 μ, with thicker walls; these were apparently stylospores.

381. Didymella culmigena Sacc. Syll. i. 558, Fung. Ital. pl. 369.

f. *endorhodia* f. nov. Peritheciis gregariis, epidermide tectis, globoso-lentiformibus, demum collapsis, poro pertusis, atro-brunneis, basi hyphis brunneo-fuligineis cinctis, ca. 200 μ diam.; contextu rufo-brunneo, crasso, parenchymatico. Ascis clavatis, apice parum attenuatis, 50–60 × 8 μ; paraphysibus nullis visis; nucleo amœne rubescente. Sporidiis distichis, fusiformibus, utrinque acutis, raro curvulis, 1–4-roseo-guttulatis, postremo 1–septatis, non constrictis, hyalinis, 14–18 × 2½–3½ μ.

Hab. ad basin culmorum et in vaginis *Cynosuri cristati*, Hopwood, prope Birmingham. Apr.

The colour of the contents of the perithecium is due to a pinkish oil, apparently residing mainly in the guttules. The spores vary much, the narrower and shorter ones having no guttules, but the great majority having two large coloured guttules. A few had three and eventually four guttules, and in the latter case a septum was present in a few spores, but without any constriction.

On the same culms there was found, in small quantity, what seemed to be the "stylospores" mentioned by Saccardo (Syll. ii. 70) as belonging to *Leptosphæria culmicola*, f. *minor*; if this should be found in other instances, it would tend to justify Saccardo's suggestion that the *Didymella* is only an immature form of the *Leptosphæria*. See also what is said under *Leptostromella pteridina* (*supra*, no. 358).

382. Leptosphæria clivensis Sacc. Syll. ii. 16. *Sphæria clivensis* B. & Br. in Ann. Nat. Hist. 1852, ix. 379, pl. 11. f. 29. *L. galiorum* Sacc. Syll. ii. 22.

Perithecia scattered, globose, $\frac{1}{4}$ mm. diam., black, immersed, erumpent by the shortly conical ostiole. Asci clavate, rounded above, attenuated downwards, pedicellate, $90–100 \times 12–4\ \mu$ (part. sporif.), 8-spored, surrounded by filiform guttulate paraphyses. Spores more or less biseriate, oblong, curvulous, rounded at both ends, 3-septate, sometimes constricted, frequently 4-guttulate, brown, subopaque, $22–24 \times 6–7\ \mu$.

On dead stems of *Arctium Lappa*, Kilpeck, Herefordshire; on *Cirsium arvense*, Bromsgrove and Droitwich. May.

The spores are at first more or less fusoid and colourless, soon olivaceous and often biguttulate (while still eseptate), becoming afterwards 1-septate, and at last 3-septate and decidedly brown ("brunneis"), closely resembling the brown 3-septate spores of some species of *Hendersonia*. Berkeley's original specimens on *Pastinaca*, from King's Cliffe (whence the name *clivensis*), have been examined and proved exactly similar. The species was found on Burdock by Cooke at Darenth, and by Delitsch in Germany, but it seems to occur abroad chiefly on *Senecio Jacobæa*: it has also been found on *Dipsacus*, and my specimens on that host, recorded (Journ. Bot. 1918, p. 286) as *L. galiorum* f. *Dipsaci*, belong doubtless to *L. clivensis*. In fact, I consider now that the whole of the forms of *L. galiorum* should be placed under the latter name: Saccardo would not have described his species (*galiorum*) as distinct if he had been acquainted with Berkeley's specimens. The chief mark of the species lies in the spores being deeply coloured at maturity, whereby it can be distinguished from allied species of the genus. *Cf.* also *L. rothomagensis* (Sacc. Syll. ii. 17), which bears a great likeness to *L. clivensis*, but may be distinct. All the forms mentioned here also bear some resemblance to *L. vagabunda*, but the mature spores of that are *fuscous*, and the young spores, even when 1-septate, are still colourless and remind one strongly of a *Diaporthe* spore.

383. Leptosphæria Phormii Grove in Kew Bull. 1921, p. 150.

Perithecia about $400\ \mu$ diam., lens-shaped, black, opaque, covered by the epidermis, then erumpent at the summit, surrounded at the base by purplish hyphæ; texture thick, parenchymatous, purplish brown. Asci elliptic-oblong, rounded above, with a very thin wall, shortly pedicellate, 8-spored, with few or no paraphyses; sporidia biseriate, elliptic-fusoid, 3-septate, not or faintly constricted at the septa, 18–25 × 5–7 μ, all the locules pale brownish grey.

On dead leaves of *Phormium tenax*, Stranraer (Boyd). Aug.–Nov.

The dye seems to wash out of the hyphæ (? by rain), and tinges the surrounding cuticle with a broad patch of pinkish-red colour.

384. Otidea violacea Smith & Ramsb. in Trans. Brit. Myc. Soc. v. 237 (1916).

This very beautiful species was found again during a foray in October, 1921, in Clows Wood, Earlswood, by Miss Stansfield. The description given (*l. c.*) was seen to be very accurate; there were several specimens, occurring on burnt ground, which would probably be similar in certain respects to the garden ground on which the Warwick specimens were found.

385. Pustularia Catinus (Holms.) Fckl. Symb. Myc. p. 328. Boud. Icon. vol. iv. p. 187; vol. ii. pl. 336. *Peziza Catinus* Holms. Ot. ii. 22, pl. 8. f. 9.

Ascophore cup-shaped, pedicellate, 1½–3½ cm. diam., ochraceous-fawn colour without, paler within, margin dentate, externally granulated with little fascicles of fawn-coloured hairs. Asci cylindrical, 300–380 × 17–20 μ; spores ovoid, colourless, smooth, then granular when mature, usually with two large oil-guttules, 23–25 × 14–15 μ; paraphyses branched, septate, colourless, slightly thickened at the apex.

Several specimens on the ground under a beech tree, among dead leaves, Kew Gardens. Aug. 1920.

I gathered this in company with Prof. Buller. Together we took it back to the Herbarium, and with the help of Miss Wakefield ascertained its name. Afterwards Prof. Buller showed us, and several other persons, how the sound caused by the "puffing" of the spores could easily be heard by holding the cup to the ear. The sound on each occasion lasted for several seconds, and resembled that made by the escape of a steam-jet from a minute orifice; at the same time the spray of the numerous spores against the ear could be felt, and they could afterwards be scraped off and microscopically examined. The same result has since been obtained from many others of the larger Discomycetes, including *Rhizina*.

Hyphomycetes.

386. Aspergillus clavatus Desm. in Ann. Sci. Nat. 1834, ii. 71, pl. 2. f. 4. Sacc. Syll. iv. 67; Fung. Ital. p. 701. Mass. & Salm. in Ann. Bot. xvi. 82, f. 104 (1902). Trans. Brit. Myc. Soc. ii. 33.

A. clavellus Peck in 34th Rep. State Mus. p. 49, pl. 2. f. 1–5.

Sterile hyphæ creeping, floccose, loose, white; fertile erect, colourless, up to 10 mm. high, 25 μ broad below, ending above in a long clavate vesicle. Head of spores about ½ mm. high, clavate, bluish green (more exactly, pale Prussian-green), then grey-green; spores in long chains, oval or subglobose, smooth, 4–5 × 2½–3 μ; sterigmata oblong, simple, obtusely pointed, about 10 × 3½ μ.

On gelatine in a petri-dish. Birmingham. Oct.

Desmazières credits his *A. clavatus* with globose spores; Peck says of his *A. clavellus* "spores globose or widely elliptic"; Saccardo's spores were oval. In the Birmingham specimens all these shapes of spores occurred; many of them were nearly spherical.

387. Ramularia Doronici, comb. nov.

Ovularia Doronici Sacc. Syll. iv. 141. Trans. Brit. Myc. Soc. 1912, iii. 368.

Spots roundish or oblong, numerous, greyish; tufts hypophyllous, densely clustered, white, covering the spot like a white meal. Spores oval, then oblong, and finally cylindrical, 10–15 × 3–5 μ, reaching at last 18–19 μ long, and then (or earlier) 1-septate, acute or obtuse above, occasionally in short chains, hyaline; sporophores up to 50 μ long, about 3 μ broad, subulate, denticulate above, irregular, acute, densely fasciculate.

On *Doronicum Pardalianches*. In country lanes near Bristol (Miss I. M. Roper). Feb. 1919. Two localities, both in Somerset.

This species has the same history as so many other Ramularias; it is at first indistinguishable from an *Ovularia*, but if some of the older specimens be more closely examined there will be found some spores which are elongated and distinctly 1-septate, and finally many such. It does not, of course, follow that the same rule applies to all species of the genus, e. g. *O. sphærioides* seems to be an exception.

388. **Cercosporella Oxalidis**, sp. n.

(§ *Cercodesmium*, conidiophoris dense fasciculato-ramosis.)

Maculis rotundatis, 2–5 mm. diam., fuscis, pagina aversa pallidioribus. Cespitulis hypophyllis, dense fasciculatis, per stomata emergentibus; hyphis fertilibus erectis, ramosis, torulosis. Conidiis obclavatis, apice acutis, basi rotundatis, 1-septatis, rarissime 2-septatis, multiguttulatis, 25–30 × 4–5 μ, hyalinis. (Fig. 14.)

Hab. in foliis vivis *Oxalidis Acetosellæ*. Bagshot Woods. Aug.

In the fresh state, the torulose hyphæ are seen to be much branched below, and the conidia which are clustered at the apex of each branch are fasciculate and pressed tight into a clavate bundle; in water, they diverge. The septum is very delicate; occasionally the lower cell gives rise to another conidium laterally at its apex, by a kind of proliferation.

389. Cladosporium Aphidis Thüm. in Œsterr. Bot. Zeitschr. 1877, p. 12. Sacc. Syll. iv. 369. Trans. Brit. Myc. Soc. vi. 203.

Hyphæ ascending or erect, branched, fascicled, faintly septate, fuscous, about 6 μ thick. Conidia oblong-ovoid, acute at both ends, at length 1-septate, not constricted, paler than the hyphæ, 10–20 × 6 μ.

On various Aphids, Edgbaston (Mrs. Merrett-Hawkes).

Saccardo records 2-septate conidia, but these were not seen. The species has also been recorded on *Chermes Pini*, in Gloucestershire. It is suggested by some that this is only a form of the common *Cl. herbarum*, but, if so, it is modified somewhat by its habitat, especially in the form of the conidia.

390. Hadrotrichum virescens Sacc. & Roum. Syll. iv. 301. Trans. Brit. Myc. Soc. v. 243.

Conidiophores forming little black linear pustules, about 1 mm. long, which are arranged in groups lying in the grooves of the leaves, and are visible on both sides, bursting through the epidermis, erect, densely crowded, straight, linear, rounded at apex, 1–2-septate, quite simple, brownish, up to $35 \times 6\ \mu$. Spores arising by a bud at the apex, at length broadly ovoid, smooth, pale, then brownish, $11–13 \times 7–8\ \mu$. (Fig. 18.)

On leaves of *Agrostis vulgaris*. Aberystwyth. April.

A variety of this species (var. *Poæ*) has also been found by Dr. J. S. Bayliss Elliott and Miss Stansfield on *Poa* at Wood End, Tanworth-in-Arden. There can be no doubt that this species is the conidial stage of *Dothidella Agrostidis* Sacc. (Miss Stansfield found the two stages on *Poa* in intimate association), and also that a form of *Placosphæria graminis* Sacc. & Roum. is the spermogonial stage of the same ascomycete.

391. Sporodesmium myrianum Desm. Exs. ser. 2, fasc. 1, no. 2. Sacc. Syll. iv. 506.

Tufts hypophyllous, punctiform, very minute ($60–80\ \mu$ diam.), each rising from a small soft blackish stroma, very numerous, rather densely scattered, appressed, black, forming greyish blotches on the leaf. Conidia pyriform, obovate, or ellipsoid, $20–30 \times 10–15\ \mu$ (or even $20\ \mu$ wide), olivaceous, sessile or nearly so, transversely 3–4-septate, not constricted, the loculi at length more or less obliquely or longitudinally subdivided. (Fig. 15.)

On leaves of *Psamma arenaria*. Borth; Sandwich, Kent. July.

By its large numbers it produces a greyish cloud-effect on the outside of the rolled-in leaves. In both cases it was accompanied, on the same leaves, by *Camarosporium metableticum* Trail. (Fig. 9.) The little mucid stroma from which the spores arise is formed in the leaf, and imparts a peculiar aspect to this species of *Sporodesmium*.

Explanation of Plate 563.

(All figures $\times 600$.)

1. *Amphorula sachalinensis*, spores.
2. *Ascochyta Stellariæ*, spores.
3. *Phyllosticta Oxalidis*, spores.
4. *Fusicoccum cinctum*, spores.
5. *Cryptosporium Tami*, spores.
6. *Ascochyta Pteridis*, spores.
7. *Septoria polaris* var. *scotica*, spores.
8. *Septoria Jasiones*, spores.
9. *Camarosporium metableticum*, spores.
10. *a*, *Leptostromella pteridina*, spores; *b*, *Didymella Hyphænis*, ascus and spores.
11. *Placosphæria Ulmi*, spores.
12. *Ascochyta carpathica*, spores.
13. *Trullula Silphii*, conidiophores and spores.

14. *Cercosporella Oxalidis*, conidiophores and spores.
15. *Sporodesmium myrianum*, spore.
16. *Achroomyces carpineus*, conidiophores and spores.
17. *Psammina Bommeriæ*, group of spores and spore.
18. *Hadrotrichum virescens*, conidiophores and spores.
19. *Doassansia Limosellæ*, *a*, spores; *b*, two pairs of basidiospores, conjugating.
20. *Tilletia Holci*, *a*, spore in surface view; *b*, spore in optical section.

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BIBLIOGRAPHICAL NOTES.

LXXXV. Robert Brown and 'The Monthly Magazine.'

In a footnote to a paper on "Henry Andrews and his 'Botanists' Repository,'" published in this Journal for 1916 (pp. 236–246) reference is made to *The Monthly Magazine* for 1807–13, from the "Monthly Botanical Reports" of which some information was cited. "The author of these Reports," says the note, "was Samuel Frederick Gray; they present interesting features which I hope to make the subject of a future note"; that hope I now propose to fulfil.

I cannot recall by what accident my attention was directed to the *Monthly Magazine* nor for what purpose I consulted it; so far as I am aware, its Botanical Reports have been almost entirely overlooked, yet they contain much matter of interest, and furnish the solution of a problem which has long been traditionally familiar and has hitherto proved insoluble. The magazine itself—the full title is *The Monthly Magazine and British Register*—in its original form extended from Feb. 1796 to Jan. 1825; its scope is indicated by the extended title of the continuation (1826–34)—"*of Literature, Sciences, and the Belles-Lettres*." The botanical portion, with which alone this notice is concerned, began in the number for July 1, 1807 (vol. xxiii.), and continued at irregular and (towards the end) infrequent intervals until May, 1815; it is entitled: "Report on the Progress and Discoveries in the Science of Botany, for June, 1807 (to be continued)." It begins abruptly—"The last month has afforded but little of novelty in this science," and contains notices of the botanical periodicals then current—the *Botanical Magazine*, *Botanist's Repository*, *Paradisus Londinensis*, and *English Botany*, with a reference to *Exotic Botany* as having been "dormant for some months past." The Report abounds in misprints—"Bellendenther," for example, for Bellenden Ker,—and the names of the genera are usually devoid of capitals; but it was evidently written by an expert botanist. But neither to it nor to any of the subsequent Reports is any name attached, nor can I find anywhere in the volumes any indication of authorship.

The interest of this first Report and a desire to ascertain its author induced me to go through the series; my first impression (notwithstanding the misprint indicated above) was that it was attributable to John Bellenden Ker (1764–1842); but as my investigations proceeded, this view became untenable. It was therefore necessary to discover someone living at the period, not connected with any of the works under review and possessed of sufficient botanical knowledge to criticize competently the books which came under his notice. Such a one was found in Samuel Frederick Gray (1766–1828). There is no need to detail the grounds on which this conclusion is based; once stated, it is sufficiently obvious. It may, however, be noted that the botanical "Monthly Reports," which, as has been said, ceased to appear in the *Monthly Magazine* in 1815, were resumed in Thomson's *Annals of Philosophy* (xvi. 115–130: 1820), where the "Botany" section of the "Historical Sketch of Improvements in Physical Science during the Year 1819" has at its head "By Samuel Frederick Gray Esq." Concerning this the following note appears in the *List of Books* &c. by John Edward Gray, printed for private distribution in 1872: "This essay, like the Medical Plants in my father's previously published supplement to the Pharmacopœia, was arranged in the natural order of Jussieu, then first used in any English work. It was condensed by my father from my notes made from the works in Sir Joseph Banks's library." The summary, which was not continued, although more comprehensive in character is on the same lines as the "Monthly Reports." J. D. Hooker (in Mem. Soc. Sc. Nat. Cherbourg, xxix. 33: 1892) writes: "That [Gray] had repute as a botanist is evidenced by his having been employed by the editor of Thomson's 'Annals of Philosophy' to write an article on Botany for that work"—a reference which incidentally shows that Hooker was unaware of Gray's connection with the *Monthly Magazine*, as probably of the Magazine itself.

The account of S. F. Gray by Mr. Boulger (Dict. Nat. Biogr. xxiii. 20), excellent so far as it goes—for the dates there given, 1766–1828 should be substituted,—is capable of considerable amplification. For my present purpose, however, I propose to confine myself to the articles in the *Monthly Magazine* which relate to the work and especially to the *Prodromus* of Robert Brown, reserving for a later paper notes upon the other contents of the magazine.

Readers of this Journal may remember that, in the course of a notice of Mr. Maiden's *Forest Flora of New South Wales* (Journ. Bot. 1903, 252), exception was taken to that author's suggestion that the non-publication of Robert Brown's MS. descriptions of Australian plants was due to some form of "suppression"—"whether this suppression eventually met with the acquiescence of Brown himself, or whether he was controlled, in this respect, by superior authority." The misleading nature of the suggestion was demonstrated, and the traditional reason for the discontinuance of the *Prodromus*, as accepted in the Department of Botany, was thus stated: "Mr. Carruthers informs us that he gathered from Mr. J. J. Bennett, Brown's friend and successor, that Brown was much annoyed at some criticisms which were passed in some Review (probably the 'Monthly' or perhaps the 'Edinburgh') upon the Latinity of the published portion of the *Prodromus*, and that he took these so much to heart that he would not complete the publication of the book." At an earlier date, on the occasion of the unveiling of the bust of Brown in his native town, Montrose, on Oct. 18, 1895, Mr. Carruthers made a somewhat fuller statement of the position, as follows:

"[Brown] was painfully careful for accuracy in all his work. It was pointed out by a reviewer, who knew more of the language than the substance of the work, that some inaccuracies in the Latinity were to be found in the volume. This led Brown to withdraw the volume after only a very few copies had been sold. He carefully corrected the called-in copies, neatly scraping out and correcting the very trifling errors. Henceforth copies of the *Prodromus* could be had only as a gift from the author; but in Germany two reprints were issued to meet the foreign demand for the work. The manuscript of this great work and of the portion never published are preserved in the Library of the Botanical Department." (See Journ. Bot. 1906, 29.)

With regard to the above, it will be seen from what follows that the estimate of the (then unknown) reviewer is hardly accurate: the copy of the *Prodromus* in the Department has been corrected by Brown as indicated.

In a paper on the *Prodromus* published in this Journal for 1907 (pp. 246–8) it is pointed out that Martius, in his *éloge* of Brown, adopted the traditional view, and definitely attributed the criticism to a writer in the *Edinburgh Review*. A variant of the tradition attributes the supposed criticism to Smith: Dr. Daydon Jackson tells me that Dr. Alexander Prior once said in his hearing that "Smith, who could not touch [Brown] in botany, was able to criticize him in his Latin." Henfrey, in his translation of the *éloge* in Ann. Mag. Nat. Hist. 3 s. iii. 321–31, adds a footnote in which, while admitting that the statement adopted by Martius was "frequently made during Mr. Brown's life and vouched for by high authority," he says he had "reason to believe" it was "founded in error," but does not indicate his reason: it was probably that indicated by Francis Buchanan—that the book "would not sell in London, and [Brown] was so mortified that I believe he will publish no more." For details connected with these statements and for information as to the printing and circulation of the *Prodromus*, reference must be made to the article in this Journal from which they are cited. "In order to set the matter at rest, so far as the supposed criticism went," Dr. Jackson "examined not only the *Edinburgh* but the other reviews of the period, and found no notice of the *Prodromus* in any of them" (*l. c.* 247).

The clue, however, is supplied, and the authenticity of the generally accepted tradition vindicated, if to the word "Magazine," in Mr. Carruthers's statement quoted above, the word "Monthly" be prefixed; for it is in the *Monthly Magazine* that we find the review which is doubtless that indicated by the tradition, and, indeed, so far as Dr. Jackson and I are aware, is the only contemporary notice of the *Prodromus*. In view of the interest attached to anything connected with Brown and his work; it seems worth while to reprint the review in full, and this I proceed to do. It appears in the number for June, 1810 (vol. xxix. pp. 516 *sqq.*), and must thus have been written very shortly after the publication of the *Prodromus* early in the year (see Journ. Bot. 1907, 247). It is curious that the very full index to the Magazine contains no reference to the *Prodromus*, although under "Natural History" the titles of other books noticed are given: it was not customary to index the names of authors. Earlier in the same year a reference to Brown's work is made in connection with a notice of the *Botanical Magazine* for March in which *Lomatia silaifolia* is figured and described (t. 1272). S. F. Gray writes: "This genus is made out of Dr. Smith's *Embothrium* by Mr. Brown, from whose paper on the Proteaceæ the name and characters are borrowed. Mr. Brown has the reputation, and we believe very deservedly, of being one of the ablest botanists of the present day. He is attached more to the system of Jussieu than of Linnæus, for which we would rather applaud than condemn him" [in Dict. Nat. Biogr. it is mentioned that Gray "was much fascinated by the method of Jussieu"]. "The greater difficulties which impede the study of the natural affinities of plants, lead to a more philosophical enquiry into vegetable physiology than the study of mere artificial arrangement can ever do. At the same time we would strenuously recommend to every student in botany, whether he means to devote himself to the study of the natural orders as displayed by Jussieu, or of the more artificial arrangement of Linnæus, to make himself thoroughly master of the Philosophia Botanica of the latter author. He will there learn to express himself with a mathematical precision, which he will never acquire from the writings of Jussieu, who always seems to bewilder himself in exceptions to general rules, by which means nothing is accurately defined. We are led to these reflections by considering Mr. Brown's specific character of *Lomatia silaifolia*, in which he says '*racemis divisis simplicibus*,' by which it appears that the racemes are either divided or simple, consequently this circumstance affords no character that can enter into a definition, and ought therefore to have been excluded. If the racemes are usually divided, though not in all instances, in default of a more precise character '*sæpius divisis*,' though an imperfect, would have been an admissible character; but to speak of them as indifferently divided or simple, is to give no character at all" (p. 305).

The title of the *Prodromus* stands at the head of the review, which begins with a paragraph wherein the nature of a Prodromus is discussed, and proceeds:—

"Since our last report, the work has been published whose title appears at the head of this; and, though given under the modest appellation of a *Prodromus*, we will venture to say, that in no book since the publication of Jussieu's *Genera Plantarum* is there displayed such a fund of botanical knowledge as in this. Though sent forth early as the harbinger of a greater work, to be expected hereafter from the same pen, no pains appear to have been spared to render it in every respect as complete as the confined limits would admit of. It proposes to give the characters, generic and specific, of such plants as were observed and collected by the author during the years 1802–5, in the expedition under Capt. Flinders, which he accompanied out, but was fortunately not with on its return homewards. To these is added an account of such plants of that country as have come to the knowledge of the author by other means, and especially of those detected by Sir Joseph Banks, in his voyage with Capt. Cook towards the south pole.

"It must be supposed, that in a country so unconnected with the rest of the world, its natural productions would be in a great measure different from those of Europe, Asia, Africa, and America; accordingly, Mr. Brown has not only been under the necessity of creating a great number of new genera, but even of considerably increasing the number of natural orders. In both respects some botanists will be ready to think, that he has been more than sufficiently liberal; and, indeed, some of his genera appear to us, from the superficial view we are enabled to take, to depend upon characters of hardly sufficient importance to keep them distinct; but a more intimate acquaintance with the plants which have come under his notice may induce us to think differently; and, at all events, our opinion can weigh but little when compared with the intimate knowledge of the structure, internal as well as external, of the plants he has described, which this author proves himself to possess.

"Mr. Brown, having to frame so many new genera, felt himself under the almost absolute necessity of proceeding upon a natural method, in order to avoid falling into great errors; and, undoubtedly, there is no other way of founding genera upon sound principles, but by studying their natural affinities. He has accordingly followed the methods of Jussieu, whose orders are, for the most part, truly natural; but, of the classes of this admirable author, Mr. Brown has formed a different estimate, conceiving them to be often artificial, and not unfrequently founded upon ambiguous principles. He has not however been solicitous about the series, but has connected organic bodies rather in the manner of a net than a chain. In our opinion, the simile of Linnæus is a more happy one, when he compares the natural orders of vegetables to a map, where the land is separated from the waters into masses of very disproportionate bulk; and these more or less connected, or entirely separate.

"The author promises to give the diagnosis of his orders, which at present are to be gathered from the full descriptions prefixed to each, and also contracted generic characters arranged after the Linnean system, with the next volume, but which are, together with the Acotyledones, to precede the present one. This circumstance explains the reason of the volume beginning at page 145, appearing, at first sight, as if nine sheets of letterpress had been omitted or misplaced. We shall be very glad to receive these additions, for in the mean time none but such as have made a considerable progress in the study of natural affinities, can easily use this work for the purpose of discovering any plant they may happen to possess. So difficult indeed is the acquisition of a knowledge of the natural families of plants, or so imperfect is the knowledge when intended to comprehend the whole vegetable world, although so easy and familiar in its partial application to certain well known orders, that the most experienced, and those who have paid the most attention to the subject extremely often form a different judgment upon the family to which a plant ought to be referred. For this reason, the utility of this work will be much increased by the addition of an artificial arrangement, by which every botanist can with ease find any plant contained in it, that he may wish to seek. By the bye, a similar arrangement was promised by Jussieu, but has not, we believe, been yet published.

"We should be giving a very false idea of this Flora of New Holland, were we to leave it to be understood, that in following Jussieu, Mr. Brown has been contented with copying the characters of the orders, or of such genera as are to be found there, for his work. On the contrary, everything here is new; Mr. Brown's descriptions of the orders are new, the descriptions of the genera and species are likewise his own, and every part abounds with observations equally original and useful: nor are these, by any means, confined to the plants of New Holland, but numbers of them are applicable to botanical science in general.

"His specific characters, Mr. Brown seems to have formed more upon the plan of Linnæus than of Jussieu; the latter author, in the *Annales d'Histoire Naturelle*, has given an account of the species of several genera, in all of which his specific characters are rather abridged descriptions than definitions. We should imagine that everyone who has put it to the trial, will have found how much time is unnecessarily consumed in determining a species by examining the characters of Jussieu; nevertheless, it seems probable, that Mr. Brown proposes at some future period, to form his specific characters upon this plan, as he hints at an intention of changing the Linnæan punctuation, and the use of the ablative case, in both which he has at present followed Linnæus. In our opinion these changes will not be for the better; for although since the happy invention of trivial names, the specific phrase is no longer necessarily to be committed to memory, and therefore, perhaps, need not be absolutely limited within the compass of twelve words; yet they might certainly be as short as possible, and should contain no characters but such as is necessary to distinguish the species from every other. These specific characters must, indeed, be necessarily imperfect and in want of perpetual change, as long as new discoveries are daily adding to the list of species before known; but this only shows the imperfection, not the want of fundamental excellence, in the system itself. While such imperfections exist, abbreviated descriptions are usefully added, but if these should be necessarily subjoined to every species, the practical utility of specific phrases will ever remain; and in the Latin language, at least, the ablative case cannot, without inconvenience, be ceded to the nominative. We sincerely hope to see the rare abilities of this excellent botanist employed in perfecting, not in superseding, these highly useful specific definitions. With respect to the Linnæan punctuation, though a little awkward at first, it is founded upon true philosophical principles, and often supplies the place of many words, expressing that by a sign which would otherwise require a paraphrase.

"Two of the natural orders contained in this work, the *Proteaceæ* and the *Asclepiadeæ*, have been more fully detailed elsewhere; the former in the Transactions of the Linnean Society, the latter in those of the Wernerian, Societies: in the work under notice they are necessarily limited to such as are natives of Australia.

"Our limits prevent our entering into any particulars of the contents of this volume, nor is it very necessary, as no botanist who is desirous of knowing anything of the vegetable productions of this part of the world can be without it; and the botanical philosopher will find, in every part, much to interest and assist him in his enquiries. Undoubtedly this Flora of New Holland will not only take the lead of all local Floras, but must rank among the very first works for promoting the science of botany in general."

It may be worth while to append the other references to Brown's work—appreciative, though not uncritical—which appeared in the *Monthly Magazine*. In vol. xxx, 309 (Nov. 1810), in the course of a review of vol. i of the *Hortus Kewensis*, ed. 2, Gray writes:

"In this order [*Proteaceæ*] Mr. Dryander has followed Mr. Brown's essay in the 10th vol. of the *Transactions of the Linnean Society*, with scarcely any alteration, further than that the term *corolla* is adopted for the *calyx* of Mr. Brown and Jussieu, and here and there a superfluous word is omitted. Undoubtedly an author could not have followed a better guide than Mr. Brown, whose knowledge of the *Proteaceæ* is greater than that of any man; yet we cannot but feel a wish that Mr. Dryander had undertaken to revise the specific characters, and given them more of the Linnean terseness and precision. We acknowledge that the task would be difficult, for in a perfectly natural order, where the species of a genus are numerous, the difference is frequently marked rather by a number of points of slight deviation than by any striking feature; nevertheless, though not easy to be accomplished, we do think that had he undertaken it, all obstacles would have been surmounted by his abilities .... With the generic characters of Mr. Brown more liberty has been taken; all of them have undergone a revision."

Similarly qualified praise of Brown is given in the review of the second volume of the *Hortus* (M. M. xxxii. 202–5, Sept. 1, 1911). Speaking of the *Asclepiadeæ* it is said: "Perhaps the author [*i. e.* Dryander] could not do better than to follow the system of Mr. Brown, who has taken great pains with it, and made more observations upon this order than any other botanist.... We should have been glad that means could have been found of limiting, in some degree, the number of genera, in those cases especially where the species are not too numerous. Several of Mr. Brown's genera consist of only one species, as far as appears at least by this extensive catalogue." But if it was common knowledge that the *Asclepiadeæ* in the *Hortus* were the work of Brown, this attribution to Dryander can hardly have been friendly to the former. In M. M. xxxiv. 191 Brown's genus *Podolobium* is maintained, "although we are somewhat jealous that Mr. Brown is rather too fond of subtle divisions."

It is pleasant, however, to find that Gray's last reference is couched in terms of unstinted praise. In M. M. xxxvi. 383, in the course of a review of Ferdinand Bauer's *Illustrationes Floræ Novæ Hollandiæ*, we read: "At present a part only of the *Prodromus Floræ Novæ Hollandiæ* is published, but it is to be hoped that the remainder will not be much longer withheld from the botanical world. When the larger work, of which this may be considered as the herald, shall appear, more ample details may be expected. But should no more than the *Prodromus* ever see light, when this shall be completed the botanical reader will not much feel the want of a more copious history."

James Britten.

REVIEWS.

Monografia del Genere Calendula L. By Domenico Lanza. Palermo, 1919, 4to. pp. 166, 10 plates. In Atti della Reale Accademia di Scienze, Lettere e Belle Arti di Palermo, vol. xi.

The genus *Calendula*, perhaps the most puzzling of all the *Compositæ* on account of the complexity of the varied forms it presents, its detachment in the Mediterranean region from the allied genera of South Africa, the extraordinary heteromorphism of the achenes and the unsolved mystery of the adaptation of their morphological variations to biological functions, has at last received adequate treatment on quite new lines in this admirable monograph by Dr. Domenico Lanza, now Director of the Botanical Institute and Gardens at Palermo, where he has succeeded the late Prof. Antonio Borzì.

Of the 164 pages before us, the first hundred are occupied by the discussion of: (1) the vegetative organs and their development; (2) the structure of the flowerheads, the mechanism of fecundation, the forms of the achenes and their possible relation to dissemination; (3) teratology and pathology in the genus; (4) experiments in cultivation; (5) hybridisation; (6) the principles of systematic arrangement of the species; (7) phylogenesis; (8) the history of the treatment of the genus by successive authors. The remainder of the work is taken up with a systematic account of the species arranged on quite new principles, and ends with 10 well drawn and well executed plates.

Hitherto the separation and arrangement of the species has been based, with most unsatisfactory and contradictory results, on the form of the achenes, these being the organs most easily observed in dried specimens, whilst the flower-characters (especially colour), leaf-texture and outline, and the nature of the root are difficult to study in the usually very defective examples that are to be seen in herbaria. It is greatly to the credit of Dr. Lanza, who has passed his life in one of the chief centres of distribution of the genus, that he has had the originality and independence of thought to abandon that discredited system, and after many years devoted to the study of *Calendulæ*—not omitting cultivation and experimental hybridisation—to found his arrangement of the species primarily on the duration of the life of the plant, arranging them in the two main sections of Annual and Perennial or quasi-perennial. In this procedure he is certainly justified by the result of his experiments, which prove that while hybrids are easily formed between the species of either section they are very difficult to obtain between an annual and a perennial species.

The next step is to arrange the species within each section according to leaf and flower characters (for the nature of which the reader must refer to the work itself), which leads—after some discussion of the views of extreme "lumpers" and "splitters" and an expression of opinion that species may be maintained as sufficiently distinct and recognisable, notwithstanding close affinity and morphological oscillation—to the admission of three species only of annuals—*C. ægyptiaca* Duf., *C. arvensis* L., *C. bicolor* Raf.; and seven of perennials—*C. fulgida* Raf., *C. Noëana* Boiss., *C. suffruticosa* Vahl, *C. tomentosa* Desf., *C. Monardi* B. et R., *C. maritima* Guss., and *C. maderensis* DC For varieties or subspecies within each of the above species we must have recourse to the achenes, whose heteromorphic variations and combinations exhibit a remarkable parallelism in the different species.

The achenes in *Calendula* are of four different shapes, known as annular, boat-shaped (*cymbiformia*), tripterous or winged, and beaked. In all previous works, as for instance in Benth. & Hook. Gen. Plant. ii. 454. we read that the beaked achenes, when present, form the outermost whorl; but by minute examination of the original position of the young achenes on the receptacle, a position that alters towards maturity, Dr. Lanza proves that the cymbiform achenes are really outside the beaked kind. Winged achenes, except in what Dr. Lanza calls tripterocarpic forms, hardly constitute an independent kind, as both beaked and cymbiform may be either winged or wingless; on the other hand, annular achenes, which are always the innermost, are relatively constant in shape. Now, in one single species, and, as would appear from some of Dr. Lanza's experiments. even in the descendants of one individual plant, quite different combinations of these four forms of achenes occur: that is why the attempts to arrange the species themselves according to achene-forms have broken down so hopelessly. For instance, the very common *Calendula arvensis* appears in no less than six different "*formæ carpicæ*"—(1) exalata rostrata, (2) exalata longirostris, (3) exalata erostris, (4) alata rostrata, (5) alata longirostris, (6) alata erostris. An almost exactly parallel series is found in *C. ægyptiaca*.

C. Gussonei Lanza, hitherto known as *C. sicula* Cir. (non W.)—a name put aside by Dr. Lanza on grounds that to me do not seem conclusive—is usually easily distinguished from *C. fulgida* and from allied forms of *C. suffruticosa* by the absence of all but annular and cymbiform achenes. Yet I have in my own herbarium a specimen from Taormina determined by Gussone himself as *C. sicula*, which has some beaked achenes as well; and Dr. Lanza has obtained from seed of a typical plant of *Gussonei* individuals showing numerous beaked achenes as well as others with broad and serrate wings—a result which, in his opinion, confirms his inclusion of the Calabrian *Calendula* (*C. stellata* var. *crocea* Guss. Pl. Rar.) in *C. Gussonei*, in spite of the deeply serrate wings of the outer achenes of the former.

In spite of his long study of the brilliant *Calendulæ* that in winter and spring adorn the rocks and fields of Sicily, Dr. Lanza has failed to discover how this extraordinary heteromorphism in the fruit can in any way help the survival or extend the area of the species. He concludes his discussion of that subject by saying that "the heteromorphism of this genus is simply morphological not biological." This is a counsel of despair which need not be accepted literally; let us rather confess our ignorance of the utility of the heterocarpism without proclaiming it to be useless.

Natural cross-fertilisation between different individuals, whether of the same variety or not, proves to be more difficult than one would suppose; as, although the flowers are proterogynous, the interval between the maturity of the stigma and the emission of pollen is extremely short, lasting only an hour or two in the annual, and about half a day in the perennial species; while the relative position of anthers and stigmatic branches ensures immediate self-pollination after that interval.

There is one unexpected omission in this monograph which leaves a free field for investigation by those who come after. *C. officinalis* L., the garden plant, is passed over in almost complete silence. Whatever may be the origin of the forms in cultivation, that origin is not known; the forms cannot be identified with or definitely referred to any of the spontaneous *Calendulæ* that are known at present, nor is it probable that in future there will be discovered any new species which could be regarded as the true, or at any rate the sole, ancestor of *officinalis*.

We must conclude with the strongest possible recommendation to to British botanists of a study of Dr. Lanza's monograph.

C. C. Lacaita.

The Wheat Plant: A Monograph. By John Percival, M.A., F.L.S. 8vo, pp. x, 463, tt. 228. Duckworth: London, 1921. Price £3 6*s.* 0*d.*

This attractive-looking volume embodies the results of twenty years' intensive study of our most important food-crop. The author has critically examined living specimens from all parts of the world, and nearly two thousand forms have been grown annually side by side, and their morphological characters in the young and mature states, as well as their habit of growth, ripening period, susceptibility to the attacks of fungi and other characters, have been investigated and compared.

The subject-matter is divided into two parts. Part I (to page 143) is an exhaustive botanical study of the wheat plant from the grain, its germination and development, to the formation of the new grain. It is well illustrated and full of interest. Part II occupies the remainder of the book, and is devoted mainly to classification, comprising a detailed description of the different races, varieties, and forms of cultivated wheat. Two wild species of wheat are known: (1) *Triticum ægilopoides* Bal., Wild Small Spelt, a native of the Balkan Peninsula and Asia Minor, from which one race of cultivated wheat, *T. monococcum*, Small Spelt, has been derived; and (2) *T. dicoccoides* Körn., Wild Emmer, native of Syria and Western Persia, under which Prof. Percival groups the remaining ten cultivated races. The races are subdivided into smaller groups or varieties, based upon obvious hereditary morphological differences of the ears and grain, and under each variety are a number of forms, the grouping of which in some of the common varieties offers considerable difficulty. In the remaining chapters the author discusses the origin and relationships of the races of wheat, variation, hybridisation, improvement and breeding, and yield. As regards phylogenetic relationship, the author groups the races in three series: I, the Small Spelt derived from *T. monococcum*; II, the cultivated Emmer Wheats, derived from *T. dicoccoides* and including the Macaroni wheats (*T. durum*), Polish wheat (*T. polonicum*), and rivet- or cone-wheats (*T. turgidum*); and III, the Bread Wheats proper (*T. vulgare*), with which *T. Spelta* is closely related; these are regarded as derived from a crossing of *T. dicoccoides* and species of *Ægilops*. An alphabetical list of wheats refers each name to its race and variety, and indicates its country of origin. A bibliography and index conclude the volume. The numerous plates are well reproduced by photography, and are a valuable adjunct to the text. Prof. Percival has fulfilled the hope expressed in his preface, that this book may be a model of the research that is needed upon farm plants. It should also act as a stimulus to further effort.

A. B. R.

The International Potato Conference.

The Royal Horticultural Society has issued (3*s.*), a Report, edited by Mr. W. R. Dykes, of the International Potato Conference held jointly by the Ministry of Agriculture and Fisheries and the Royal Horticultural Society in November last "in order to secure the full discussion of the manifold and complex problems with which breeders and growers of potatos are confronted." The volume will be useful to those who are interested in potato problems: it must be said however that the contributions are of very unequal merit; a few are valuable and give details of recent work, but others are below the standard one is entitled to expect at an International Conference. The first paper is on "Breeding, Selection and Development Work in the U.S.A." by W. Stewart, followed by three papers on the same aspects in Britain by W. Robb, D. MacKelvie, and F. J. Chittenden. H. V. Taylor writes on "The Industrial and Commercial Uses of the Potato"; R. N. Salaman has an able paper on "Degeneration of Potatoes," and collaborates with J. W. Lesley in a preliminary paper on "Some Information on the Heredity of Immunity from Wart Disease." The remaining papers deal with diseases. The first by V. H. Blackman on "The nature of immunity from Wart Disease" occupies little more than half a page, but gives the essential points of Curtis's investigations on the life-history of *Synchytrium endiobioticum*: the second by W. B. Brierley on "Some research aspects of the Wart Disease Problem" might with advantage have been somewhat similarly restricted. G. H. Pethybridge's paper on "Some recent work on the Potato Blight," summarises the work on the discovery of the oospores of *Phytophthora* and the results obtained during the last two decades on means of combatting the disease. This is followed by H. M. Quanjer's paper "New work on Leaf-curl and allied Diseases in Holland," which is the most valuable in the Report; it is well supplemented by P. A. Murphy's "Some recent work on Leaf-roll and Mosaic." A. D. Cotton summarises "The situation with regard to Leaf-curl and Mosaic in Britain," and W. A. Orton gives an interesting account of "New work on Potato Diseases in America." It was not to be expected that all aspects of the subject could be treated at such a conference, but one would have thought, if blight were to be considered at all, a discussion on spraying would have been useful.

Speaking of the papers as a whole, we think the editor would have been well advised to have deleted the vast amount of padding which occurs in some of them, particularly as much of this was omitted at the conference itself. The re-reading of what Mosaic is, for example, gives one the feeling of having been through a course of Coué; and one would have thought that there was no need for a description of starch and similar matters of common knowledge. Misprints are far too numerous, and errors of initials and titles are not absent. Each author seems to have been given a free hand as to how he should label his figures or plates, but all are consistent in their spelling of "potatos." It is to be hoped that there will be more such conferences, but that they will be more representative. Doubtless many scientific bodies would be pleased to assist in the various ways open to them to make the meetings a success; attention might, moreover, be called to the continued existence of the British Museum (Natural History).

J. Ramsbottom.

BOOK-NOTES, NEWS, ETC.

Charles Macintosh, one of the old type of naturalist, passed away at Inver, Perthshire, on January 5th of this year. In early life he had been a sawmiller, but having one of his hands mutilated he had to change his occupation and became a rural postrunner between Dunkeld and Balnagned. On the botanical excursion of the British Association to Dunkeld last year, Mr. W. Barclay and Mr. J. R. Matthews kindly invited me to accompany them on a visit to Macintosh, and we called at the lowly Inver cottage in which he was born in 1839, and in which he lived until shortly before his death; a living room in which the principal items were a harmonium with some manuscript, a violoncello in the corner, a table near the window with a microscope, a few books, and an agaric gave one a striking impression of the interests of the towering, gaunt, kindly Scot. In a walk through the neighbouring woods—after looking in an outhouse for fungi left by any of his village boys, and having pointed out Neil Gow's cottage with a certain amount of enthusiasm—Macintosh indicated the habitats of many of his mycological discoveries; and to Barclay, an old friend, he soon began to talk of mosses, birds, the river, old roads, markets, hybrid larches, and so on in a manner so interesting that the younger members of the party contented themselves with a word here and there, so that the old man might continue. In his earlier days Macintosh had assisted Dr. Buchanan White with Dunkeld localities for his *Flora of Perthshire*; in later years he had specialised so far as such a naturalist could do so, in mosses and fungi. He collaborated much with Mr. J. Menzies, the Perth mycologist, himself a working-man naturalist, and with him made many additions to the British Fungus Flora. Though these were chiefly microfungi, Macintosh declared he was "o'er tall to see the wee ains." From what one was privileged to see in so short a visit, the hamlet of Inver will sadly miss the old postrunner naturalist.—J. Ramsbottom.

At the meeting of the Linnean Society on April 6, Dr. Rendle showed a seedling of the Red Horse-chestnut (*Æsculus rubicunda*) in which a new terminal bud had been developed to replace the original shoot (plumule) springing from the seed. The original main shoot (epicotyl) had been broken some distance below the plumule; but after a few days a new growth was seen to have covered up the broken section, and gradually to develop into a new terminal bud. The new bud did not resemble the plumule, which produces at once a pair of large compound leaves of a similar character to the adult foliage, but suggested a normal terminal bud the outer leaves of which are bud-scales, the leaves of the perfect form being protected in the interior of the bud. Adventitious buds are very common in plants, but the speaker did not know of a similar case of direct replacement of the plumule as a result of injury.

At the same meeting was read a paper on the life-history of *Staurastrum Dickiei* var. *parallelum* by Mr. Charles Turner, of which the following is an abstract:—

The want of rain, and the subsequent partial stagnation of the pools left by the side of a mountain stream in Denbighshire, were probably the cause of the very great number of zygospores produced by this desmid during the summer of 1921. It was observed that the contents of the spores were, at first, of an oily character and that this circumstance rendered the early stages of the nucleus difficult to trace. During the later stages the production of four nuclei in the spore is readily visible before its germination: this apparently indicates that the process of conjugation resulted in the formation of a diploid nucleus, and that a reduction division occurred inside the spore before the discharge of its contents. This early formation of "desmid mother-cells" is frequently seen, and the germination of the spore results in the formation of four, three, two, or one desmid only, usually accompanied by an atrophied nucleus in the surrounding protoplasm when the smaller numbers are formed. The protoplasm is subsequently assimilated and the desmids go free. The process of conjugation is usually of the normal type, and the zygospores are produced between the two desmids without the formation of a conjugation tube; but in one instance the occurrence of this rather uncommon condition was observed and a conjugation tube about 30 μ in length and 10 μ in diameter was seen. The conjugating desmids were asymmetrically placed and the protoplasmic contents appeared to indicate a slight differentiation of the sexes, as they were passing from one to the other without a corresponding return. The conjugation of a four-rayed with a three-rayed form is not infrequent, and a four-rayed form may be occasionally seen associated with the three-rayed embryonic desmids in the protoplasm discharged from the same spore, when germination takes place. The vegetative division is often accomplished by the development of a single circular bulging cell between the two semicells. The contents of this may divide, or an hour-glass constriction may cause the ultimate formation of two desmids.

At the meeting of the same Society on May 4 Mr. Edwin Ashby exhibited pressed specimens of Orchids from South Australia including a number of the "spider-like" members of the genus *Caladenia*, and the green-hooded forms of the genus *Pterostylis*: many of these have a sensitive labellum which on the entrance of an insect closes up the entrance for a short period; Mr. Ashby suggested that this was for the purpose of fertilization. A member of the genus *Thelymitra*, which only open their bright-coloured petals in hot bright sunshiny days, and two species of *Caleya* were exhibited, both provided with a sensitive labellum which, on being touched, folds up in two separate movements. A species of *Diuris* intermediate between *D. maculata* and *D. longifolia*, although now a fixed form, seems certainly to have been derived by hybridization. For, many years before it was described by Dr. Rogers as *D. palachila*, Mr. Ashby had known it under his own own name of *hybrida*, thinking it could hardly deserve specific rank. A very beautiful form known as *Caladenia tutulata*, intermediate between *Glossodia* and *Caladenia*, was shown and its characters explained.

At the same meeting, a volume from the library of Henry Lyte (1529–1607), which had been found by Mr. Harold Downes in 1916 in a general dealer's shop at Taunton, formed the subject of a communication from its discoverer. The volume consists of two works of Antoine Mizauld, a French physician (1520–1578), *Alexikerus* and *Nova et Mira Artificia*, bound together. At the top of the title-page of *Alexikerus*, in red ink, is the signature "Henry Lyte," and across the printer's device (a mulberry tree) is "Henry Lyte, 1565."; the signature is repeated on the title-page of the second work. A few trifling marginal notes are scattered through the volume, and many passages are underlined, the notes and underscorings, as well as the signatures, being in red ink. At the end of the volume are two pages of MS. notes mostly medical definitions or short descriptions of diseases. All the notes, which are in Lyte's hand, were published by Mr. Downes in *Somerset and Dorset Notes and Queries* for 1917.

On the same occasion, Prof. J. Lloyd Williams, gave an account of the Life-history of *Laminaria* and *Chorda*. He remarked that, up to a few years ago, Botany students were taught that the Laminariaceæ, though they exhibit the highest advance in their external morphology and internal structure, possessed no method of sexual reproduction, but propagated themselves by means of asexual zoospores; and consequently they had to be classed, not with the higher, oogamous members of the Phæophyceæ, but with the lower Phæozoosporeæ. The recent discovery of the development from germinating zoospores of two kinds of gametophytes, producing respectively eggs and antherozoids, compels us to revise our ideas respecting the group and its systematic position. The author, after describing in detail the structure of the zoospore, its behaviour in germination, and the cytology of the processes, stated that cultures of *Laminaria* three weeks old, and of *Chorda*, three or four months old, almost invariably showed the presence of two kinds of multicellular germlings, one kind large-celled, the other consisting of cells many times smaller. Sauvageau, by observing the development in his culture of abnormal sporangia of *Saccorhiza*, was able to prove that both kinds of germlings were produced from zoospores in the same sporangium. All attempts at carrying the discovery further by observing the actual liberation of the sexual cells failed until two years ago, when the author witnessed the discharge of antherozoids and the process of fertilization. The process of dehiscence of the oogonium and the liberation of the eggs were explained in detail, and the difference between the behaviour of the inner wall in *Laminaria* and *Chorda* explained.

The *Annals of Botany* (April) contains papers on "The Leaf-skin Theory of the Stem," by Edith R. Saunders; "On the Absorption of Ions by the Roots of Living Plants," by Gladys M. Redfern; "On Hybridization of some Species of *Salix*," by S. Ikeno; "The Fungus present in *Pellia epiphylla* Corda," by W. F. F. Ridler; "The South-east African Flora, its origin, migrations and evolutionary tendencies," by J. W. Bews; two papers on "Growth Studies," by J. H. Priestley, A. F. C. H. Evershed, and W. H. Pearsall; "Studies on Intrafascicular Cambium in Monocotyledons," by Agnes Arber; "The Germination and Growth of Fungi at various temperatures," by William Brown.

The first number of the Report of the Welsh Plant-breeding Station, University College of Wales, Aberystwyth, is devoted to preliminary investigations with herbage plants. The results brought together are the outcome of three years' preliminary work, and have been obtained chiefly from field and garden trials, many of which have a direct practical bearing on grassland husbandry. The contents are concerned with the incidence of fungus diseases, problems connected with the fertilisation of grasses and clovers, the seasonal productivity of the herbage plants in general use, and other matters.

In the *Zeitschrift für Botanik*, xiv. Heft 4 (1922), F. Rawitscher publishes the second part of his "Beiträge zur Kenntnis der Ustilagineen" in which he deals with the cytology of *Tilletia Tritici* Wint., *Cintractia Montagnei* Magn., *Urocystis Violæ* Fisch. v. Waldh., and *Doassansia Sagittariæ* Fisch.

The *New Phytologist* (Ap. 25) contains a continuation of Mr. Walter Stiles's paper on Permeability; "Physiological Studies in Plant Anatomy," by J. H. Priestley and Dorothy Armstead; "A Critical Study of certain Unicellular Cyanophyceæ," by W. B. Crow; a review of Miss Lorrain Smith's *Lichens*, by W. Watson; and "A method for inducing protoplasmic streaming," by W. Seifriz.

The *Nuovo Giornale Botanico Italiano* (Apr. Oct.: issued Dec. 1921) contains a continuation of C. C. Lacaita's notes on rare or critical Italian plants—*Acanthus spinosus*, *Betonica hirsuta*, *Iris collina*, and *Inula candida* are among the species discussed, and a new variety (*australis*) of *Ilex Aquifolium* is described—and A. Ponzo writes on the genera of *Cistaceæ*.

The *Transactions of the Botanical Society of Edinburgh* (vol. xxviii. pt. 2; 1921) contains "Additions to the Flora of Orkney," by Col. H. H. Johnston; "Moss Records from St. Kilda," by William Evans; "*Craigia*, a new Genus of Sterculiaceæ," by W. W. Smith and W. E. Evans (with plate); *Pyrola rotundifolia* L. in Caithness, with notes on the genus," by Arthur Bennett.

The *Annali di Botanica* (xv. fasc. 4: Feb. 28) contains "Variazione brusca in *Nicotiana sylvestris*," by R. Savelli, and "Osservazioni statistiche sul fiore di *Anemone apennina*," by C. Sibilia, with numerous short communications. The page-headings in this periodical are absolutely devoid of information.

The researches of Mr. R. T. Gunther into the MSS. in the Library of Magdalen College, Oxford, of which some account was given in this Journal for 1921 (p. 119), have borne abundant fruit in the handsome volume entitled *Early British Botanists and their Gardens*; this has been published by the Oxford University Press, and will be noticed in these pages at an early date.

The *Gardeners' Chronicle* for Apr. 29 contains an interesting account of the Edinburgh Botanic Garden and a portrait of the new Keeper, Prof. W. Wright Smith.

At a Congregation held at Cambridge University on May 6, the degree of Doctor of Science was conferred on Prof. John Percival, of University College, Reading.

Martinus Nijhoff (The Hague) publishes a monograph of 77 pages by Dr. G. L. Funke on "Onderzoekingen over de Vorming van Diastase door *Aspergillus niger*." The price is two guilders.

Yet another name must be added to the notices of deaths which have already been of sadly frequent occurrence during the present year—Mr. George Simonds Boulger, whose contributions to this Journal have extended over many years, died at his residence at Richmond on May 4. Some account of his work will follow in due course.

THE

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BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers

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ETHEL SAREL GEPP

(1864–1922).

Ethel Sarel Barton (afterwards Gepp) was born at Hampton Court Green, Surrey, on Aug. 21, 1864. About 1872 the family moved to Ticehurst, Sussex, where she spent a happy childhood; for some time she went to the same school as her brothers, and later was educated at home—she always attributed her broader outlook to the absence of the narrowing influence of a girls' school. In 1883 the home was broken up by the death of her mother; her father went to India, and Ethel went to Leipzig, where she remained for about a year and a half studying music, especially the violin, on which instrument her keen appreciation of music would doubtless have enabled her to become an accomplished performer. But an attack of "writers' cramp," brought on by malnutrition and overwork, compelled her to abandon her studies and to part with her violin; she, however, continued her piano instruction, and in later years when her health allowed, rendered effectively works of the classical composers. Modern music did not appeal to her.

After her return to England, Ethel went, in 1886, to stay with an aunt at Eastbourne. Here she acquired a love of Botany from the Rev. H. G. Jameson, who had established a class for young people whom he interested chiefly in Mosses, in the study of which he was and is a proficient. He furnished his pupils with lithographed keys to the British Mosses; these were subsequently printed in this Journal for 1891 and later incorporated in a volume published in 1893.

After returning to London she lived in Kensington, and in April, 1889, came to the Natural History Museum with a view to working in the Department of Botany, of which the late Dr. Carruthers was then Keeper; and George Murray, then in charge of the Crytogamic Herbarium, advised her to take up Marine Algæ. She attended Dr. Scott's classes at the Royal College of Science—George Brebner, Prof. Thomas Johnson, and Miss Lorrain Smith were among her fellow-students; she worked daily at the Museum, and subsequently became practically, though unofficially, a member of the working staff, her knowledge being always at the disposal of students or correspondents. Among the latter may be named J. G. Agardh, F. Schmitz of Greifswald, and Edouard Bornet; among her personal friends and acquaintances were included many of the leading botanists, especially those interested in Algæ.

Her first published paper was that on the galls of *Rhodymenia palmata*, printed in this Journal for March, 1891; she had previously collaborated with Murray (to whose *Phycological Memoirs* she contributed), in a paper on *Chantransia* read before the Linnean Society in 1890, but not published in the Society's *Journal* until May, 1891. From that time until the breakdown of her health in 1911 she was a frequent contributor to these pages; among her papers may be mentioned those on Cape Algæ in 1893 and 1896, biographical notices of

Agardh (1901) and Batters (1907), numerous reviews, and a series of notes on recent algological work. To the *Transactions* of the Linnean Society she contributed a paper on *Turbinaria* in 1891; to its *Journal* papers on various genera of Algæ (1898–1900); and to its *Proceedings* (1894–5) a translation of the autobiography of George Ehret. In the account of the results of the 'Siboga' Expedition (1899–1900) she published a monograph of *Halimeda* (1901), and in collaboration with her husband an important monograph of the *Codiaceæ* (1911). Other papers, some of them with the same collaboration, dealt with the Marine Algæ of China, the Indian Ocean, Ceylon, Borneo, the Kermadecs, and New South Wales. For twenty years (until her death) she wrote algological abstracts for the Journal of the Royal Microscopical Society and for the *Botanisches Centralblatt*.

In 1891 Ethel spent a long holiday in Scotland, where she worked at the Marine Biological Station known as "the Ark" at Millport, Cumbrae; here she made the acquaintance of Sir John Murray and of E. A. L. Batters, whose knowledge of Algæ greatly extended her acquaintance with them, especially of the smaller parasitic species; her collections made during this period are in the Botanical Department. In 1892 she attended the meeting of the British Association at Edinburgh, where her knowledge of French and German proved useful to Sir John Murray, at whose house she was staying; she was also present at the Association meetings at Oxford in 1894, Dover in 1899, and Glasgow in 1901. In July 1895 her work was interrupted by an attack of pleurisy, which, after a period of convalescence, was renewed in the following year, and necessitated a winter's residence on the Riviera.

On her restoration to health Ethel's work at the Museum was resumed, her holidays being mostly spent in the south of England; she was accustomed to speak with great pleasure of a walking tour in the Black Forest in the autumn of 1898, when on her way home she visited her friends the Webers at Eerbeck, in Holland, with whom she had long been intimate. In October of 1901 she visited Dublin, where she selected from Harvey's herbarium duplicates of his Algæ for the British Museum.

In 1902, as briefly announced in this Journal at the time, Ethel was married at St. Luke's, Chelsea, on June 9, to Mr. Antony Gepp, whose acquaintance she had made in the Museum.

The marriage was followed by a visit to Italy, which she keenly appreciated; and from 1903 onwards they lived happily at Kew, where a daughter and son were born in 1905 and 1908. Ethel continued her work on Algæ at the Kew Herbarium and at the British Museum as opportunity served until August, 1911, when her health broke down under a serious attack of phthisis, from which she never recovered. Under urgent necessity she was moved to Paignton in November, and subsequently to St. Marychurch and Torquay; in the latter place a house with sunny aspect was taken in 1913, to which the family removed. Here Ethel fortunately secured as companion Miss R. C. Garde, whose skill and constant devotion undoubtedly extended her life by a period of nine years. During this period there were numerous and health-giving visits to Dartmoor and Tunbridge Wells, with the family; and in 1920 a visit to Kew enabled Ethel to renew many old acquaintances.

Her life at Torquay was a very happy one, cheered by her husband's weekly visits and the occasional visits of friends, by the company of her children, and by the presence of her dear friend Miss Garde. Mrs. Gepp was no querulous invalid; her interest in current events never failed; always an attentive and sympathetic listener, she was a most thoughtful hostess, keenly interested in the doings of her friends. Her gracious manner and beautiful and expressive voice added to the charm that her visitors experienced, to which those of her friends whose letters I have been allowed to see paid eloquent tribute. A quotation from one of these will convey better than words of mine could do the impression formed by her guests:—

"I like to think of her as I always remember her—sitting in her chair in the sunshiny window-room, her well-filled table beside her, her well-beloved pen in her hand, her brain busy with work or thought—only turning as the door opened to spring up briskly with her welcoming smile and grasp: not a word or sign of symptoms or illness, but intelligent criticisms on current affairs or letters in the *Times*, an amusing story of the doings of neighbour or friend, or a proud recital of some feat of 'the children'; or, again, better still, out of doors on her beloved moors, actively moving about wrapped in a warm cloak, her laughing face always making the best of any contretemps—ready for a picnic or an expedition with the help of her faithful donkey . . . . how could one remember that she was an invalid? She was the life of the party, the centre of attraction for young and old: everyone gravitated round her—all sought her encouragement or advice."

During the last two or three years, recurrent attacks of heart trouble weakened Ethel's powers of resistance, and a sharp attack of influenza during the recent epidemic quickly exhausted her strength. In spite of the most careful nursing, she passed away on April 6, to the intense regret of all who had known her.

Mrs. Gepp's services to Algology are indicated in some commemorative names. *Bartonia* was, of course, already occupied; but *Ethelia*, established as a subgenus of *Squamariaceæ* by Mrs. Weber van Bosse (in Trans. Linn. Soc. 2 S. viii. 138) was raised to generic rank by F. Schmitz in the Botany of the *Siboga* Expedition. Other commemorations are *Caulerpa Bartoniæ* G. Murray and *Delesseria Bartoniæ* F. Schmitz; *Lithothamnion Geppii* Lemoine and other species were dedicated jointly to husband and wife.

James Britten.

SOME REMARKS ON NOMENCLATURE.

By A. J. Wilmott, B.A., F.L.S.

A further series of nomenclatural notes has been published by Schinz & Thellung in Vierteljahrschrift der naturf. Ges. Zürich, lxvi. 257→ (1921). The following British plant-names are mentioned:—

Nymphozanthus L. C. Richard, 1808 (May), antedates *Nuphar* Smith (late 1808 or 1809): see Fernald, 1919, in Rhodora, xxi. 183–8. Schinz and Thellung suggest that *Nuphar* might be made a *nomen conservandum*. I agree with Sprague (p. 54) that such changes should not be made until the question of conserving the usual name has been considered: either all important names in continual and constant use for fifty years or more should be retained or the list of *nomina conservanda* should be altogether abolished. I would suggest that the names now in the list would be better called *nomina conservata*, *i.e.*, those of the original list of *nomina conservanda* which actually were conserved; *Nuphar* would then be called a *nomen conservandum*—at present it is necessary to use the cumbrous expressions "nomen conservandum me (or Congress. Vienn.) judice." Fernald cites Richard, pp. 63, 68, 103. In the library of the National Herbarium we have Richard's interleaved copy which he presented to R. Brown, in which reference to *Nymphozanthus* (*Nymphæa* also) has been lined out on p. 63. The paragraphs on p. 68 beginning "L'amande de ce genus" and the succeeding one have also been crossed out and a new account is given on the interleaf —evidently as a result of the work for his 1811 paper, since the letter is dated June 1811.

Hirschfeldia incana (L., 1755: *Sinapis*) Lagrèze-Fossat, 1847; Fl. de Tarn et Garonne, 19 (*Hirshfeldia*), much antedates Lowe, 1868 (Ind. Kew.), for this combination.

Cardamine hirsuta subsp. *flexuosa* Forbes et Hemsley, 1886, in Journ. Linn. Soc. xxiii. 43, antedates *C. hirsuta* subsp. *silvatica* Rouy et Fouc., 1893.

Polygala serpyllifolia J. A. C. Hose, 1797, in Usteri, Ann. d. Bot. xxi. 39, antedates *P. serpyllacea* Weihe, 1826.

Viola montana L. The authors' statements are erroneous, see this Journal, liv. 261 (1916).

Melandryum Roehling, 1812: Deutschl. Fl. ed. 2, ii. 37 (overlooked by S. & T., who state that Roehling's genus was without description), is antedated by *Physocarpon* Necker, 1790, Elem. ii. 164. S. & T. suggest *Melandryum* as *nomen conservandum*, since *Physocarpon* has never contained any specific name. It is to be noted that Dalla Torre and Harms (Gen. Siphonog.) put *Physocarpon* under 2491 *Lychnis* while keeping up 2494 *Melandryum*. *M. dioicum* dates from Simonkai, 1886: Enum. Fl. Transsilv. 129.

Saxifraga rosacea Moench. S. & T. would replace this by *S. decipiens* Ehrh., 1790, Beitr. v. [175: *nomen nudum*, the usual citation] 47. On. p. 47 Ehrhart says that *S. petræa* Roth. tent. i. 184 is not *S. petræa* L. but is his *S. decipiens*, hence S. & T. say it is not a *nomen nudum* because of Roth's locality cited—"in Hercyniæ rupibus, prope Elbingrode." But Roth's diagnosis is that of Linnæus, hence *S. decipiens* was undiagnosed. Since the Rules state, and it seems philosophically correct, that names rest on their diagnoses, it is difficult to see how S. & T. can justify their use of undefined names merely from the habitat cited.

ŒNANTHE CHÆROPHYLLOIDES Pourret, 1788, is shown to be probably *O. pimpinelloides* L., 1753, and not to replace *O. Lachenalii* C. C. Gmelin, 1805.

MATRICARIA MARITIMA L., 1753, Sp. Pl. 891, antedates *M. inodora* L., 1755, Fl. suec. ed. 2, 297. When these are regarded as conspecific, as is now usually the case (see Lester Garland in Journ. Bot. 1921, 171), the former must be used as of L. emend., mihi, sensu nov. The inland form is var. *agrestis* (Knaf, 1846, in Flora, xxix. 299, as *Dibothrospermum* sp.) comb. nov.

INULA CONYZA DC. S. & T. still insist that *I. squarrosa* (L., 1753, as *Conyza* sp.) Bernh. is valid. If the Rules are applied retroactively we are bound to reject their contention that it is the *present* and not the *then* state of knowledge which counts. We have to consider Bernardi's nomenclature from the point of view of a contemporary reviewing his work. Such a contemporary would have said "This is absurd; there is already Linnæus's *Inula squarrosa*; Bernhardi ought to have known that!"—we must remember that there was no *Index Kewensis* in those days, and that we are still very ignorant of existing varietal names. A. P. DeCandolle did in fact notice this when he had occasion to deal with both species at the same time, and quite correctly made a new name for the more recent *I. squarrosa*, viz., *I. Conyza*.

THRINCIA TARAXACOIDES Lacaita in Journ. Bot. 1918, 97. S. & T. retain the trivial *nudicaulis* (L., 1753, sub *Crepide*). I had previously investigated this case and entirely agree with him. S. & T. do not appear to appreciate the arguments Lacaita sets forth. I do not think that such combinations as "*T. taraxacoides* Gaudin as to name only" should be employed; Gaudin's plant was not *Hyoseris taraxacoides* Vill.; his name cannot apply to this plant.

VERONICA PERSICA Poiret, sec. Lacaita (*op. cit.* 55), is similarly not accepted by S. & T. In spite of Lacaita's arguments they retain *V. Tournefortii* Gmelin, which is a *nomen confusum*, embracing "elements altogether incoherent," and to be rejected by Art. 51. 4. S. & T. paraphrase this by saying that Lacaita rejects the name as consisting of "heterogeneous constituents," adding that by such method half the Linnean names would disappear; their investigation appears much less thorough than Lacaita's.

SISYRINCHIUM ANGUSTIFOLIUM Miller, 1768, is retained by S. & T. against *S. Bermudiana* L., 1753, "type" [the Virginian plant], excluding var. β (Bermudian plant). The question resolves itself into: Does the Linnean trivial name include the var. β? Where Linnæus gives a varietal name to his β and γ it is possible to answer in the negative, but where there is no such other name we must include the varieties. It might be possible to draw a distinction between cases where Linnæus had an α and those where he has a "type," but that such distinction would be wrong the present case demonstrates, since in a note Linnæus himself says "α in Virginia." This shows that α may be understood in the *Species Plantarum* in all cases where it does not occur, and that the first splitter may choose the var. β as the type if he sees any good reason to do so. For this same reason it seems right to use *Ulmus glabra* Huds., 1762 (quoad β "typo" excluso), emend. Miller, 1768.

Digitaria Ischæmum comb. nov. *Panicum Ischæmum* Schreber ex Schweigger, 1804, employs the earliest definite trivial for our *D. humifusa* Rich. The plant ("foliis . . . passim pilosis") referred to under *Digitaria Ischæmum* Muhl. Descr. gram. 131 is *Panicum sanguinale.*

Setaria Beauv. is *nomen conservandum*, me judice. It has been in use for a hundred years and *Setaria* [Acharius] Michaux has been neglected for the same period.

Agrostis tenuis Sibth., 1794, is replaced by *A. capillaris* L., 1753 [? partim; non Linn. herb.]; Hudson, 1762; Leers, 1775; Hitchcock, 1920. I have not yet investigated this case.

Agrostis alba L. is certainly *Poa nemoralis* var. *uniflora.* The correct name for *A. alba* auct. is either *A. palustris* Hudson, 1762 (Fl. Angl. 27), or *A. stolonifera* L., 1762, emend. (partim), but it is not yet certain whether the latter name is more correctly referred to *A. verticillata* Vill., *cf.* Asch. & Graebn. Syn. II. i. 172 (1899); Hitchcock, 1904 (in Bot. Gaz. xxxviii. 141), and 1920 (in U.S. Dep. Agric. Bull. 772, pp. 128, 129).

Phragmites is retained by S. & T., who show that Adanson had chiefly in view the common Reed. For those who reject non-binominal works such as that of Adanson, it should be noted that the first author to precise *Arundo* L. was Pal. de Beauv., 1812 (Agrost. 60), who retained the name for *Phragmites* and made a new genus of *Donax*, with which position I concur. Hitchcock (1920), however, fixes *Arundo Donax* as the type of the genus *Arundo* from the citation in Gen. Plant., viz., "Scheuch. t. iii. 14, 3," saying that Scheuchzer's fig. 14 of Tab. iii. (A, B, and C) represents *A. Donax.* But D of the same figure is *Phragmites*, which Scheuchzer describes equally thoroughly. If the "3" of Linnæus stands for C, Hitchcock's argument might hold, but, as it seems to be an assumption, we may, by the principle of residues, retain *Arundo* L. emend. Beauv. for *Phragmites* [Adans.] Trin., 1820.

Puccinellia Parlatore, 1850, is accepted as earlier than *Atropis* Grisebach in Ledebour, 1853 [Trin., 1838, and Ruprecht, 1845, as section only].

Lepturus Trin. partim, et auct. recent. plur., non R. Br. is replaced by *Pholiurus* Trin. (*P. filiformis* Schinz et Thell. *op. cit.* 265).

S. & T. remark that Druce (1917) in B. E. C. 1915 Report 416, has taken up *Scabiosa Virga-pastoris* Miller for *S. suaveolens* W. & K., because the *Index Kewensis* identifies it thus. They point out that this identification cannot be right and that the Tabernæmontanus plant cited has the habit of *Knautia silvatica* or *K. integrifolia*. In the National Herbarium is a type labelled "Helvetia," correctly determined by Banks as *S. silvatica* "H. L."—*i. e.*, compared with Herb. Linn.

Schinz and Thellung conclude by offering their comments upon the questions raised by Sprague in this Journal (1921, 129; 1922, 129). This seems the time to raise a few points I would add to the discussions.

A. The code should be as simple as possible. The method of precision by means of a type—*i. e.*, the individual of a group which must retain the name whatever changes the group may suffer—would lead to simplification and has been found to work well in Zoology. The acceptance of this really valuable method might form a basis of agreement with those Americans who refuse to accept the Vienna code.

B. Divergent interpretations might be settled by a system of official case-law. An example of every known class of case could be appended to the last rule on which it depends: if numbered serially we could then choose the one similar to that under discussion and say "by [Art. *m*] Case *n* the correct name is X—— Y——," and so save much print and argument. Cases could be dealt with by a committee, and would form a fixed basis for discussion of the various principles involved in the whole code. Some method of eliminating divergence of interpretation is necessary, and this would seem to me to be the best and simplest to work.

C. A third suggestion would involve a change of rule, but not of "principle." To state in Art. 4 that the first essential point is "to aim at fixity of names," and in Art. 2 that "the principles are the foundation of the rules," and then to frame rules which allow the possibility of a single plant having one name as a species, another as a subspecies, a third as a variety, a fourth as a subvariety, etc., seems inconsistent. It destroys "fixity of name" and involves a continual change of type, whereas it is only by means of the method of types that any precise fixity can be obtained. The rules seem in this respect to be antagonistic to progress. In Art. 48 and 49 there should be no question of taxonomic rank. One name for one natural group should be the aim. This was the practice of the DeCandollean code, and, unless the present method was made as an act of grace in return for the giving up of the "Kew Rule," it is difficult to see why such a reactionary idea was introduced. Every practical nomenclator will have met dozens of cases where recognised names disappear under this rule; not only so, but possibly not a tithe of the changes have yet been made. When its effects are contemplated, it is not surprising that some persons will have nothing to do with a code which includes it and ignores the method of types.

I would further suggest that the method of alteration of code should be by printing the proposed changes after general debate at one conference, passing them finally only at the next conference, by which time their effects and value (or harm) will have become manifest.

With regard to Mr. Sprague's points, I hold the following opinions:—

(1) Latin must stay unless we can first get Russians, Spaniards, Japanese, etc., to agree to "Latin, French, English, or German." But if we do not allow English it is open for anyone to rename all species published under the American code!

(2) "Ridicule" should be placed very low in the list of principles, and seems irrelevant. Zoologists (who duplicate) experience no inconvenient public ridicule, nor need the views of the general public be considered, if one may judge from the scientific wisdom displayed in the press. Duplications should be allowed in accordance with Art. 16, and Art. 55. 2 should be repealed.

An objection to the present rule is illustrated by the case of *Arundo Calamagrostis* L., 1753, which became *Calamagrostis lanceolata* Roth., 1788. What was later shown to be a mere albino of this was described by Weber (1780) as *Arundo canescens*=*Calamagrostis canescens* (Weber) Gmelin. As it is impossible to call an albino a monstrosity, authors who have applied the Vienna Code call the whole species *C. canescens* Gmel., whereas could they have sent their plants to Gmelin for confirmation he would probably have rejected all of them, for the albino is very rare. In any case it is necessary to write *C. canescens* Gmel. emend. Druce, but *C. Calamagrostis* (L.) is preferable. The present rule involves also a change of the type; the Linnean type being rejected for that of Weber. When once the classification of a group has been orientated round one point (type), it is inconvenient to have to make a fresh orientation.

(3) Misleading geographical names. These are little more misleading than some descriptive names, and less so than incorrect descriptions. Misleading names should be avoided, but not rejected, as they are few and it would be difficult to agree where to draw the line. If complete agreement could be reached the position would be different. The same with (4).

(5) Accidental binominals. It would probably be helpful if all non-binominal books were rejected. This is done in Zoology, and was proposed at Vienna. The discussion was generally favourable to this view until Briquet stated that to adopt it would lead to numerous name-changes, since Adanson's names would be rejected, and the matter was dropped. So far as the British Flora is concerned, M. Briquet's apprehension was unfounded: practically all the Adanson names in general use would still stand upon the authority of Gaertner, DC., etc., just as Tournefort names stand on Linnæus's authority. The only change which is required, if we reject Adanson, is from *Mibora*, a "name-change" introduced by Babington, back to *Chamagrostis* Borkh., recognised for fifty years. The great majority of genus name-changes made "by the Rules" has been due to the disinterment of generic names from post 1753 non-binominal works. Since this misapprehension led straight to the changes which the Congress was anxious to avoid, it is hoped that the next Congress will reconsider the matter.

(6) Rejection of all homonyms. Rejection would lead to many

name-changes, but would tend to fixity and be simple to work. I do not think all systematists realise how many names now in use are invalid if the retro-active principle is strictly employed. Accumulation of evidence as to the amount of change this proposition would cause would be useful, as the greater simplification would be a great advantage.

(7) Citation of misidentifications. There is no trouble if the type-method is used, as the original author of the name and type will be cited—within parentheses, if he did not make the combination. To say *Mærua nervosa* Oliver, "as to name only," is not a way out of the difficulty. Nomenclature (names) and plants (descriptions) cannot be completely separated. A "new combination" is necessary in such cases, see *Thrincia taraxacoides*, and *Digitaria Ischæmum* above, but I would prefer to cite merely the original author of the name, whom examples such as these show to be the *real* arbiter accepted by all workers.

(8) I agree, *e.g.*, *Corydalis* Medik. and *Corydalis* DC. are two distinct genera. Both cannot be *utique conservanda*.

Schinz and Thellung seem to take the position that the Vienna Code is as a law of the Medes and Persians. By Art. 3 this is a *reductio ad absurdum*. Those who are anxious to have an *accepted* International Code should consider Art. 3 and be prepared to reject anything which does not seem essential to the progress of the science. But progress necessitates change, and the sooner a necessary change is made the less disturbance is created. To regard the Code as final must involve its death.

A SPINELESS VARIETY OF GENISTA ANGLICA L.

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

When botanizing on the heathland at Boat of Garten, Inverness-shire, in the summer of 1916, I collected specimens of a form of *Genista anglica* which attracted my attention by its uniformly prostrate habit and almost spineless stems. In July of last year I met with the same form about a mile below the hotel in the Clova Valley, Forfarshire, where I saw many plants of it trailing among the dwarf heather on the banks and braes, and presenting a totally different aspect from the normal species.

The peculiarities of this prostrate form will perhaps be best indicated by first recalling some of the characteristic features of the typical plant. The stems of ordinary *G. anglica* are usually more or less erect, branching freely above and forming a dwarf bush. Each growing branch bears numerous alternate, oblong or lanceolate leaves, in the axils of which, except the lowest or occasionally all on very weak branches, are spreading, slender but sharp spines, 5–25 mm. long (generally equalling or exceeding the leaves), each clothed with several narrow leafy bracts, or rarely one or two smaller secondary spines below. Between the base of the spine and its supporting leaf a leaf-bud is frequently seen, especially on the stronger branches. In winter most of the leaves fall and the axillary spines, which persist and become hard and rigid, then give the plant its familiar prickly aspect. In early spring the leaf-buds under the spines begin to grow, those towards the apex of the branches generally developing into short flowering stems, densely leafy but spineless, while others grow into longer branches to continue the existence of the plant.

The Scotch spineless form, as I have seen it, is invariably prostrate, and shows no deviation towards the type. On an average, it is somewhat slenderer, but it produces stems as much as a foot long, and its leaves, which are very glaucous at Clova, are fully of normal size. The axillary spines are never fully developed, and are more often than not entirely absent. When present, they are suberect and scarcely half as long as the subtending leaves, being only 2–4 mm. in length. They are, indeed, little more than bristles, and are equalled or even exceeded by their bracts. Frequently a tuft of bracts alone appears in the axil without any spine whatever; and such spines as are formed are almost uniformly deciduous with the leaves, so that the older parts of the stems are spineless and naked. I can find no trace of the characteristic leaf-buds below any of the spines, and fresh branches are apparently developed from the occasional tufts of axillary bracts. In my experience a much smaller proportion of flowering branches is produced than in the type, and the number of flowers rarely exceeds six on any one branch. In one of my specimens, contrary to what might be expected, the leaves of a flowering branch show a few of the small bristle-like spines.

I can find no material of this peculiar form in the European collection at South Kensington, but three British examples there probably belong to it, viz.:—*A. Somerville*, Kincraig, Easterness, 1891; *E. S. Marshall*, Tomintoul, Banff, 1905; *A. Ley*, Rhosgoch Bog, Radnor, 1885. A slight degree of doubt attaches to these specimens, as they may possibly have been taken from exceptionally weak individual plants and not be really representative.

The only allusion to a plant of this kind that I can find in British Floras is in Babington's *Manual*, ed. 9, p. 87, where, in the specific diagnosis of *G. anglica*, the stem is stated to be "sometimes quite prostrate."

In Rouy & Foucaud's *Flore de France*, iv. p. 227 (1897), there is, under *G. anglica* L., a variety *β subinermis*, which shows the special features of the Scotch form. This variety is founded on *G. anglica* sub-var. *subinermis* Le Grand, Fl. Berry, éd. 2, p. 70 (1894), and is diagnosed "Tiges basses, plus ou moins couchées; épines faibles et rares, ou presque nulles.—Cher, marais tourbeux de Nançay (*Le Grand*)." I have been unable to consult the second edition of Le Grand's Flora for his original description, but that given by Rouy & Foucaud, so far as it goes, fits our plant exactly except for the habitat, which appears to be wetter than the Scotch stations that I have seen. The essential character of a prostrate habit in combination with practically spineless stems is evidently common to the Scotch and the French plants, and constitutes a remarkable variation from the ordinary form of the species. On this ground it seems reasonable to assume their taxonomic identity.

The status of this curious *Genista*, whether it should be held a sub-variety of *G. anglica* (as by Le Grand), a variety (as by Rouy & Foucaud), or merely a form is debateable. While its peculiarities are of a vegetative nature, it is not easy to attribute them to immediate environment. It occurs away from the type, is very distinct in appearance, and in some localities, at least, it seems quite constant. It is therefore proposed to follow Rouy & Foucaud and admit the plant to the British list as a variety, thus:—

Genista anglica L. Sp. Plant. 710 (1753).

var. *subinermis* Rouy & Fouc. Fl. Fr. iv. 227 (1897).

(= *G. anglica* subvar. *subinermis* Le Grand, Fl. Berry, éd. 2, 70 (1894).

Prostrate or nearly so, with weak trailing stems. Spines generally absent; when present, feeble, often equalled by the bracts, and not more than half as long as the leaves; very rarely persisting on the old stems. Foliage glaucous in the Clova form. Flowers fewer than in the type, rarely exceeding six on a branch.

Heaths at Boat of Garten, Inverness-shire; Clova, Forfarshire, and elsewhere in Scotland; probably also in other parts of the British Isles.

THE POLLINATION OF EARLY SPRING FLOWERS BY MOTHS.

By W. H. T. Tams, F.E.S.

Recently Mr. Miller Christy, when endeavouring to ascertain what insects pollinate the Primrose (*Primula vulgaris*)—a problem which has long presented something of a mystery,—came to the conclusion [see his paper in *Journ. Linn. Soc., Bot.* xlvi. (now in the press) (1922); also Mr. A. A. Dallmann in this Journal, lix. pp. 316–322, 337–345 (1921)] that the flowers of this species are pollinated usually by nocturnal Lepidoptera, as had been suggested by Darwin over sixty years ago, but never proved. Thereupon Mr. Christy inquired of several leading entomologists as to what particular species of moth are to be found on the wing regularly in this country during the early period of the year when the Primrose is in flower—that is, roughly, from the 15th of March to the 15th of May. As a result of this inquiry, Dr. R. C. L. Perkins, F.R.S., supplied him with such a list, comprising some 35 species of Geometridæ and Noctuidæ.

Having got this, Mr. Christy began to think his needs had been fully met. He soon found, however, that he had advanced very little in his quest, for it was still necessary to ascertain which (if any) of the species on the list had tongues of sufficient length to penetrate the deep corolla-tube of the Primrose (varying from 10–20 mm.) and thus reach the nectar at the bottom. Mr. Christy set to work immediately to ascertain what was known on this point, but he found at once that, though a certain amount of information as to the tongue-lengths of a few of the commoner humble-bees, bee-flies, and butterflies was given by Muller (*Fertilization of Flowers by Insects*, 1883) and Knuth (*Flower Pollination*, 1906-09) in their well-known works on flower-pollination, nothing was recorded as to the tongue-lengths of the night-flying moths likely to be concerned in the pollination of the Primrose—nor, indeed, of any other of our spring-flowering plants.

In this dilemma, Mr. Christy (having sought help, without success, from all the entomologists of his acquaintance, including Dr. Perkins) called at the Entomological Department of the British Museum to inquire whether anything was known as to the tongue-lengths of the various moths on Dr. Perkins's list. The matter was (as Mr. Christy pointed out) of some importance to botanists, agriculturists, horticulturists, and others, in connection with the pollination of flowers and the consequent production of good and fertile seed.

However, the information he sought was not available, inasmuch as the subject of tongue-lengths had been neglected almost entirely, both by insect-collectors and entomologists: the chief reason being that, to them, the subject was of little or no interest, inasmuch as the length of tongue (being in many species, at least, highly variable) could not be depended upon as a specific character. It was then suggested to me that it might be of use if I measured the tongue-lengths of the various moths on Dr. Perkins's list—and this I did.

The task might have been easy if fresh specimens had been available to work on ; but it was by no means easy in view of the fact that I was obliged to make use of the old duplicate specimens in the Museum cabinets. It may be useful to others desiring to make similar investigations to explain the method adopted :—The heads of the moths were soaked for 24 hours in KOH (10 per cent.). In some cases the proboscis unrolled as a result of the softening, in the other cases it was unnecessary to unroll it. A piece of celluloid, marked with millimetres, was then placed in the bottom of an inverted watch-glass containing alcohol and, so far as possible, the proboscis straightened out along the scale. It was thus possible to estimate its length approximately, allowing for the fact that it was not possible absolutely to straighten the proboscis.

The results are set forth in the Table (p. 205), which shows also the months during which each species of insect flies and the chief flowers it is known to visit (this information is taken mainly from Mr. A. G. Scorer's *Entomologist's Log-Book*, 1912).

When these results were submitted to Mr. Christy, he found that four only of the species examined (namely, *Calocampa exoleta*, *C. vetusta*, *Cucullia verbasci*, and *Phlogophora meticulosa*) had tongues long enough to render them of interest in connection with his investigations, but that those four were of special interest, inasmuch as all of them are (like the Primrose) abundant throughout the whole of the British Isles and one of them (*C. verbasci*) is the

Name of Species.	Flight months.	Length of proboscis.	Flowers visited.
Selenia bilunaria Esp. (S. illunaria Hbn.)	4–5	4 mm.	......
Pachys strataria Hufn. (A. prodromaria S. & D.)	3–4	(none)	......
Hibernia leucophæaria (S. & D.)	4–5	1 mm.	......
Anisopteryx æscularia (S. & D.)	3–4	(none)	......
Anticlea badiata Hübn.	3–4	6 mm.	......
Xanthorhoe fluctuata L.	5–6	5 mm.	......
Triphosa dubitata L.	8–5 (hibernates)	7·5 mm.	Ivy, Heather, Ragwort, and Sallow.
Polyploca flavicornis L.	3–4	4·5 mm.	Sallow.
Barathra brassicæ L.	6–7	10 mm.	......
Tæniocampa instabilis Esp.	2–4	5·5 mm.	Sallow.
Tæniocampa gothica L.	3–4	5 mm.	Sallow.
Panolis flammea Hübn.	3–5	6·5 mm.	......
Orrhodia spadicea Hw.	9–4	7·5 mm.	Ivy and Sallow.
Scopelosoma satellitia L.	9–3	7 mm.	Ivy.
Calocampa exoleta L.	9–5	12 mm. (about)	Ivy.
Calocampa vetusta Hübn.	9–4	12 mm.	Ivy.
Hypena rostralis L.	8–9	5 mm.	......
Gonodontis bidentata Cl.	4–6	7·5 mm.	......
Rumia luteolata L.	4–6	5·5 mm.	......
Hemerophila abruptaria Thnb.	4–5	7·5 mm.	......
Tephrosia bistortata Gr.	3 & 8	6·5 mm.	Sallow and Barberry.
Asthena candidata S. & D.	5–7	3·5 mm.	......
Cabera exanthemata Sc.	5–8	6 mm. (about)	......
Noctua plecta L.	5–6	5·5 mm.	......
Phlogophora meticulosa L.	5–6	11 mm. (about)	Pinky.
Cucullia verbasci L.	4–5	20 mm. (about)	......
Cucullia scrophulariæ Cap.	5	20 mm. (about)	......

Some of the insects named come abroad again later in the year.

only species of moth which has ever been observed to visit any Primrose.

Mr. Christy, in his paper above mentioned, made such use as he thought necessary of these results. Having done that, he suggested that, as those results were entirely novel in their way and were likely to be of interest to other botanists studying the pollination of our early spring-flowering plants other than the Primrose, it would be well if they were published. The present paper is the outcome. It may, perhaps, induce other entomologists to undertake further work on the same lines.

THE DISTRIBUTION OF FERNS.

At the meeting of the Linnean Society on June 1st, Prof. A. C. Seward delivered the third Hooker Lecture, entitled "A Study in Contrasts: The Past and Present Distribution of certain Ferns," illustrated by lantern-slides.

The lecturer stated that a botanist, especially one whose interest is not limited by the world of to-day, feels a certain kinship with the archæologist who seeks information on the life and nature of the people who fashioned and used the material discovered in the course of excavation. "For the vegetable kingdom also," as Asa Gray said, "there is a veritable archæology." The discovery of a deposit rich in fossil plants throws a light interesting to the systematist or to the student of plant-geography, but our aim is to see in imagination the plants of other days as though they still lived, and the mechanism of the organism and something of the conditions under which it grew. The object of this lecture is to give examples of the application of palæobotanical enquiry to problems of plant-geography; to follow into the ages which man never knew, the history of some families of Ferns; to trace their wanderings and to discover their original home. The data gathered from existing plants must be supplemented by records of the rocks, records as Darwin said, of a history imperfectly kept, and of this chapter only here and there a few lines.

Once established, Ferns have a power of spreading by vegetative means, and the lightness and resistant nature of their spores enable them to play a successful rôle as colonisers and emigrants to new countries. When Treub visited Krakatau three years after its violent volcanic eruption, he found eleven species of Ferns as pioneers of the new flora. As a class Ferns are cosmopolitan, though certain of them are strictly limited in their range and highly sensitive to the influence of physical or climatic conditions; the Bracken, *Cystopteris fragilis* and *Polystichum Lonchitis* were adduced as examples.

The following families were then passed in review: Gleicheniaceæ, Matonineæ, Dipteridineæ, Schizæcaceæ, and Marattiaceæ; the lecturer's object being to bring together some of the facts already published than to attempt to add much that is new. Palæozoic forms were excluded, partly because of the difficulty of precise statement on their affinity, but chiefly because it is not until the Mesozoic era that existing types became clearly defined. Twice only had he collected fronds of *Gleichenia*; on the edge of a Malayan forest where it luxuriated under a tropical climate, and from sediments deposited in a delta or inland lake on the submerged fringe of Cretaceous Greenland. The apparent identity of the living and the dead gives reality to Carpenter's aphorism: "We are still living in the Cretaceous period." In one of his letters, Hooker expresses the opinion that "Geology gives no evidence of a progression in plants," and adds: "I do not say that this is a proof of there *never* having been a progression—that is quite a different matter—but the fact that there is less structural difference between the recognizable representatives of Conifers, Cycadeæ, Lycopodiaceæ, etc., and Dicotyledons of the chalk and those of the present day, than between the animals of those periods and their living representatives, appears to me a very remarkable fact." The unfolding of plant-life viewed through the distorting mists over the successive stages of earth-history, takes the form of a series of outbursts of energy; the records of one period tell us nothing, while those of the next reveal a fresh type of vegetation, or it may be, a single genus in possession of widely-scattered regions of the world. We seem unable to do more than observe the completed results; the beginnings are hidden from us, and the farther we penetrate into the past the farther into the distance recedes the object of our search.

There was no intention to connect the Mesozoic records with the Palæozoic; between the two there appears to be a wide gulf. The difficulty of making direct contact between the age of Pteridosperms and the succeeding age of Ferns, may be largely due to the difficulty of determining whether a Palæozoic fern-like frond should be classed as a Pteridosperm or a true Fern; but, on the other hand, the relationship between the two ages may not be so close as it is usual to assume. In the latter part of the Triassic period, we seem to pass with remarkable suddenness to a new phase of plant evolution; the old order gives place to the new; one cycle is completed and another has begun. This transformation in the plant world may be intimately associated with some far-reaching event in the physical history of the earth's crust. It may well be that crustal foldings in the latter part of the Palæozoic era, and the prevalence of desert or semi-arid conditions over wide regions during a part of the Triassic period, were factors which influenced the progress and direction of plant development.

As continental areas shifted and land and sea changed places it needs no geological knowledge to grasp the fact that the rocks accessible to investigation cannot give us all the clues we seek; parts of old continents remain; others are beyond our reach.

GEORGE ALFRED HOLT

(1852–1921).

On December 19th, 1921, died at Sale, Cheshire, George Alfred Holt, a man who would probably have made his name as a distinguished cryptogamic botanist, if his eyesight had not suddenly failed him.

Born in Douglas, Isle of Man, on May 18, 1852, he served his apprenticeship to a chemist in Douglas, and came to Manchester about the year 1880, entering into partnership with another chemist. Being fond of botany, he soon got into touch with the leading botanists of the neighbourhood; he was a constant companion of

John Whitehead, the working-man bryologist, and added many new records of rare mosses and hepatics for Lancashire, Cheshire, and Derbyshire, evidences of which are seen in the "List of Mosses and Hepaticæ" contributed by him to the *Flora of Ashton under-Lyne and District* (compiled by the Ashton-under-Lyne Linnean Botanical Society: 1888). He also contributed sets of rare Hepaticæ to Carrington and Pearson's "Hepaticæ Britannicæ Exsiccatæ," the most remarkable of which was *Cephalozia fluitans* var. *gigantea*.

Being a bachelor with ample leisure, Holt made frequent excursions into North Wales, the Lake District, and the Craven District of Yorkshire, and his discoveries were recorded in the Proceedings of the now defunct Manchester Cryptogamic Society. In 1883 he discovered in Ravensdale, Derbyshire, *Thamnium angustifolium*, which he published in this Journal for 1886, p. 65, with a plate. In 1885 he visited Killarney with the late S. A. Stewart, and made extensive collections of mosses and hepatics; the latter he sent to Spruce, who, in addition to many rare species, recognized two new hepatics (*Radula Holtii* and *Lejeunea Holtii*), which were described by Spruce (with plate) in this Journal for 1887 (pp. 33, 209).

About this time, fearing the loss of his eyesight, Holt suddenly gave up the study of mosses and hepatics, to the regret of his friends, and devoted his time to grasses and sedges; several records for these plants are given on his authority in Lord de Tabley's *Flora of Cheshire*.

In 1882 Holt compiled "A List of the Mosses of the Isle of Man," which was published in the *Transactions of the Isle of Man Natural History and Antiquarian Society*, i. Douglas, 1888, pp. 62–84; his "Additions to Manx Moss List: April 1898" appeared in *Yn Lioar Manninagh*, iii. pp. 402–4 (Douglas, 1898). To vol. i. of the same Journal (pp. 10 & 19) he contributed critical notes on *Plagiothecium Borrerianum* and *Mnium stellare* in 1882; also a list of "Manx Grasses, July 1901," to vol. iv. (pp. 20, 58–60). His collection of phanerogams and mosses is in the possession of the Isle of Man Natural History Society; his other cryptogams he presented to the Manchester Museum, where they are recorded as the "Holt Collection."

I had the pleasure of his friendly companionship in many a ramble, and felt keenly his sudden decision to give up microscopic study; but in this he was justified, for he became blind some time before he died. Of a quiet, shy, and retiring disposition, unknown except to a very few, thus passed away one whose name will ever be associated with two of the rarest and most beautiful species of native hepaticæ.

I am indebted for some of my information to Mr. H. de W. Marriott, who has been his constant friend during the last few years, and to whom I tender my grateful thanks.

William Henry Pearson.

SHORT NOTES.

The Abundance of Blossom this Year. It may be well to put briefly on record that the late spring and early summer of 1922 were remarkable for the extraordinarily profuse blossoming of nearly all plants. Not only have practically all flowering trees and shrubs shown an excessive amount of blossom in the districts frequented by me and by some of my friends, but the wealth of flowers on herbaceous plants of ordinary stature and on rock-plants has also been noticeable. A friend in Cornwall writes "I don't think I have ever seen the common dwarf flowers of the rough downs of the cliffs in such abundance, making sheets of colour—very lovely."

Certain trees in Clifton which rarely flower, or do so to a very limited extent, e. g., *Paulownia imperialis* (one of the few trees of the family Scrophulariaceæ) has been a beautiful sight. Yesterday in the gardens of Mr. Hiatt C. Baker at Almondsbury, Glos., it was noticeable that on account of the drought last year and the hot weather of May and June 1922 a number of Mediterranean species with foliage more or less felted with grey tomentum have remained their natural colour, whereas usually in this country, and particularly in Ireland, the whitish-grey foliage becomes greener. Such plants as *Lavatera Olbia* and the beautiful *Convolvulus althæoides* may be cited as examples. The latter is less green than often in Provence.

Nor have I ever observed so much Hawthorn turning so marked a pink just before the petals drop—as pink as the last-named Convolvulus or even a deeper rose. It would appear that this coloration is more frequent in the lowlands, at least in the Bristol district. Last autumn I observed that the second flowering of the Dog Rose was also chiefly in hedges of the low-lying pastures not far from the coast.—H. Stuart Thompson.

[The astonishing display of Hawthorn blossoms seems to have attracted general attention, but can nowhere have been more remarkable than in the counties of Dublin, Wicklow, and Westmeath, which I visited at the end of May and beginning of June; in the last, in the Mullingar district, the branches were sometimes so laden with blossom that no leaves were perceptible, and the effect in some places was that of a fall of snow.—Ed. Journ. Bot.]

Vicia bithynica.—In drying a series of this Vetch for distribution, I noticed the day after they were put in the press that many tendrils had elongated and attached themselves to other specimens on the same sheet. Even making allowance for possible slightly closer proximity through pressure, it is an interesting physiological fact.

Last year, owing to the drought, I could not find a sign of any portion of this annual Vetch in one of its well-known localities in N. Somerset, where in June 1920 the grassy bank was partly clothed with hundreds of fine plants in flower and fruit. This June the Vetch is in fair quantity there, though rather shorter than usual. The seeds of 1920 had failed to germinate last year. White, in his *Flora of Bristol*, points out that this rare species is "remarkably uncertain in quantity from year to year"; and that on the high bushy bank referred to above it was plentifully in pod in August 1886, "with many ripe seeds"; and two months later, on October 5th, the late David Fry reported "a fresh crop of plants in flower." Surely Withering, Smith, Lindley, J. D. Hooker (*Students' Flora*), and other authors were incorrect in calling this species perennial? I concur with Bentham and the French botanists in regarding it as annual, or possibly it may sometimes be biennial. "July and August" of the earlier English authors has suitably been corrected to May and June as its usual time of flowering in this country.—H. S. Thompson.

Alchemilla filicaulis Buser (p. 165). The explanation of Mr. Ley's locality has been kindly sent me by Miss Armitage. Honddu valley (the Llanthony valley: Monmouthshire) was for botanical purposes included in the Flora of Herefordshire (District 14). Daren (=Taren) means a rocky cliff in the valley side.—A. J. Wilmott.

REVIEW.

A Review of the New Species of Plants proposed by N. L. Burman in his Flora Indica. By Elmer D. Merrill, *Director and Botanist, Bureau of Science, Manila.* Separate from *The Philippine Journal of Science*, vol. xix. no. 3, September 1921. Manila, Bureau of Printing.

In this Review, Mr. Merrill has increased the debt of gratitude which is due to him from all who are interested in the history of Botany. Since 1905, when he published his first account of the species described in Blanco's *Flora de Filipinos* (1837–1846), of which his *Species Blancoanæ* (1918) may be considered as a second and greatly enlarged edition, he has, in the intervals of his investigations of the present Philippine flora, devoted himself to the elucidation of the work of earlier authors. His *Interpretation of Rumphius's Herbarium Amboinense* (1917) is noticed at length in this Journal for 1918, p. 362–5; and his *Commentary on Loureiro's Flora Cochinchinensis*, of which he has generously supplied the principal herbaria with copies in type-script, is an invaluable comment on that work. Now, in the painstaking and accurate way which has rendered his publications so valuable, he reviews the species proposed by Burman in his *Flora Indica* (1768), and in the course of his work restores many names for which Burman's claims to recognition have hitherto been ignored or disregarded.

As a result of his careful investigations, Mr. Merrill has been "impressed with the fact that many European botanists do not seem fully to realize the value and utility of types when interpreting insufficiently described species of the early authors. In many cases," he continues, "a few hours' journey, or in others a little correspondence, would make available the data which would definitely fix the status of a species. Instead of this course, however, the unsatisfactory but easy method seems to have been pursued of leaving the unknown ones under 'species incognitæ,' 'species valde dubiæ,' 'species excludendæ,' or other equally unsatisfactory categories." This criticism applies with especial force to the attitude adopted for many years by Kew towards the British Museum. Although so easy of access, the National Herbarium was only consulted by Bentham and Hooker in special cases; the former, as has more than once been pointed out, when engaged on his *Flora Australiensis*, to a large extent ignored the collections and MSS. of Banks and Solander, and in the preparation of the *Genera Plantarum* the old material was insufficiently examined.

In his introduction Mr. Merrill calls attention to the fact that "no botanist with a wide knowledge of the Indo-Malayan flora seems to have made a critical examination of the *Flora Indica* or of Burman's herbarium [now at Geneva], with a view of correlating his work with that of other authors." The actual types, however, "in many cases have been examined by subsequent authors who were engaged in monographic work," and their conclusions have been included in the present paper, which, however, is based on the published *Flora*, examination of the specimens being impracticable. In the book, about 1305 species are included, of which about 241 are proposed as new. "Of the species included more than 500 are definitely indicated as from India; that is, mostly from what is now known as India proper: from Java about 115 species are enumerated; from Ceylon about 90; from China about 50; from Japan about 15; from Persia about 20."

As a necessary consequence of Mr. Merrill's careful examination of the work, many new combinations have been created. This has in several instances led to the supersession of generally accepted names —e. g., *Polypodium Scolopendrium* Burm. f. (1768) replaces *P. phymatodes* L. (1771); *Dendrobium caninum* (Burm. f.), *D. crumenatum* Sw. (1799); *Indigofera Colutea* (Burm. f.), *I. viscosa* Lam. (1789). Such alterations, although inevitable if the Laws be followed, may be regretted, especially when a name so familiar as *Sandoricum indicum* Cav. (1787) has to give away to *S. koetjape* on account of its identity with *Melia koetjape* Burm. f.—the fact that "Koetjape is the common Javanese name" hardly reconciles one to the change. It is, however, satisfactory that the changes have not been wantonly made, and for this Mr. Merrill's name is sufficient guarantee. His note on the transference of *Alpinia malaccensis* Roscoe (*Maranta malaccensis* Burm. f.) to *Languas* Koenig may be cited as an example of his method:—

"Burman's binomial typifies *Alpinia malaccensis* Rosc., a species that has apparently been misinterpreted by modern authors; see Valeton in Merr. Interpret. Herb. Amb. (1917) 155. The type of the genus *Alpinia*, as described by Linnæus, is *Alpinia racemosa*, of Tropical America, which currently appears in botanical literature as *Renealmia racemosa* (L.) A. Rich. This is the only species of *Alpinia* that was known to Linnæus; hence it must be the generic type. The proper application of the generic name *Alpinia* is to the numerous American species now known as *Renealmia*, the latter generic name now falling as a synonym. Among the numerous synonyms of *Alpinia* auct., non Linn., *Languas* is the earliest available one for the numerous Old World species currently but erroneously referred to *Alpinia*."

Similar notes, which suggest ample opportunity for those who specialise in new combinations, are scattered throughout the paper: *Telosma cordata* (*Asclepias cordata* Burm. f.) replaces *Pergularia odoratissima* Sm.—"*Pergularia* of Linnæus is the proper name for the African species long placed in *Dæmia*." A number of Burman's names taken up here had already been dealt with by Mr. Merrill in his interesting notes on the Flora of Manila (Philipp. Journ. Sci. (Bot.) vii. 227–251).

The figure (which Mr. Merrill has not seen) cited by Burman from Sloane's Hist. Jamaicensis as representing his *Trichomanes nivea*—"a species of unknown status"—is cited by Jenman in his paper "On the Jamaican Ferns of Sloane's Herbarium" (Journ. Bot. 1886, 35) as representing a variety (*subnuda*) of *Notholæna trichomanoides* R. Br.

It may be noted that the copy of the *Flora Indica* in the Department of Botany, which was bought from a bookseller in 1882, was at one time the property of Sir William Hooker; it contains numerous marginal notes and drawings from his pen and pencil.

JAMES BRITTEN.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on June 15, Dr. Rendle showed two seedlings of Horse Chestnut from which the terminal bud had been removed by cutting through the epicotyledonary stem. In each case a number of minute buds appeared on the cut surface after the healing of the wound; the buds were arranged round the edge of the section corresponding with the position of the cambium-layer in the stem. A new shoot was also produced in the axil of each of the cotyledons. These new shoots resembled the shoot which is normally developed from the plumule, except that the first pair of foliage leaves was produced at the second node, while a pair of small scales was formed at the first node just above the level of the soil. The speaker referred to the seedling shown by him at a recent meeting of the Society in which the plumule had been replaced by one new symmetrically developed terminal bud.

At the same meeting Mr. T. A. Sprague exhibited plants and illustrations concerning his identification of *Sison Ammi* L., an Umbelliferous plant published by Linnæus in the first edition of the *Species Plantarum* in 1753 which has hitherto been a puzzle to botanists. The elder Jacquin in 1773 identified it with a species now known as *Apium leptophyllum*; and Caruel in 1889 identified it with *Ptychotis ammoides*. But examination of the type-specimens in the

Linnean Herbarium and the British Museum shows that it is *Carum copticum*, a well-known medicinal plant which yields the Ajowan seeds and Ajowan oil of commerce, from which thymol is obtained. Linnæus gave it the trivial name *Ammi* because he believed it to be the source of the "seeds of the true Ammi" of pharmacy: "Ammios veri semina." The history of the drug Ammi goes back nearly 2000 years. Dioscorides, who lived in the first century of the Christian era, described it as having a minute seed with the flavour of marjoram. The illustration in the *Codex Vindobonensis*, which dates from the sixth century, represents *Ammi Visnaga*. The Ammi depicted by Fuchsius in the sixteenth century was *Ammi majus*; the plant figured by Matthiolus about the same time was *Ptychotis ammoides*. But when we turn to the beautiful plates of Umbelliferæ published by Rivinus at the end of the seventeeth century we find that the officinal Ammi of that date was *Carum copticum*. This is confirmed by the specimen of Ammi in the herbarium of Ferro (at the Natural History Museum), a Venetian apothecary who died in 1674. The geographical source of the drug also suggests that the true Ammi was *Carum copticum*. The best quality of Ammi was imported from Alexandria, but was actually grown in Arabia, where *Carum copticum* is still cultivated. One point remains to be cleared up: the native country of *Carum copticum*. It is or has been cultivated in Egypt, Abyssinia, Arabia, Palestine, Mesopotamia, Persia, Afghanistan, Baluchistan, India, and the Malay Archipelago; but is nowhere certainly known in a wild state.

On the same occasion Mr. Joseph Burtt-Davy gave a summary of his paper, "A Revision of the South African Species of *Dianthus*." He said that the genus *Dianthus*, as represented in South Africa, has long been troublesome to systematists. "The characters on which we have to depend for specific delimitation, in this genus, are less amenable to precise definition than is the case in many other genera. To indicate the difficulty which has been experienced by authors in dealing with them, I need only point out that no fewer than ten names have been assigned by botanists at various times to what is obviously one and the same species, seven of the ten being due to wrong identifications with the descriptions of other species. On the other hand, the name *D. scaber* Thunb. has been assigned at various times to twelve distinct species, owing to a misconception of the plant described by Thunberg. By the courtesy of Prof. Juel of Uppsala (through the Director of the Royal Botanic Gardens, Kew), I have now had the opportunity of studying the types of Thunberg's four South African species, and thus to clear up the confusion. The Thunberg specimen of *D. incurvus* Thunb. does not match any South African material at Kew or the British Museum, nor does it answer the description in Thunberg's *Flora Capensis*. Thunberg himself identifies it on the sheet with *D. albens* Ait., but the specimen does not agree with the type of *D. albens* in the British Museum. We can only conclude, therefore, that the Thunberg specimen is not the type from which he drew up his description. In the *Flora Capensis* Sonder recognized nine species of *Dianthus*. Of these, *D. holopetalus* proves inseparable from *D. incurvus* Thunb. and *D. pectinatus* E. Mey. inseparable from *D. prostratus* Jacq., thus leaving seven valid species in the *Flora Capensis*. To these must be added four species:—*D. micropetalus* Ser. and *D. Burchellii* Ser. (1824) sunk by Sonder respectively under *D. scaber* Thunb. and *D. incurvus* Thunb., *D. mooiensis* Williams (1889), and *D. numaensis* Schinz (1897)."

The *Bulletin de la Société de Genève* (xii. nos. 6–9; 1920) contains a continuation of R. Chodat's botanical results obtained on the Swiss expedition to Paraguay; this eleventh section deals with *Boraginaceæ*: Madame M. Barbey-Gampert gives an "Esquisse de la flore des Picos de Europa" in which several new species and varieties are described: Mdlle. V. Grouitch has "Contribution à l'étude de la flore bactérienne du Lac de Genève": H. Lindenbein describes "Les Protophycées (*Glœocapsomorpha prisca* Zalessky) une flore marine du Silurien inférieur de la Baltique" in which he disputes Zalessky's conclusions that *Glœocapsomorpha* is a member of the Cyanophyceæ but regards it as representing a new group, *Protophyceæ*, which shows analogies both with *Cyanophyceæ* and *Rhodophyceæ*: R. Chodat writes on "Algues de la région du Grand St.-Bernard" in which four new genera and several new species are diagnosed: Mme. R. J. Paley on "Le périplasmodium dans les anthères de l'*Arum maculatum* L.": L. Rehfous "Sur la périodicité des bourgeons non protégés" and A. Lendner adds a paper "A propos de l'hétérothallisme de *Coprinus*," a subject on which there seems to be at present no lack of workers.

The papers in vol. xii. (1921) of the same periodical are "Étude sur les réactions chimiques pendant le gonflement de l'amidon dans l'eau chaude" by W. Lepeschkin, a series of eight notes by R. Chodat forming "Matériaux pour l'histoire des Algues de la Suisse"; "Sur la flore vasculaire des environs de Modane, de Bardonnèche et de Suze (massif du Cenis)" by G. Beauvard; "Contribution Phytogéographique sur le versant méridional des Alpes Pennines" by H. Guyot; "Le problème du *Leucobryum candidum*" by I. Thériot; "Recherches sur les organes du bord des jeunes feuilles" by W. Lepeschkin; "Phanerogamarum Novitates" by G. Beauvard, who also contributes a "Notice sur l'Herbier du Docteur Louis Bouvier."

The *Times* of June 15 contains a long notice, with portrait, of the late Major Hesketh Vernon Hesketh Prichard, D.S.O., who was born in India in November 1876, and died at Gorhambury, St. Albans, on June 14. A notable traveller, a big-game hunter, an excellent cricketer, a keen naturalist, and author, in collaboration with his mother, of some readable romantic novels, his most important work was done as a teacher of marksmanship in the war, an account of which he gave in his book *Sniping in France* (1920). His claim to record in these pages rests upon his collections in Patagonia, presented to the National Herbarium, a list of which is appended to his *Through* *the Heart of Patagonia* (1902). This was preliminary to a more complete enumeration by Dr. Rendle, wherein will be found descriptions of several interesting new species, many of them bearing the collector's name—e. g., *Anarthrophyllum Prichardi*,—appeared in this Journal for 1904 (pp. 321–334, 367–378). Although not a botanist, Prichard was a keen observer of vegetation, and his notes supply much interesting information.

The *Journal of the Arnold Arboretum*, vol. iii. no. 1, contains new species and varieties of *Cratægus*, by C. S. Sargent, and a note on the Hobart Botanical Gardens, by E. H. Wilson; the bulk of the number is occupied by a continuation of A. Rehder's "new species, varieties, and combinations." The number, which has only lately reached us, bears date "July, 1921"; a reference to "January 31, 1922," on an inner page of the wrapper, indicates, however, that it cannot have been issued before that date; in view of the fact that it contains many new species it is to be regretted that the date of actual publication is not given.

In the *Bulletin de la Société Mycologique de France* (xxxvii. no. 4) B. Peyronel writes on "Nouveaux cas de rapports mycorhiziques entre Phanérogames et Basidiomycètes"; the paper records ten species of Basidiomycetes associated with *Larix decidua*, six with *Betula alba*, five with *Populus tremula*, nine with *Fagus sylvatica*, and seven with *Corylus Avellana*; but until a full account of these results is given they cannot be accepted. F. Bataille's "Flore analytique et descriptive des Tubéroïdées de l'Europe et de l'Afrique du Nord" is of the type associated with the name of this author.

Among the "birthday honours" we note the name of Sir F. W. Keeble, Sherardian Professor of Botany at Oxford, of whom an appreciation with portrait appears in the issue for June 10 of the *Gardeners' Chronicle*, with which journal Sir Frederick has been for many years associated. The *Chronicle* for June 17 contains a detailed appreciation of Sir Frederick Moore, to whose retirement from the Royal Botanic Garden, Glasnevin, Dublin, we have already alluded; a tribute to Sir Frederick from Mr. W. Watson, of Kew, with portrait, appeared in the same journal for May 20.

The *Times* for May 31st gives an account of a proposed attempt to be made by the U.S.A. Bureau of Plant Industry to test whether the æcidiospores of *Puccinia graminis* are carried to the wheat-growing areas by high air-currents. Airmen are to open "aerial germ-traps" at specified heights which will collect and hermetically seal a certain amount of the upper air-stream. The black stem-rust is reckoned to be responsible for the yearly destruction of 200,000 bushels of wheat in America.

The well-known *Zoologisch-botanische Gesellschaft* of Vienna is being compelled to sell parts of its herbarium in order to discharge financial liabilities. It desires to find a purchaser of its collection of European mosses, consisting of about 12,000 specimens of more than

1000 species, collected by well-known bryologists. The price asked is £100. Particulars may be had from the General Secretary, Dr. Hans Neumayer (Wien, III./3, Mechelgasse 2).

Among the series of picture-cards issued by the Trustees for sale at the Natural History Museum, are three sets illustrating exhibits in the Botanical Gallery. "Remarkable Plant Structures" (5 cards) depicts five of the more striking exhibits, such as the Vegetable Sheep, the Mass of Diatoms from Australia, a "Witches Broom" and others; "Germination of Wheat" (5 cards) reproduces a beautiful series of models; and "Dispersal of Fruits and Seeds" (20 cards), represents a selection from the exhibit dealing with this subject. The reproductions are by photography and, especially the series on "Germination" and "Dispersal," should be useful to school-teachers and students of botany. The cost is sixpence each for the two sets of five which are in monotone and half-a-crown for the larger set, five of which are in colour. Cards may also be bought singly.

Mycologia, xiv. no. 3, contains "Reliquiæ Farlowianæ" by R. Thaxter, "New or Noteworthy Rusts on Carduaceæ" by H. S. Jackson, "Dark-spored Agarics (*Gomphidius* and *Stropharia*)" by W. A. Murrill, and "The Method of Cleavage in the Sporangia of certain Fungi" by C. A. Schwarze.

The Journal of Indian Botany for May contains "Notes on Indian Plant Teratology," by F. Hallberg; a continuation of P. F. Fyson's monograph of Indian Eriocaulons, with plates; and notes on Bengal *Polyporaceæ*, by S. R. Bose.

The recently issued part of the *Flore générale de l'Indo-Chine* (t. vii. fasc. 3) contains the concluding portion of the *Cyperaceæ*, by E. G. Camus, and the first instalment of the *Gramineæ*, by M. Camus and his daughter.

The *New Phytologist* (xxi. no. 3; June 1) contains a continuation of Walter Stiles's papers on "Permeability" and of the "Physiological Studies in Plant Anatomy" by J. H. Priestley and Edith E. North.

Messrs. Gurney and Jackson have published a new edition (the tenth) of Babington's *Manual*, "with emended nomenclature and an Appendix by A. J. Wilmott," of which a notice will appear in due course.

The *Botanical Magazine* of Tokyo for March contains a paper on new Japanese Violets by Takenoshiu Nakai, in which nineteen new species are described.

To the already long list of those whose loss we have recently had to deplore must be added the name of Dr. William Carruthers, who died at Norwood on June 2, in his 93rd year. A notice will follow in due course.

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BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers

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WEST INDIAN HEPATICÆ.

By William Henry Pearson, M.Sc., A.L.S.

A collection of *Hepaticæ* made in the West Indies by Miss Eleonora Armitage in 1896 was sent to F. Stephani and named by him some years ago. It has been presented by Miss Armitage to the Manchester Museum and I have been asked to make a list of the species. Taking advantage of the opportunity, I have examined the specimens and compared them with those in the Museum, and have added my notes on the same and descriptions of new species.

I follow Dr. Spruce's arrangement as published by Mr. A. Gepp in "Hepaticæ Elliottianæ" (Journ. Linn. Soc. xxx. 331; 1894) except that I raise the subgenera of *Lejeuneæ* to the rank of genera, in accordance with recent writers. In my descriptions of size of stems and cells I use the relative terms suggested by Dr. Spruce in the preface to my *Hepaticæ of the British Isles* (1902).

During the preparation of the paper I have drawn twenty-three plates of figures. On account of the expense these cannot be published; meanwhile they are deposited with the specimens in the Manchester Museum.

Tribus I. Jubuleæ.

Odontolejeunea lunulata (Web.) Spruce. *Hab.* On leaf, Mountain Lake, Dominica, Jan. 1896.

Obs. The specimens in Spruce's Hep. Am. et And. Exsicc. in the Manchester Museum are male plants, with very long amentula, 30 to 36 pairs of bracts; bracts dentate, bracteoles denticulate. Stephani says (Sp. Hep. v. 178; 1912) "amentula small, 6 pairs of bracts"; the underleaves are entire, except at their base where they are coarsely dentate, some are sagittate; Stephani says "everywhere regularly denticulate"; Spruce says (Hep. Am. et And. p. 145; 1884) "wings of the perianth wide"; Stephani (*op. cit.*) has "wings narrow," I find them wide.

Odontolejunea Armitagei, n. sp. Monoicous. Medium size; pale brown; dichotomous. *Leaves* subimbricate, patent-divergent, semi-ovate, antical margin spinulose-serrate; postical with 2–4 teeth (2 very large); lobule subquadrate. *Underleaves* 3 to 4 times smaller than the leaves, rotund, entire. *Bracts* oblong-ovate; bracteole oval-spathulate. *Perianth* pyriform, tricarinate, upper portion winged.

Growing on the upper surface of living leaves, to which the plant is attached by the peculiar rosette bunches of radicles—as Dr. Spruce says "like a closely rayed star," or, to use a very homely illustration, a chimney sweeper's brush; pale to olive brown in colour; medium size; when wet and detached from the leaves, flaccid and delicate. Stems innovantly dichotomous, the innovant branch arising, on one side only, from below the perianth. Leaves patent-divergent (70°) to almost horizontal (90°), convex, subimbricate; lobe semi-ovate to oval, apex rounded or subacute, with 2 or 3 teeth; antical margin spinulose-serrate, 15 to 20 teeth, some hamate; postical margin with usually 2 large teeth, one or two small teeth frequently added; cells medium size, quadrate; walls somewhat thick; trigones wanting or very small; lobule decurrent, oblong-quadrate, 5 to 6 times smaller than the lobe, tumid at the base, keel rounded, complanate on the upper portion or involute, free margin with 2 or 3 one-celled papillæ or entire. Underleaves 3 to 4 times smaller than the leaves, 2 to 3 times broader than the stem, rotund or broadly to longly rotund, sometimes with a narrow base and slightly winged, margin entire or rarely near the base sparingly and minutely denticulate. Inflorescence monoicous; ♀ on stem or innovant branches. Bracts smaller than the perianth, oblong-oval, margin serrate, lobule minute; bracteole oval-spathulate, concave, sometimes slightly retuse, margin entire. Perianth pyriform, winged to about the middle, wings narrow, spinulose-dentate, antical side plane, postical with a prominent obtuse keel, entire or with 1 to 3 teeth near the apex; slightly rostellate, apex spinulose-dentate, teeth 3 to 4 cells long.

Andrœcia numerous on stem or branches, amentula very slender; ♂ bracts 6 to 14 pairs, oval, entire, lobule two-thirds smaller, entire; bracteole obovate-cuneate.

Dimensions. Stems 1 to 1½ inch long, with leaves 2·5 mm. to 3 mm. wide; leaves 1·5 mm. × ·75 mm., 1·25 × ·75 mm.; lobule ·35 × ·25 mm., ·3 × ·25 mm., ·3 mm. × ·2 mm.; cells ·03 mm.; underleaves ·35 mm. × ·35 mm., ·4 mm. × ·3 mm.; bracts ·8 mm. × ·5 mm.; bracteole ·75 mm. × ·55 mm.; perianth 1 mm. × ·6 mm. (middle); teeth at apex ·2 mm.; capsule ·4 mm. × ·375 mm.; male catkin ·75 mm. long × ·15 mm. broad; male bracts ·275 mm. × ·175 mm.: male bracteole ·125 mm. × ·1 mm.

Hab. Mountain Lake, Dominica, Jan. 1896.

Obs. Stephani detached from a leaf and put in a separate packet stems of this species, and named it *Lejeunea lunulata* Nees. Another specimen from a palm leaf, similarly detached, he named it *L. Sieberiana* G. Both specimens are the same and monoicous.

When he examined this collection Stephani was of opinion that *L. Sieberiana* was found in the West Indies; but from his latest contribution to the subject (v. 173) he had evidently changed his views, as he only records *L. Sieberiana* G. from Mauritius, the original station for this species. He also records *L. chærophylla* only from Peru, ignoring the record of *L. chærophylla* var. *paroica* S. from the West Indies in Spruce's Hep. Elliottianæ, also those of A. W. Evans, "Hepaticæ of Puerto Rico" in Bull. Torrey Club, xxxi. 182–226, 1904, where *L. chærophylla* is given as a synonym of *L. Sieberiana*, following the original views of Stephani and of Schiffner.

The first reference to *L. Sieberiana* from the West Indies is in a note by Spruce in Hep. Elliottianæ under *L. chærophylla* (p. 336): "Stephani has lately referred this plant to *L. Sieberiana* Gottsch., a Mauritian species, described in Syn. Hep. p. 328, with 'foliis margine supero apiceque minute serrato-denticulatis, infere subintegerrimis'; whereas *L. chærophylla* has the leaves equally and somewhat strongly dentate all round. Moreover *L. Sieberiana* is said to be sterile, and is therefore probably dioicous; whereas I have never seen *L. chærophylla* without perianths; nor is any mention made of the cordate base of the stipules, so conspicuous in the latter."

The next reference to the subject is the note under *O. Sieberiana* by Evans, *l. c.* 189: "*Lejeunea chærophylla* is here reduced to *O. Sieberiana* on the authority of Schiffner, who is supported in his statements by Stephani. Both of these writers examined Sieber's type. According to Stephani, Spruce himself at one time acquiesced in the reduction; but apparently he changed his mind later, as in Hep. Elliottianæ—published shortly after his death, it is maintained that both species are distinct. The specimens of *L. chærophylla* distributed in Hep. Spruceanæ have entire underleaves and perichætial bracteoles, and to this extent differ from many of the West Indian forms of *O. Sieberiana*, but as the denticulation of these parts is always variable, this slight difference can hardly be considered sufficient to separate the species."

L. Sieberiana was published in Syn. Hep. p. 328: "Habitat in *Memecylo cordato*, Insulæ St. Mauritii (Sieber, Flora mixta n. 170)." Evans (*l. c.* p. 189) says "The type-specimens are said to have been collected on the island of Mauritius, but Stephani looks upon this statement as an error due to the mixing of labels and concludes that Sieber's specimens also came from Tropical America. At all events the species has not recently been collected in Africa."

Mr. Gepp, to whom we owe the editing and publication of Hep. Elliottianæ, writes: "In reply to your letter about *O. chærophylla* & *O. Sieberiana*, I see that Stephani says in *Hedwigia* (xxxiv. 1895, pp. 238–9), very distinctly, that he sent part of the type of *L. Sieberiana* to Spruce several years before his death, and that Spruce at once recognised in it his *L. chærophylla*, but changed his views later in Hep. Elliottianæ; that *L. chærophylla* is a Tropical American species, and that *L. Sieberiana* is alleged to have come from Mauritius, but that he [Stephani] has already put that right (I do not know where); it does not grow in East Africa, the place of origin is false, since Sieber on his journey let his Hepaticæ get mixed; both plants belong therefore to the Tropical American flora and are doubtless identical: therefore Spruce's name *chærophylla* is struck out."

Sieber never went to South America; but he did go to Mauritius, New South Wales and the Cape, in his voyage in 1822–24. According to Urban (Symb. Antill. iii. 126) he financed other travellers, viz.:—F. Kohaut to Martinique (1819–21); Hilsenberg & Bojer to Mauritius and Madagascar (1821–3); F. Kohaut & Jos. Schmidt to Senegal (1822); F. Wrbna to Trinidad (1822); C. Zeyher to the Cape (1822).

Urban says that the "Flora Mixta" contains some Martinique plants; I have never found out why it was called "Flora Mixta"; possibly it was because it contained specimens from more than one country and from more than one collector.

The fact that the original type of *L. Sieberiana* was growing on leaves of *Memecylon cordatum*, a Melastomaceous plant only recorded from Mauritius (Flora Mixta, no. 170), and that Gottsche's description does not apply to any of the Western species—Gottsche's accurate and illuminating descriptions are unrivalled—induces me to consider that *L. Sieberiana* is not the species which Stephani names as coming from Dominica.

I have now to consider whether the plant is the same as *L. chærophylla*, which species I have had the advantage of studying in the specimens distributed by Spruce in Hep. Spruceanæ. In *O. Armitagei* the leaves are more horizontally inserted, plane not crisped, not widely incurved at the postical margin, becoming almost funnel-shaped as Spruce aptly describes them; antical margin spinulose-serrate, some spines hamate, not coarsely dentate, postical margin with usually two large teeth or segments (as in *L. lunulata*), one or two smaller teeth frequently added, not more regularly coarsely dentate; lobule not saccate, broader than high, not the reverse: perianth more broadly pyriform, not cuneate oblong or subcordate, winged to about a third, not nearly to the base; bracts oblong, serrulate, not oval and distantly coarsely dentate; bracteole oval-spathulate, sometimes slightly retuse, not oval-rotund or suborbiculate; amentula longer and narrower, very graceful, with bracts oval, rarely subacuminate; bracteoles oblong not oval.

In the Manchester Museum there is a specimen named "*Lejeunea lunulata* var. *paucidentata* Brasilia, opp. Caldas, Oct. 1854, G. A. Lindberg S.O.L.": this is monoicous, with short and broad amentula; the leaves are crumpled and I cannot find any character to distinguish it from *O. chærophylla*. Specimens distributed in Hep. Cub. Wrightianæ (named *L. lunulata*, so far as those in the Manchester Museum are concerned), as well as a specimen vaguely named "*L. lunulata* Weber, Hepatic in thick wood, M.V., Feb. 13," are both monoicous and I should refer them to *O. chærophylla*.

O. angustifolia St., a monoicous species from Dominica, according to the description of Stephani in Sp. Hep. agrees in having two large teeth on the postical margin of leaf, but differs in the more oblong leaves, with acute apex, very large underleaves, 5 times broader than the stem, obcuneate-rotundate; perianth narrowly pyriform, very long, 2·75 mm., nearly 3 times longer than *O. Armitagei*.

Cyclolejeunea convexistipa (Lehm. & Lindenb.) Evans. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. Of this remarkable species an admirable description is given by Evans, *l. c.* 198. The leaves on some of the branches differ so widely from the stem leaves that you would naturally consider them as belonging to another species.

The specimens in the Manchester Museum of *C. convexistipa* (Hep. Cub. Wrightianæ) agree exactly with these from Dominica. Specimens named "*L. convexistipa* L. & L., *L. patinifera* Tayl. MS. Jamaica, Dr. Wright, Herb. Greville" differ slightly, but I think can only be referred to this: the disc-like gemmæ which are found on the margin of the leaves of this genus are present on the plants.

O. stachyclada Spruce, which has been reduced to a synonym of this species by Stephani and Evans, differs from it in its brown colour, ramification, leaves less distinctly dentate or denticulate, absence of the two ocelli, bracts more acute, perianth sub-emersed, broader below, more vase-like, amentula short, 3 to 5 pairs of bracts, not long (6 to 22 pairs, Evans, 20 pairs, Stephani). Spruce knew *L. convexistipa*, for he refers to it in his notes on *O. truncatula* S. and gives several localities for it in Hep. Elliottianæ (p. 337). Although near *C. convexistipa*, I consider it distinct from this species.

L. surinamensis Mont. is given as a synonym of *C. convexistipa* by Stephani (Sp. Hep. p. 184), but on p. 187 it is described as a distinct species. The specimens under this name from Cuba, Wright, in the Manchester Museum agree with *C. convexistipa*.

C. PERUVIANA (Lehm. & Lindenb.) Evans. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. A variable species, although the leaves keep regular in shape, their antical margins vary from being entire to denticulate or spinulose, the underleaves vary in size and from being orbiculate-emarginate on the stems, are often on the branches oval-bifid; it is a dioicous species and is to be distinguished from other species of the genus by its reddish brown colour and the frequent presence of the "utriculi," kidney-shaped water sacs at the base of some of the branches or on the stem itself; they appear to be malformed leaves where the lobule has developed abnormally at the expense of the lobe.

L. Chitonia Tayl. has been referred to *C. peruviana* by Spruce and Stephani; but later Stephani reinstated it as a distinct species. Evans considers it a good species and gives (*op. cit.*) a full description and plate. Original specimens in the Manchester Museum confirm Prof. Evans's determination.

L. adglutinata Tayl. in Lond. Journ. Bot. v. p. 389 (1846) is also referred to *C. peruviana* by Stephani; original specimens in the Manchester Museum ("Cayenne, Herb. Tayl.") appear to me identical with *C. Chitonia* (Tayl.). These specimens have been seen by Stephani, who wrote on them: "A form of *L. peruviana*; what Taylor says about the stipules is not exact; they are as robust as in most *Lejeuneæ*." Spruce, who later saw this note of Stephani, adds: "The stipules of *L. peruviana* do truly vary in size more almost than those of any *Lejeuneæ*." The stipules on the specimen in the Museum are large and much dentate. Specimens named *O. peruviana* in Spruce's Hep. Am. et And. Exsicc. show the different stem and branch underleaves, as well as the kidney-shaped sacs.

Under the name *C. peruviana* are specimens determined by Stephani (Plantæ in itinere secundo per Boliviam lectæ. Epiphyll Bergwald von Espirito Santo 1600 m. leg. T. Herzog, Juni 1911). These appear to me to be very different from any form of *C. peruviana* that I have seen.

C. ACCEDENS (G.) Evans. *Hab.* On leaves, Mountain Lake, Dominica, Jan. 1896.

Obs. Specimens of *Prionolejeunea leptocardia* Spruce in Hep. Am. et And. Exsicc. agree with this species; according to Evans, Spruce had an idea that they did so. The presence of the discoid gemmæ supports this view.

C. MIMULA St. Sp. Hep. v. p. 192. *Hab.* On leaves, Mountain Lake, Dominica, Jan. 1896.

Obs. The pale green colour, antical margin of leaves spinulose, the small, deeply divided and dentate underleaves, and other characters agree well with Stephani's description.

PRIONOLEJEUNEA DENTICULATA (Nees) Syn. Hep. p. 337. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. Specimens named *P. denticulata* var. in Spruce's Hep. Am. et And. Exsicc. (K. 1529, Manchester Mus.) agree well with those from Dominica, save that the leaves are rather more acuminate.

DREPANOLEJEUNEA CAMPANULATA Spruce. Small, pale green to brown. Stems 6 to 10 mm. long, pinnate, branches few, long. *Leaves* distant, patent-divergent (70°) to erecto-patent (30°), twisted, semi-falcate, semi-ovate or lanceolate, acuminate, apex of leaf with a single cell, then 2–2 and 3, margin serrulate, often with a large tooth on the postical margin near the lobule, about 10 serrate teeth on the antical, fewer and smaller on the postical margin; cuticle smooth or slightly papillose; cells small, quadrate or oblong-quadrate, walls thick, no trigones, 2 ocelli on some of the leaves; lobule 3 to 4 times smaller, tumid, oval or oblong, free angle toothed, keel smooth. *Underleaves* minute, twice the breadth of the stem, obcuneate, bifid to $\frac{1}{3}$ or bipartite to middle or below, segments divergent, subulate, 2 single cells, then 2–3, disc 3 cells deep by 6 cells wide. *Inflorescence* dioicous, ♀ on short branches, proceeding from stem or branch; bracts large, oblong acuminate, serrate, lobule narrow, oblong, serrate; bracteole cuneate, bifid to $\frac{1}{3}$, segments acute, serrate. *Perianth* not seen. *Amentula* long, 6 to 10 pairs of bracts, bracts globose, lobule almost equal in size to lobe, keel fringed with large papillæ; monandrous.

Dimensions. Stems ·05 mm. diam.; leaves, lobes ·4 mm. × 2 mm., ·35 mm. × ·2 mm., ·3 mm. × ·2 mm., ·3 mm. × ·1 mm., ·15 mm. × ·1 mm., ·075 mm. × ·05 mm., cells ·02 mm., ·03 mm. × ·015 mm.; underleaves ·1 mm. × ·075 mm., bracts ·6 mm. × ·175 mm., bracteole ·3 × ·175 mm., segments ·1 mm., amentula ·65 mm. long × ·2 mm.

Hab. On leaves, Mountain Lake, Dominica, Jan. 1896.

Obs. This was named *L. inchoata* Meissn. by Stephani; not being satisfied with this determination I was inclined to consider it a new species and as such sent it to Prof. Evans for his opinion. He wrote: "Your new *Drepanolejeunea* is different from anything I have seen from Puerto Rico and seems to represent a good species. It might be well, however, to compare it with Spruce's *D. campanulata*, with which it has many features in common. Since the closely related *D. infundibulata* grows in the West Indies, *D. campanulata* is perhaps to be expected there also." Fortunately Dr. Spruce's Herbarium is in the Manchester Museum, so I have had the opportunity of examining all his specimens of this beautiful but very minute and difficult genus. There are two packets labelled *D. campanulata*, containing, as Prof. Evans says, two species of *Drepanolejeunea*, but all very fragmentary. I was able to pick out a few stems which agree well with those from Dominica; the latter also are very meagre and too imperfect to base a new species upon.

D. INCHOATA (Meissn.) Syn. Hep. p. 343, *fide* Stephani. *Hab.* On leaf, Mountain Lake, Dominica, Jan. 1896.

Obs. In addition to specimens of *D. campanulata* being named *L. inchoata* by Stephani, a part of a small stem had been separated and named as such by him; this agrees with Prof. Evans' figures and with what I understand the species to be. As Prof. Evans points out, the branch leaves of *D. inchoata* are smaller and narrower; but as *D. campanulata* has well-developed ♂ and ♀ on them, they cannot be branches of *D. inchoata*, unless it is a very multiform species.

D. Thwaitesiana (Mitt.), *D. setistipa* St. Under the name of "*L. inchoata* Meissn., Sumatra, ad folia *Litsaeæ latifoliæ* Blum., leg. Korthals, ex herb. S. O. Lindberg" there are specimens of this species in the Manchester Museum; the numerous ocelli, oblong lobule, bisetulose underleaves distinguish it from *D. inchoata*; on many of the leaves there is a somewhat large tooth at the postical base of leaf near the lobule. The male plant had not been seen by Stephani; but I found a few on this specimen; the amentula arise from the stem and are long, 6 to 8 pairs of bracts, or at the apex of some of the branches, then short, 3 to 4 pairs of bracts; bracts globose, lobule slightly smaller than the lobe; keel finely crenulate; bracteoles only on the lowest pair of bracts.

CYSTOLEJEUNEA LINEATA (Lehm. & Lindenb.) Evans. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. This is a very distinct species; the remarkable involute lobules readily distinguish it.

STREPSILEJEUNEA INFLEXA (Hampe) Spruce. *Trachylejeunea inflexa* Stephani. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. Leaves papillose, acute, ·65 mm. × ·4 mm., ·7 mm. × ·4 mm., lobule ·2 mm. × ·125 mm.; Stephani says "trigones large," the cells appear to me to be roundish, with thick walls and no trigones; underleaves rotund, bifid, three times broader than the stems, segments acute. Specimens in the Manchester Museum—"Guadeloupe, ex herb. Torrey, No. 21,000"—agree in every particular; leaves ·6 mm. × ·4 mm., underleaves ·3 mm × ·3 mm., stem ·1 mm. diam.

TAXILEJEUNEA SULPHUREA (Lehm. & Lindenb.) Spruce. *Omphalanthus sulphureus* Lehm. & Lindenb. Syn. Hep. p. 307. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. A very conspicuous species, the white colour, large serrated leaves, small lobules, large, slightly bifid underleaves distinguishing it from other species.

T. MARTINICENSIS (Gottsche MS.). *Hab.* Waterfall, Dominica, Jan. 1896.

Obs. This is named *Taxilejeunea debilis* (L. & L.) by Stephani. There are fortunately good perianths on the plant; according to Stephani's description, *T. debilis* should have them three times longer than broad, with the wings armate, with a long narrow rostellum; these are not twice as long as broad, with smooth wings and the rostellum so small as hardly to be seen; the leaves are usually acute or apiculate, sometimes with 2 or more teeth; it agrees better with the description of *T. martinicensis* than with *T. debilis*. Leaves 1 mm. × ·6 mm., perianth 1·1 mm. × ·7 mm.

Lejeunea cladogyna Evans in Amer. Journ. Bot. v. 134 (1918). *Hab.* Jack in the Box Gully, Barbados, March 1896.

Obs. Thanks to the full description and good figures given by Prof. Evans, there is little difficulty in determining this species, which is recorded from Puerto Rico. The leaves are distinguished by their narrow base of insertion, much smaller marginal cells, lobule very small or absent, monoicous inflorescence, perianths on very short branches "innovating on one side, the innovation short and sterile," 5-winged.

Dimensions. Stem with leaves ·08 mm. broad, leaves ·05 mm. × ·03 mm., ·05 mm. × ·045 mm., cells ·002 mm., marginal cells ·001 mm., lobule ·012 mm. × ·009 mm., underleaves ·015 mm. × ·012 mm., bracts ·05 mm. × ·02 mm., lobule ·025 mm. × ·015 mm., bracteole ·03 mm. × ·015 mm., perianth ·06 mm. × ·04 mm.

Tribus II. Jungermannieæ.

Radula pallens Nees. *Hab.* Mountain Lake, Dominica, Jan. 1896.

Isotachis erythrorhiza Besch. in Journ. de Bot. vii. 184 (1893). *Hab.* Mountain Lake, Dominica, Jan. 1896.

Obs. Named by Stephani *Isotachis dominicensis* St., n. sp., a name evidently suppressed, as it does not appear in his Sp. Hep.; this is probably one of the four "species" into which the *Isotachis* of the Souffrière of Guadeloupe had been divided, which to Dr. Spruce were "unintelligible."

Herberta Armitagei, n. sp. Dioicous, cæspitose, largish to large; pale brown to reddish. *Stems* simple or rarely bifid, with few flagella, frontally compressed, oval on cross-section (20 cells × 10), cortical cells about 40, with the two inner rows brown, inner cells white. *Leaves* secund, imbricate, amplexicaul, patent to erecto-patent, vittate, bifid to the middle or below, lower portion (disc) ovate-oblong, base dilated, margin entire, involute, apex entire, or rarely with a slight notch, segments subulate, acuminate, vitta (elongated cells) broad, 40 cells broad at the base, marginal cells 10 on each side, vitta extending to apex of segments, sinus obtuse or acute. *Underleaves* similar to the leaves, sometimes a little smaller, vitta 25 cells broad at the base, marginal cells 5 on each side.

Dimensions. Stems 2 to 3 inches long, ·04 mm. × ·03 mm., with leaves 4 mm. to 5 mm. wide; leaves 3·5 mm. long × 1 mm. wide near base, segments 2 mm., 3 mm. × ·09 mm., segments ·175 mm., segments ·02 × ·03 mm. wide at their base, cells of vitta ·14 mm. × ·03 mm., marginal cells ·025 mm., ·03 mm.

Hab. Mountain Lake, Dominica, Jan. 1896.

Obs. Stephani named this species *H. juniperina* (Sw.) from which it differs in shape of leaf, dilated base, entire margins, cell structure, broader vitta; *H. juniperina* has vitta 15 to 20 cells broad at base, marginal cells 20 to 25. Prof. Evans writes "I have examined with much interest the *Herberta* from Dominica, collected by Miss Armitage, but have not reached a definite decision about it. It bears a good deal of resemblance to *H. commutata* (Steph.), which Stephani reports from Guadeloupe as well as from Ecuador, the type locality. Have you compared it with that species? I wish that Stephani had published figures of his new species. If the Dominica plant proves distinct from *H. commutata*, I think it would be safe to describe it as new." *H. commutata* (*H. pensilis* Spruce non Taylor), Hep. Am. et And.), of which there are fine specimens in the Manchester Museum, is a much more delicate species, with distant, squarrose leaves, not secund, vitta 18 cells wide, marginal cells 10 on each side.

H. costaricensis (Steph.) and *H. angustifolia* (Steph.) which have entire leaves, are described as with distant squarrose leaves. I have not seen specimens of these.

There are specimens in the Manchester Museum (n. 20247) named "*Sendtnera juniperina*, M. Perrim, Guadeloupe, Dr. Madiano," which Austin has named *Sendtnera pensilis* Tayl.

This, according to Taylor's original description (in Lond. Journ. Bot. v. 372; 1846) is a plant a foot long; he says "the simpler, subcompressed elongated, waved and pendent stems, and more distant leaves easily separate this from *S. juniperina*." Stephani describes *H. pensilis*, with coarsely laciniate leaves; I have not been able to examine Taylor's original specimen.

The specimen from Guadeloupe agrees exactly with those collected by Miss Armitage in Dominica.

Hab. M. Perrim, Guadeloupe; Mountain Lake, Dominica, Jan. 1896, Miss E. Armitage.

Trichocolea tomentosa (Swartz) Spruce.

Hab. Mountain Lake, Dominica, Jan. 1896.

Kantia portoricensis St. (*K. vincentiana* C. H. Wright).

Hab. Growing with the preceding, Mountain Lake, Dominica, Jan. 1896.

Plagiochila Magdalena Gottsche in Steph. Sp. Hep. p. 577 (1905).

Dioicous, largish to large, dark to pale brown. Stems slightly branched, strong, wiry. Leaves approximate, subimbricate, alternate, patent-divergent to patent, 70°–50°, triangular, apex obtusate, subtruncate; antical margin curved, decurrent, recurved, with 1 to 3 teeth; apex with 3 to 5 long spines; postical margin with about 15 long spines, 4 to 7 cells long, ampliate, crossing the stem slightly, near the postical base sub-rotund, with 1 or 2 long spines.

Named by Stephani *P. dominicensis*, and recorded as such in Sp. Hep. p. 576, Dominica (Armitage). In his notes he says "I have not had the opportunity of examining the original, so describe the plant from the above, Dominica (Armitage, Eggers), Guadeloupe (l'Herminier), which agree perfectly with the original description. The comparison of the authors (Taylor & Gottsche?) with *P. superba* is strikingly exact. Gottsche had this plant (legit l'Herminier) as

P. Magdalena determined, but nowhere described it." Stephani's description of *P. dominicensis* Tayl. is that of *P. Magdalena* Gottsche, and I fail to see where it agrees with Taylor & Gottsche's description.

From *P. dominicensis* it differs in that the leaves are very decurrent; in *P. dominicensis* they are not so. Insertion more erect, patent-divergent to patent 70° to 50°, in *P. dominicensis* they are horizontal to patent-divergent 90°–70°; apex obtusate or subtruncate, not rounded; leaves more triangular with apex narrower; postical margin more ampliate, projecting beyond the stem, in *P. dominicensis* to the middle of the stem only; the cells are also rather larger with thinner walls.

Gottsche, who knew *P. dominicensis*, evidently considered our plant distinct from it, or he would have referred l'Herminier's plant to it.

P. dominicensis Tayl., Dominica (Elliott), named by Spruce, agrees exactly with the original, specimens of which are in the Manchester Museum (ex herb. Greville). *P. superba* Nees, is a much larger plant, with leaves of a different shape, margin ciliate.

Dimensions. Stems 5 mm., with leaves 7·5 mm., leaves 4 mm. long × 2·5 mm. broad at base, 1 mm. at apex, cells ·06 mm. × 0·5 mm., ·06 mm. × ·04 mm.

Hab. Mountain Lake, Dominica, Jan. 1896.

P. BARBADENSIS St. Sp. Hep. p. 563.

The specimens of this species in Miss Armitage's Collection were named by Stephani *P. Guilleminiana* Mont. In his Sp. Hep. he describes *P. Guilleminiana* with leaves oblongo-trigonous, apex 4 times narrower than the base. In Miss Armitage's specimens they are semi-ovate, apex twice as narrow as at the base; he must have later recognised its distinctness and published it as a new species, *P. barbadensis*, Barbados (Armitage).

There are no specimens of *P. Guilleminiana* Mont. in the Manchester Museum; a specimen so named, probably by Austin, from Sandwich Islands (Baldwin 201), has nothing in common with the description. The leaves are patent, oblong-trigonous to oblong-subquadrate, apex acute or obtuse, antical margin very decurrent, much recurved, entire, postical margin extending to the middle of the stem, teeth few, irregular.

The species is not recorded by Stephani nor Spruce from the West Indies.

Stephani (Sp. Hep. pp. 524–5) reduces two of Spruce's species —*P. oreocharis* and *P. rhizophila* (Spruce Hep. Am. And. pp. 495, 498)—to synonyms of *P. Guilleminiana*; both differ from Lindenberg's descriptions and figures. *P. oreocharis* is a very distinct species; the contorted, longly decurrent postical margin of leaf alone distinguishes it from any other. *P. rhizophila* has semi-cordato-ovate leaves, which are remarkably ampliate at their postical base.

Stephani's list of 966 species of *Plagiochilæ* may possibly require reducing: but as Spruce took infinite trouble and time in studying the species he named, I fear Stephani does not give him due credit;

on the face of it the immensity of the task undertaken by Stephani in describing the *Hepaticæ* of the world precludes the possibility of doing full justice to all the species, although admiration is none the less due to him for the great work he has done.

Hab. Jack-in-the-Box Gully, Barbados, March 1896.

P. ARGUTA Gottsche.

So named by Stephani, I cannot find any mention of this species in Sp. Hep. or elsewhere. Stephani lists a *P. arguta* Steph. in his Sp. Hep. from Patagonia.

Hab. Mountain Lake, Dominica, Jan. 1896.

P. TENUIS Lindenb. Sp. Hep. p. 50.

Hab. Mountain Lake, Dominica, Jan. 1896.

P. HUSNOTI St. Sp. Hep. p. 506.

Hab. Mountain Lake, Dominica, Jan. 1896.

Metzgeria Armitagei, n. sp.

Dioicous; pale green, delicate, flaccid, stratose; medium size; *stem* repeatedly dichotomous, patent (50°), linear, margins recurved; costa firm; *cortical cells* small, similar to inner, 10 to 12, 4 to 5 antical, 6 postical, inner cells opaque and indistinct, cross-section oval-oblong, postical side setose; *wings* 18 to 20 cells wide, glabrous; adjacent cells to costa large, cuticle minutely papillose; cells medium to rather large, quadrate or oblong-quadrate, 4 or 5 sided; walls thick, no trigones, marginal cells similar, slightly crenulate; *margin* setose, setæ short, single or in pairs, straight or slightly hamate. Non-gemmiparous.

Dimensions. Stems 1 to 1¼ inches long, ·2 mm. wide, cells ·04 mm. × ·04 mm., ·04 mm. × ·05 mm., setæ ·075 mm. long.

Hab. Near Maracaas Falls, Trinidad, April 1896; Dominica, Jan. 1896.

Obs. As the structure of the *Metzgeriæ* is so simple and rudimentary, only a few characters can be depended upon in the description of species; amongst them is the structure of the costa or midrib, which is found to be very constant in all species. *M. Armitagei* has a costa with a cortical layer of 10 to 12 small cells; the only other species with this character is *M. dichotoma* (Sw.) from the West Indies and Brazil. The short diagnosis in Syn. Hep. (1844) is of little help. Lindberg describes and figures it in his monograph on Metzgeriæ (Acta Soc. p. F. et F. fenn. 1. p. 20 (1877)) with postical side of leaves setose-pilose, pili long, leaf cells ·035 mm. × ·05 mm. Stephani says (Sp. Hep. p. 943) cells ·027 mm. × ·036 mm. The specimens from Brazil, Caldas, 1854, G. A. Lindberg (M. Mus. n. K. 3640), which I have had the opportunity of examining, agree with Lindberg's description; but I find the cells measure less than either Lindberg or Stephani states, namely, only ·02 mm. × ·025 mm., ·025 mm. and ·02 mm. × ·03 mm.

There are specimens in the Manchester Museum named *Metzgeria dichotoma* (Jamaica, Dickson, Herb. Tayl. & Wilson, 1870, Herb. James) which bear no relation to *M. dichotoma*, having a costa with two large antical and two large postical cortical cells; the wings are glabrous, but the costa and margin are furnished with long hamate cilia, clearly bringing them to *M. hamata*, which Lindberg records from Jamaica.

Metzgeria procera Mitt. in Hook. f. Fl. Nov. Zel. II. ii. 166 (in obs.) (*M. hamata* var. *procera* Lindb. Monogr. Metz. p. 28), which Stephani records from Dominica has remarkably large cells—according to Lindberg ·1 mm., and Stephani ·074 mm. to ·117 mm.; whereas both these specimens are only ·05 mm. in size, about the normal size of *M. hamata*.

M. planiuscula Spruce (in Journ. Linn. Soc. xxx. 368; 1893), which I have been able to examine through the kindness of Mr. H. Beesley, has no relationship to *M. Armitagei*, having a very small, delicate costa, with 2 antical and 2 to 3 postical cortical cells, margin of leaves crenulate, pili on pagina, costa and margins, cells ·075 mm. to ·1 mm., these particulars refer to specimens from Dominica. I have not had an opportunity of examining those under this name from Brazil and Paraguay.

Dumortiera hirsuta Reinw. Blume et Nees in Syn. Hep. p. 543.

Hab. Roseau Valley, Dominica, Jan. 1896.

Marchantia domingensis L. & L.

Hab. Basin of Waterfall, Dominica, Jan. 1896.

M. chenopoda L.

Hab. Waterfall, Roseau Valley, Dominica, Jan. 1896.

As Prof. Evans says (Trans. Conn. Acad. Sc. xxi. 220; 1917): "the appendages to the scales present striking and distinctive features. In *M. chenopoda* they are lanceolate to broadly ovate, apex acuminate, acute or apiculate, margin entire or variously and irregularly toothed, the teeth rarely numerous and often restricted to the basal portion; those on Miss Armitage's specimens are lanceolate, acutate or apiculate, margin entire. In *M. domingensis* they are broadly lanceolate to ovate, apex acute or apiculate, margin densely dentate.

Anthoceros vincentiana L. et L.? "Fragmentary and without ripe spores" (Stephani).

Hab. Mountain Lake, Dominica, Jan. 1896.

GROWTH EXPERIMENTS ON *SPERGULA* AND *PLANTAGO*.

By B. Millard Griffiths, M.Sc., F.L.S.
(*Department of Botany, Armstrong College, Newcastle-on-Tyne.*)

Spergula.

In the summer of 1919 an armful of plants of the Corn Spurrey was roughly pulled up at random in one place in an oat-field near Kewaigue in the Isle of Man. The bundle of plants was allowed to dry and the seeds were shaken out. The seeds were found to be a mixture of specimens with smooth testas and specimens with mealy testas, in the proportion of about four to one; the mealiness was sometimes confined to one side of the seed or to one side and half the other. The seeds were carefully separated by hand-picking into completely smooth seeds and seeds with mealiness on the testa, and some two hundred of each kind were sown in two plots at University College, Reading, on May 5th, 1920. By September 1920 the mealy seeds had produced a crop of plants robust in habit, markedly sticky to the touch, and yielding exclusively seeds with mealy testas. The smooth seeds gave rise to plants more delicate in habit and of slightly smaller size, only slightly or not at all sticky, and yielding seeds which were exclusively smooth skinned. The former type of plant is *Spergula arvensis* Linn. and the latter *S. sativa* Boenn.

It is evident that both species were growing together in the original collection, but without hybridising, as otherwise in such a large number of seeds sown there should have been a mixture of forms. The two forms are clearly of specific rank and not varieties.

Plantago.

P. lanceolata.

In April 1920 a series of experimental cultivations were made at Reading on varieties of this plant. Typical *P. lanceolata* has long leaves, long peduncles and cylindrical inflorescences. A variety (*sphærostachya* Roehl.) occurring frequently in grassy fields and on the tops of walls, has small narrow leaves, shorter peduncles and an inflorescence which is spherical. Its seeds tend to be larger and stouter than those of the typical form. All intermediate varieties between the type and var. *sphærostachya* occur. The following series of growths was carried out:—

1. *P. lanceolata*; seeds from typical robust form growing on recently disturbed soil, Belfast.

2. Intermediate varieties with leaves of different sizes and inflorescences varying from elongated cylindrical to elliptical. Seeds of these were separated into those with thick incurving sides, and thin and scarcely incurving sides.

3. Typical var. *sphærostachya*; seeds from specimens from grassy fields and tops of walls in the Isle of Man.

All the above were grown in pots to begin with, and afterwards planted out with about five centimetres between each plant.

4. Long row of typical *P. lanceolata*; seeds from robust Belfast plant.

5. Long row of typical var. *sphærostachya*; seeds as above.

In September 1920, the resultant plants were found to be all large and robust *P. lanceolata* of typical form, with long leaves, long peduncles and cylindrical inflorescences. No distinction could be made between plants grown from seeds of the type, of intermediate forms, or of the var. *sphærostachya*.

In April 1920, the experiments were repeated at Armstrong College, Newcastle-on-Tyne, as follows:—

1. Seeds from robust Reading plant. 2. Seeds from typical specimen of var. *sphærostachya* from grassy down above Streatley, Berks. 3. Seeds from similar form from pasture field near Kidderminster, Worcs.

All were sown so that each plant was about five centimetres from its neighbour. In September 1921, it was again found that no distinction could be made between the resultant plants. All were large and typical *P. lanceolata* without exception.

In addition, seeds of the robust form from Reading were sown broadcast in a shallow earthenware dish. The dish contained about five or six millimetres of soil only, and it was liable to be waterlogged or rather deficient in moisture, according to the weather. By September, the plants that grew were all small, narrow-leaved specimens, closely resembling var. *sphærostachya* in habit. The inflorescences, however, did not appear that season, neither have they yet appeared.

The above experiments seem to indicate that the varieties of *P. lanceolata* are largely dependent on habitat, and that the variety *sphærostachya* can be produced at will by putting the plant under unfavourable conditions of growth.

P. MAJOR.

Two fairly well-marked forms of this plant are found. The normal form has a small, somewhat rounded leaf with a blunt apex, the petiole with a rather shallow channel, and the inflorescence only a few inches long. It is widely distributed, and occurs wherever the soil is sufficiently moist, and even on walls when overshadowed by trees. The other form is larger, the leaf prominently veined and apex acute, the petiole deeply channelled, and the inflorescence over a foot long. It is rather sporadic, occurring in corn fields frequently, but also elsewhere.

Seeds were collected from a normal plant growing by the side of a road, and from a large-type growing among grass beside a canal. The collections were sown broadcast in two plots at Reading in May 1920. In September 1920 the small-type seeds had produced nothing but small-type plants, but the large-type seeds gave four large-type plants and about sixty or seventy small-type. Seeds of the small-type thus grown were sown at Armstrong College in April 1921; they produced nothing but small-type. Seeds of one of the above four large-type plants were sown similarly, but no large-type resulted: all were small-type.

It would appear likely, therefore, that these two forms of *P. major* are not varieties caused by differences in habitat, but are more in the nature of pure lines, the large-type being possibly a recessive to the small-type. The determination of these would of course require careful experimentation on the usual genetic lines.

MERISTIC FLORAL VARIATION IN GALIEÆ.

By L. A. M. Riley, B.A.

Specific descriptions in floras are, as a rule, simply diagnostic, little attention being paid to the extent of variation of species beyond recording some well-marked variety. This is particularly the case with meristic floral variation. It is often forgotten that the purpose of Systematic Botany is not to provide a convenient method by which botanists may name plants, but to study and correlate the characters and affinities of different groups, even though certain characters may be practically worthless for purposes of determination. The study of meristic variation, for instance, is hardly a practical method of determining a species, though, in cases of two or more species whose independent status is in question, a knowledge of their respective meristic variation would be valuable in deciding their claims to specific rank.

Natural groups of plants may be either *homomeristic* or *heteromeristic*. A homomeristic group is one in which all the subordinate groups have the same floral formula, e. g., *Compositæ*, *Umbelliferæ* (excluding the gynæceum). A heteromeristic group is one in which the subordinate groups have floral formulas which differ numerically, e. g. *Onagraceæ*, *Rubiaceæ*, *Primulaceæ*.

It may be assumed that variation in the number of parts is more likely to occur in heteromeristic groups than in homomeristic; the fact of a group being heteromeristic shows that a change in the number of parts has occurred in the past, and the tendency to change may well persist in the form of meristic variation.

Allomeristic groups are such as differ meristically from a majority of related groups, e. g. *Potentilla erecta* Hampe, which is tetramerous in contrast with most other Potentillas which are pentamerous. Similarly *Veronica* has a 4-lobed corolla, whereas most other scrophulariaceous genera have 5-lobed corollas. Meristic variation is naturally more prevalent in allomeristic groups than in isomeristic. Pentamerous and trimerous flowers are not infrequent in *Potentilla erecta*, and great meristic variation has been observed in *Veronica persica* Poir. (Penzig, Pflanzenteratologie, i. 433; ii. 212).

The family *Rubiaceæ* is heteromeristic, the number of corolla-lobes ranging from 4 to 6 in the *Naucleæ* and 4 to 10 in the *Guettardeæ* and *Chiococceæ*. The tribe *Galieæ* is also heteromeristic. In Bentham and Hooker's *Genera Plantarum* eleven genera are included in this tribe of which *Rubia* and *Phuopsis* are described as

Percentages of flowers of different types.

	Galium uliginosum.	Galium saxatile.	Galium Aparine.	Galium Mollugo.	Galium palustre.	Galium boreale.	Galium verum.	Asperula cynanchica.	Asperula galioides.	Asperula tinctoria.
2-merous	...	0·1	...	...	0·1	0·1	...	...	...	0·6
3-merous	6·0	1·2	0·5	0·4	5·0	3·0	1·0	0·6	3·6	95·7
4-merous	92·8	98·4	98·2	99·5	85·7	96·4	91·9	98·5	96·3	3·7
5-merous	1·2	0·3	1·3	0·1	9·1	0·5	7·1	0·9	0·1	...
6-merous	...	...	...	...	0·1	...	...	...	...	...
	100	100	100	100	100	100	100	100	100	100

5-merous, *Crucianella* as 4–5-merous, while the corolla of *Vaillantia* is 3-partite in the male flowers and 4-partite in the hermaphrodite flowers. The seven other genera including *Galium* and *Asperula* are described as 4-merous.

In view of the foregoing, meristic variation in the species would be anticipated. This anticipation is amply fulfilled, as is shown by the results of an examination of 1000 flowers each of three species of *Asperula* and seven species of *Galium* given on preceding page.

The material of *Galium boreale*, *Asperula galioides*, and *A. tinctoria* was obtained from plants cultivated in the Royal Botanic Gardens, Kew, between June 23rd and July 6th, 1922. The material of the remaining species was collected from the district round Odiham, Hampshire, between the same dates.

Attention is specially drawn to the interesting figures for *Asperula tinctoria*, which has a very high percentage of trimerous flowers and 0·6 per cent. of dimerous flowers. Penzig found that trimerous flowers preponderated in *A. tinctoria* and frequently occurred in all other species examined by him (Penzig, *l. c.* ii. 39). He records hexamerous flowers in *Galium Aparine*, *G. Mollugo*, and *G. verum*. Unfortunately he gives no statistics, thus considerably lessening the value of his observations.

GEORGE SIMONDS BOULGER

(1853–1922).

George Simonds Boulger, the second son of Dr. Edward Boulger who was in general practice there, was born on March 5, 1853, at Bletchingley, Surrey. From his earliest childhood he was devoted to science; he began to collect specimens of woods when he was seven, and wrote "Boulger's Notes on Astronomy." He was noted for his excellent memory, which he always retained; before he went to school he could repeat long extracts from Shakespeare and Scott, which had been read to him. He rode and hunted with his father and sisters, and when a very small boy went to Epsom with his father —a distance of nine miles—to see the Derby.

At eight years of age George was sent to a preparatory school at Reading; four years later he went to Wellington College, of which E. W. Benson, subsequently Archbishop of Canterbury, was then head master. At his father's death in 1869, George was sent to Epsom College, where he had obtained a scholarship; at the age of seventeen he went to Wren, a well known coach, to prepare for the Indian Civil Service; for this he passed the first examination, but failed in the second, partly from ill-health but partly because the time which should have been devoted to the acquirement of native languages having been spent largely in scientific work. At a later period he joined Wren's tutorial staff, on which he remained until the outbreak of the War. After this he was appointed to a temporary post at the Imperial Institute in 1917 in connection with the Indian

Trade Enquiry; he later became permanently attached to the staff, and was appointed guide lecturer in the exhibition galleries and lecturer under the African Tropical Service Course which posts he held at the time of his death. He also contributed articles and reviews to the Imperial Institute Bulletin.

In 1876, Boulger was appointed Professor of Natural History at the Royal Agricultural College, Cirencester. At this time he projected a Flora of Gloucestershire, for which he communicated preliminary notes (subsequently printed as a pamphlet), to the Annual Meeting of the Cotteswold Field Club in 1877; a "Report of Progress" was made to the Club at its annual meeting in the year following and also printed, in which the collaboration of Mr. Allen Harker and the help of various contributors was acknowledged. The Flora however was not proceeded with and is now, as is generally known, in the hands of the Rev. H. G. Riddelsdell. Boulger's connection with Cirencester did not altogether cease; in 1906 he was appointed Honorary Professor to the College—a title by which he was generally known.

Having settled in London, he married in 1879 Miss Dorothea Henrietta Havers—at that time well known as a novelist under the name of "Theo Gift"; it was to Mrs. Boulger that I was indebted for the singularly graphic pen-picture of Mr. W. Newbould in the obituary notice published in this Journal for 1886 (p. 172).

From this time until his death Boulger devoted himself with unremitting energy to literary and biological work. He became a familiar figure in scientific circles, placing his knowledge at the disposal of all who consulted him; it may be doubted whether any one has ever done more to popularise science. His information was always to be depended upon, and his work was always scholarly; he had a wide acquaintance with general and classical literature, and his pleasant and attractive manner rendered him readily accessible. He was always ready to help in any literary undertaking, and the number of volumes which acknowledged indebtedness to his assistance is very large. A good lecturer on a great variety of subjects and a ready speaker, he was in much request at the meetings of local scientific societies; he was also much esteemed as a guide in the field excursions and rambles of various bodies especially those of the Essex Field Club and the Selborne Society; on these occasions his extensive knowledge of history and archæology, and especially of ecclesiology, in which he was keenly interested, lent an additional and varied charm to his leadership.

In the work of the two Societies named Boulger had for many years taken a leading part: in both he had filled the office of president and was at the time of his death vice-president. He edited *Nature Notes* for the Selborne Society from 1898 until recently; he cooperated in the museum and other undertakings of the Essex Field Club and was a constant contributor to its organ, *The Essex Naturalist,* to which we may look with confidence for a more general appreciation of his abilities than can be expected from a journal which is only concerned with one aspect of his work. He was also a vice-president of the South-Eastern Union of Scientific Societies and contributed various papers to its publications; his interesting paper on the "History of Kew Gardens" and its connection with the History of Botany, published in the *South-Eastern Naturalist* for 1915 was followed in 1917 by one of similar scope on "the Chelsea Physic Garden"; his "Botanical Bibliography of the South-eastern Counties" had been printed in the *Transactions* of the Union for 1899. Boulger became a Fellow of the Linnean Society in 1877 and was a Honorary Fellow of the Royal Horticultural Society.

Although not a critical botanist nor specially interested in any particular group, Boulger had an exceedingly good general knowledge of British plants, which gave to the popular works in which he was concerned a value rarely attaching to such publications. In 1894–5 he collaborated with Mrs. J. A. Owen in *The Country, Month by Month*, for which he supplied the botanical information; and in 1914 contributed the letterpress which accompanied Mrs. Henry Perrin's drawings in the handsome work on *British Flowering Plants*, produced at her expense. His *Familiar Trees*, first issued in two volumes 1887–8 and again (in three) in 1906–7, attained a large circulation; the edition of Johns's *Flowers of the Field* "entirely rewritten and revised" by him, which appeared in 1899, has been frequently reissued, and still remains the most useful book for beginners. Observations on individual plants are scattered through our pages; the paper on entire-leaved forms of *Lamium* (1903, 150) and notes on a new variety (*schizopetala*) of *Erica cinerea* (1912, 315) and dialysis of the corolla in *Convolvulus arvensis* (1915, 359) are the most interesting of these; a note on *Lathræa* (1921, 301) was his last contribution to our pages. The paper on the preservation of our wild plants (Journ. R. H. S. xxix. (1905) partly reproduced in this Journal for 1906 (p. 414) shows a wide acquaintance with the British flora. His paper on "The Life-History of the Beech," published in the *Quarterly Journal of Forestry* for 1907, is a thorough piece of work for which a gold medal was awarded. In 1917 he published under the title *Name this Flower* a translation, adapted to the British Flora, of M. Bonnier's *Les Noms des Fleurs*; at the time of his death he was engaged in similarly adapting the same author's *Flore du Nord de la France et de la Belgique*.

Boulger's connection with this Journal dates from 1877, in which year he published "a historical criticism" on the classification of monocotyledons; in the previous year he had contributed to the British Association a paper on the evolution of sex in the vegetable kingdom. But although always interested in matters connected with plant physiology and classification, his chief botanical work lay in the direction indicated in his early days. At Cirencester in 1876 he delivered what in a later lecture he claimed as "the first course of lectures on forestry as a complete science ever delivered in this country": this later lecture—on "The Science and Teaching of Forestry"—was given in the same place in 1882; even at that period "there could hardly be said to be any interest" in the subject, and the subsequent recognition of its importance is due in no small measure to Boulger's insistence upon this. A comprehensive summary of the economic forestry of the world, published in the Transactions of the Scottish Arboricultural Society in 1887, is an excellent example of the thoroughness of his work; since 1893 he has written the notices of volumes on forestry sent to this Journal for review. His book on *Wood* (1903) was noticed at length in the volume for that year (p. 26).

It is however by his researches into the history of British botany and of British botanists that Boulger will be chiefly remembered by readers of these pages. The biographical sketches of Dale (1659–1739; Journ. Bot. 1883, 193), and Uvedale (1642–1722; (1891, 9)); the papers on "Joseph Andrews and his Herbarium" (1918), on the elder Tradescant as "The First Russian Botanist" (1895, 33), on "Jonathan Stokes and his Contemporaries" (1914), and on "A Seventeenth Century Botanist Friendship" (1918, 197), may be cited as examples of the detailed information which Boulger possessed in so eminent a degree, and was able to convey in a manner as interesting as it was accurate. In the direction of biography, reference must be made to his numerous contributions to the *Dictionary of National Biography*, and to his work on our *Biographical Index of British and Irish Botanists*, which, printed in serial form in this Journal from 1888 was issued as a volume in 1903. Since that date Boulger and I had been steadily working at a new edition of this, the production of which was hindered by the cost of printing; we had hoped to produce it during the present year and Boulger was engaged in the preparation of the introductory matter. It is sad to think that the new edition, should it appear, will include the name of one who had taken so active a part in its preparation—as well as, in all probability, that of the present writer, for the prospect of publication is still remote.

It was not only in this Journal that the fruits of Boulger's biographical and bibliographical researches appeared; in the pages of the *Essex Naturalist* he published numerous papers and notes relating to the botanists of the county. Before 1883 he was engaged in tracing the history of Essex botany; his papers dealing with the subject, which he treated chronologically, began in the *Essex Naturalist* for 1899 and, continued at intervals, were unfortunately not completed. As was natural, the great Essex naturalist attracted his attention; his paper containing "Unpublished Material relating to John Ray" (*Essex Review*, 1917) contains much information derived from the Bodleian and other sources, in addition to that which he had already published in the *Transactions* and *Journal* of the Essex Field Club and in the *Essex Naturalist*. Boulger's last undertaking in the direction of biographical and historical research was the "Outline History of Botany in Surrey" (fortunately already in type) prepared for Mr. C. E. Salmon's forthcoming Flora. For many years he had contributed weekly to *The Times* interesting and well-informed articles on Kew Gardens. This enumeration of Boulger's writings is by no means complete, but is sufficient to show the wide scope of his botanical interests and the range of his publications. Of Boulger's

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geological work—he was a Fellow of the Geological Society—this is not the place to speak, except in so far as it was associated with botany. In that connexion he read before the Geologists' Association in 1880 a paper, of which an abstract was given in this Journal (1880, p. 62), on the geological and other causes of the distribution of the British Flora; his first review in these pages—of Kidston's *Palæozoic Plants*—appeared in 1886 (p. 285). Since 1884 he had been lecturer on botany and geology at the City of London College. Questions of plant-distribution always interested him; in 1912 he contributed to the "Temple Primers" series a useful little volume on *Plant Geography*.

For some time before Boulger's death, his friends had noticed slight indications of failing health. But he continued his work with his usual energy, and it was with a feeling of shock that the news of his death was received. He was taken ill on the 29th of April and died at his residence at Richmond, Surrey, on May 4. He was buried in Richmond Cemetery on the 9th, many of his scientific friends testifying by their presence at the grave or at the requiem which preceded the interment the regard in which his memory was held.

It would be an injustice to Boulger were this notice to conclude without some allusion to what he would certainly have regarded as the chief interest of his life. A convert in 1888 to the Catholic Church, he was not only personally a devout follower of her teachings, but both by precept and example endeavoured to promote her interests. Apart from purely spiritual associations, his work in connexion with the Society of St. Vincent de Paul—a charitable lay association devoted to relieving the spiritual and temporal necessities of the Catholic poor—brought him into communication with others than his co-religionists; in the councils of that body, as well as locally, he held a prominent position, and his devotion to its interests, added to his strenuous efforts in other directions, doubtless accelerated his death, which may be attributed in great measure to overwork.

For the information as to Boulger's early days I am indebted to his niece Miss Ethel Chawner, of Lyndhurst: she adds: "We often heard him speak of you and always with affection as an old and valued friend."

James Britten.

THE TYPE-SPECIES OF *BIGNONIA*.

By T. A. Sprague, B.Sc., F.L.S.

The genus *Bignonia* Tourn., as defined by Linnæus in 1753–4, included species of *Catalpa* (1), *Gelsemium* (2), *Doxantha* (3), *Cydista* (4). *Amphilophium* (5), *Tanæcium* (6), *Anisostichus* (7), *Tabebuia* sensu Benth. et Hook f. (8), *Argylia* (9), *Campsis* (10), *Ampelopsis* (11), *Stenolobium* (11, Plumier synonym), *Oroxylum* (12), *Pajanelia* (12 β) and *Jacaranda* (13); the numbers in brackets correspond with the species of *Bignonia* in Sp. Pl. ed. 1, 622–5.

Bignonia L. (1753) thus comprised six genera of *Bignonieæ* and seven of *Tecomeæ* besides one each of *Loganiaceæ* and *Vitaceæ*. Bureau (Monogr. Bignon. 44, t. 7; 1864), followed by K. Schumann, regarded *B. unguis-cati* (*Dorantha unguis-cati*) as the type; Britton (Ill. Fl. ed. 2, iii. 237; 1913), on the other hand, stated that the type-species was *B. radicans* (*Campsis radicans*). Britton's conclusion, if confirmed, would entail the re-naming of the tribe *Bignonieæ*, since, according to his view, *Bignonia* is one of the *Tecomeæ* (*Campsis*). Fortunately, however, there appears to be no doubt that *B. capreolata* (*Anisostichus capreolatus*) is the type-species, whether under the recent American Regulations for fixing generic types (*Science*, n. s. xlix. 333; 1919), or according to the method of "residue."

As *Bignonia* was originally described by Tournefort (Elem. Bot. 133, t. 72; 1694), the type should be selected from those species common to Tournefort's *Élemens* and the first edition of the *Species Plantarum*, namely from *B. unguis-cati*, *æquinoctialis*, *capreolata*, *radicans* and *indica* (Amer. Reg., Art. 7, c). Linnæus (Gen. Pl. ed. 5, 273) cited Tournefort's plate, which is decisive (Art. 6, b). *B. capreolata* was the species *figured* by Tournefort (Elem. Bot. t. 72, fig. A–D—the capsule apparently represents some other Bignoniad), and should therefore be accepted as the type-species (Art. 7, a, 2). The *historically oldest* species (Art. 7, e), on the other hand, appears to be *B. radicans* (*Gelseminum Indicum maximum flore phœniceo* Ferrarius, Fl. Cult. 196, 199: 1633; *Gelseminum ederaceum Indicum* Cornutus, Hist. 102 cum. ic.; 1635). *B. capreolata*, however, was well-known to botanists in the second half of the seventeenth century. It had been recorded in 1653 and 1669 as cultivated in the Botanic Garden, Blois (*Clematis tetraphyllos Americana* Brunyer, Hort. Reg. Bles. 19; Morison, Hort. Reg. Bles. Auct. 54); and in 1665 in the Paris Botanic Garden (*Clematis tetraphyllos Americana Digitalis flore* Joncquet, Hort. Reg. Par. 53). Boccone saw it in gardens at Florence during the following decade (*Clematis tetraphylla Americana* Boccone, Ic. 31, t. 15, fig. 3; 1674); and Zanoni had it in cultivation at Bologna for a long time previous to 1675 (*Clematide tetraphylla Americana* Zanoni, Ist. Bot. 74, t. 28; ed. Montius, 49, t. 33, as *Bignonia Americana capreolis donata siliqua breviori*). Dodart described and figured it independently in 1676, and suggested that a new genus might be established for the reception of this species and *Gelsemium ederaceum indicum*—"Cette plante et le Jassemin d'Inde à fleur pourprée pourroient faire un genre particulier, parce que leurs fleurs et leurs graines sont tout-à-fait semblables (*Clematis Americana siliquosa tetraphyllos* Dodart, Mem. 71). This suggestion was carried out in 1694 by the publication of the genus *Bignonia* Tourn. Breyne observed *B. capreolata* in flower in 1679 in Beverningk's garden in Holland (*Clematis Americana uliginosa tetraphyllos* Breyn. Prodr. ed. 2, 20; 1739). Thus *B. capreolata* had become widely cultivated in France, Italy and Holland fifteen years before the publication of Tournefort's *Elemens*.

If we follow the method of "residue," the result is the same. Of the fifteen genera included in *Bignonia* L. (1753), twelve had been segregated by the year 1838. *B. unguis-cati* and *B. æquinoctialis* were separated by Miers in 1863 as types of the new genera *Doxantha* and *Cydista* respectively (Proc. Hort. Soc. iii. 189, 191; 1863). There remained only *B. capreolata*, which Miers had referred to *Doxantha*, but which was segregated by Bureau in 1864 as the type of a new genus *Anisostichus*. Seemann, in reviewing Bureau's *Monographie*, remarked that "it is really high time that botanists should come to some understanding as to what is to be regarded as the type of *Bignonia*," and came to the conclusion "that the genus *Bignonia* would exist no longer, except as a receptacle of species not yet examined by any competent authority" (Journ. Bot, 1864, 356). It is hoped that *B. capreolata* may now be recognised as the type-species.

As the names *Bignonia* and *Doxantha* were transposed by K. Schumann in *Die Natürlichen Pflanzenfamilien* and in *Martius, Flora Brasiliensis*, it seems advisable to give the synonymy of the two genera. Miers explicitly stated that *B. unguis-cati* was the type-species of *Doxantha*; hence it is inadmissible to use the name *Doxantha* for a genus in which *B. unguis-cati* is not included.

Bignonia [Tourn. Elem. 133, t. 72; 1694] L. Sp. Pl. 622 (1753); Gen. Pl. ed. 5, 273 (1754), emend.

Anisostichus Bur. Monogr. Bignon. 43, t. 6 (1864).

Doxantha K. Schum. in Nat. Pflanzenfam. iv. 3 B, 216 (1894), et in Mart. Fl. Bras. viii. pars. 2, 10, non Miers emend.

Type-species: *B. capreolata* L.

Judging from the description, *B. californica* Brandegee (*Zoe*, v. 170; 1903) appears to be congeneric.

Doxantha Miers. in Proc. Roy. Hort. Soc. iii. 189 (1863), emend.; Seem. in Journ. Bot. 1864, 356.

Bignonia Bur. Monogr. Bignon. 40, t. 7 (1864); K. Schum. in Nat. Pflanzenfam. iv. 3 B, 226, et in Mart. Fl. Bras. viii. pars 2, 10, 281; non L. emend.

Type-species: *B. unguis-cati* L.

SHORT NOTES.

An Abnormal Primrose. A primrose with considerably abnormal flowers was found in Culvery Woods, Pensford, Somerset, on April 29th, 1922: calyx deeper coloured than usual, more hairy and not contracted at the throat; corolla was funnel-shaped with an open throat, green with yellow markings at the throat, while the laminæ were wrinkled, slightly emarginate and ciliate; stamens short, joined to the corolla 6 mm. from the base of the tube, the whole length of the corolla being 21 mm.; style much elongated, exceeding by 3–4 mm. the wide throat of the corolla and with longer hairs; stigma bi-lobed, the lobes sometimes long and bending back to form a crutch; ovary much elongated, hairy, laterally compressed, with 5 longitudinal ridges, formed by folds in the thin wall; placentation free-central. All the flowers of the plant were similar: the particular interest of the specimen seems to be the bi-lobed stigma, occurring in a plant which is usually considered to have 5 carpels. The foliage-leaves and general growth of the plant showed no special peculiarities, but since Penzig makes no mention of this abnormality, the fact seems worthy of record.—L. Batten.

An Early Hudson's Bay Collector. In the Banksian Herbarium are a considerable number of sheets endorsed in Banks's hand "Hudson's Bay, 1773." We had always assumed that these were of Banks's own collecting, and it was only lately that, the matter having attracted notice, it became evident that he never went to Hudson's Bay, nor does his correspondence throw any light on their acquisition. One of the species collected—*Pulmonaria* (now *Mertensia*) *paniculata*—is described in Hort. Kew. i. 182 (1789) from Solander's MSS., with the information: "Introd. 1778 by Daniel Charles Solander"; Solander (MSS.) localises the plant: "Habitat ad Sinum Hudsoni Americæ septentrionalis," but says nothing as to the collector; he himself was never at Hudson's Bay. Sims (Bot. Mag. 2680 (1826) says: "Originally introduced to the Kew Garden by the late Dr. Solander, in 1778." The Banksian specimen and the plant introduced to the Kew Garden doubtless had a common origin; but who collected in Hudson's Bay in 1773?—James Britten.

Juncus conglomeratus L. This is put down in most Floras and in Pryor's Fl. of Herts as "common." But I believe it much scarcer here, at any rate, than is supposed: and at Midhurst, Sussex, last week, for hundreds of *J. effusus* there was, perhaps, one of *conglomeratus*. There is the compact, early-flowering form of *J. effusus*, which in a general view simulates it so closely as to be easily mistaken for it, especially as the capsule darkens to nearly the same colour, and it often possesses at the tip of the capsule a slight point (noticed by Sturm, *Deutschlands Flora*). This misleads one into thinking one has found the apiculate capsule of some authors, more properly diagnosed for *J. conglomeratus* by Babington:—"The mucro in the hollowed top of the capsule resembles a little hill bearing the style." In the Hitchin district in 1921, I am not sure that I found more than a single plant of *J. conglomeratus* for thousands of *J. effusus*. I was studying the areas closely for *J. diffusus* Hoppe, which I found in two. I should be interested to learn if *J. conglomeratus* has large areas where it is common or dominant.

There is one point which I cannot quite clear up: Babington speaks of the sheaths at the base as "inflated"; I can only find them rather loose, not larger in the centre than elsewhere.—J. E. Little.

Ranunculus Lingua in E. Gloucester. A specimen of *Ranunculus Lingua* L. has just been sent me from East Gloucestershire: the first trustworthy record for v. c. 33. From the same county a golden-yellow flowered privet has been forwarded to me, the nature of which I cannot yet determine: later I hope to grow it on in the garden for the purposes of comparison.—H. J. Riddelsdell.

REVIEWS.

Manual of British Botany containing the Flowering Plants and Ferns arranged according to the Natural Orders by Charles Cardale Babington, M.A., F.R.S., F.L.S., late Professor of Botany in the University of Cambridge. Tenth Edition with amended Nomenclature and an Appendix edited by A. J. Wilmott, B.A., F.L.S., Assistant in the Department of Botany, British Museum. Small cr. 8vo, pp. liv, 612. Thin paper, cloth limp. 16*s*. net. Gurney & Jackson.

A publishers' note informs us that "the demand for this *Manual*, which for seventy years has been the only critical work, in a portable form, on the British Flowering Plants, Ferns, etc., has necessitated the preparation of a Tenth Edition"; this, Mr. Wilmott tells us in his preface, "is, with two exceptions, a reprint of the last: at the late Mrs. Babington's request I undertook to bring the names up to date, and to add a short appendix to include the most important additions to our knowledge of the British flora." There is, however, a curious alteration on the titlepage for which, we understand, the publishers are responsible, whereby the words "the late," prefixed in the ninth edition to the author's name, are transferred to his Cambridge appointment, thus suggesting that Babington still lives but has abandoned his professorship. Another eccentricity, for which we presume the publishers are also responsible, is the citation of "press notices of the *third* edition," the present being the *tenth*. They are, however, to be thanked for the convenient form in which the edition is produced; thin paper, limp binding, and rounded corners make it a pocketable volume.

The mention of the ninth edition brings us at once to a serious omission which, both from a botanical and a bibliographical standpoint, detracts from the value of the present issue. Beyond the reference to "the last" edition quoted above, we find no reference to the ninth; and the work of Messrs. Groves, which greatly increased its usefulness and indeed gave the *Manual* a new lease of life, is not even alluded to. Babington's preface to the eighth edition (1881)—the last for which he was responsible—is rightly reprinted; but the preface to the ninth (1904) which is equally essential to the understanding of the volume is omitted. We trust that, in the event of a reissue, this serious defect will be repaired, or at least that the blank page following Mr. Wilmott's preface will be utilised so far as to convey some of the important information which the preface contains; some explanation is certainly needed of the initials of the brothers Groves which follow the footnotes added by them to Babington's text and, in the absence of any reference to their work, must puzzle the younger students who use the *Manual*.

This work included, as stated in their preface, the making of "a large number of alterations in names and authorities"; in this new edition the nomenclature has been further "amended," and the Vienna Code has been departed from on the lines indicated by Mr. Wilmott in our last issue (p. 200, n. 5). As to the desirability of this we express no opinion; it appears that the departure was made "with Mrs. Babington's consent." The alterations necessitated by Babington's "method of giving binominals to his β, γ, etc." were, however, "not permitted," and the method was retained, though contrary to the code. There is something comic in the exercise of this power of binding and loosing by a lady whose only claim to botanical recognition was the relation in which she stood to the author of the *Manual*, the copyright of which she held.

Mr. Wilmott's "main endeavour has been to make the names correct," and those who know how much attention he has given to questions of nomenclature will share his "hope that [this] is now fairly accurate." Even since the printing of "the greater part of this reprint," however, further changes became necessary; these, so far as they "appear to be certainly well founded, are included in the corrigenda." It may be useful to point out that they appear on the back of the half-title, facing p. 1; there is no table of contents, and the corrigenda may easily be overlooked.

A comparison of the names here adopted with those in ed. 9 would probably lead to interesting results: we note that *Minuartia*, adopted in ed. 9, in accordance with Mr. Hiern's conclusions published in this Journal for 1899, is here replaced in the text by *Alsine*; in the corrigenda, however, *Alsine* is in its turn superseded and *Minuartia* restored. This and similar occurrences suggest that ed. 9 has been insufficiently consulted—thus Mr. Wilmott in his preface says that "the use of *Myosotis scorpioides* L. emend. Rendle and Britten [1907] is correct," but the name as restricted appears in ed. 9 (1904); moreover in the text of the present edition the name stands more accurately as "*M. scorpioides* L. emend. Hill." Of the "continual change," which Mr. Wilmott rightly regards as "unfortunate," his edition affords an example of striking rapidity: the plant known to most of us as *Vicia gracilis* Loisel stands in the text (p. 99) as *V. tenuissima* Schinz & Thell.; but this is in its turn replaced in the corrigenda by *V. varia* Wilmott—a name which we believe has not hitherto been published. *Myosoton* Moench replaces *Malachium* Fries—*Cerastium* "*vicosum*" on the same page (64) is presumably a misprint. We note that Mr. Wilmott retains the name *Koeleria splendens*, which was discussed in this Journal for 1906 (p. 104).

A notable alteration throughout is "the attempt [that] has been made to cite the author who first gave the name the (approximate) connotation expressed in this book [e.g. "*Chelidonium* L. em. Crantz"]. It was difficult in some cases to determine exactly what limits the professor [Babington] intended, but it was assumed that the diagnosis included everything known which it did not exclude." The principle thus indicated is in accordance with Art. 44 of the Vienna Code; but Mr. Wilmott does not seem to have applied it consistently: *e. g.* if it be advisable to write "*Chelidonium* L. em. Crantz"—presumably because Crantz referred to *Glaucium* certain species placed by Linnæus in *Chelidonium*,—it would appear that "*Adonis* L." should be equally restricted ("emend.") by reference to the author who first limited that genus by the separation or omission from it of *Knowltonia* (*Adonis capensis* L.). Incidentally we note that emendation is indicated in different ways—"*Chelidonium* Linn. em. Crantz," "*Trifolium* Linn. em., Koch," "*Lupinus* Linn. diagn. em., DC." The necessity for these restricted references is set forth by Mr. Wilmott in a somewhat *ex cathedrâ* statement which we confess our inability to follow: the rendering of "make out" by "facio" seems to us open to criticism: "Identification consists in saying what you make out (facio) the specimen to be the same as (idem). As the descriptions and figures are not always similar, and the plants vary, identification should consist in citing the description, figure, or specimen with which a specimen has been matched. The use of a name is only a brief way of referring to some description in order to avoid either giving a new one for every specimen recorded, or preserving every specimen. The source whence the name is taken should therefore be indicated if the identification is to be definite. If this is done, it becomes relatively immaterial which of two or three names is used, since the meaning is always discoverable."

The botanical interest of the book of course centres in the second Appendix—the first, to which no reference is made in the preface, contains Mr. Rogers's conspectus of *Rubi* and is reprinted from the ninth edition. In the second, which occupies thirty pages, "only the more important advances" of the last seventeen years are included. Mr. Wilmott says "it was difficult to decide what to omit," and he was well advised to exclude a large number of so-called "varieties" based on trivial characters. But it is surprising to note the absence of any reference to *Hieracium* and *Saxifraga*, which have received much attention during the last seventeen years: E. S. Marshall's careful description of new species or forms of these genera in this Journal for 1913 and 1918 should, we think, have been noted; the omission of *Nitella spanioclada*, figured and described in our volume for 1919, is, we presume, due to inadvertence. Many of the genera are treated at considerable length: *Fumaria* occupies more than four pages; other examples are *Alchemilla*, *Rhinanthus*, *Salicornia*, *Orchis*, *Ulmus*, *Polygonum*, *Orchis*, and *Koeleria*. We think that in some of these cases referenee should have been made to the sources whence the information was obtained and where it might be supplemented: *Salicornia* and *Ulmus*, for example, are figured and fully treated in the *Cambridge British Flora*; and for *Orchis* and *Epipactis* the papers in this Journal by Messrs. Stephenson and Col. Godfery (not "Godfrey") might have been indicated.

While welcoming this tenth edition on behalf of those for whom it has been undertaken, we must express a fervent hope that it will be the last. Mr. Williams in his review of the ninth edition (Journ. Bot. 1904, 272) expressed regret that the time and trouble expended by the Messrs. Groves in "polishing up and trimming a Manual which marked a closed chapter in British botany" should not have been bestowed upon producing a British Flora of their own. The regretted death of one of the brothers and the concentration of the survivor upon a group which demands all his attention must prevent the realisation of such a hope; but there are others, including Mr. Wilmott himself, who might combine in producing a thoroughly satisfactory handbook to British botany. Even though the hand which has, since the death of its author, controlled the destinies of the *Manual* is now removed, it would be futile again to attempt to patch up a work which in the past has been of incalculable serviee to British botanists.

The Call of the Wildflower. By HENRY S. SALT. Cr. 8vo, cloth, pp. 192, price 6*s.* net. Allen and Unwin.

IN this pleasant little book, Mr. Salt turns his attention from the animals, with whose wrongs he is a well-known sympathiser, to flowers, with which "it is as friends, not garden captives or herbarium specimens, that the flower-lover desires to be acquainted." To know them he must see them in their native haunts, and this Mr. Salt has done, "starting from the coast of Sussex"—a county which figures largely in his book—"and ascending to the high mountains of Wales and the north-west." He laments that "books mostly fail, not only to portray the life of the plant, but even to give an intelligible account of its habitat and appearance"; formulates the usual objection, first we think expressed by Thomas Hood, who said that if we really loved flowers we should'nt give them such hard names; and, in a chapter headed "Botanesque," criticizes "botanical phraseology."

The book however is a very favourable specimen of its kind; Mr. Salt has a genuine enthusiasm for wild flowers, and has observed them in many and various localities, and his description of these and of the plants themselves is accurate as well as sympathetic. There is an amusing chapter on "the lying legend" "Trespassers will be prosecuted"—"trespassers will *not* be prosecuted, for the sufficient reason that in English law trespassing is not an offence provided they do no sort of damage and that if their presence is objected to they politely retire": he sometimes descends to puns—"orchistra" for a chalkpit abounding in orchids and "Anne-Prattle," which is rather cruel, for Miss Pratt did good work in her way. He is properly severe on vandalism such as that displayed by the 'gentleman,' who came with two gardeners in a motor and departed laden with "*Gentiana verna* for his private rockery . . . . such a botanist, if botanist he can be called, deserves to be himself transplanted or transported—to Botany Bay." The book is well printed; but one wonders why the names of genera, with rare exceptions, begin with a small letter.

BOOK-NOTES, NEWS, ETC.

WE regret to announce the death of the Rev. JOHN VAUGHAN, who since 1909 has been a Canon Residentiary of Winchester Cathedral; he preached in the Cathedral on the morning of Sunday

July 9, but was immediately afterwards taken ill and removed to his house in the Close, where he died the following morning. He was born at Finchingfield, Essex, where his father was Vicar, on Jan. 22, 1855; was educated at Felsted School and graduated M.A. at Corpus Christi College in 1876. Ordained in 1878, he held curacies in Gloucestershire and Hampshire, and in 1890 was Vicar of Porchester in the latter county. In 1902 he became Rector of Droxford; here he remained for ten years, and it was during this period that he contributed to the *Cornhill* and other magazines the papers which were published in 1906 in a volume entitled *The Wild Flowers of Selborne and other Papers*—these included an interesting sketch of John Goodyer, whose association with Droxford greatly interested him. In this and in his other volumes, the last of which—*The Music of Wild Flowers*—was noticed in this Journal for 1920 (p. 278), he "combined with a sound knowledge of botany and natural history a gift of historical imagination"—we take this sentence from the *Times*, to whose columns he had for the last two or three years contributed articles dealing with plants and nature generally. His collected papers show an acquaintance with early English botanical writers and their works which, combined with their accuracy, place them far above the work of the ordinary "popular" author. Canon Vaughan was in great request as a lecturer on natural history, archæology, and other subjects, and was for twelve years Organizing Secretary of the Diocesan branch of the Central Church Union—a post from which he recently retired on account of failing health.

From the *Thirty-eighth Annual Report of the Watson Botanical Exchange Club*, 1921–22—the date of issue is not stated—edited by the Hon. Secretary, Mr. H. S. Thompson, we learn that it has been decided to invite "several good Continental botanists to join the Club, so as to facilitate comparison of certain British plants with forms growing on the Continent." The Report as usual contains many valuable notes, some of which might be condensed with advantage. Mr. S. H. Bickham has presented many plants from the herbarium of Joseph Sidebotham (1824–85) which will doubtless be useful; but it is difficult to see what is gained by including these, collected in well-known localities at very distant dates, among the notes; and comments such as those under *Scilla autumnalis*, containing equally familiar information, seem equally unnecessary. The printing at the head of paragraphs of the erroneous determinations made by contributors, followed by corrections, is, we think, likely to discourage and seems to serve no useful purpose; the note headed "*Lavatera cretica* L." (which might indeed have been entirely omitted without loss) and that under "*Callitriche polymorpha* Lönnr." exemplify our meaning. It is not clear whether specimens are distributed under the names by which they are sent; if so, there is the obvious danger that, although careful members will correct the labels in accordance with the Report, others may neglect to do so. It is gratifying to learn that there has been an increase in membership and in the number of specimens sent in; the distributor for the past year was Mr. W. R. Sherrin, who contributes to the Report a useful key to the British species of *Juncus*; that for 1922–3 is Mr. J. E. Little.

The *Kew Bulletin* (No. 2) contains a long and interesting biography of the late Sir John Kirk, by the Director of the Gardens; a revision of the "Serrato-ciliata" group of *Tropæolum*, by Miss D. K. Hughes, with four excellent figures, includes full descriptions of 32 species, of which half are new; Dr. E. J. Butler gives an account of "Phytopathology in the United States." The number also contains the address presented by the Kew staff to Sir David Prain on his retirement.—To No. 3 Mr. Sprague contributes a revision of *Amoreuxia* with six species (two new) and a plate of the seeds; Mr. Ridley describes new species of *Rigiolepis* and *Vaccinium* from Borneo; Mr. Hutchinson amplifies the description of T. R. Sim's genus *Heywoodia*, of which a figure is given; the "Decades Kewenses" are continued; and Mr. W. B. Turrill begins a series of notes on *Cyperaceæ*, in which he deals with a complicated question of nomenclature in the genus *Pycreus*: there is a notice of the late J. F. Duthie, with bibliography, by Mr. J. S. Gamble.—No. 4 contains a revision of *Canavalia*, by C. V. Piper and S. T. Dunn, in which the Old World species, 16 in number (five new), are dealt with, the distribution being very fully given: C. H. Lankester gives an account of a visit to Mt. Elgon, Uganda; and new species from Mount Everest of *Aconitum*, *Tanacetum*, *Androsace*, *Primula*, *Gentiana*, and *Dracocephalum* are described by various botanists.

The long years of work devoted by Prof. Setchell and his colleagues to the study of the marine algæ of California are now yielding a harvest of publications. In *Phycological Contributions II. to IV.*, by W. A. Setchell and N. L. Gardner (*University of California Publications, Botany*, vii. 1922, pp. 333–426, pls. 32–49) fifty-four new species and twenty-one new forms of small brown algæ are described and figured. The genera concerned are six:—*Myrionema*, *Compsonema*, *Hecatonema*, *Pylaiella*, *Streblonema*, *Ectocarpus*. The distinctive characters of the first three are emphasized. *Myrionema* has a monostromatic basal disc composed of crowded branched filaments radiating from a common centre; from almost every cell of these arises an erect filament, either fertile (with zoosporangia or gametangia) or occasionally sterile; and the loculi of the gametangia are uniseriate. In *Compsonema* the loculi of the gametangia are pluriseriate. In *Hecatonema* the base is distromatic, and the gametangial loculi are pluriseriate. A new order (Ectocarpales) is defined, and the characters by which it differs from Cutleriales, Sphacelariales, Laminariales, and Dictyosiphonales, are briefly indicated. Algologists are much indebted to the authors for this excellent piece of work with its clear descriptions and figures and critical notes.—A. G.

In the *Orchid Review* for July, Mr. J. Ramsbottom has an article on "Germination of Orchid Seeds"—a reply to Prof. L. Knudson's paper on "Nonsymbiotic germination of orchid seeds," which appeared in the *Botanical Gazette* for January. The American author, working with *Cattleya* and *Lælia*, was able to germinate the seeds in the presence of soluble organic substances and sugars without the intervention of the root fungus; from his experiments Knudson held that "the evidence for the necessity of the fungus for germination has not yet been conclusively proved." Mr. Ramsbottom controverts this statement, basing his arguments on the following facts: 1. The roots of all orchids growing naturally have fungi in their roots, the fungus being always the same species; 2. The fungi throughout the *Orchidaceæ* are species of *Rhizoctonia* (*sensu* Bernard); 3. The only fungus bringing about germination is the one from the roots of the parent plant; 4. Orchid seedlings, both native and cultivated, always show the fungus from the earliest stages of development; 5. The fungus must be beneficial, harmful, or of no effect. Comparative experiments show that in the case of *Odontoglossum* germination occurs only when the "*Odontoglossum* fungus" is present.

The *Twenty-seventh Annual Report of the Moss Exchange Club* (Arbroath: T. Buncle & Co., 1922) is pervaded by a sad tone and laments the death of two valued members of more than twenty years' standing—Ll. J. Cocks, of Esher, and E. Cleminshaw, of Birmingham; also the illness and resignation of the Secretary, Mr. William Ingham, who has so ably served the Club for many years. The Treasurer tells us that the Club has become weakened by death, sickness, and resignation, and that its future management is under consideration. He points out that the Beginners' Section, started under the care of E. C. Horrell in 1900, has tended to split off and become an independent society and is thus a source of weakness instead of strength to British Bryology: amalgamation would reduce the present working expenses. The lists of specimens contributed to the Club show that an increased interest was taken in *Sphagnaceæ* during the past year. In the critical notes will be found a number of corrections of bryological records for the counties of Worcester, Stafford, Warwick, and Hereford.

The *Journal of the Department of Agriculture*, published at Pretoria, is devoting attention to the noxious weeds of South Africa, which, "owing to the alarming rapidity of their spread in recent years, are becoming increasingly dangerous to pasturage, wool, and other agricultural pursuits." The number for June contains a paper by K. A. Lansdell, Assistant in the Division of Botany, on the germination and growth of Dodder (*Cuscuta chinensis* Lam.) with numerous illustrations and suggestions to its eradication. To the same number, the Agrostologist to the Division, Sydney M. Stent, contributes a paper on "Dubbeltje (*Tribulus terrestris*) and Geeldikkop in Sheep"—the latter being the popular name of a disease mainly caused by the *Tribulus* and deriving from it the name *tribulosis*. "Dubbeltje" is applied also to *Emex australis* and *Pretrea zanguebarica*, which also have spine-armed fruits; but the *Tribulus* (of which a figure is given) is the principal culprit.

Professor Trelease, of Illinois University, sends us the second edition, revised, of his *Plant Materials of Decorative Gardening*. By its aid it is claimed that the question "What is that plant?"—"difficult to answer unless flowers are present, because the ordinary Manuals make use of flower and fruit characters—may be answered easily for over 1000 trees and shrubs, including those most commonly planted in the eastern States and in northern Europe, from foliage only." The introduction contains directions for using the keys provided as a means to the determination of the genera, and is followed by a "systematic arrangement of the plant materials" with keys to species under each genus; the orders are briefly and the genera very fully described. This little book, which is convenient for handling and of pocketable size, may be obtained from the author at Urbana, Illinois, for a dollar—"postpaid if order is accompanied by cash."

An instructive note *On the Californian "Delesseria quercifolia"* is supplied by Dr. Carl Skottsberg (*University of California Publications in Botany*, vol. 7, pp. 427–436, 1 pl., 1922), who shows that, though this alga has been issued as conspecific with the true *D. quercifolia* Bory from subantarctic America and is closely allied to it, yet it does differ both in habit and anatomy. Further, he surveys the history of *Delesseria* and points out that if *D. sanguinea* be recognized as the type of *Delesseria*, then the British species *D. sinuosa* must be excluded and Kützing's genus *Phycodrys* must be restored for it (as has already been done by Batters in his Catalogue, 1902, where the plant becomes *P. rubens* (Huds.) Batt.), and will also include *P. quercifolia* (Bory) Skottsb. and *P. Setchellii* Skottsb., under which name is described the Californian alga which had been wrongly referred to *Delesseria quercifolia*.—A. G.

The *Journal of the Linnean Society* (Botany, xlv. no. 305; June 20: 12*s.*) contains a paper by B. Millard Griffiths on "The Heleoplankton of the Berkshire Pools," which includes figures and descriptions of a new *Peridinium* (*P. Suttoni*); and the conclusion of the account of the plants collected in New Caledonia and the Isle of Pines in 1914 by Mr. R. H. Compton—the Hepaticæ, with two plates and numerous new species, are elaborated by Mr. W. H. Pearson; the Marine Algæ by Mr. Gepp; the Freshwater Algæ by Dr. Nellie Carter, with a new genus of *Stigomenaceæ* (*Rosaria*), some new species and a plate; Charophyta by Mr. James Groves (*Nitella Comptonii* sp. n. with plate); Lichens by Miss Lorrain Smith, with a new genus of *Pannariaceæ* (*Lepidoleptogium*) and some new species; Fungi by Miss E. M. Wakefield, with two new species.

The aim of M. Henri Leclerc in his *Précis de Phytothérapie* (Masson, Paris, 12 fr. net) is to convince his readers "que le médecine des simples, si chère à nos aïeux, débarrassée, grace aux lumières des méthodes actuelles, des obscurités qui l'enveloppaient et des légendes qui la défiguraient, est encore capable de rendre des services." With this object he has brought together an interesting and carefully compiled epitome of the works of the older writers (so far as these relate to the medical uses of plants) whose observations have been confirmed by long experience and are supported by recent investigations, including those of the author. The little book is thus a successor, brought up to date, of the "herbals" which at one time held an important place in popular medical practice; although relating to the French flora, it will be of service to others interested in the subject.

We are glad to announce that, after an interval of six years, it has been found possible to resume the publication of *Hooker's Icones Plantarum*, of which the fourth part of vol. i. (fifth series) was issued in June. This is entirely the work of Dr. Stapf and contains full descriptions and figures of grasses, largely from Tropical Africa, which have already been diagnosed by that author in the *Flora of Tropical Africa* and elsewhere. Two new genera are established—*Diheteropogon* (t. 3893), "sectio *Piestio Andropogonis* proximus" and *Odyssea* (t. 3100) for a plant which "in the course of time has become connected with no fewer than nine mostly widely different genera—a veritable Odyssey, hence the name." The titlepage and index to the volume are included in the part. We note that "the impression of the *Icones* is limited to 250 copies, and the work will not be reprinted."

The third Memoir issued by the Botanical Survey of South Africa (Pretoria, 10*s.* 6*d.*) is devoted to the *South African Cyperaceæ*, and mainly consists of notes on the genera, "including an account of their geographical distribution, the descriptions of the plates, the South African material of the species illustrated, their geographical distribution, and here and there remarks on them." There are also morphological and ecological notes and a selected bibliography. The Memoir is illustrated by eighty excellent plates, in which are represented every genus mentioned in the *Flora Capensis* and as far as possible every section of the larger genera. The elucidation of new species and genera is deferred for future publication; the aim of the present is "to give a nucleus of well-determined species by a number of faithful illustrations."

Messrs. Luzac have published (2*s.* n.) a pamphlet on *The Soma Plant*, by Braja Lal Mukherjee, M.A. "This plant," says the author, "has been variously described in Ayurvedic works, but most of them, if not all, seem to have drawn materials from imagination, and scholars who have attempted to identify this plant have based their theories on a text which has not been traced." After a careful comparison of Vedic texts and other sources, Mr. Mukherjee concludes that "the old identification of Soma with *Asclepias acida*, *Sarcostema brevistigma* or as *Ephedra vulgaris* or *Periploca aphylla* which was based on one only text quoted from an unknown post Vedic author is not confirmed by Vaidic text, and we believe that the much-revered King Soma is no other than *Cannabis sativa* of modern commerce."

No. 8 of the *Journal of the Botanical Society of South Africa* contains a paper by Mrs. L. Bolus on the *Geraniaceæ* of the region, with a clavis to the genera and species and a plate showing floral details of each. Mrs. Bolus also reprints from an earlier number, now out of print, papers on South African Heaths.

The botanical sections of the *Memorias do Instituto de Butantan* (vol. i. fasc. 5), published in April, contains an account with descriptions of the *Melastomaceæ* contained in various Brazilian herbaria by F. C. Hoehne. Many new species are described, and there is a full list of the specimens examined.

THE
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BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitu le has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers

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IN MEMORY OF WILLIAM CARRUTHERS (1830–1922)

William Carruthers was born at Moffat, Dumfriesshire, where his father was a merchant, on May 29, 1830, and his education began at the Academy of that place. At the age of fifteen he went to Edinburgh University, where, save for two periods during which he was engaged in teaching, he remained until 1854. In the latter half of that year he went to New College, Edinburgh, with the view of entering the ministry of the Presbyterian Church; but, on the advice of Dr. John Fleming, under whom he studied natural science, he resolved to abandon an ecclesiastical for a scientific career. The early bent of his mind, however, and the influence of his college training, found full expression in his later life. When he came to London he took a leading part in the affairs of the Presbyterian Church: from 1880 to 1910 he was first secretary and then chairman of its committee on publications, and from 1876 until the year before his death was editor of its magazine, the *Messenger for Children*; indeed, there was not one of the standing committees of the Church of which he had not at some time in his life been an active member. He was keenly interested in ecclesiastical history, particularly that of the Commonwealth period, and had a large and valuable collection of publications relating thereto.

After leaving New College, Carruthers became lecturer on botany to the New Veterinary College at Edinburgh. At this period, geology and palæontology chiefly occupied his attention and afforded the material for his first published papers. He had already made the acquaintance of the leaders of science in Edinburgh; and it was through John Hutton Balfour, then Professor of Botany, that he was offered the post of Assistant in the Department of Botany in the British Museum—this had become vacant by the appointment of J. J. Bennett to the Keepership, in succession to Robert Brown who had died in 1858. The appointment, which was temporarily delayed under circumstances detailed in this Journal for 1876 (p. 101), was made in the following year, in the autumn of which Carruthers entered upon his duties. He was then the only assistant, as Bennett had been to Robert Brown, and the work of the Department to a considerable extent devolved upon him. A warm attachment, somewhat interrupted by the marriage of Bennett at an advanced age, sprang up between the Keeper and his assistant; and when the former retired at the end of 1870, Carruthers naturally succeeded to the Keepership, his appointment dating from Feb. 15, 1871. Shortly before this he had been invited by Asa Gray—a frequent visitor to the Department for the purpose of consulting the early American collections there preserved—to join him at Cambridge, Mass., with the view of becoming his successor; but Carruthers, though much attracted by the offer, decided to remain at the Museum. The staff of the Department had been increased two years before by the appointment of Henry Trimen, who had already done good botanical work, as an additional assistant: the vacancy now caused by Carruthers's promotion was filled by me in 1871 (see Journ. Bot. 1917, p. 93).

This was not my first introduction to Carruthers: I had made his acquaintance in 1864. In my rambles over Putney Heath and Wimbledon Common, I had found a plant, an outcast from a garden, which had puzzled me, and at the suggestion of W. W. Newbould, who had introduced himself to me on the strength of a list of Kew Bridge plants which I had published in the first volume of this Journal (1863), I took it to the Botanical Department, where Newbould was then a familiar figure. He made me known to J. J. Bennett, whom I can see now, coming out of the Keeper's room with his hands beneath his coat-tails, who took me to Carruthers who solved my difficulty—the plant was *Rivina lævis.* The circumstances under which Newbould severed and subsequently renewed his relations with Carruthers and the Department are set forth in my account of Newbould (Journ. Bot. 1886, 165).

Shortly after this I went to High Wycombe, returning to London in 1869 to take up an appointment in the Kew Herbarium: I used then to meet Carruthers at the Linnean Society's meetings, to which J. G. Baker often took me, and later when visiting the Botanical Department in connexion with the *Crassulaceæ*, which I was preparing for the forthcoming volume of the Flora of Tropical Africa. Trimen was well known to me both by correspondence while I was at High Wycombe and through meetings at the Society of Amateur Botanists: in joining the Museum staff I was therefore not coming among strangers, and nothing could have been kinder than Carruthers's welcome. With his assistants—or, or as he preferred to call them, colleagues—his relations were always most friendly: during my twenty-four years' association with him, I can remember no occasion on which any friction arose between us; and this was perhaps the more noteworthy as on certain matters unconnected with the Department we differed very strongly. An assistant in another Department, whose relations with his Keeper were less cordial, once referred to the botanists as "a happy family," and the phrase not inaptly expressed the prevailing atmosphere. The fact that the Department was contained in one gallery and practically in one room doubtless contributed to this, but with another chief the result might have been very different.

Coming from Kew, where the casual inquirer was officially discouraged, I was struck by Carruthers's almost excessive readiness to supply information or to answer questions of the most trivial nature. I remember, for example, that we supplied specimens and drawings to the artist who was designing the laurel wreath which Tracy Turnerelli proposed to present to Lord Beaconsfield, and a fig-leaf for a sculptor who required that garment for a statue on which he was engaged; still more do I remember a large lady, with a small companion, who was a frequent visitor, to whom Carruthers lent at her request a volume—his own copy—of the *Genera Plantarum*, which she returned in the course of two or three days with the remark that she had found several mistakes in it. His assistants were, I fear, less patient; but Carruthers took the view that we were a public institution and that the public had a right to our services.

Almost immediately after his appointment, Carruthers was called upon to appear before a Royal Commission on Scientific Instruction, whose deliberations, it was thought, might result unfavourably to the British Museum, and especially to the Department of Botany. At the time of Robert Brown's death, an attempt was made to secure the transfer of the Banksian Herbarium to Kew; the Commission afforded an opportunity for renewing the attempt, of which Dr. Joseph Hooker, Bentham, and John Ball availed themselves. The evidence tendered by these botanists and that of Carruthers, published in the Report of the Commission, will afford interesting material for the future historian of Botany in England, who must not overlook the Appendix to the Report, in which Ball's evidence is dissected by Carruthers in merciless style. I entered the Department in September, 1871, when the storm was still raging, and, coming as I did direct from Kew, had the advantage of hearing both sides of the controversy. The sufficiency of Carruthers's rebuttal of the attack is shown by the fact that the Department remained untouched, nor was a later effort in the same direction more successful.

At this time the cramped condition of the Natural History collections, coupled with the need of further space for the development of the other parts of the Museum, had become almost intolerable. The Department of Botany then consisted of what was practically one long gallery divided into two portions: the first, where the assistants worked, contained the arranged portion of the herbarium; in the second, out of which opened a small public gallery were the attendants—in this the unarranged collections were stored in large cupboards. It also contained the British Herbarium, which Carruthers had separated from the general collection, and certain small special herbaria, subsequently incorporated in the General Herbarium; the Keeper's room adjoined the herbarium and was entered from it. When Murray joined the staff in 1876, it was necessary to erect an iron gallery for the accommodation of the smaller cryptogams of which he was in charge; but this was only a temporary expedient, for by this time the removal of the Natural History collections to South Kensington had been decided on, and the arrangements for the new herbarium had been planned by Carruthers in conjunction with his friend Richard Owen, then Director of the Museum. Only those who can remember the state of affairs previous to 1880, when the removal took place, can appreciate the difficulties of work under such conditions, or the relief afforded by the change from overcrowded, badly lighted, and unsuitable rooms to the spacious galleries now occupied by the Department, which in their turn are already becoming too small for the additions continually made to their contents.

In connexion with the removal it was necessary to provide a library, not only for general use but for each department; for these the Government made a liberal allowance: this Carruthers, for his his own department, expended to great advantage, and succeeded in bringing together one of the finest botanical libraries in the world. He also devoted much attention to the arrangement of the public

s 2

galleries and to the labelling of the specimens exhibited. In the Herbarium Carruthers paid special attention to the Ferns, which he elaborated for Seemann's *Flora Vitiensis*, describing several new species; the part containing these, though dated Oct. 30, 1869, was not published until February, 1873. Ferns, both fossil and recent, had always interested him: although his name nowhere appears in connexion with it, he was mainly responsible for a folio volume on *The Ferns of Moffat*, published in that place anonymously in 1863. This was the joint production of Carruthers and the lady—Miss Jeanie Couch Moffat—who in 1865 became his wife; her actual share in the work, however, was confined to the preface (signed "O"). Of his two sons, Samuel William, to whose account of his father in the R. A. S. Journal for 1910 I am indebted, graduated M.D. at Edinburgh and is in practice at Norwood; the younger, John Bennett, followed his father (whom he assisted in his work for the R. A. S.) in taking up Botany as a profession, and became Government Botanist in Trinidad, where he died in 1910 (see Journ. Bot. 1910, 217).

Although of late years Carruthers's communications to this Journal were infrequent, he was much interested in its establishment in 1863 by Seemann, whom he had greatly helped in working up the old material at the Museum in connexion with his *Flora Vitiensis*—help which Seemann acknowledged in dedicating to him the genus *Carruthersia*. Owing to Seemann's frequent absences abroad, the editorship for the first seven volumes was largely in Carruthers's hands, and he was a fairly frequent contributor: the first number contains a paper from his pen on *Tryblionella*, a genus of *Diatomaceæ* in which order he was then interested—he compiled the list of these for J. E. Gray's *Handbook of British Waterweeds*, published in the following year; to vol. iii. (1865) he contributed a paper on "The Nomenclature of the British *Hepaticæ*," in which he restored many names of genera and species given by S. F. Gray, whose work—not, it would seem, without deliberate intention (op. cit. p. 299)—had been entirely ignored. In matters of nomenclature Carruthers afterwards took great interest—his last contribution to the Journal (apart from reviews) was "On the Nomenclature of *Platycerium*" (1900, 123). He also contributed excellent biographies of J. J. Bennett (J. Bot. 1876, 97), John Miers (1880, 33), and W. C. Williamson (1895, 298), with all of whom Carruthers was on terms of intimate friendship—tempered in the last case by somewhat acrimonious discussions on points of palæobotanical interest.

It was indeed as a palæobotanist that Carruthers especially distinguished himself; to the importance of his work in this direction tribute is paid in an article in the *Geological Magazine* for 1912 (pp. 193–199), which, though unsigned, may be safely attributed to his colleague in the Museum, the late Henry Woodward: to this is appended a list of Carruthers's papers, extending from 1858 to 1885. When, in the year succeeding the publication of the first of these (on Dumfriesshire Graptolites), Carruthers came to the Museum, the extensive collection of fossil plants made by his predecessor Robert Brown, the first Keeper of the Department—at the unveiling of whose memorial bust in his native town, Montrose, in 1895, Carruthers delivered an address (Journ. Bot. 1896, p. 26),—was placed under his special care: his first important paper (on *Lepidodendron* and *Calamites*), published in this Journal for 1886 (pp. 347–348), was largely based on material in this collection and in the Geological Department, to which he had free access. Other papers rapidly succeeded, both in this Journal and in the *Geological Magazine*; in the Linnean Society's *Transactions* (xxvi. 675–708; 1870) he published an important monograph on fossil Cycadean Stems: this was followed by his election to the Royal Society in the ensuing year. It must always be matter for regret that the supplementary volume to Lindley and Hutton's *Fossil Flora*, which it was understood Carruthers had undertaken in connexion with the reissue of that work in 1872, was never carried into effect; it would usefully have brought together the invaluable information which must now be sought in his papers scattered through various periodicals.

In relation to this side of Carruthers's work it may be mentioned that in 1869 he delivered at the Royal Institution a lecture on "The Cryptogamic Forests of the Coal Period," which was published in the *Geological Magazine* for that year. In 1886 he delivered to the Biological Section of the British Association, of which section he was President, an important address on "The Age of some Existing Species of Plants," which is printed, with additions by the author, in this Journal for the same year (p. 309); a similar subject was treated in his Presidential Address to the Linnean Society at its anniversary meeting in 1890—"The Early History of some of the species of Plants now constituting a portion of the Flora of England." In each of these addresses the evidence adduced was such as to show that the plants of the glacial period "exhibit the same characters, in that reduction or modification which their living descendants possess," and the problem thus presented to the supporters of the Darwinian theory has never yet been fully met. "The relation of our existing vegetation to preceding floras," he said, in his remarks introductory to the former, "has frequently been made the subject of exposition, but to handle it requires a more lively imagination than I can lay claim to, or perhaps than it is desirable to employ in any strictly scientific investigation." While thus cautious in accepting theories or conclusions based on what appeared to him insufficient evidence, Carruthers, as a man of science, was intolerant of attempts to defend revealed religion without adequate scientific knowledge; his letters in the *Times* with reference to *Mosses and Geology* by Dr. Samuel Kinns—a work published in 1872 which had a large circulation—sufficiently indicate his attitude in that direction.

In 1861 Carruthers became a Fellow of the Linnean Society, of which at the time of his death he was almost the oldest member. He took a keen interest in the affairs of the Society, and served on the Council for various periods of three years from 1866 and as Vice-President for similar periods from 1877; from 1886–90 he was President. In 1888 it fell to his lot to preside over the arrangements for the centenary of the Society, which occurred that year, and in his address he summarised its history during the hundred years of its existence: a full account of the proceedings on the occasion will be found in this Journal for 1888 (pp. 203–213); for his services in organising and carrying out the celebration a special vote of thanks was accorded to Carruthers by the Society. His addresses in the two years following were notable: to the former, on the relations of our recent flora to that which preceded it, reference has already been made; the other, on the portraits of Linnæus, is printed in the *Proceedings* of the Society for 1888–9, and is in every way an admirable piece of work. Carruthers, although without a sense of colour, had a singularly keen appreciation of form and was a keen student of engravings, and the full list of portraits appended to the paper is an evidence of the thoroughness of his investigation. At a later period Carruthers returned to the subject, and in 1891 communicated to the Society the notes he had made on the portraits seen in Sweden during a visit to that country in the earlier part of the year.

In 1874, Carruthers took a conspicuous part in a crisis in the Society's affairs, which was attended by serious differences of opinion and painful—even dramatic—incidents: those who were present will not forget the scene when Bentham, having in vain directed Carruthers, who occupied the floor, to "sit down," vacated the Chair and left the room, followed by Sir Joseph Hooker and other sympathisers: a studiously restrained account of the meetings of this period will be found in this Journal for 1874. No one now doubts that the alterations introduced as a consequence of the crisis were beneficial, and these results were due in no small degree to Carruthers's action. Six years later he supported with characteristic energy the movement which resulted in the election of Dr. Daydon Jackson as Secretary to the Society. On both of these occasions, and indeed on others when necessity arose, Carruthers justified the description given by Woodward as being "a good fighter and, when he had made up his mind that his cause was a just one, very tenacious in maintaining his ground"; a certain inability to appreciate views opposed to his own was not without its advantages. His fighting powers had previously been called into action in connexion with the disposal of Welwitsch's Angolan Collection, which by his will, of which Carruthers was an executor, had been bequeathed to the British Museum. Welwitsch was a Portuguese subject, and on his death in 1872 the collections were claimed by Portugal. The resultant litigation extended to the end of 1875, when a satisfactory compromise was arrived at of which a summary will be found in the Journal for that year (p. 380); the Department is indebted to Carruthers's exertions for the splendid set of Welwitsch's plants now in the Department.

Carruthers's last public work on behalf of the Society was in 1907, when he was deputed by the Council to represent them at the bicentenary celebrations in Sweden of the birth of Linnæus; on this occasion the degree of Ph.D. was conferred on him by the University of Upsala. His portrait, painted by P. A. Hay in 1895, hangs in the meeting-room of the Society. Besides being a Fellow of the Linnean and of the Royal, Carruthers was associated with many other societies in whose work he took a more or less active part. In

1875 he was President of the Geologists' Association and in 1901 of the Royal Microscopical Society; in that capacity he delivered before the latter body in 1901 an address on John Ellis (1710–76) and in 1902 one on Nehemiah Grew (1641–1712) and his 'Anatomy,' taking occasion to demonstrate the attempts that had been made to depreciate the work of Grew and to rob him of the credit that belongs to him as an original investigator—these addresses were printed in the *Journal* of the Society: he was also an Honorary Member of numerous local societies both at home and abroad. In 1884 Carruthers attended the meeting of the British Association at Montreal; on this occasion he also visited Mexico and the United States, and brought back specimens for the British Museum Herbarium.

Both as a speaker and as a lecturer Carruthers was effective. Gifted with a good presence and a strong but pleasant voice, he had the power of clear statement, which is more important than eloquence, and always succeeded in interesting his audience; he was also an excellent chairman.

An account of Carruthers's undertakings would be incomplete did it contain no reference to his important work in connexion with the Royal Agricultural Society, to which in 1871 he was appointed Consulting Botanist—a post he held with complete satisfaction until his retirement in 1909. Of his work in that capacity we have a modest summary from his own pen in the Journal of the Society for the latter year, preceded by an introduction by Mr. Charles Coltman Rogers, Chairman of the Botanical and Zoological Committee, in which the highest appreciation is expressed of Carruthers's services, and accompanied by an excellent portrait. To the Journal he contributed many papers of practical interest, of which that on Ergot, reproduced in this Journal for 1875 (p. 15) is one of the most noteworthy: and at his suggestion the Society published in 1892 an admirable set of eight coloured diagrams of the life-history of the Wheat plant, reproduced from Francis Bauer's original drawings in the Department of Botany, for which he supplied the text. The *Times*, summing up this branch of Carruthers's work, says: "In economic botany he was in a sense father of the great institute at Cambridge. When he began seed testing on a very small scale in his own house in 1871 it was a new thing in England. Under his hand it grew during forty years to very large proportions, and he added to it the investigation of plant disease. But possibly his chief work there was in the selection of grass for pasture and the guaranteed purity and germination of grass seeds. He also conducted what will always remain a classical series of observations on the vitality of farm seeds."

On May 29, 1895, Carruthers's long connexion with the Department automatically ceased, he having reached the age limit allowed by the rules of the Civil Service. The Trustees of the Museum had recommended the retention of his services for a further period, but the Treasury declined to accept their recommendation. For some time he continued to visit the Department; as has been already shown, he maintained his relations with the Linnean Society and, until his eightieth year, his work for the Royal Society of Agriculture. But by degrees his religious and literary interests absorbed such attention as he could devote to them; and in the quiet pursuit of these in his home at Norwood, in the company of his devoted wife and son, the remainder of his days was passed. He died peacefully at his residence on the second of June, in his ninety-third year, leaving the record of a long, useful, and honourable life.

JAMES BRITTEN.

PLANT NOMENCLATURE.

By JOHN HENDLEY BARNHART, M.D.
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ALL readers of the *Journal of Botany* are familiar with the recent discussions on nomenclature started by Mr. Sprague last year, and continued by him and others, at the invitation of the Editor, in subsequent numbers of the Journal. Such suggestions as I wish to contribute to this symposium are based upon the admirable numerical outline formulated by Mr. Sprague in his "Plant Nomenclature: some Suggestions" (Journ. Bot. 1921, 153–160) and "Plant Nomenclature: a Reply" (Journ. Bot. 1922, 129–139).

1. *Revocation of Art. 36* (*requiring Latin diagnoses*).—It appears to me that the only reason that can be advanced for any limitation in the choice of language in which a writer desires to express himself is consideration of his audience. There was a time, long years ago, when every botanical taxonomist was expected to be able to read and write fluently the tongue then recognized as the language of science—Latin, or, to be more accurate, New Latin, which is Latin plus many other things wholly foreign to the Latin of antiquity. That day is past, and to-day nearly every botanist can read with little difficulty English, French, and German, and can write at least one of those languages. As far as descriptive botany is concerned, one who can read these three need have little difficulty with any other Romanic or Teutonic language, and this extends the scope of his reading to Swedish, Norwegian, Danish, Dutch, Flemish, Portuguese, Spanish, Italian, and Latin. These two groups, the Romanic and Teutonic languages, with many words in common, and not more than two or three for any plant structure or character, include the mother-tongues of nearly all the plant taxonomists of to-day, and some one of these languages is available for literary expression to nearly every educated person whose mother-tongue lies outside of these two groups. If, then, any limit is attempted to the languages recognized for diagnoses of novelties, such limit should be upon a linguistic basis, without reference to the characters employed; for most botanists, Magyar, Czech, Finnish, and Welsh, employing Roman characters, are as difficult of interpretation as Russian, Arabic, or Japanese. Those who use such languages for scientific writing spite themselves; they are actuated by a nationalistic sentiment which blinds them to the desirability of making themselves understood by their colleagues.

Whether any attempt to curb this blindness by rules can be effective in preventing it, and whether any rules outlawing such publication will prevent the recognition of diagnoses in such languages by those who can read them, may be open to question.

Perhaps this may be the appropriate place to call attention to the actual meaning of Article 36. The discussions at Vienna made it perfectly clear that when this article said "Latin diagnosis" it meant "diagnosis," not description. The supporters of this article emphasized the fact that it was expected that each author would write his *description* in the language of his choice, but must accompany this with a *diagnosis* in Latin, preferably in as few words as consistent with clarity, noting the important peculiarities of the novelty. This distinction between diagnosis and description has been almost universally ignored by those who have attempted to conform to the Rules—naturally so, as this article was printed with no explanatory annotation.

2. *Rejection of names which are apt to excite ridicule.*—Just what makes a name ridiculous? Mr. Sprague thinks that *Cerastium cerastioides* (a *Cerastium*-like *Cerastium*) is as bad as *Linaria Linaria* (a *Linaria* that *is* a *Linaria*), and perhaps it is; but I confess that neither is ridiculous to me. Did Mr. Sprague never hear of a manly man or a womanly woman? Has anyone ever suggested that Jerome Jerome, the British author, and Thomas Thomas, the Welsh artist, bear untenable and ridiculous names that require correction? It has always seemed to me that Linnæus, in 1753, came perilously near using a duplicate binary name when he wrote *Cuminum Cyminum*, yet no botanist has ever questioned this "ridiculous" name, as far as I am aware, except Salisbury, in the little work in which he renamed almost everything to suit his fancy.

While speaking of names that excite ridicule, we should not overlook the various Kuntzean monstrosities, such as *Englerophœnix* and *Schweinfurthafra*, while *Krynitzkia*, *Przewalskia*, and *Aa* are bad enough, and the most ridiculous generic name known to me is *Schtschurowskia*—yet all these are authorised by all current rules. No rules that permit such names can hope to escape ridicule.

3. *Rejection of seriously misleading geographical names.* Mr. Sprague has wisely withdrawn this suggestion, as it would "probably prove to be unworkable in practice."

4. *Rejection of specific names differing only in termination.*—Although this provision is incorporated in the American Code, it has never appealed to me as of importance. To my mind there is no danger of confusion between such names as *Lysimachia Hemsleyi* (Hemsley's Lysimachia) and *Lysimachia Hemsleyana* (the Hemsleyan Lysimachia). Surely this is much less confusing than the recognition as valid of two such generic names as *Lomatia* and *Lomatium*.

5. *Rejection of accidental binomials.*—This is difficult of application, but desirable if it can be proven practical. Hill's work of 1756 was certainly non-binomial; but our rules are all deficient in providing no authority for the rejection of Hill's double *generic* names. Although he was aware (Brit. Herb. 187, line 13) that "a generical name consisting of more than one word is always improper,"

he used many of them, such as *Bursa pastoris*, *Raphanus rusticanus*, and *Filix fœmina*. Of course, we would be obliged to write these names with hyphens, to distinguish them from specific binary names. They have always been ignored by common consent, but I know of no modern rules which deny their validity; and they are no worse than *Saxo-Fredericia*, which has always gone unchallenged.

6. *Rejection of specific homonyms.*—Mr. Sprague's original recommendation was clear, logical, and consequently defensible. As modified by Mr. Rehder's attempted distinction between taxonomic validity and nomenclatural validity it loses much, and I fail to see that it gains anything. Very few binary names have ever come to my notice which, while actually and unequivocally published, are not liable under any circumstances ever to be revived; Mr. Rehder mentions one, *Quercus lanuginosa* Lam. (1778), a mere renaming of *Q. Cerris* Linn. (1753), but I think he would find it difficult to discover another. Rules and exceptions to rules should not be framed to cover such utterly inconsequential points as this.

7. *Treatment as a "nomen delendum" of a new combination associated by its authors in the original place of publication with specimens belonging to a different species.*—This I regard as by far the most dangerous of all Mr. Sprague's suggestions, and I do not see how it can be defended—as it has been—by men experienced in taxonomic work. Mr. Sprague says (Journ. Bot. 1921, 156): "If the original combination were treated as valid, it would become a permananent source of confusion." This, it seems to me, should read: "*Unless* the original combination were treated as valid, it would *inevitably* become a permanent source of confusion." The adoption of Mr. Sprague's proposal would open the flood-gates to the re-making, upon the most trivial pretexts, of combinations previously adequately and unequivocally published, and the same combination would be subsequently cited to various places of publication according to the view taken by the author of the citation concerning the validity of these pretexts. The *only* way in which a new combination can be made *identical* in significance with a previously published name is by publishing it with a *single synonym*! If, at the same time, other synonyms are added, or a new original description, based upon other than the type-material, the concept differs; it is purely a matter of opinion how much it differs, and whether a new attempt should be made to establish the "new combination."

The claim has been made in all seriousness that no two botanists ever have exactly the same concept of a given species, and perhaps this is literally true—except that often one will discuss another's species without forming any independent opinion concerning it. It follows that when a writer publishes a new combination based clearly and unequivocally upon an earlier name, at the same time describing something else, he is merely guilty of confusing two (or more) things under a single name—which often occurs in the description of a new species, where there is no synonymy. The only way to clear up an error of this kind is to keep the name for the part to which it properly belongs, and this is the *synonym*, if the new combination is based upon it, rather than the erroneous description associated with it. No person accustomed to the application of any *type* method, can well overlook this obvious fact. And when this fact is clearly understood, such a complex citation as that suggested by Dr. Schinz, "*Mærua nervosa* (Hochst.) Oliver (pro p., ex. syn.) em. Gilg. et Bened.," is utterly absurd.

8. *Generic "nomina conservanda."*—Mr. Sprague's recommendation reads: "All generic names recommended in the future as 'nomina conservanda' should be accompanied in each case by a summary of the generic history, and a statement of the reasons for and against the name." Why the words "in the future"? The example he gives shows how important the same course is for the names now on the list. If the present list had been prepared in accordance with this suggestion, it would certainly have made a more forceful appeal to the botanical world.

Lists of "nomina conservanda" are unquestionably at variance with one of the "leading principles" as set forth in the International Rules (Art. 3): "The rules of nomenclature should neither be arbitrary nor imposed by authority." But the trouble is with Art. 3. Are not all rules more or less arbitrary? And of what value is any rule without the force of authority? This sentence should be cut out of Art. 3, which would then read: "[The rules of nomenclature] must be simple and founded on considerations clear and forcible enough for everyone to comprehend and be disposed to accept." This, after all, is the ideal to be pursued.

Mr. Sprague says that the principle of "nomina conservanda" is "of a common-sense nature." Perhaps so; but the application of the principle is a matter upon which even persons of common-sense will find agreement difficult. Everyone recognized that the presence of the lists seriously weakens the rules, and that such exceptions should be avoided if possible.

As the list of "nomina conservanda" for flowering plants now stands, it possesses two very serious weaknesses: one, covered by Mr. Sprague's eighth suggestion, that it does not explain for what group of plants each name is to be conserved (the genera are not typified); the other, that the list includes many superfluous names for whose conservation the rules themselves provide. Another weakness is that the list includes many names of genera so small, or so rarely mentioned hitherto in literature, that their importance does not warrant an exception to the rules. Many of the weak spots in the list are due to the way in which it was adopted. Several lists, prepared in advance and before it could be known just what the provisions of the Rules would be, were presented to the Congress, and that of Dr. Harms was adopted in its entirety. Of course, the time available precluded any discussion of individual generic names.

Mr. Sprague, in his second discussion (Journ. Bot. 1922, 132), calls attention to the fact that the "nomina conservanda" are "nomina *utique* conservanda" or "doivent être conservés *en tous cas*." I must confess that I was not convinced that the French and Swiss delegates at Vienna, who emphasized this expression in their discussions, themselves understood just what they meant by it. If Mr. Sprague's interpretation is correct, that it is intended to protect each "nomen conservandum" against all rivals, two corollaries follow: the list of "nomina rejicienda" is absolutely superfluous, and the list of "nomina conservanda" should include not only generic names now known to possess rivals, but the names of all important genera, so that new discoveries of "nomina priora" will not upset names in current use.

9. *Gender of generic names.*—If any attempt is to be made to avoid the "grammatical blunders which disfigure botanical nomenclature," this is one of the last considerations requiring attention. Plant names, especially generic names and such group-names as *Hamamelidoideæ* and *Moræeæ* offend the classical scholar at every turn.

It must not be forgotten that a very large proportion—much larger than would be supposed by one who has not devoted particular attention to the subject—of generic names were first proposed without a word of explanation concerning their derivation or meaning. In some cases their source is fairly unmistakable, but in many the accepted derivation is mere guess-work, and may at any time prove erroneous. The only safe course seems to be, barring evident or provable errors, to accept the dictum that "a name is a name," and that its author knew as much about its gender as anyone else is likely ever to know. Of course, as Mr. Sprague says, the author sometimes failed to indicate the gender—when he may be assumed to have forfeited the right to the first person who used the name in such a way as to make its gender clear.

A few exceptions might be permissible, such as those discussed by Mr. Sprague under 9 A, 9 B, 9 D, and 9 E, but I must disagree with 9 C: "Indeclinable names borrowed from non-classical languages should be neuter." The inference here seems to be that names borrowed from non-classical languages are *therefore* indeclinable. But the New Latin of science (and theology) is a *living* language, not a dead one, and it has a growing vocabulary. Even classical Latin incorporated into itself words from other languages, and declined them, and this practice spread with the extension of Roman influence in post-classical times. My own view is that any generic name should be treated as declinable if Latin words analogous in form can be discovered. Mr. Sprague gives five examples, assuming that everyone will recognize them as indeclinable. But anyone imbued with the *spirit* of the Latin language would not hesitate to decline most of these. *Taonabo, -onis*, may follow the declension of *bubo, -onis*; *Batatas, -æ*, that of *Æneas, -æ*; *Agati, -is*, that of *Sinapi, -is*; and *Amelanchier, -eri*, that of *puer, -eri*. In the case of *Manihot*, I know of no analogous Latin word, for the reason that such a word, if thoroughly Latinized, would have become inevitably *Manihos, -otis*; but even in this case it seems to me safe to assume that *if* the Latin language had ever taken over such a word in unchanged form, it would have been declined *Manihot, -otis*. In passing, it may be remarked that all fungi growing on *Liquidambar* and named for the host have been called "*Liquidambaris*," although the second half of this name is recognized as of Arabic origin.

In discussions of gender, too, it must be remembered that the gender of Latin and Greek words was a matter of common consent, as much as of rules; it was most definite in the case of words in general use in conversation and in literature. When a word was rarely used, and in the literature that has been preserved is known to occur only in the writings of two or three scholars, it is likely to be recorded in the dictionaries as variable in gender. What a different concept of the classical languages would prevail if we really knew them, instead of being obliged to interpret them through the fragments that have been preserved!

10. *Orthographic correction of names.*—It is really amusing to read, in connection with this suggestion of Mr. Sprague's, his own comment: "A glance at Post and Kuntze's Lexicon (1904) is sufficient to demonstrate the need for caution in orthographic correction." How true! And if one becomes familiar with the discussions by Kuntze, the older proposals of Saint-Lager, and the newer ones of Clements ("Greek and Latin in biological nomenclature," Univ. Stud. Nebr. iii. 1–85, 1902; an essay too little known to botanists), he soon realizes that there is no middle ground; either radical and wholesale revision of orthography must be undertaken, or alterations in spelling must be rigorously avoided, being permitted only in cases where the evidence is clear that there was an unintentional error in the original publication. Reformers are apt to cast names into too rigid moulds, forgetting the flexibility of classical orthography.

11. *Small initial letters for all trivial names.*—This is a common practice in America, and I have no serious objection to it. Classical precedents cannot be cited, for the classical languages knew nothing of small letters, and our classical friends might reasonably insist upon the use of *capitals only* for scientific names. Such names as *Rumex britannica* and *Liriodendron tulipifera*, when written in this way, look like errors for *Rumex britannicus* and *Liriodendron tulipiferum*; but the number of such cases is small and is perhaps too insignificant to warrant opposition to a general rule.

12. *Omission of comma between name and authority.*—As far as as I am aware, such a comma has never been used outside of the British Empire, except by Asa Gray and those who have followed his example. Few Englishmen seem to realize how provincial the use of this comma is. It would be interesting to know just how it came to be introduced; I have been able to trace it no farther back than the writings of the elder Hooker. Earlier writers often separated the name and authority by a period, and it seems to have occurred to Sir William that such a full stop was undesirable, and a comma would therefore be preferable. British conservatism has clung to the practice, in the face of the rest of the world; and the *Index Kewensis* alone contains more than half a million superfluous commas.

13. *Fixing of generic types.*—The desirability of some provision for fixation of types seems to me unquestionable. An international commission is desirable, if so constituted that its members comprehend the significance of a type-method and will render unprejudiced decisions. Otherwise such a commission might do very serious harm.

14. *Invalidity of generic homonyms not listed under "nomina conservanda."*—If "nomina conservanda" are to be recognized at

all, some such provision as this seems essential. Problems of homonymy are really more important than those of synonymy. More confusion is caused by the use of the same name for various things than by the use of different names for the same thing. And it should be remembered that words with identical stems are essentially homonymous. Even *Carex* and *Carica* are homonyms, for in both cases the stem is *Caric-*, and all group-names of equivalent rank derived from these two names are necessarily identical.

15. *A new name should not be regarded as valid unless it is proposed unequivocally and unconditionally.*—Mr. Sprague has overlooked the fact that this provision is already incorporated in the International Rules. In Art. 37 we read: "Citation in synonymy or incidental mention of a name is not effective publication." This was taken almost verbatim from Canon 12 of the original "American" Code: "A name is not published by its citation in synonymy, or by incidental mention." As this "Canon" was first proposed and defended by me, I should know what it means, and can assure Mr. Sprague that it was intended to cover almost exactly the class of cases cited by him. His wording may be somewhat clearer than that of the Rules, but I am not sure of this. I found the idea one very difficult to express in an unequivocal manner.

Mr. Sprague's proposition would certainly prove useful if it resulted in curbing the tendency more manifest at Kew than anywhere else of representing botanical authors as saying what they did not say. The *Index Kewensis* contains thousands of such misrepresentations—not clerical or typographical errors, but editorial mis-statement of facts. When Bentham, in the *Genera Plantarum* (ii. 289), published *Stenachenium*, he cited the type-species as "*Pluchea macrocephala*, DC. Prod. v. 450 (*Conyza megapotamica*, Spreng.)." Turning to the *Index Kewensis* (iv. 988), we find under *Stenachenium*: "macrocephalum, *Benth. ex Benth. & Hook. f. Gen.* ii. 289." But it is *not there*, and the makers of the *Index Kewensis* knew it was not there, for they did the same thing in every similar case. They were not even justified in the assumption that Bentham *would* have called the species *S. macrocephalum* if he had named it, rather than *S. megapotamicum* or some entirely different name, for Bentham would have followed the now abandoned "Kew rule," which permitted him in describing a new genus to assign any specific name he chose, regardless of the earlier nomenclatural history of the species.

16. *Invalidity of a wrong determination.*—Any method of types, with proper recognition of the principle of the rejection of homonyms, should provide for the cases discussed by Mr. Sprague under this suggestion.

17. *Priority of family names.*—Unless I am mistaken, I was the first to suggest the application of the principle of priority to family names ("Family nomenclature," Bull. Torrey Bot. Club, xxii. 1–24, 1895). I long ago gave up the idea as impractical, for there is no reason that can be advanced for singling out family names from other group-names for the application of the principle of priority. I still believe that uniform use of the termination *-aceæ* for family names is desirable, as is the use of a uniform system of terminations

for each category of corresponding rank. The suffixes recommended for some groups in the International Rules are, however, open to serious objection upon linguistic grounds, while many more euphonious suffixes are warranted by classical precedent. The endings recommended by the American Code for suborders, subfamilies, and subtribes are far less harsh and much to be preferred.

[The omission of the comma has been the rule of this Journal since 1890, and the "provincial" use, though still retained by Kew, is now generally abandoned.—15. The "mis-statement" referred to, against which we have more than once protested, was made by direction of the Kew authorities, and contributors to the colonial Floras were directed to follow the practice.—Ed. Journ. Bot.]

CORNISH SPHAGNA.

By F. Rilstone.

The sphagnum-bearing areas in the two Cornish vice-counties are quite dissimilar. In East Cornwall (v.c. 2) the extensive Bodmin Moors, with their outliers, resemble Dartmoor, and in many deep bogs and pools thrive robust green forms of the *Subsecunda* and various *Cuspidata* forms, particularly the beautiful alga-like var. *plumosum* of *S. cuspidatum*. In West Cornwall (v.c. 1), on the contrary, Sphagna are found in small peaty moors left untouched when the lands were enclosed half a century or more ago. On these moors the *Cuspidata* rarely occur, and the robust *Subsecunda*, though possibly in as great variety as in East Cornwall, are restricted to springs and deep ditches. The small, delicate, brightly-coloured forms of the group *Subsecunda*, on the other hand, are often very abundant.

The distribution of forms of the group *Cymbifolia* presents some rather surprising features. *S. cymbifolium*, usually considered one of the commonest of these plants, is by no means generally distributed. It appears to be of fairly frequent occurrence on the elevated moors of East Cornwall and in the Land's End district, but I have not been able to find it in the intervening area. Its distribution may thus be expressed in terms of the geological formations as not uncommon on the granite, rare on or absent from the "killas." In a moor below Helman Tor it grows in company with the rare *S. subbicolor*, and *S. hakkodense* occurs in both vice-counties. Against the comparative rarity of *S. cymbifolium* must be placed the abundance of *S. papillosum*, which in many robust and handsome forms of various shades of green and brown is a striking feature of Cornish moors, particularly in West Cornwall.

So little has been written on the ecology of the *Sphagna* that I venture the following remarks. All the common *Sphagnum* forms in Cornwall fall under one or other of the four groups *Acutifolia*, *Cuspidata*, *Subsecunda*, and *Cymbifolia*. Of these the *Cuspidata* are confined to the wettest moors and usually to elevated land where they occupy the deeper pools and marshes. The *Subsecunda* occupy the extreme range of *Sphagnum* habitats from the deep pools where robust green forms luxuriate to the peaty borders of badly-drained enclosures, where such forms as *S. auriculatum* var. *tenellum* and similar forms of *S. inundatum* still persist. The *Acutifolia* rarely compete for the occupancy of deep moorland pools, but otherwise occupy every kind of habitat from wet bogs to damp peaty patches by roadsides. Plants of the *Cymbifolia* group avoid both the drier habitats and deep pools, being usually plants of moderately wet moors and bogs. *S. papillosum* in West Cornwall is generally associated with Cotton-grass, *Molinia cœrulea*, *Hypericum elodes*, *Pedicularis palustris*, and plants of similar requirement as regards moisture, though the dense low tufts of forma *conferta* may intrude into slightly drier ground. It follows that as lands are reclaimed or become drier through natural causes the first plants to disappear are the *Cuspidata*, with the more robust *Subsecunda* (though these may persist in springs and deep ditches), and next the *Cymbifolia*; while the most persistent are the more delicate forms of the *Subsecunda* and some of the *Acutifolia*. In fact, wherever a few thin tufts of *Sphagna* remain by damp roadsides or in field-borders they prove to be either *S. plumulosum* (or one of its near allies) or delicate forms of *S. subsecundum*, *S. auriculatum*, or *S. inundatum*, and where, as sometimes happens, peaty ground merges gradually into pasture, these plants occupy the outmost ranks. Thus (to quote a typical case) in Lambourne Valley, about a mile and a half in length, *Sphagna* remain only in a few square yards of peaty ground by the stream in the border of a field, associated with fruiting *Hylocomium squarrosum* and partly shaded by furze bushes, and the actual plants occurring are *S. plumulosum* var. *viride* and var. *versicolor* f. *tenellum*, and *S. inundatum* var. *diversifolium* f. *eurycladum*.

It is noticeable that the plants of drier habitat among the *Subsecunda* are often of somewhat plumose appearance and have the margins of the branch leaves more or less incurved, but do not exhibit torsion of the branches; this in my experience is restricted to plants of very wet ground and is often most apparent in the upper (aerial) parts of such plants as grow in shallow water.

Another fact which may have some meaning is that these plants of drier habitat all belong to the sub-group in which the outer (dorsal) surface of the branch-leaves is abundantly supplied with pores, these pores being most dense towards the point of the leaf—the part most exposed to the atmosphere—whereas the plants with fewer pores, or with pores differently situated, grow submerged or with only the growing point exposed. Plants of the first sub-group grow, of course, in very wet places, but not, I believe, floating or submerged. All my Cornish gatherings of *Subsecunda* fall readily into one or other of two groups:—

(*a*) Plants of aerial growth, *i. e.* growing on comparatively firm ground, or if in shallow water then with erect stems rising considerably above the surface. All are plants with dorsal pore development, viz.:—*S. subsecundum*, *S. inundatum*, *S. auriculatum*, *S. aquatile*, and *S. contortum*.

(*b*) Plants of aquatic habit, floating or submerged:—*S. obesum*, *S. Camusii*, *S. crassicladum*, and *S. turgidulum*.

I do not know to what extent submerged forms of the first sub-group may occur in other localities, but if it be considered that the pore-development has been a response to aerial conditions of growth, such submerged forms may perhaps be viewed as having reverted to the aquatic habit without losing the characteristic pore-development. This in turn suggests a possible explanation of the pseudopores of *S. crassicladum* as reversions from the *auriculatum* type.

At any rate, there does seem some reason for regarding the firm-ground *Subsecunda* as organised for rapid transpiration. Growing as they do in soil which, though firm, is still saturated, the scarcity is not of water, but, as pointed out by Mr. J. A. Wheldon (*Collection, Taxonomy, and Ecology of the Sphagna*, 1918), of mineral food. Spreading long-pointed leaves, with pores most numerous on the most exposed portions, must be conducive to the quick passage of soil-water through the plant, and the incurving of the leaf-margins, usually a check on transpiration, must have an exactly opposite effect when the pores are dorsal instead of ventral. Apparently, too, the amount of exposure determines the number of pores. Mr. E. C. Horrell (*European Sphagnaceæ*, p. 63) states, "In the examination of plants belonging to this section it is important that both the branch- and stem-leaves should be selected from the upper part of the stem, just below the capitulum"—implying that the pore-development is there most typical. I find, too, that where the branches just below the capitulum are prolonged at the apices into attenuate points the more or less imbricate basal leaves of these branches will be porose only in the upper (exposed) half or three-fourths, while the narrow fully-exposed leaves of the attenuate points will be porose throughout their length.

It is interesting to notice that the dorsal pore-arrangement here suggested as enabling these plants to occupy situations too dry for most *Sphagna* are reproduced in the only other species which seem able to survive similar conditions, viz. *S. plumulosum* and its near allies. The two groups have other points of resemblance. In the field the eye learns to distinguish tufts of the *Subsecunda* from those of *S. plumulosum* by the yellowish colour of the former and the more or less falcate arrangement of the capitulum branches, but where these characters are lacking tufts of the *Subsecunda* may easily be passed over as belonging to the *Acutifolia*. Generalizations are perhaps unsafe, but observations in the field, under the perhaps peculiar conditions of the West Cornwall moors, would suggest that whereas drier conditions destroy the *Cuspidata* and in the *Cymbifolia* induce a dense stunted growth, the *Acutifolia* and *Subsecunda* have evolved taller, lax, and sometimes rather plumose forms with an adequate transpiration device which have much more successfully overcome the difficulties of the drier situation.

Most of the plants mentioned in the following list have been seen, and many of them named, by Mr. W. R. Sherrin or Mr. J. A. Wheldon, or both. The nomenclature and arrangement are those of Mr. Wheldon's *Synopsis of the European Sphagna*, 1917. Localities in East Cornwall are indicated by (2); the remainder are in West Cornwall.

Sphagnum fimbriatum Wils. var. *validius* Card. and var. *intermedium* Russ. Bog near Cheesewring (2); from the same locality Mr. Sherrin collected var. *robustum* Braith. and var. *laxifolium* W.

S. rubellum Wils. var. *pallescens* W. Bog near Cheesewring (2); var. *rubescens* W. Carnkief and district; var. *purpurascens* Russ. Calamasag (2).

S. acutifolium Ehrh. var. *viride* W. Roughtor (2) at 1300 ft.

S. quinquefarium W. var. *viride* W. f. *mastigocladum* Wheld. Damp roadside in oak woods near Looe (2).

S. plumulosum Roll. var. *viride* W. Frequent on moors in West Cornwall; f. *laxum*, Lambourne; var. *lilacinum* Spruce. Plants apparently referable to this variety occur on Silverwell and Ventongimps Moors, but, though very distinct in the herbarium, are usually merely altered forms of the next variety; var. *purpureum* W. f. *robustum* W. Frequent in West Cornwall; var. *versicolor* W. Common throughout the county; f. *validum* W., the most plentiful form, fruits freely at Silverwell and near Idless; f. *tenellum* W. Ventongimps and other moors near Perranporth; f. *ascendens* W. Ventongimps.

S. compactum DC. Not uncommon in East Cornwall; var. *subsquarrosum* W. f. *densum* W., Goss Moors near Roche (2).

S. squarrosum Pers. var. *spectabile* Russ. f. *patulum* W. Moors north of Helman Tor (2).

S. amblyphyllum Russ. var. *mesophyllum* W. f. *molle* Russ. Draynes Valley and near Cheesewring (2).

S. pulchrum W. var. *fuscoflavens* W. f. *tenue* W. Bog near Cheesering (2).

S. recurvum P. de Beauv. var. *robustum* Breidl. f. *longifolium* W. Bog near Cheesewring; var. *majus* Angstr. pp. f. *silvaticum* Russ., Bodmin Moors and Draynes Valley; f. *sphærocephalum* W., Bog near Cheesewring.

S. cuspidatum Ehrh. var. *falcatum* Russ. f. *molle* W. Near Cheesewring (2); var. *plumosum* Schimp f. *remotum* W., a very beautiful form of this in moorland pools near Kilmar Tor (2); var. *densum* W., near Roughtor (2).

S. molluscum Bruch. f. *vulgatum* W. f. *compactum* W., near Kilmar Tor; f. *gracile* W. or near it, Goonhavern Moor.

S. obesum W. var. *brachycladum* W., Goonhavern Moor.

S. subsecundum Nees var. *parvulum* W. Silverwell Moor; var. *tenellum* W., a frequent plant on moors in the Perranporth area; f. *subfalcatum* W., Goonhavern, Carnkief, and Newlyn East.

S. inundatum R. et W. var. *ovalifolium* W. f. *brachycladum* W., Moors near Helman Tor (2); f. *eurycladum* W., near Helman Tor; f. *laxifolium* W., Calamasag (2); var. *lancifolium* W. f. *falcatum* Schlieph. and f. *tenellum* W., Wheal Frances near Carnkief; var. *diversifolium* W. f. *eurycladum* W., Lambourne.

S. auriculatum Schimp. var. *tenellum* W., Goonhavern; var. *ovatum* W. f. *intortum* W., Carnkief Moor; f. *rufescens* W., Goonhavern Moor; f. *variegatum* W., Goonhavern Moor; f. *pungens* W., Penhallow Moor, Newlyn East; var. *laxifolium* W., Goonhavern and Carnkief; var. *cano-virescens* W., Penhallow Moor, Newlyn East, and Mill Downs, Ventongimps; var. *submersum* W., Goonhavern.

S. aquatile W. var. *turgidum* W., Silverwell Moor.

S. contortum Schultz var. *microphyllum* W. f. *leiophyllum* W., Hele Ager Moor near Land's End.

S. crassicladum var. *magnifolium* W. Cheesewring neighbourhood (2), Draynes Valley (2), Goonhavern (a form near f. *rufescens* W.) and Wheal Rutson near St. Agnes; var. *intermedium* W. f. *ovalifolium* W. subf. *breviramosum* W., Draynes Valley (2).

S. Camusii W. Silverwell and Goonhavern Moors.

S. rufescens Nees et Hornsch. var. *magnifolium* W. f. *luteofuscum* W. Deep moorland pools near Kilmar Tor (2).

S. turgidulum W. var. *sordidofuscoatrum* W. Goonhavern and Silverwell, plants lying prostrate in shallow watery depressions, and not unlike robust *Hypnum scorpioides* with which they are sometimes associated; var. *fulvum* W., Goonhavern.

S. hakkodense W. et Card. Ventongimps Moor (1) and bogs near Cheesewring (2). This, which is really a papillose form of *S. cymbifolium*, is recorded in the "Synopsis" only from Belgium and Japan.

S. papillosum Lindb. var. *normale* W. A very common plant. Forma *majus* Grav. Silverwell and Ventongimps; f. *squarrosulum*, Ingham & Wheldon subf. *neglectum* Ingh. & Wheld., Ventongimps Moor; var. *brachycladum* W., a frequent variety; f. *pallescens* Wheldon, near Helman Tor (2); var. *confertum* W. Frequent; f. *pallidum*, Cheesewring Moors (2) and Goonhavern; f. *inundatum* Wheldon, Goonhavern; var. *sublæve* Limpr. f. *validum* W. subf. *fuscescens* W., Goonhavern; f. *breviramosum* W. f. *heterocladum* W. and f. *orthocladum* W., Cheesewring Bogs.

S. cymbifolium Ehrh. var. *pallescens* W., moors near Helman Tor; var. *fuscescens* W., Hele Ager Moor (these gatherings include var. *fuscovirens* W. and var. *fuscorubescens* W., now united with var. *fuscescens*).

Mr. R. W. Smitham, who is studying the East Cornwall Sphagna, has also collected a series of *cymbifolium* forms from the Bodmin Moors (2).

S. subbicolor Hampe. Moors near Helman Tor (2).

BIBLIOGRAPHICAL NOTES.

LXXXVI. Grauer's 'Decuria.'

The title-page of this work is as follows: "Plantarum minus cognitarum decuria. Dissertatio inauguralis medica quam in Academia Christiano-Albertina præside D. Georgio Henrico Weber .... d. XIII Martii MDCCLXXXIIII ..... submittit Sebastianus Grauer. Kiloniæ." It appears to be very rare and to have been generally overlooked. Pritzel (Thes. ed. 1, 317, n. 11014) catalogued it under "Weber, Georg Heinrich," with a cross-reference from "Grauer" in the index; in the second edition of the *Thesaurus* Grauer's name appeared only in the index, and with a wrong entry-number. The following account has been drawn up from a copy in the Library of the Linnean Society, presented by Banks in 1796.

Of the ten names proposed by Grauer, nine are included in the *Index Kewensis*, *Thymus hirtus* Grauer being omitted. They appear, however, to have been taken up at second-hand: thus *Ribes glandulosum* Grauer from Labrador is entered as "Hab. ?" and a "*R. glandulosum* Ait." is also included, although Aiton merely adopted Grauer's species (attributing it to Weber). The chief interest of the *Decuria* is that five of the specific names published in it supersede names that are generally accepted. As the work is so rare it seems desirable to reprint Grauer's descriptions in a condensed form.

1. Heliotropium hirsutissimum Grauer, Pl. Min. Cogn. Dec. 1 (1784). Heliotropium caule tomentoso, villoso; foliis alternis, ovatis, villosis; spicis conglomeratis terminalibus.—*Heliotropium majus, villosum; flore magno, inodoro.* Tourn. Coroll. 7.

Hab. In Insula Melo.

Caulis fruticosus; rami tomentosi, inferius incani, superius sordide lutescentes, villosi pilis longis incanis. *Folia* petiolata, alterna, ovata, villosa, splendentia; petioli tomentoso-villosi, incani. *Inflorescentia* spicata, terminalis; spicæ conglomeratæ, subsolitariæ. *Flores* alterni. *Calyx* ut rami, tomentoso-villosi, laciniis linearibus, obtusis. *Corolla* generis; tubus calyce longior, utrinque villosus; faux clausa squamis subulatis; limbus glaber. *Pericarpium* simile congeneribus. *Semina* de more gentis membrana torulosa obducta, unilocularia, leviter villosa.

[*Heliotropium hirsutissimum* supersedes *H. villosum* Willd. (1797), which is based on the same Tournefortian reference. Halácsy (Consp. Fl. Græc. ii. 314; 1902) followed Boissier in retaining the name *H. villosum*, although it had been reduced in the *Index Kewensis* (i. 1122; 1893) to *H. hirsutissimum*.—T. A. S.]

2. Ribes glandulosum Grauer, *l. c.* 2. Ribes inerme; racemis erectis; pedunculis et germinibus glandulosis.

Hab. In Terra Labrador. Lecta ibidem a Chirurgo beato *Brassen*.

Caulis fruticosus, inermis; rami glabri, fusco-glauci, nitentes, juniores leviter villosi. *Folia* petiolata, sparsa, quinquelobata, serrata, glabra, subtus glauca; petioli villosi, villo glanduloso, ad insertionem alati. *Inflorescentia* racemosa; racemi erecti; pedunculi glandulosi, glandulis capitatis fuscis, albo-petiolatis, crebris; bracteæ brevissimæ. *Calyx* generis, ut pedunculi tectus glandulis. *Corolla* planiuscula; petala rotundata, integerrima, longitudine germinis.

Obs. Nova planta, quæ a *R. alpino* differt bracteis flore brevioribus, foliis utrinque glaberrimis; a *rubro* racemis erectis, petalis integerrimis; a *nigro* racemis erectis et germine glanduloso.

[*Ribes glandulosum* Grauer is conspecific with *R. prostratum* L'Hérit. (1785), which it antedates. It was not cited in Janczewski's monograph of *Ribes* (Mém. Soc. Phys. Hist. Nat. Genève, xxxv.; 1907), but was taken up in Britton and Brown, Ill. Fl. ed. 2. ii. 238 (1913).—T. A. S.]

3. Epilobium angustissimum Grauer, *l. c.* 3. Epilobium foliis linearibus, floribus inæqualibus.—*Epilobium flore difformi, foliis linearibus* Hall. Hist. i. 427, n. 1001. *Chamænerion angustifolium*,

alpinum, flore purpureo Tourn. Inst. 302; Scheuchz. It. Helv. i. 33; iv. 332. *Lysimachia Chamænerion dicta angustifolia* C. Bauh. Pin. 245. *Lysimachia speciosa angustifolia* J. Bauh. Hist. ii. 907. *Pseudolysimachium purpurem minus* Dodon. Pempt. 85.

Hab. In Norvegiæ et Helvetiæ alpibus.

Radix perennis. *Caulis* lignosus, ramosissimus, villosiusculus. *Folia* linearia, canaliculata, integerrima aut denticulato rariter serrata, subtus reticulato-venosa. *Pedunculi* tomentosi incani. *Calycis* foliola lanceolata, purpurea, lanata. *Petala* inæqualia, distantia. *Stamina* declinata. *Pistillum* declinatum; germen tomentosum, incanum. Cætera generis.—Varietates flore albo, et flore variegato habet Tournefort, Cor. 303.

[*Epilobium angustissimum* is conspecific with *E. Dodonæi* Vill. Prosp. 45 (1779). Haussknecht (Monogr. 49; 1884) cited it as a synonym, attributing it to Weber.—T. A. S.]

4. Thymus hirtus Grauer, *l. c.* 4. Thymus floribus capitatis; caulibus procumbentibus; foliis ovalibus, utrinque pilosis.

Hab. In Hispania.

Caules suffruticosi procumbentes, debiles, villosi; rami copiosi, diffusi. *Folia* opposita, inferiora sessilia, superiora petiolata, ovalia, integerrima, superne pilosissima, pilis longis albis, inferne nervosa, costata, nervis et costis pilosis, pilis brevibus, margine ciliata. *Inflorescentia* terminalis, capitata, foliosa. *Calyx* pilosus, laciniis ciliatis. *Corollæ* læte purpureæ. *Stamina* tubo corollæ breviora. *Stylus* longo prominens.—Reliqua characteri generico respondentia.

Obs. Diversa omnino planta, quæ a *Thymo serpyllo* foliis superne pilosissimis, ubique, neque basi tantum ciliatis, a *Thymo vulgari* caulibus procumbentibus et floribus capitatis nec verticillato spicatis satis distinguitur.

[I suggest *Thymus Chamædrys* var. *vestitus* Lange.—W. B. Turrill.]

5. Peltaria aspera Grauer, *l. c.* 6. Peltaria foliis lanceolatis, siliculis serratis, hirsutis.—*Jonthlaspi orientale fructu echinato* Tourn. Coroll. 14.

Hab. In Oriente.

Caules diffusi, ramosi, asperi setis stellatis. *Folia* lanceolata integerrima glauco virescentia, alterna, tota obducta setis stellatis. *Inflorescentia* racemosa; pedunculi hispiduli. *Calycis* foliola ovato-oblonga, concava, æqualia. *Petala* oblonga, integra, alba, unguibus calyce brevioribus. *Stamina* generis; antheræ albæ. *Germen* oblongum, compressum, hispidulum. *Silicula* oblonga apice integerrima, compresso-plana, margine serrata, utrinque hirsuta setis articulatis, unilocularis, monosperma, non dehiscens. *Semina* plana, in centro siliculæ, leviter emarginata.

Obs. Habitus *Clypeolæ* a qua removent siliculæ non emarginatæ, nec dehiscentes.

[This is *Clypeola* (*Bergeretia*) *echinata* DC. Syst. ii. 328 (1821), which is well figured by Jaubert and Spach, Ill. Pl. Or. iii. t. 206, under the name *C. chætocarpa*. Under International Rules the species should be known as Clypeola aspera (comb. nov.).—W. B. Turrill.]

6. Erysimum hybridum Grauer, *l. c.* 6. Erysimum foliis lanceolatis, denticulatis; siliquis calyce triplo longioribus, superne incrassatis.

Enata Kilonii (in horto cl. *Hasse* Advocati judiciorum superiorum meritissimi) patre *Cheirantho Cheiri* Linn. matre *Erysimo cheiranthoide* Linn.

Radix alba, fibrosa, crassiuscula. *Caulis* altus, lignosus, angulatus, viridis, aspersus punctis nigricantibus; tectus pilis albis rigidis, arcte appressis, per lentum conspicuis; rami angulati, diffusi, copiosissimi. *Folia* saturate viridia, utrinque nuda, glaberrima, alterna, lanceolata, denticulata; denticulis minimis, remotis, apice albicantibus. *Calyx* coloratus, foliolis duobus brevioribus, latioribus, basi gibbis, apice flavo-marginatis; duobus longioribus, angustioribus, carinatis. *Corolla* odorata; petala sulphurea; unguis longitudine calycis; lamina obovata, longitudine unguis. *Filamenta* alba, tubum æquantia; antheræ flavæ. *Glandulæ* quatuor, duæ majores, excavatæ ad basin filamentorum breviorum, duæ minores ad filamenta longiora. *Germen* longitudine staminum, quadrangulum, sericeum; stylus nudus, brevis: stigma capitatum, emarginatum. *Siliqua* exacte tetraëdra, stricta, calyce triplo longior, versus apicem latior, incana, sericea, terminata stigmate persistente, bivalvis, bilocularis. *Semina* oblongo-rotundata, pendula, apice membranacea, basi aucta.

Habitus *Erysimi hybridi* omnino est *Erysimi cheiranthoides*, ita ut primo aspectu non nisi ex magnitudine unum ab altero distinguas. Sed caulis altior et ramosior, folia non sinuata, pulposioria et molliora, substantia et colore *Cheiranthi Cheiri*; corolla major, sulphurea, odorato, odore suavi ad *Cheiranthum Cheiri* accedente, sed nonnihil mitiori; siliquæ breviores. Stigma magis ad *Cheiranthum Cheiri* accedit, quam ad *Erysimum cheiranthoïdes*, etsi hoc ab isto parum tantum differat. Semina perfecta eadem sunt cum *Cheirantho Cheiri*. Glandulatio communis cum illa *Cheiranthi Cheiri* et ea *Erysimi cheiranthoides*. Utraque enim fere eadem est. Mutuavit ergo *Erysimum hybridum*, a matre habitum et folia denticulata, a patre staturam, calycem, corollam, odorem, semina.

[Interesting as an early record of a bigeneric hybrid. Focke (Die Pflanzen-Mischlinge; 1881) mentioned no hybrids between *Cheiranthus* and *Erysimum*. Bois has given the name *Cheiranthesimum Cayeuxii* to a hybrid obtained in 1911 by crossing *Erysimum Marshalli* (*Cheiranthus Marshalli* Hort.) and *Cheiranthus mutabilis* L'Hérit. (Rev. Hort. 1913, 445).—T. A. S.]

7. Lathyrus strictus Grauer, *l. c.* 12. Lathyrus pedunculis unifloris; cirris diphyllis; leguminibus linearibus, dorso sulcatis.

Hab.? Enata in horto Dni *Christiani* Pharmacopæi eruditi et dexter rimi ex seminibus ab amicissimo *Schneckero* missis.

Caulis angulatus, ramosissimus, totus glaberrimus. *Folia* ovalia, gemella, acuminata, integerrima, subtus glauca, brevissime petiolata, petiolis decurrentibus. *Stipulæ* lanceolato-subulatæ, dente postico subulato decurrentes. *Cirri* ramosi, diphylli. *Bracteæ* setaceæ oppositæ, a flore remotæ. *Inflorescentia* uniflora, axillaris; pedunculi longi. *Calyx* generis. *Corolla* violacea. *Legumen* longissimum, compressum, lineare, subulatum, dorso sulcatum. *Semina* remota, pro longitudine leguminis pauca.

Obs. Ab omnibus *Lathyris* pedunculis unifloris a Linneo recensitis manifeste differt.

8. Astragalus norvegicus Grauer, *l. c.* 13. Astragalus caulescens, diffusus; foliolis ovalibus, glabris; leguminibus triquetris, pilosis.

Hab. In Norvegia. Lectus a Dno Præside prope Roeraas versus prædium Engan, ad Glomen fluvium.

Caules suberecti, undique diffusi, subramosi, angulati, glaberrimi. *Folia* pinnata cum impare, alterna; petioli glabri; foliola opposita, sessilia, glabra, ovalia, integerrima, marginata, impare petiolato; paria circiter 6. *Inflorescentia* capitata; capitulum terminale, ovatum, densum; pedunculi axillares, solitarii, longissimi, teretes, sulcati; pedicelli brevissimi, atro-pilosi. *Stipulæ* geminæ, ovatæ, acutiusculæ, glabræ. *Bracteæ* squamosæ reflexæ, subulatæ, hirsutæ. *Perianthium* ovatum, atro-pilosum, superne lunulatim excisum, inferne quinquedentatum, laciniis duabus superioribus remotioribus, majoribus. *Corolla* dilute violacea; vexillum lateribus reflexum, emarginatum, macula albidiore notatum; alæ magnæ ad basin hamatæ; carina marginata, appendiculata. *Legumen* calyce longius, atro-pilosum triquetrum, ad basin rotundatum, terminatum stylo inclinato persistente, exacte biloculare.

Obs. Nova, ni fallor, planta, quæ filia *Astragali Ciceris* Linn., ad cujus habitum valde accedit, sed caules teneriores, strictiores, foliola pauciora, emarginata, nec acuminata, capitula minora, corollæ violaceæ nec ochroleucæ, legumina triquetra, brevioribus pilis ornata hunc satis a *Cicere* distinguunt.

[Evidently conspecific with *Astragalus oroboides* Hornem. Fl. Dan. viii. fasc. 24, 4, t. 1396 (1810), which it antedates by 26 years.—T. A. S.]

9. Xeranthemum nobile Grauer, *l. c.* 16. Xeranthemum fruticosum, receptaculo paleaceo, foliis lineari-lanceolatis, crassis, tomentosis.

Hab. ad Caput bonæ spei.

Caulis fruticosus, tomentosus; rami longi, uniflori, incano tomentosi. *Folia* ramea sessilia, laxe imbricata, appressa, crassa, lineari-lanceolata, acutiuscula, sordide tomentosa. *Inflorescentia* uniflora; pedunculi longi, nudi, adspersi hinc inde squamis scariosis, albis. *Flos* magnus. *Calyx* niveus, laxe imbricatus, foliolis longe triangularibus, interiores multo minores, lanceolatæ, violaceæ, apice et disco albo. *Corollæ* violaceæ, parvæ. *Stamina* albida. *Semina* coronata pappo piloso ex setis copiosis. *Receptaculum* paleaceum, paleis strigosis.

Obs. Facile distinguitur a congeneribus tomento denso totam plantam vestiente, receptacula paleaceo! cum pappo plumoso. Solum enim *annuum* habet receptaculum paleaceum. *Xeranthemum vestitum* Linn. valde affine est *nobili* sed differt receptaculo nudo.

[From the description I consider this to be *Helipterum variegatum* DC. (*Xeranthemum variegatum* Berg. Pl. Cap. 271; 1767). The paleaceous receptacle mentioned by Grauer was probably merely his way of describing the honeycombed receptacle of *H. variegatum*. The linear-lanceolate, sordidly tomentose leaves, the long bracteate peduncles and the violet "calyx" point to this species rather than to *H. speciosissimum* DC., the only other one to which the description might apply.—J. Hutchinson.]

10. Inula helvetica Grauer *l. c.* 17. Inula foliis sessilibus, lanceolatis, serratis, subtus tomentosis; pedunculis tomentosis, confertis, incanis. *Aster caule ramosissimo*; *foliis ovato-lanceolatis subtus incanis*; *floribus umbellatis* Hall. Hist. 31, n. 73, t. 2 (optima).

Hab. In Helvetia.

Caulis erectus, ramosissimus, teres, sulcatus, ut plurimum purpurascens, subtomentosus; rami teretes. *Folia* arida, sessilia, alterna, lanceolata, acute serrata, copiosa, subtus albida, tomentosa. *Inflorescentia* sparsa subcorymbosa; pedunculi axillares, longi, tomentosi, incani, foliosi, conferti, uniflori. *Calyx* inferne squarrosus; laciniæ lanceolatæ interiores appressæ. *Corollæ* flavæ, radii ligulatæ disco plus duplo longiores, copiosæ, quinquedentatæ. Cætera omnia generis characteri convenientia. Tota planta odorata.

Obs. Diversa omnino planta ab *Inula germanica* Linn., quam hucusque præter Hallerum ab nullo auctore descriptam invenio. *Helenium montanum Salicis folio subtus incano* Vaillantii eandem esse plantam confirmarunt Hallero specimina a Vaillantio olim transmissa.

[Schinz and Thellung have recently suggested that the binomial *Inula Vaillantii* Vill. (1789) should be replaced by *I. Halleri* Vill. (1785) (Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 305; 1921). The earliest name for the species is, however, *I. helvetica* Grauer (1784). —T. A. S.]

T. A. Sprague.

GEORGE FREDERICK HOSE
(1838–1922)

George Frederick Hose, who died at Normandy, Guildford, on March 26, had attained distinction in many directions, as has been duly chronicled in the press notices of his career. Born at Cambridge, Sept. 3, 1838, and educated privately and at St. John's College, he was ordained in 1863, and from 1868 occupied various clerical posts in the Straits Settlements; in 1881 he was consecrated Bishop of Singapore, which position he occupied until his retirement in 1898. He was one of the founders and the first president of the Straits branch of the Royal Asiatic Society; his knowledge of Malay enabled him to revise and translate the New Testament into that language, and in other directions he did much useful work.

In addition to this, however, Hose did much to promote the study of Botany, and it is with this that we are here concerned. He was especially interested in the ferns of Borneo and of the Malay Peninsula; of these he made an extensive collection, distributing them to various herbaria, including Kew. His own collection was destroyed by an invasion of termites into the cabinets in which they were preserved during his absence on leave, but a complete series is in the herbarium of the Singapore Botanic Garden: many were described by Mr. Baker in this Journal (1891, 107) and elsewhere, and with several—e. g. *Hemionitis Hosei*—his name was associated. He published a catalogue of the ferns of Borneo in the *Journal of the Straits Branch* R. A. S. nos. 32, 31–84 (1899). He is also commemorated in the beautiful climber *Hosea Lobbiana* (based on *Clerodendron Lobbianum* C. B. Clarke), which he cultivated for many years in his garden at Kuching in Sarawak. This garden contained many interesting and beautiful plants, which Hose had brought from the Borneo forests. Towards the close of his stay in the East, he collected and studied the grasses and sedges of Borneo.

For much of the above information we are indebted to a notice (accompanied by an excellent portrait) by Mr. H. N. Ridley, published in the *Journal of the Straits Branch* R. A. S. no. 57 (1910). In a letter to us, Mr. Ridley, who speaks of Hose as "an exceptionally pleasant and delightful companion," thus refers to his versatility in languages: "He could conduct services in English, Malay, Chinese, and Dyak, whichever race formed the bulk of the congregation: one Sunday, most were Chinese, but halfway through a travelling party of Dyaks dropped into the church, so he stopped his Chinese prayers etc. and gave his sermon in Dyak."

The Bishop's nephew, Charles Hose, collected in 1894–5 in the Baram district of Sarawak and North Celebes; his Monocotyledons are described by Dr. Rendle in this Journal for 1901, pp. 173–9.

SHORT NOTES.

CERASTIUM PUMILUM IN SUSSEX. In the Journal for 1902, 214, the late E. S. Marshall recorded this species from Oxen Down as a plant new to Sussex. He very kindly sent me specimens which were mounted and put away. Having recently examined somewhat closely this species and allies, I felt sure these Oxen Down examples could be only *C. tetrandrum*; Mr. J. W. White, who knows *C. pumilum* in the dark, confirms my suspicions. Whilst this re-naming cuts the ground under *C. pumilum* as a plant of Sussex, it is pleasant to be able to reinstate the species on the same page. When botanizing on Highdown Hill, Clapham (v.c. 13), in April 1921, I came across a small colony of undoubted *pumilum*, which, although dwarf (barely an inch high), was unmistakeable.—C. E. SALMON.

SANDORICUM KOETJAPE AND DENDROBIUM CANINUM. On p. 210 the Editor notices Mr. Merrill's *Review of the New Species of Plants proposed by N. L. Burman in his Flora Indica*, and quotes several new combinations created by Mr. Merrill. Among these are *Sandoricum koetjape* as a new combination for the plant usually known as *S. indicum*, and *Dendrobium caninum* for *D. crumenatum*.

The *Sandoricum* described by Burman as *Melia koetjape* and combined into *Sandoricum koetjape* by Mr. Merrill is not, as the latter states, *S. indicum* Cav. but *S. nervosum* Blume (Bijdr. 163), who gives as the native name, Ki Kadjapi. This species was again described by King (Journ. As. Soc. Beng. lxiv. 21) as *S. radiatum*; it is very distinct from *S. indicum* Cav. The barbarous word "koetjape" which Mr. Merrill adopts as a specific name is a Dutch mis-spelling of kechapi by which the tree is known to the Malays. *Sandoricum indicum* Cav. is known as Sentol, so that if a change be made, *S. koetjape* must be substituted for *S. nervosum* Bl. not for *S. indicum* Cav.

Dendrobium caninum (Burm.) is a new combination proposed by Mr. Merrill to replace the well-known *D. crumenatum.* This cannot possibly be Burman's *Epidendrum caninum*, which was based on a wholly different plant, described and figured by Rumphius (Herb. Amboin. vol. 6, t. 47, fig. 1) as *Angræcum caninum.* Burman quotes the figure and description from Rumphius. Mr. Merrill reduces the well-known *D. crumenatum* to this species apparently because Burman gives "Angrec utan" (literally wild orchid) as a Javanese name. The original *A. caninum* is described as having large fringed purple flowers, smelling of dogs—a description which does not fit *D. crumenatum*, nor does the figure resemble it in the least. Swartz's description of his *D. crumenatum* (Schrad. Journ. ii. 237; 1799) is based on a figure on the same plate of Rumphius, fig. 2, which Rumphius does not describe. From these facts it seems quite clear that on no grounds can the name *Dendrobium crumenatum* be replaced by *D. caninum*, and the name *D. crumenatum* must stand for the Pigeon Orchid.—H. N. Ridley.

"Dandelion Invasion." [Under this heading the *Times* of July 29 prints, in an unsigned article, the following, which seems worth preserving. The plant referred to as having spread along the G.W.R. is, of course, *Senecio squalidus*, but Winchester is not on that line.—Ed. Journ. Bot.] "Wherever I have travelled in far Western Canada I have been amazed, appalled, by a vegetable invasion much more wholesale than any human immigration. Within the last three or four years the dandelion has taken complete possession of British Columbia, and seems to have found its optimum, as the botanists say, in the orchards of the Okanagan Valley. The floors of many orchards are now completely white with its seed heads. They look like the spilth of innumerable petals. Meadows and lawns are in the same state. The plants grow as thickly as if purposely seeded. It is a question whether ever in botanical history any plant or weed has taken quite such sudden and thorough possession of a countryside. Cattle flourish on the leaves, and they are eaten in every other salad, but the invasion is regarded seriously by Government experts. In almost every district, some one person is accused of introducing the weed; but I think the chief author is that great seed-distributor, the railway. The dandelions are nowhere more multitudinous than along the Canadian Pacific Railway, both on the sides of the track and in the meadows or station lawns. Did not some Hampshire botanist trace the spread of some rarer plant—I think a toadflax—all along the Great Western Railway from Oxford to Winchester? The course by which Timothy grass has spread in Newfoundland is the one railway line that runs through the island. Probably the dandelion has escaped from a freight of hay. It is, after all, along with the hawkweeds, much the most widely distributed over the world of any weed that grows."

REVIEWS.

Emile Burnat (1828–1920).

Emile Burnat: Autobiographie publiée avec une étude sur le botaniste et son œuvre, des souvenirs et documents divers, par John Briquet, *Directeur du Conservatoire et du Jardin botanique de Genève, et* François Cavillier, *1er Assistant au Conservatoire.* Genève: Conservatoire botanique.

This interesting volume may be regarded as a filial tribute from those responsible for its production, for M. Briquet was associated with its subject for more than thirty years, while M. Cavillier at an even earlier period became Keeper of M. Burnat's herbarium. The autobiography, although in some respects its most interesting feature, occupies but 40 pages of the 185 which the volume contains, and it is to the latter portion that we must look for details as to the extent and value of Burnat's work.

Emile Burnat was born at Vevey on October 21, 1828, of a Vaudois family whose history dates back to 1515. He was educated at Geneva and Paris, and became engineer to a firm of manufacturers at Dornach near Mulhouse, in which his uncle, with whom he lived, was a partner. Here he remained from 1852 until 1870, having in the meantime married and attained a leading position; in 1870 he left Mulhouse and returned to his birthplace, where he had built a house, and from that time devoted such leisure as his numerous public duties—he was eminently a man of affairs—would allow.

Burnat had already made considerable progress in botanical studies, and had begun to collect plants in 1842–3, availing himself of the opportunities presented by numerous excursions in Switzerland, France, and Alsace. In 1871 he stayed at Cannes with his family; here he met Thuret and Bornet, at whose instance he decided to take up seriously the study of the flora of the Maritime Alps with a view to publication. From 1872 to 1914 he made numerous excursions in that region, sometimes in company with other botanists—Boissier, Barbey, Micheli, Leresche, Coste, among them; sometimes with only his coachman for a companion. Meanwhile, while thus limiting the scope of his observations, he continued to add to his herbarium, which was confined to European plants, and to increase his library. From 1876 to 1892 he published, sometimes in collaboration with Gremli—the keeper of his herbarium from 1874 until 1899, of whom he gives an interesting sketch,—numerous papers on the flora; in 1892 appeared the first volume of the *Flore des Alpes maritimes*, to be followed by three other volumes from his pen, the fifth and sixth being elaborated by MM. Briquet and Cavillier.

His herbarium continued to grow: by the end of 1917 it included 8837 of the 9395 species enumerated in Nyman's *Conspectus*, represented by 210,408 specimens, of which 40,365 had been collected on his travels; it now numbers 219,384 specimens. For the accommodation of this and his library—then including 2618 volumes—Burnat had already built a special room; but their continued growth soon rendered this insufficient, and he decided to present them to the city of Geneva, who built for them an annexe to the Conservatoire Botanique to the cost of which Burnat generously contributed.

Space will not allow us to do more than mention the interesting chapters devoted to "Souvenirs personnels" and "Notes relatives à mes collaborateurs"; and we can only mention the second part of the volume, in which MM. Briquet and Cavillier in a series of chapters give fuller details of Burnat's travels, of his botanical work, and of his interest in questions of nomenclature; it may be noted that "l'expression 'dénomination mort-née' ou 'nom mort-né' a été employée pour la première fois par E. Burnat en 1892 (Fl. des Alp. mar. i. p. 198)." Lists are given of Burnat's publications, of his principal titles, of the plants bearing his name—which include two genera, *Burnatia* Micheli and *Burnatastrum* Briquet,—of his correspondents and fellow-workers, and of the principal collectors represented in his herbarium. There are also three addresses delivered by Burnat, and those delivered at his obsequies at Corsier on Sept. 2, 1920, and at Dornach on Sept. 6. An admirable portrait appears as frontispiece to the volume.

Practical Plant Biology: a Course of Elementary Lectures on the General Morphology and Physiology of Plants. By HENRY H. DIXON, Sc.D., F.R.S. 8vo, pp. xii, 292, with 94 text-figures. Longmans: London, 1922. Price 6*s*.

THIS book consists of a series of thirty lectures designed as an Introductory Course in Botany for medical and other science students. Suggestions for practical work are given at the end of each lecture. The course, which is presumably the outcome of Prof. Dixon's experience in Dublin University, differs from many courses for beginners in that the use of the microscope is treated at the outset, and the simpler forms are first dealt with; the lectures then pass on to the more complicated forms and "gradually lead the student to some knowledge of the development, structure, and physiology of the higher plants." The evolutionary method thus adopted involves working from the less to the more familiar forms of plant-life and plunges the student at once into the more difficult technique of the subject. Some of the older generation of botanists will remember beginning their work on similar lines. The subjects of study, following on chapters upon the microscope and cell-structure respectively, are yeast, *Chlamydomonas*, and bacteria (each with two lectures), *Spirogyra*, *Volvox*, *Vaucheria*, *Mucor*, *Penicillium*, *Fucus*, *Polysiphonia*, *Marchantia* (two lectures), *Funaria*, *Aspidium* (two lectures), *Selaginella*, *Pinus* (three lectures), *Ranunculus* (two lectures), and *Scilla*. Physiology is introduced where appropriate; thus the earlier lectures give opportunity for discussion of respiration, photosynthesis and enzyme action; and the anatomy of the plant-structures is also studied. The three concluding lectures deal with nuclear division, heredity and evolution, and the theory of descent. We find the print trying to read; it is rather small and shows through the paper. The figures are generally adequate, but the drawing of *Mucor* showing mycelium and sporangia would not have passed muster in the old days. A. B. R.

BOOK-NOTES, NEWS, ETC.

In the *Journal of Ecology* (x. no. 1), Mr. R. H. Yapp suggests the formation by the Ecological Society of "a central 'Ecological Reference Herbarium,' or a series of such herbaria, housed in suitable centres." This "would aim not so much at recording the occurrence of species as at accumulating material which might in time be a veritable mine of information useful to ecologists: such as, for example: developmental stage; growth forms (including root-systems); forms of leaves in different parts of the same plant or at different seasons of the year, and seasonal status generally; habitat forms and so on. The winter conditions of herbaceous plants, a subject ignored by our Floras but nevertheless of great importance in connexion with the study of partial habitats, would no doubt form an important part of any ecological herbarium." The scheme thus adumbrated is to be discussed later. Mr. Yapp, in addition to the essay in "The Concept of Habitat," in which the above suggestion occurs, contributes to the same number a paper on "The Dovey Salt Marshes in 1921." The number also contains "The Ecology of the Gorse with special reference to the Growth-forms on Hindhead Common," by E. G. Skipper (with plate); "Changes in the Coast Vegetation near Berrow, Somerset," by H. Stuart Thompson; "The Distribution and Origin of *Salix* in South Africa," by J. Burtt Davey; "The Vegetation of West Greenland," by R. E. Holttum; "A Spitzbergen Salt Marsh," by John Walton (with 3 plates).

The *Kew Bulletin* (No. 5) contains a continuation of Miss Wakefield's "Fungi Exotici" and of "Contributions to the Flora of Siam" by W. F. Craib, in which many new species are described. Mr. W. B. Turrill describes and figures flowers of a new variety of *Erica vagans*, named *kevernensis* from the place of its discovery—St. Keverne, Cornwall. The new plant differs from the usual form of the species in the shape and colour of its corollas, which "are broadly campanulate, with a wide open mouth and well developed, more or less reflexed lobes. In colour the fresh corollas are a charming rose-pink with no tinge of purple." Only one plant was observed, but from this the discoverer, Mr. P. D. Williams, of Lanarth (who also discovered the hybrid between *E. vagans* and *E. tetralix*, named after him), took cuttings which grew and produced seed; the form now occupies a whole bed at Kew. "It is impossible at present to decide fully the botanical status of this plant: no morphological characters which would suggest a hybrid origin have been found."

The Government of Chosen, Seoul, Corea, has published in a handsome volume *An Enumeration of Plants hitherto known in Corea*, by T. Mori, "Instructor in the Seoul First Higher Common School." In his preface the author summarises the work that has been done on the flora, and continues: "Although the plant life in Corea is more and more carefully studied and investigated, yet no complete list of the plants has been published, to the great inconvenience of students as well as collectors. That is the reason why I have boldly compiled this Work in spite of my poor knowledge.

Moreover, I have had to compile this Work in the time I could spare from my regular duties in school, and so I am afraid there may be some errors in it: if I can make this work more perfect through the kind help of critics, great will be my joy." The total number of species enumerated (Embryophyta and Pteridophyta) is 2904, with 161 introductions, arranged alphabetically under the orders, of which a list is given; there are full indexes of Corean, Chinese, and Japanese names, but none of the Latin genera: the text of the book is in Corean, so we are unfortunately precluded from giving an opinion of it.

The *Annales du Jardin Botanique de Buitenzorg* (vol. xxxii. pt. 2) contains "Studies in Tropical Teratology," by J. C. Costerius and J. J. Smith (with 12 plates); a paper on *Lanomyces*, a new genus of *Perisporiaceæ*, by E. Gäumann (6 pl.); "Morphological and Biological Notes on *Rafflesia* flowers observed in the Highlands of Mid-Sumatra," by P. H. Justensen (12 pl.); and "The Embryo-sac of *Vittadinia*," by B. T. Palm. The *Bulletin* of the Garden for April (iv. pt. 2) contains "In Memoriam Dr. K. Gorter" (with portrait), by A. J. Ulteé; "Some Galls from Hongkong and Krakatau," by Dr. Van Leeuwen; "Two new Malayan Fern Genera" (*Parasorus* and *Grammatopteris*), by Captain v. Alderwerelt v. Rosenburgh (2 pl.), and on "New or noteworthy Malayan *Araceæ*," also by the same author: the June issue contains "Mykologische Mitteilungen," by E. Gäumann and a continuation of J. J. Smith's "*Orchidaceæ* novæ Malayenses" (mostly *Dendrochilum*).

The Department of Botany has recently acquired an interesting MS. volume written by Edward Robson of Darlington (1763–1813), whose name is known to British botanists in connexion with *Ribes spicatum*, which he described in Linn. Trans. iii. 240, and as a contributor to *English Botany*, where he is described by Smith (t. 70) as "a very assiduous and accurate botanist." The volume—a small octavo of 237 pages with index—is described on its title-page as: "Supplement to the British Flora; or a Catalogue of the British Plants (in the Linnæan System) with the Characters, Places of Growth, &c., of the species not contained in that work. By Edward Robson. Darlington. 1790"—the "British Flora" referred to is that of his uncle, Stephen Robson (1741–1779), published in 1777, of which a copy, with corrections in the author's hand, was presented to the Department at the same time. The title accurately describes the contents of the volume; more than half is occupied by the cryptogams, of some of which there are coloured figures. The books were until lately in the possession of Mr. Joseph J. Green, of Hastings, a great-nephew of the author, of whom in a prefatory note to the Supplement he gives biographical details, tracing the passing of the volume through the hands of various members of the family.

A second edition of *A Naturalist's Calendar*, based on observations made at Swaffham Bulbeck, Cambridgeshire, between 1820 and 1831, and later from 1845–49, by the Rev. Leonard Blomefield (formerly Jenyns), edited by Sir Francis Darwin, has been published by the Cambridge University Press (price 3*s.* 6*d.*). Not having seen the first edition, we do not know how this differs from it; Sir Francis

Darwin's very interesting introduction, which includes a summary of other calendars and a biographical sketch of Blomefield, is dated October 1921. It also contains a disquisition as to "what flower is meant" by "the Cuckoo flower of the older botanists." Sir Francis says "the older botanist (*sic*) referred to is probably Gerard, and he seems to mean *Cardamine pratensis*"; the matter, however, can hardly be doubtful, as both Gerard and Parkinson limit the name to the *Cardamine*: Wood-sorrel, which "may have been intended with about equal propriety," is called by both Cuckoo's *meat*. Sir Francis's further suggestion "Could it have been the Cuckoo-pint?" may be dismissed without consideration. In addition to the Calendar itself, there is an "alphabetical arrangement of the periodic phenomena with a reference to the mean date of occurrence." Apart from its interest, the little book is very attractively produced.

Botany fares badly in *The London Naturalist* (the Journal of the London Natural History Society) for 1921 (L. Reeve, 3*s*. net). The Report of the Botanical Section "has been curtailed drastically," from motives of economy, and occupies less than half a page: "much important matter has been suppressed or postponed"; the little that is given mainly relates to excursions of members in Dorset and the Lake District, and can hardly be considered "important." All that we learn about London Botany is that "for the Northern portion, 5 new species have been added to the records, and 29 for the Southern: noteworthy among the latter are *Silene nutans* L. and *Mentha gentilis* L." Three papers on birds and insects, two obituary notices, and a presidential address make up the 95 pages of which the volume is composed.

Under the heading "The First Liverpool Flora and its Author," Mr. A. A. Dallman in the *Lancashire and Cheshire Naturalist* for May–June gives a detailed account of Thomas Batt Hall, whose *Flora of Liverpool* was published in 1839. Hall was born July 25, 1814, at Coggeshall, Essex, where he was engaged in the silk trade. In connexion with this he came to Liverpool in 1835–6, and remained until 1839, when he returned to Coggeshall, where, however, things did not go well with him; in 1852, in the hope of bettering his fortunes he went to Melbourne, but the hope was not realised. Failing health and anxiety resulted in acute mental trouble, and he died in the Yarra Bend Institution on October 26, 1886. His herbarium of mosses and lichens is in the Essex Museum.

The July number of *The Flowering Plants of South Africa* contains descriptions and figures of *Corycium crispum* Sw., *Aloe excelsa* Berger, *Gladiolus alatus* var. *namaquensis* Baker, *Gazania pygmæa* Sond., *G. Pavonia* R. Br., *Ornithogalum Thunbergianum* Baker, *Ferraria antherosa* Ker, *Harveya squamosa* Steud., *Gladiolus Pritzelii* Diels, and *Ochna pretoriensis* Phillips, sp. n.

The Bernice Pouahi Bishop Museum publishes in its Memoirs (viii. no. 3) an account of *The Grasses of Hawaii* by A. S. Hitchcock—the result in great measure of an excursion undertaken by him in 1906 for the purpose of studying the grasses of the islands. After a general introduction, keys to the tribes and genera are given, followed by full descriptions of the species, many of which are new, with remarks as to peculiarities, distribution, &c. The total number of species included is 130, of which 47 are native (39 being endemic) and 83 introduced, mostly from Europe. The memoir is illustrated by 110 excellent figures, and ends with a "catalog of numbers cited."

The *Phanerogams of the Juan Fernandez Islands* is reprinted by Dr. Carl Skottsberg (Almquist, Upsala) from the second volume on the natural history of those islands. It contains a large number of new species, very fully described, and a new hybrid genus of Rosaceæ—*Margyracæna*,—"the result of natural crosses between the native *Margyricapus* and the introduced *Acæna argentea*." There is a chapter on the composition and character of the indigenous flora, a separate list of introduced species, and a bibliography; the text contains numerous figures of dissections and there are eleven plates. The pamphlet is very attractively produced.

To the *Gardeners' Chronicle* for July 15 Sir Frederick Moore contributes an "appreciation" (with portrait) of Mr. William Watson, who has recently retired from the curatorship of the Royal Gardens, Kew; Major T. F. Chipp, B.Sc., has been appointed Assistant-Director of the Gardens. Mr. C. Harman Payne is publishing in the *Chronicle* (beginning July 23) a series of papers on "The History of the Moss Rose," in which he criticises somewhat severely the paper by Major Hurst, published in Journ. R. Hort. Soc. xlvii. part 1. The number for Aug. 5 contains continuations of the account of Mr. Kingdon Ward's sixth expedition in Asia and of Mr. N. E. Brown's papers on *Mesembryanthum* and allied genera; in the present instalment species of *Conophytum* are figured and described.

Vol. ix. no. 2 of the *Records of the Botanical Survey of India* is devoted to new *Euphorbiaceæ* from the Malay Peninsula, which are described by Mr. A. T. Gage in great detail, each description approaching or even exceeding a page in length. In such cases a short diagnosis, presenting the salient points of difference, should, we think, be given, or at least that these should be italicized in the descriptions.

The *Mémoires de la Société Géologique de Belgique* (February) contains papers by A. Gilkinet on the "Flore fossile des Psammites du Condroz (Dévonien supérieur)" (13 pl.) and "Plantes fossiles de l'argile plastique d'Andenne" (4 pl.).

The *Orchid Review* for August contains an interesting paper by Mr. Oakes Ames, of the Bussey Institution, Harvard, "On the Capacity of Orchids to survive in the Struggle for Existence," based on their appearance on Krakatau after its devastation in 1883.

Dr. Watson's "Key to the Determination of Lichens in the Field," published with this Journal for June and July, has been reprinted in pamphlet form and may be obtained from the publishers, price 2*s*. net, post free.

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LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers.

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MISCELLANEA BRYOLOGICA.—VIII.

By H. N. Dixon, M.A., F.L.S.

(Continued from Journ. Bot. 1921, p. 139.)

Microthamnium Mitt. (1869).

Much ink has been spilled over this name. Hennings in 1902 proposed to substitute for it the name *Mittenothamnium*, on the ground that Mitten's name had already been pre-occupied in 1846 by Naegeli for a genus of algæ. In 1906 Fleischer deprecated the creation of a new name, on the ground that Hampe had already founded *Stereo-Hypnum*, a Section of *Hypnum*, for the species placed by Mitten and others under *Microthamnium*. This was adopted by Brotherus (Engl. & Prantl, Pflanzenfam., Musci, ii. 1236). Cardot (Rev. Bryol. 1913, p. 20), following also Hagen (Remarques sur la nomenclature des Mousses, in K. Norske Vidensk. Selsk. Skrift. 1910, no. 3, p. 12), restores Hennings's name on the ground that *Stereo-Hypnum* was not validly published as a generic name, and gives a page of new combinations required by this change. Fleischer in *Nova Guinea*, vol. xii., Bot. livr. 2, p. 125 (1914), starts a new hare. He states that the generic name *Rhizo-Hypnum* Hampe must be adopted in the place of *Stereo-Hypnum* Fleisch. and *Mittenothamnium* Hennings, stating that Hampe's name was validly published according to all the laws of nomenclature; "da er (*i. e.* Hampe) in Symbolæ, *loc. cit.* p. 269, bereits 1877 nach allen Regeln der Nomenklaturgesetze giltig publizirt ist und also die Prioritaet hat!" Now "Hampe, *loc. cit.*" lands us nowhere, except on more examples of "Hampe, *l. c.*" But the reference is to the *Symbolæ ad Fl. Brasiliæ centralis* in Vid. Meddel. fra den naturh. Foren. Copenhagen, 1877, p. 269, where we find:—

91. *Rhizo-Hypnum Versipoma*, n. sp., *Microthamnium* Mitt., followed by a full specific description; then

Rhizo-Hypnum camptorhynchum Hpe.,

i. e. a citation of a previous species under the same generic name.

There is no generic description, no suggestion of "gen. nov.," no citation of species intended to be included; while the succeeding citation of a combination under the same generic name surely contradicts the idea that Hampe had the idea of founding a *new* genus. If he had so intended, he would probably, and should certainly, have adopted Mitten's name, which he cites as synonymous. (It will hardly be suggested that he foresaw Hennings's objection to *Microthamnium*!)

The fact is that Hampe never troubled himself with meticulous distinctions between genera and subgenera when forming his binomials. A glance at the *Symbolæ* (e. g., *op. cit.* 1870, p. 284) shows that he distinctly states there that the *genus* is *Hypnum*; under that he gives various subgenera or sections, but is entirely careless whether he uses these or the generic *Hypnum*, or even some other author's generic name, for the binomial! Thus in this one paper he has:—

Gen. Hypnum.

Dendro-Hypnum.

62. *Dendro-Hypnum fasciculatum* Sw.

Platy-Hypnum.

66. *Euglossophyllum radiculosum* C. M. Synops.

Sect. Vesicularia.

68. *Hypnum subdenticulatum* C. M. Synops.

69. *Platy-Hypnum splendidulum* Hornsch. Fl. Brasil.

It will, I think, be generally felt that the substitution of *Rhizo-Hypnum* for *Stereo-Hypnum* in no way helps matters.

I have not myself adopted any of these substitutes for *Microthamnium*, but I have published one or two species under Mitten's name, and have thereby incurred some friendly criticism from fellow-bryologists. There have appeared to me several reasons for following this course. In the first place, assuming that Mitten's name came under those which by the International Laws become disqualified, there is still the list of "Nomina conservanda" to be drawn up for mosses, and it would be quite reasonable to suppose that when the time comes for this to be done, *Microthamnium* might find a place on that list. It has been established for more than fifty years; it is a rather large genus, containing at least a hundred species, and the consequent new combinations needed are therefore not inconsiderable.

In the second place, of the three names proposed as substitutes, all have at least some faint suspicion attached to them as to their absolute compliance with the laws of valid publication, and it is doubtful whether unanimity would be reached by this road. And, thirdly, it is held by some competent botanists that an existing generic name should not be rendered invalid in one of the great divisions of the Vegetable Kingdom by reason of its previous employment in another. As the International Laws stand, this position can at present, perhaps, hardly be taken, but it might fairly be argued that it is at least open to consideration under the special arrangements "reserved for the Congress of 1910" (see Intern. Rules, Art. 9, footnote 1).

I have briefly stated the above arguments, because it appears to me that they apply with some force not only to the case under consideration, but to any proposed alteration in bryological nomenclature involving rather considerable changes at the present time. But the main object of this note, and my chief ground for maintaining the validity of *Microthamnium* Mitt., rests upon a quite different consideration which has recently come to my notice.

All the authors cited above appear to have accepted Hennings's dictum that *Microthamnium* Mitten is antedated by *Microthamnium* Naegeli, genus *Algarum*. But, as a matter of fact, this is incorrect. Naegeli's name is published in Kuetzing, Sp. Algarum, p. 352 (1849), and appears thus:—

Microthamnion, *Naegeli* in litt.

M. Kuetzingianum Naegeli, No. 221.

There has, so far as I know, never been any variation in the spelling; it has always been cited as *Microthamnion* Naegeli.

It is quite evident that the case falls under Art. 57 of the Intern.

Rules—"When the difference between two names, especially two generic names, lies in the termination, these names are to be regarded as distinct, even though differing by one letter only."

There is surely no loop-hole of escape from this, and *Microthamnium* Mitt. may be considered as securely established.

Didymodon recurvus (Mitt.).

Mitten, in the M. Ind. Or. p. 37, describes *Desmatodon recurvus* Mitt., based on a specimen "In Himalaya reg. trop., Sikkim, *J. D. Hooker*." He cites as a synonym "Gymnostomum recurvum *Griff. Not.* p. 397; *Icon. Plant. Asiat.* ii. t. xcii, f. 11; errore typographico *G. longirostro* ad pedem tabulæ adscriptum."

This is misleading. In the first place, xcii should read xcv; and the figure referred to is II, not 11. The legend at the bottom of plate xcv undoubtedly lacks lucidity: it reads "I *Gymnostomum atroviride* Gr. I II III *G. longirostrum.* IV. *Diastoma denticulata.*" It certainly appears as if the name for fig. II had dropped out, though it is by no means certain that Griffith was not figuring two different specimens of his *G. longirostrum.* However this may be, there is no evidence that Griffith intended to represent his *G. recurvum* by fig. II. In fact, the evidence is all the other way. *G. recurvum* Griff. is already figured in the *Icones* on pl. xcii, fig. II, and this reference is cited by Mitten (*op. cit.* p. 33) under *Barbula rufescens*, to which species Griffith's *G. recurvum* undoubtedly belongs. It is quite a different thing from the plant figured by Griffith on pl. xcv, fig. II, which, however, may well be conspecific with the plant described by Mitten as *Desmatodon recurvus.*

The synonymy should read thus:—

(*a*) Didymodon recurvus (Mitt.) Broth. in Engl. & Prantl, Pflanzenfam. Musci, i. 405 (1902).

Desmatodon recurvus Mitt. in Journ. Linn. Soc., Bot. iii., Suppl. p. 37 (nec *Gymnostomum recurvum* Griff.).

? *Gymnostomum longirostrum* Griff. p. p., Icon. Pl. Asiat. ii. t. xcv. fig. II.

(*b*) Didymodon rufescens (Hook.) Broth. *op. cit.* p. 406.

Gymnostomum rufescens Hook. Icon. Pl. rar. t. 17.

Gymnostomum recurvum Griff. Not. p. 397; Icon. Pl. Asiat. ii. t. xcii. fig. II.

Paris (Ind., ed. 2) under *Didymodon recurvus* has copied Mitten's synonymy, and needs correcting as above.

Hooker's specimen of *D. recurvus* Mitt., from Sikkim, at Kew, is a tall robust plant. Mitten, I think, a little exaggerates the unaltering of the leaves when dry. They are strongly—and at the apex frequently circinately—incurved. The cells are rather large, slightly smaller towards margin, forming a very inconspicuous border, scarcely comparable with that of *D. Wallichii* (Mitt.); and generally practically entire. Mitten has overlooked one character of some importance. The apical leaves frequently have the mucro of the excurrent nerve clothed with a tuft of brown septate gemmæ. The reddish-brown colour of the plant is very marked.

I have detected this species in two collections received from North India: viz., on wood, about 7000 ft. alt., Almora, coll. Miss Shepheard, 1910 (no. 21); and Landour, Mussooree, alt. 6900 ft., June 1921, coll. Kenoyer & Dudgeon (no. 22 *b*). These agree well with Hooker's plant, though they do not show the apical gemmæ.

Duby's Choix de Cryptogames, &c.

The dates of these publications as given by Paris are very inaccurate. Many of the new species were published in *Flora* before their publication in the Mém. Soc. Phys. . . . Genève; and, moreover, the dates for the latter publication given by Paris generally refer to the dates on which the papers were read, not those of their publication. As far as I am aware, there were seven papers issued, of which the following is the correct bibliography:—

Title of Separate.	Original Publication.	Paging.
1. *Choix de Cryptogames Exotiques nouvelles ou mal connues.* 1867, pp. 1–14. I. Mousses.	Mém. Soc. Phys. . . . Gen. xix. (1868).	pp. 291–304.
2. *Choix de Cryptogames Exotiques nouvelles ou mal connues.* 1869. I. Mousses (suite), pp. 1–14.	*Ibid.* xx. (1870).	pp. 351–364.
3. *Choix de Cryptogames &c.* 1870. I. Mousses (3me suite). *Musci Welwitschiani, Acrocarpi*, pp. 1–13.	*Ibid.* xxi. (1871).	pp. 215–227.
4. *Choix de Cryptogames &c.* 1871. I. Mousses (4me suite). *Musci Welwitschiani, Pleurocarpi*, pp. 1–20.	*Ibid* xxi. (1871).	pp. 425–444.
5. *Choix de Mousses Exotiques nouvelles ou mal connues.* 1875. pp. 361–374.	*Ibid.* xxiv. (1876).	Same paging.

(All the new species here described were first published in *Flora*, lviii. (1875), pp. 282–285.)

6. *Choix de Mousses Exotiques nouvelles ou mal connues.* 1876, pp. 1–14.	*Ibid.* xxvi. (1879).	Same paging.

(Spp. 1– 7 were first published in *Flora*, lx. (1877), pp. 73–77.)
„ 8–18 „ „ „ „ „ pp. 90–95.)

7. *Choix de Mousses Exotiques &c.* 1880, pp. 1–10.	*Ibid.* xxvii. (1881).	Same paging.

(All the new species were first published in *Flora*, lxiii. (1880), pp. 168–174.)

Fissidens Zippelianus Doz. & Molk.

Fissidens Zippelianus is a well known and very widespread moss; it is not only distributed through the Indo-Malayan region and New Guinea, but as Fleischer has pointed out (Musci . . . . von Buitenz. i. 44) it exists in tropical Africa under the name of *F. coriaceifolius* C. M., and, I have but little doubt, under several other names. Unfortunately, the name *Zippelianus* must itself, I fear, pass into the region of synonymy. I had occasion recently to examine the type of *F. silvaticus* Griff. (Mumbree, Griffith, 303, in Herb. Kew.), and I find it identical with *F. Zippelianus*. *F. silvaticus* was published in 1841, and must therefore have precedence over *F. Zippelianus*, which dates from 1854. Mitten, it is true (Musc. Ind. Or. p. 138), gives as a synonym of *F. silvaticus*, *F. javanicus* Bry. jav.; but Fleischer (*op. cit.* 49) has shown that this is quite an error, however it may have arisen. Unfortunately, Fleischer had not access to Griffith's plant, but only the description and figures (on which latter too much reliance must not be placed), or he might have gone further and detected the actual affinity of Griffith's species. The synonymy must therefore stand thus:—

Fissidens silvaticus Griff. Not. p. 429 (1841), et Icon. Pl. Asiat. ii. t. 81, fig. 1.

F. Zippelianus Doz. & Molk. in Zoll. System. Verz. p. 29 (1854), et Bry. jav. i. 2, t. 2 (1855).

F. terminiflorus Thw. & Mitt. in Journ. Linn. Soc., Bot. xiii. 322 (1872). &c., &c.

Orthotrichum leptocarpum Br. & Schp. e C. M. Syn. i. 706.

Schimper's specimens of this are at Herb. Kew. C. Mueller describes the capsule as "immersa, ... angusta, *distincte octies striata*." Brotherus, on the other hand, places it in a Section with "capsule smooth (or rarely indistinctly striate), exserted." It seemed desirable to clear up the discrepancy.

Schimper's specimens fill nearly a sheet. They consist of (*a*) the type, Schimp. iter Abyssin. no. 429 *b*; several tufts (*b*) do., no. 488, from a different locality. (*c*) "Orthotrichum molluscum mihi (in Bruch's hand) Abyssinia; hb. Schimper." And three other specimens, all from Abyssinia; two at least, and probably all, collected by Schimper.

All these gatherings, with the exception of a tuft on no. 488, have nearly exserted, perfectly smooth capsules, indistinguishable from *O. speciosum*. The vegetative characters appear to agree with *O. speciosum*.

It may be assumed that this plant was the one intended by Bruch & Schimper by "*O. leptocarpum*." But it is clearly not that described by C. Mueller. Now part of one of the tufts of (*b*) no. 488 consists of a different species, agreeing well with C. Mueller's description. The capsules are, to be literally exact, not fully immersed, but they are far more nearly so than in the other plant, and indeed would by many authors be described as immersed. They are strongly striate. The leaf form and structure appear to be identical in both plants, except that the leaves in the former when moist are somewhat *recurved-squarrose*, while in the plant with subimmersed capsules they are widely patent, but straight, not recurved. The stomata in both are superficial.

The two species evidently grow together, and one must assume that C. Mueller's specimen of 429 *b* consisted partly or entirely of the ribbed subimmersed form. It is clearly this latter which C. M. describes, and which must bear the name *O. leptocarpum*, though, under the circumstances it would appear more correct to call it *O. leptocarpum* C. M. than *O. leptocarpum* B. & S.

The actual *O. leptocarpum* C. M. is represented in Schimper's herbarium by a half-sheet of specimens under the MS. name of "*O. abyssinicum* Hpe. MS." It is in good condition and pure. It quite agrees with C. Mueller's description in the Synopsis, and also with the specimen of no. 488 already cited.

The plant with smooth exserted capsules intended as *O. leptocarpum* by Br. & Schimp., and no doubt distributed under that name, has already been described and published. It is *O. firmum* Vent. in Nuov. Giorn. bot. iv. 15 (1872). This was based on one of Schimper's gatherings "In reg. Bogos Abyssiniæ circa Keren." It must evidently be a common plant in that district, and differs from *O. speciosum* only, but quite sufficiently, by having 16 processes on the inner peristome.

Bruch appears, from his specimen (*c*) above, to have taken a different view from Schimper, or else to have recognized that the plant intended by them for *O. leptocarpum* was not the plant actually described by C. M.; and he therefore called the former *O. molluscum*. Venturi's publication, however, precludes the adoption of Bruch's MS. name.

The two will arrange themselves thus:—

O. LEPTOCARPUM C. M. Syn. i. 706 (1849).

Type. Abyssinia, in monte Silke; Schimper, no. 429 *b*, iter Abyss. p. p.; in herb. C. M.

O. FIRMUM Vent. in Nuov. Giorn. bot. iv. 15 (1872) (*O. leptocarpum* Schp. MS. in herb., nec C. Mueller).

Type. Circa Keren, Abyssinia; Schimper. Co-types; Schimp. iter Abyss. nos. 429 *b* p. p., and 488 p. p. Simen, Abyssinia; Schimper, in herb. Schimp.

BRACHYTHECIUM DECURVANS (Mitt.) Jaeg.

This north Indian moss was described by Mitten, as *Hypnum decurvans*, in the Musc. Ind. Or., from a plant collected by Royle, "In Himalaya boreal-occident.," and another by Thomson, by the Sutlej (no. 1011). It is compared by Mitten with *H. cameratum*, and is placed by Brotherus, in the Musci, under *Cirriphyllum*.

I have an original specimen of Royle's (comm. N.Y. Bot. Gard., ex herb. Mitten); and have compared several other specimens, *e.g.* no. 21, Bryoth. exot., E. Levier, coll. Gollan, and others at Kew. There can be no doubt that the plant is a *Bryhnia*, and so close to *B. novæ-angliæ* (Lesq. & Sull.) Grout that it is exceedingly doubtful if it be specifically distinct. Vegetatively it is identical, and the only difference I have been able to detect is that the lid in *B. decurvans* is rather more longly and finely rostrate, and on this ground I do not venture to reduce it to *B. novæ-angliæ*, although I have found here and there on N. American plants (*e.g.*, Aust. M. Appalach., no. 329) capsules with the lid very near at least to the Himalayan species. There would be nothing remarkable if this should prove identical with Sull. & Lesqueureux' species, as that, besides having a wide distribution in the northern parts of N. America, is known from Japan and also from Scandinavia. For the present, however, it is best kept apart, as

Bryhnia decurvans (Mitt.) Dixon comb. nov.

Hypnum decurvans Mitt. in Journ. Linn. Soc., Bot. iii., Suppl. p. 78 (1859).

Brachythecium decurvans Jaeg. Adumbr. ii. 410. *Cirriphyllum decurvans* Broth. in Engl. & Prantl, Pflanzenfam. Musci, ii. 1154.

Syrrhopodon rufescens Hook. & Grev.

In publishing a list of Mr. Binstead's Borneo Mosses (Journ. Linn. Soc., Bot. xliii. 298) I recorded no. 87, from Sekong, as *Syrrhopodon bornensis* (Hampe) Jaeg. This I find was an error; it is *S. rufescens* Hook. & Grev. Fleischer has pointed out the difference between the two; in *S. bornensis* the leaves when dry are straight, erect, and appressed; in *S. rufescens* the lamina is reflexed, with spreading, flexuose, almost twisted acumen. *S. rufescens* is new to Borneo; specimens so named from Pontianak belong, according to Fleischer, to *S. revolutus.*

Thysanomitrium Richardii Schwaegr., and its allies.

Paris (Ind. ed. ii.) gives

Pilopogon umbellatus (W. Arn.) Broth.

Campylopus umbellatus W. Arn. Disp. p. 24 (1826).

The entry, however, is incorrect in two respects. The paging should be 34, not 24. Moreover, W. Arnott published the plant under *Thysanomitrium* (spelt *Thesanomitrium*), not *Campylopus.* Cardot (Plantæ Hochreutinerianæ, Musci, in Ann. Conserv. et Jard. bot. de Genève, vol. xv.–xvi. p. 161) has pointed out that the name *Thysanomitrium* must stand, as having priority over *Pilopogon,* if the species of the subgenus *Eupilopogon* Broth. and those of subgenus *Thysanomitrium* Broth. are united; while if, as he suggests, they are better separated, the species of *Eupilopogon* will remain under the generic name of *Pilopogon,* while those of subgenus *Thysanomitrium* will retain that generic name—unless reunited with *Campylopus,* for which arrangement there is a good deal to be said. For the present I prefer to keep them distinct, under the name of *Thysanomitrium.*

Thysanomitrium umbellatum was founded on a specimen collected by Gaudichaud "In insulis Sandwicensibus (alt. 350–450 hexapod.)," and described by W. Arn. (*loc. cit.*). It was published by Schwaegrichen as *Trichostomum umbellatum* in Freycinet, Voy. de l'Uranie, p. 233 (1826). Each of these authors cites the other's work, which must have been published almost simultaneously, but W. Arnott's was the earlier. He describes it as only differing from *T. Richardii* in the longer peristome teeth, which are, moreover, split to the base. It may be assumed that the comparison with *T. Richardii* is based on Schwaegrichen's figure (Suppl. ii. pt. i. t. 118). While, however, the figures Schwaegrichen gives of the stem and macroscopic characters afford a very good idea of the plant, both the description of the peristome ("dentes . . . . lineari-lanceolati, solidi . . . . brevissimi, fusco-rufi") and the figures of it are very incorrect, and in all probability must have been taken from a partially destroyed peristome. The teeth in *T. Richardii* are longly filiform in their greater part, the crura sometimes separated for the greater part of their length, united below—sometimes for only a short distance—and there transversely barred.

As a matter of fact, the Hawaiian plant shows no difference from the Central and S. American species in the peristome. I have examined an original specimen gathered by Gaudichaud in Herb. Bescherelle, and I find the teeth precisely similar to those of *T. Richardii*; and this is the case with other Hawaiian specimens I possess. The specimen is labelled "Rauwack," *i.e.* in the Moluccas, where Gaudichaud also collected; but neither W. Arnott nor Schwaegrichen, in the description of Gaudichaud's Mosses, refers to its having been collected there, and I think the locality must be an error. Duby's figure of his *Campylopus nigrescens* (Mém. Soc. Phys. . . . . Genève, xix. 292 (1868) tab. i. *e*), which Mitten found inseparable from *T. Richardii*, gives a very fair idea of the peristome, though the teeth are represented as perhaps too regularly barred, and united further up than is at least usual.

There is no suggestion that *T. umbellatum* differs from *T. Richardii* in any other respect; and there can be no doubt that it is the same species.

The reduction, however, by no means ends here. C. Mueller appears to have overlooked *T. umbellatum* W. Arn. altogether. It is not included in the Synopsis, nor is there any reference to it in the *Bryologia Hawaiica*. In that work he describes *Thysanomitrium hawaiicum*, n. sp.; and as he does not make any comparison with *T. umbellatum*, while the description applies perfectly to that species, the conclusion is obvious that he was unaware of Arnott's species, and was unconsciously describing the same plant. In the Bry. Hawaiica C. Mueller describes as his type a slender plant, and as var. *robusta* a much larger plant which he had formerly labelled *T. Baldwinii*. In the posthumous Gen. Musc. Frond. he reverts to the earlier view, and considers *T. Baldwinii* as distinct. They represent two rather extreme forms of *T. Richardii*.

Paris (Ind. ed. ii. p. 398) has confused *Thysanomitrium hawaiicum* C. M. (*Flora*, lxxxii. 440) with *Dicranum hawaiicum* C. M. (Bot. Zeit. 1862, p. 328). It is the former plant which is *Pilopogon hawaiicus* Broth. The latter should appear under *Campylopus* as *C. hawaiicus* (C. M.) Jaeg. Adumbr. i. 140. It is the same with *T. Powellii* C. M., from Samoa. Even C. Mueller can only say of that plant that it "relative solum differt" from *T. hawaiicum*, which for that author is conceding a good deal. The Samoan plant, in fact, differs in no way from the Hawaiian *T. Richardii*.

There is some confusion over this name. Paris gives *Thysanomitrium Powellii* C. M. in Engler's Bot. Jahrb. 1896, p. 320. In that place (vol. xxiii.), however, C. Mueller does not describe the species, but cites a previous reference as "*loc. cit.*" This runs down to the Musci Polynesiaci, where, however, the name does not appear. It seems probable that the name was never actually published.

We must now turn to the Indo-Malayan plants.

Trichostomum Blumii was published in 1844 by Doz. & Molk. In the original description thore is no comparison with *T. umbellatum* or the allied plants. Peristome is not described. The Indo-Malay plant, a common and widely distributed moss, is recorded from such a wide area (including Hawaii), and is so exactly identical with the Hawaiian *T. umbellatum* W. Arn., that one wonders that its identity has not been pointed out. This, however, is no doubt partly due to the fact that C. Mueller in the Synopsis has omitted all mention of *T. umbellatum*, which has been overlooked. Hampe, however (teste Bry. jav. i. 81), had arrived at the conclusion that the Javan plant was identical with the S. American *T. Richardii*—as I believe, quite correctly,—for the authors of that work cite "*Thysanomitrium Richardii major* et *minor* Hmpe. in Sched. Junghuhn" as a synonym of *Campylopus Blumii*.

The different forms of *T. Richardii*—e.g. those represented by *T. hawaiicum* C. M. and *T. Baldwinii* C. M.—are all included in the various forms of *T. Blumii*, in which, as in all its distribution, the blackish colour of the plant is frequent, though perhaps it preponderates less than in the Hawaiian and American forms.

Dicranum nigrescens Mitt., moreover, is precisely the some thing. Here, too, it seems strange that Mitten, who compares it with *T. exasperatum*, should make no comparison with *T. Blumii*, in spite of the fact that Wilson had actually referred some of Hooker's specimens to that species (as *D. Dozyanum*).

I give below an outline of the revised synonymy, without attempting to give the various combinations under which most of the trivial names have appeared. In all probability a considerable number of additions will have to be made to this list. Thus Brotherus gives eight S. American and West Indian species as "sehr nahe verwandt" with *T. Richardii*.

It is not out of the question that *T. exasperatum* (Brid.) may ultimately prove to be conspecific with *T. Richardii*, although the problem runs on quite different lines. The broadly-pointed, often cucullate, muticous leaves seem at first sight to place it in quite a different category from *T. Richardii*; and there are other minor characters. Several considerations, however, tend to minimize the value of that character. Thus, *Campylopus bicolor* (Hornsch.), an Australasian moss, has the same form of leaf-apex as *T. exasperatum*. But I have in recent years received from the Rev. W. W. Watts Australian specimens of "*Campylopus Davalianus* Watts," which I find to be the same thing as *C. ericeticola* C. M.; and these are precisely the same thing as *C. bicolor*, only that they have a short hair-point on some of the leaves. *C. atrovirens* De Not., moreover, has the very similar marked var. *muticus* Braithw. Further, certain plants, such as *C. præmorsus* (C. M.) and *C. Thwaitesii* (Mitt.) (*cf.* Fleischer, M. von Buitenz. i. 116) are admittedly intermediate between *T. exasperatum* and *T. Blumii*. And, finally, the very similar geographical distribution of *T. exasperatum* and *T. Blumii* lends support to the view, especially if, as seems probable, *Dicranum surinamense* C. M. is the same thing as *T. exasperatum*.

As to uniting the two, however, there might well be difference of opinion, whereas the reductions I have proposed above can, I think, be established without controversy; and in view of the fact already mentioned that there are possibly some minor differences in *T. exasperatum*, I do not propose its reduction here.

THYSANOMITRIUM RICHARDII Schwaegr. Suppl. ii. pt. i. p. 61, t. 118 (1823).

Campylopus Richardii Brid. Bry. univ. i. 474 (1826).

Pilopogon Richardii Broth. in Engl. & Prantl, Pflanzenfam. Musci, i. 336.

Campylopus nigrescens Duby in Mém. Soc. Phys. . . . . Genève, xix. 292 (1868).

Thysanomitrium umbellatum W. Arn. Disp. p. 34 (1826).

Pilopogon umbellatus Broth. *op. et loc. cit.*

Trichostomum Blumii Doz. & Molk. in Ann. sc. nat. 3rd ser. ii. 316 (1844).

Campylopus Blumii Bry. jav. i. 81.

Dicranum Dozyanum C. M. Syn. i. 385 (1849).

Dicranum nigrescens Mitt. in Journ. Linn. Soc., Bot. iii., Suppl. p. 19 (1859).

Campylopus nigrescens Jaeg. Adumbr. i. 121.

Thysanomitrium Powellii C. M. in Engler's Bot. Jahrb. xxiii. 320.

Pilopogon Powellii Broth. *op. et loc. cit.*

Thysanomitrium hawaiicum C. M. in Flora. lxxxii. 440 (1896) (nec *Dicranum hawaiicum* in Bot. Zeit. 1862, p. 328; nec *Campylopus hawaiicus* Jaeg. Adumbr. i. 140).

Distr. Costa Rica; Mexico; Guadeloupe; Andes Quitenses et Peruv.; Chile; Hawaii; Samoa; Fiji; Japan; India; Ceylon; Malaya; Sunda Is.; Philippines; Tonkin; Tahiti.

DISTRIBUTION OF CYRTOPUS SETOSUS (Hedw.) Hook. f.

The Handbook of the N.Z. Flora, p. 461, gives as the distribution of this interesting monotypic genus, besides New Zealand, which may be looked upon as its headquarters, Tasmania, South America, Sandwich Is. I can find no evidence in literature or in Hooker's herbarium of its existence in S. America, and I think that must be expunged from the distribution. Rodway (*Tasmanian Bryophytes, Mosses*, p. 25) says of this "Reported from Tasmania, but no Tasmanian specimens in the collections. Very possibly an error." Undoubted specimens, in good fruit, however, are to be found in Hooker's herb. "V. D. Ld., Cunningham, 42"; and "Van D. Land, Gunn." There remains the Sandwich Is. record. I find no other record of it in literature. C. Mueller makes no reference to it in the *Bryologia Hawaiica*. But there is at Kew (under *Cyrtopus setosus*) a specimen in Herb. Hook. labelled in Hooker's hand "Neckera. Mouna Raab, Sandwich Is., Lindley," which is undoubtedly the true plant, c.fr.

The distribution of so well-marked and conspicuous a species, having its headquarters in New Zealand, and elsewhere known (except in Tasmania) only from the Sandwich Is., is certainly unusual, and the evidence for it should be well founded. The above label, it will be noted, at first sight seems rather suspicious. There is certainly no such mountain as Mouna Raab in the Sandwich Is., and Lindley was never there nor anywhere near. The specimen clearly raised a problem, which, however, with the assistance of Mr. Skan, I have been able, I think, to settle quite satisfactorily. The name of Lindley on the label does not necessarily imply that he was the collector; it may only mean that Hooker received the specimen from him. Now David Douglas visited Hawaii in Jan. 1834, and made the ascent of Mouna Kuāh, where, as described at some length in his Diary, he made many observations and collected plants. The mountain is now known as Mauna Kea, but it has gone through various forms of transcription, including Mowna Kaah and Mouna Keah. One of the plants collected by Douglas on Mouna Kuāh is referred to by him as "*Argyrophyton Douglasii*"=*Argyroxiphium sandwicense* Hook. Ic. Pl. t. 75. Now the locality given by Hooker for the plant represented on t. 75 is "Mowna Kaah"; and among the sheets of that plant at Kew is one in Hooker's herbarium written up by Hooker in precisely the same hand as the label of the *Cyrtopus*:—"Mouna Raah; coll. Macrae." The R is unmistakable; the final *h* is written so that with scarcely any alteration it might easily be taken for a *b*. In the label of the *Cyrtopus* Hooker has gone just a shade further and actually transcribed it as a *b*.

A further sheet of the *Argyroxiphium*, also from the same mountain, coll. Macrae "ad Montem Keah," came from the Horticultural Society's Collection. Now Lindley was in close touch with the Hort. Soc., and he was a friend of Douglas. It almost *saute aux yeux* that Hooker's label of the *Cyrtopus* indicates that he received the specimen from Lindley, Lindley in his turn having probably received it from the Hort. Soc., to which it came with other plants collected on Mauna Kea either by Macrae or Douglas. I do not know that Macrae collected mosses at all; but Douglas was a noted moss collector (cf. *Neckera Douglasii* Hook.); and in his Diary of his ascent of Mouna Kuāh he makes more than one reference to the mosses. I think it can scarcely be doubted that this specimen of *Cyrtopus setosus* was collected by Douglas on that occasion, and that the distribution of the species in the Sandwich Is. is thoroughly established.

The transitions of spelling which the place-name has undergone are perfectly obvious and natural when the handwriting is consulted, though less so when shown in the printed character; but the "phylogeny" of the name may be traced thus:—

Kaah

Kuāh Raah

Keah Raab

Kea

LINNEAN SPECIES IN OUR DAYS.

By Ernst Almquist, *Professor emeritus, Stockholm.*

Nature itself has grouped a large proportion of living organisms into units that are very easy to recognize. Their descendants remain constant both in appearance and character, the distinguishing characteristics of the different units being well-marked. Most of the Linnean species are such units.

Linné emphasizes that species are created by Nature and not by the scientists. Many of them were well known before his time—Ray described many; but, as far as I know, it was Linné who first pointed out the constancy of the "distinctions." He also proved this constancy; every year he sowed thousands of different forms from all countries—not one species lost its characters (Transmutatio frument. 1757, p. 6).

It is deplorable that Linné's experiments on species are not thoroughly known. Biology still suffers from it. Only those facts and theories are now remembered that his contemporaries, with the spirit of that time, were able to understand and digest. The following important facts are very often forgotten:—

1. Linné's species possess *constant characters* that do not change in different environments.

2. Some species Linné describes as *collective species.* De Vries points out that Linné did this intentionally, but his successors almost forgot it. Thus *Primula veris* contains three constant species, named trinominally.

3. Linné separated the varieties into two different groups, *varietates ex loco* and *varietates constantes*; the former go back to the common forms by culture, the latter do not (Metamorph. plantarum, 1755, p. 18). The constant varieties are innumerable: "dantur enim innumeræ varietates qua cultura non reducuntur, sed constantes persistunt" (Flora suec. 1755, p. 247). The life of man is too short for discerning the immense number: "finem ludentis polymorphæ naturæ, vix attingat botanicus" (Phil. bot. p. 249).

The constant varieties may be considered as independent species; but very small differences, *e.g.* apetaly or greater size of flower, Linné found not sufficient for creating new species (Metamorph plant. p. 18).

4. Some species are easy to recognize, but some forms are really difficult or impossible to distinguish. In certain genera Linné generally found the species well limited, but one group would contain an excess of similar forms; in some genera all forms were connected closely. In the *Species Plantarum* Linné reserved pronouncement on the species of *Rosa*, *Salix*, and the *Fungi*. He speaks of "*genera prolixiora*" or "*diffusiora*"—the American *Quercus*, *Aster*, *Passiflora*, *Cactus*, the African *Geranium*, *Mesembryanthemum* (Plantæ hybr. 1751, pp. 6, 29). He suspected that the varieties of *Tulipa*, *Brassica*, *Lactuca*, *Pyrus*, etc., originated by crosses (Fundamentum fructificat. 1762, p. 21).

5. Part of the last-named varieties, *e. g.* the cultivated kinds of *Brassica*, Linné compares with the strains of the dog. Like the

parents, the descendants produce continually varying forms; Linné does not acknowledge these as species, but supposes that they are hybrids. Thus beyond the varieties *ex loco* and the constant varieties, Linné observed still a third kind, the hybrids (Fund. fructif. p. 13).

Linné and Darwin.

Darwin studied the struggle for existence. The influence of environment is very great. Nature decides on the fate of all forms. A great many new forms are too weak for the struggle and disappear, but some are stronger than the parents and supplant them. Of course, the same law must prevail both for new constant varieties and for hybrid forms.

Linné spoke of "bellum omnium in omnes." He observed the immense number of seed and brood that the organisms produce; and found in this Nature's method of preserving living organisms in the former state. Darwin went much deeper and discovered an important biological law that I like to call "Darwin's law," by which I mean the different influences of environment on different forms.

Unfortunately Darwin did not know of Linné's experiments with the constant varieties. He regards the varieties as beginning new species, influenced by the struggle for existence. We do not now assume that natural selection is able to create *new genes*. But when occasionally new genes or new combinations of hybrids appear, Nature decides on them, and in this way upon the development of flora and fauna in every country.

If in cultivation new varieties appear spontaneously, they will often be in more favourable conditions than in a wild state. Protection, *e. g.* of *Œnothera Lamarckiana*, is able to save many forms that are not fitted for the struggle for existence.

Linné and Mendel.

Linné crossed two species of *Tragopogon* and raised a fertile hybrid. In his garden sometimes new hybrids appeared spontaneously. From his studies of Peloria (1744) his mind was constantly led to hybrids as the origin of new species. He formed the theory that all new species originate from crosses, and that in this way the whole development of plants originates from only one species in any natural family. He often appeals to scientists to investigate the question earnestly:—

"Per hanc hypothesin quisque cordatus botanicus admonetur, ut ad ortum specierum posthac sollicite attendat et experimenta instituat, utrum casu et arte produci queant; si hoc obtinetur, clavem habebimus huc usque desideratam fundamenti fructificationis a priori, a posteriori hactenus tantum inductam et exemplis confirmatam." "Si interim hæc sententia vel hypothesis recipiatur, clavis adest fundamenti fructificationis a priori, quæ omnes aperit januas claussas in systemate vegetabili, et sine qua introitum a priori frustra quæsiveris" (Fundam. fructif. 1762, p. 22).

A century passed away, and the expected "cordatus botanicus appeared." By his analysis of species Mendel began a new era in Biology.

Mendelism.

Fortunately we possess an authoritative work on Mendelism. W. Johannsen, in his textbook (*Elemente der exsakten Erblichkeitslehre*, ed. 2, 1913), presents the results with good criticism and exact methods. From this I take the following points:—

The Linnean species are really not units but embrace a various number of "small species." These last must be the units in a systematic natural history (p. 7).

Vilmorin and Mendel's rule to cultivate each individuum apart is necessary for analyzing the forms. This method gave excellent results for the sugar industry, but has not been attended to by scientists. The pure culture is as important in botany for studying heredity as in bacteriology (p. 196). Botanists have too readily described new species without cultivation.

A pure line includes all individuals that descend from one homozygous, self-impregnating individuum. The pure strains are quite homozygous and seem to exist only among pure lines. The constancy of the pure line persists until the homozygous nature is disturbed by crosses or mutations (pp. 154, 627).

Investigations concerning variability have shown three kinds of variation: (1) pure phænovariation; (2) geno-phænovariation; (3) pure genovariation of the hybrids (pp. 7, 661).

The idea of the character of species is dissolved. The characters are not hereditary; but the elements, the genes, are. Inheritance is a genotypic phenomenon, its manifestations are *eo ipso* phænotypic (pp. 628, 665). The genotypic elements, the genes, are fixed and immutable. It is unthinkable that a gene is a free living element. The gene alone cannot produce anything. The whole genotypus works all. Perhaps a moderate number of different genes are sufficient for producing many biotypes (pp. 634, 667).

So far, analysis by Mendel's methods is still in its initial stage. Only the superficial features, not the deeper organisation of the plants, have been the object of study. We do not know whether we shall ever be able to analyze species and genera (p. 668).

Fate of the Constant Forms.

How will the Linnean species prosper in the time to come? I think very well, as far as they are constant and limited by Nature. Science interests herself in all Nature's works. The units or groups, the natural families and genera, as well as collective species and constant varieties, will in all periods be subjected to researches, especially in regard to their inter-relationship. Linné assumes that in each natural group all the species and varieties are related, and are descendants from only one species in the group.

Generally all collective species, and also the well-defined constant varieties that in culture still keep their character, can be called Linnean species. Neither does there exist any difficulty in acknowledging as species the apogamic constant forms and the asexual constant strains.

The self-impregnating wild plants are homozygous. If they are occasionally impregnated by a foreign species, the former state will be restored by degrees. I have cultivated thousands of individuals and several hundred different forms of *Capsella bursa-pastoris*, and I found almost all constant in several generations.

Allogamous Wild Plants.

Here I see a great danger for many Linnean species. The Mendelists seem generally to assume that they must be heterozygous and varying continually. If so, they do not correspond to any Linnean species, and thus a large proportion of all species must be rejected. Therefore it is necessary to examine earnestly the wild species that are impregnated by insects or by wind. As far as I know, the conclusion that these species must be heterozygous is verified only in a few wild groups, e. g. *Salix*.

If only a few allogamous species in a country be proved homozygous, the conclusion that all are heterozygous should be withdrawn. Clearly the existence of constant varieties within a species does not prove a continuous formation of hybrids, nor does the appearance of hybrid forms from new crosses. The hybrids must be produced by the nature of the plant itself. One form may be homozygous in one country, and the corresponding form in another country heterozygous, if isolation and environment are different.

Many heterozygous plants are easily mistaken as constant, especially if the obvious hybrids are few. Nevertheless, De Vries discovered varieties of *Œnothera Lamarckiana* even in natural growth. He looked earnestly also for other species that were able to produce "single variations." He cultivated numbers of such species, also allogamous forms. But beyond *Œ. Lamarckiana* he found all in the "immutable period," and assumed that at Amsterdam most of the wild species were immutable (Mutat. Theorie, i. p. 357). De Vries found them in immutable period—that is to say, constant. It will be necessary to remind ourselves that wild plants have lived during long periods; *Œ. Lamarckiana*, on the contrary, is probably a recent product.

Linné sowed very great numbers of plants, and always sought for varieties. Some hybrids appeared, but all the species remained constant. I think, therefore, that Linné is right, as a rule, in assuming that allogamous wild plants are also able to keep their character. As I said above, he was reserved concerning some groups, and asked for further research.

The common floras offer a kind of verification of the constancy of many wild plants. Really there seems to exist a great number of well-defined allogamous species.

My own experience is not great, but I have observed most of our Linnean species in their natural environment, and I also sowed allogamous plants, such as *Digitalis*, *Verbascum*, *Geum*, *Papaver*, *Œnothera*, etc. Never was I able to find varieties of a Linnean species that I could presume to be hybrids produced by the species itself.

Can an Allogamous Plant be Homozygous?

Species originate from crosses: so thought Linné, and several Mendelists seem to cherish the same idea. Nevertheless, many of the hybrids have become homozygous. Beyond doubt some of the allogamous groups are able to develop in the same direction as the self-impregnating forms really do.

Many new forms are unfit for free competition. That concerns not only sterility and other infirmity. My experience with the strains of *Capsella* was very significant. Imported species are seldom able to compete with natives. I will cite an example. At Vestervik, only 200 km. distant from the capital, most of the strains from Stockholm disappear in a short time. I know exceptions from the rule, especially strains from Mediterranean countries. Thus Nature makes a great difference even between very similar competing units. This rule prevails among many groups of plants.

By crosses the weak hybrids will, of course, disappear. But also many vigorous new combinations will be excluded by the force of Darwin's law, not being able to keep the field in the environment. If a strain have collected by degrees the best qualities for the struggle for life, it will easily surpass other combinations and develop, I think, in direction to be homozygous. If homozygous, it has the greatest chance to resist in the struggle, because it tends to keep its good qualities. I suppose that Nature in this way creates new constant units.

Nature and its Analysis.

I do not know whether the successors of Mendel have met with greater difficulties in their studies than Linné and his successors have done. It would need immense work to discover all the natural units and groups of the organic world. It requires acute observation to discover the difference between variation *ex loco* and constant varieties, to prove the constancy, to discern the collective species, and to discover and prove the existence of plant hybrids. This work has proceeded but two centuries, and is not nearly complete in our day.

Science begins by stating and arranging the facts; it continues with analysis. Linné discovered and proved the immutable characters of the constant varieties and species. Mendel and his successors dissolved the characters and found fixed and immutable genes. Linné speaks of three different categories of existing varieties; Johannsen divides the variability into three kinds of variation. These three categories of Linné and Johannsen are, of course, not identical: the second category is widely different, and according to Linné contains only constant varieties. I think we need in science categories both of existing organisms and of their variability, generally both the Nature fact and its analysis. In other branches of the science the same rule prevails—no one can construct meteorological facts from physical laws, nor the laws of epidemics from a bacteriological laboratory.

HENRIETTA CERF.

(1810–1877)

Those who are in the habit of turning over the pages of old periodicals for purposes of reference must be aware of the difficulty of identifying the authors of communications signed only with initials or entirely anonymous. At the time of publication, identification, at any rate in the former case, is not difficult; but as time goes on, and folks go off, such identification becomes more and more troublesome, if not actually impossible. In this Journal the use of initials has almost been confined to reviews, and of these it is proposed to publish when occasion offers the list of identifications already prepared.

The matter was lately brought prominently to my notice on referring to the New Series of the *Phytologist* (1855–61)—perhaps the worst indexed of many badly indexed journals, carrying on, as it does, the tradition which makes the contents of the Hooker Journals practically inaccessible—in which to many articles and notes only initials are appended. The notes are often of so trivial a nature that it is hardly necessary to trouble about them; but the interest of some of the former is sufficient to provoke inquiry. Of this I have recently had an example in the case of "H. C.," who contributed to vols. iii. and iv. of that periodical notes on Belgian plants, and to vol. v. (pp. 33–45, 70–72) a "List of Plants collected about Dover, Walmer, Folkestone, and Sandgate," to which the *Flora of Kent* makes no special reference. The writer, who referred to Crépin as a correspondent, was evidently a competent botanist, but I failed to identify the initials with those of any British botanist of the period: it was only when I noticed, on the page last mentioned, a reference by the editor (Alexander Irvine) to "the fair authoress," that a clue was supplied. This Dr. Daydon Jackson successfully followed up, finding in this Journal for 1877 (p. 380) a brief reference to her death, and a longer notice by Crépin in Bull. Soc. Roy. de Belgique of the same year (xvi. 54), part of which it seems worth while to reproduce:

"Mademoiselle Henrietta Cerf, née à la Jamaïque le 10 février 1810 et morte à Bruxelles le 22 octobre 1877, était une dame d'un esprit très-cultivé et dont les connaissances en botanique étaient fort étendues. Elle ne borna pas ses recherches à la botanique rurale; mais elle suivit régulièrement les progrès faits par les questions les plus élevées de la science. Sa bibliothèque, enrichie des traités les plus savants publiés en Angleterre, en Allemagne, en France, etc., témoigne d'un goût très-prononcé pour la botanique. Mademoiselle Cerf a étudié avec le plus grand soin la flore de nos diverses provinces. Pendant un séjour de plusieurs années qu'elle fit, avec sa famille, au château de Bloquement, près de Dinant, elle eut l'occasion d'explorer l'une des parties les plus riches de la vallée de la Meuse." The plants then noted as the result of her observations are given in her papers in Phyt. iii. 161–4, iv. 33–4; on the last page she speaks of "our village of Houx," in which presumably the château was situated. I was inclined to attribute to Mdlle Cerf, from internal evidence, a paper on "Belgian Botany" in Phyt. vi. 305–390, 421–477, signed "H. H. C.," but the fact that this is not included in the list of her papers given by Crépin (*l. c.*) made me look further; the references on pp. 314, 320, identify "H. H. C." with H. H. Cripps, of High Street, Tunbridge Wells—is anything known about him? Crépin, by the way, includes in his list a paper on "East Anglian Botany" (Phyt. vi. 327–335), with which assuredly Mdlle Cerf was in no way concerned: although headed "From a Correspondent: to the Editor" the style suggests that the writer was Irvine himself.

The first contribution of "H. C." to the *Phytologist* (ii. 616; Nov. 1858) is not mentioned by Crépin: it is "On the Fertilization of Imperfect Flowers," and is followed by a translation of D. Müller's paper in Bot. Zeit. for 1857 (Oct. 23) in relation to *Viola*. Other translations by Mdlle Cerf (not signed, but attributed to her by Crépin) are those from Treviranus in Bot. Zeit. of the same year, on the hybernacula of *Hydrocharis* and *Potamogeton crispus* (Phyt. v. 190, vi. 68); although neither is signed, the former is attributed to "H. C." in the index to the volume. Mdlle Cerf, as the index to "communications received," prefixed to each volume, shows, frequently corresponded with Irvine; in case anyone should be sufficiently interested in her to look up the references, it may save him the trouble if I say that, with the exception of those already given, they are, with two exceptions, mere acknowledgements of the receipt of communications from "H. C." The exceptions are in vi. 283 (Sept. 1862), where "our amiable friend 'H. C.,' now residing and botanizing in Ross-shire, is informed that a series of Scotch Roses will be very acceptable"; and on p. 447, where she has a short list (without notes) of "Cromarty Plants." Crépin (*l. c.*) writes: "Avec les récoltes qu'elle a faites dans notre pays, en Écosse, en Angleterre, aux bords du Rhin, en Suisse, etc., elle avait composé un herbier fort intéressant et dont les plantes sont admirablement préparées": she was a foundation member of the Société Royale de Botanique de Belgique.

A perusal of Mdlle Cerf's papers, especially those on the Belgian flora (Phyt. iii. 161–4; 33–4, 70–72), to which she added *Artemisia camphorata*, confirm Crépin's estimate of her capacity as a botanist, and show that she was well acquainted with botanical literature: they also, in some indefinable way, convey the idea of a charming personality, and suggest that Crépin's tribute—"que cette dame sera profondément regrettée de tous ceux qui l'ont connue"—is no mere conventional expression.

James Britten.

MERISTIC VARIATION IN PAPAVER DUBIUM.

By T. A. Sprague, B.Sc., F.L.S.

According to Fedde, the number of stigma-rays is 4–10 in *Papaver dubium* and 5–18 in *P. Rhœas* (Engl. Pflanzenr. Papaverac. 294, 314; 1909). Owing to their large meristic range, these species are exceptionally well adapted for the study of meristic variation. The results of an examination of 56 plants of *P. dubium*, recently (July) found growing on weeds near the edge of a relatively open shrubbery, suggest that the number of carpels is dependent to some extent on the amount of food available when their primordia arise. Out of 22 plants of one gathering, 12 vigorous ones, bearing altogether 58 flowers, had an average of 5·6 stigma-rays; whereas 10 weak or starved plants, bearing 30 flowers in all, had an average of only 4·7 rays. Further, the capsules and expanded flowers on a plant usually had a higher average of rays than the flower-buds on the same plant. The carpels of *Nigella damascena* afford a parallel instance: "normally, that is to say in well-nourished flowers, they are five; in later flowers they are partly four and partly three" (Goebel, *Organography*, ii. 538; 1905).

The vigour of a plant may find expression in its size and weight, extent of branching and consequent number of flowers, and in the number of parts of the flower. A certain correspondence was to be expected between the number of flowers on a plant and the average number of stigma-rays, since these two numbers are presumably correlated separately with the degree of vigour of the plant. How fully this correspondence is realized is shown in the subjoined table, which gives figures for 28 plants in which none of the capsules or flowers had been destroyed. The other 28 plants had from one to four capsules of flowers missing in each case, and are dealt with separately. All unexpanded buds which were sufficiently advanced for analysis were taken into account:—

Plants examined	6	8	5	6	3	Total 28 plants.
Flowers examined.........	12	24	20	30	21	Total 107 flowers.
Flowers per plant.........	2	3	4	5	6–8	Range 2–8 flowers.
Average of stigma-rays...	4·5	5·0	5·35	5·53	6·0	General average 5·35.

Comparison of the third and fourth lines of the table shows that the average number of stigma-rays increases along with the number of flowers per plant. The figures for the 28 plants in which one or more capsules or flowers were missing were relatively irregular, as was to be expected. Nevertheless, 18 plants with 2–5 flowers each had an average of 4·9 stigma-rays per flower; whereas the other 10 plants with 6–9 flowers each had an average of 5·5 rays. The corresponding averages for the undamaged plants were 5·2 for those with 2–5 flowers each, and 6·0 for those with 6–8 flowers; the averages for the damaged plants being lower, owing to the fact that the flowers destroyed were mainly the older ones, which, as already pointed out, have a higher average of rays than the younger flowers on the same plant.

Two further illustrations may be given of the correlation of the average number of stigma-rays with the amount of food available. A set of 9 *very starved* plants gathered subsequently had an average of only 4·1 rays, two of the flowers having only 3 rays each, the lowest number hitherto recorded. The 3-rayed flowers had 6 stamens each, and one of them had also a single theca on the margin of one of the petals. Reduction of the stamens in *Papaver* to 6 has been observed by Goebel in starved plants (Einleit. Experim. Morphol. Pfl. 131; 1908). On the other hand, 107 capsules and flowers on a group of plants *cultivated* in the Herbaceous Ground at Kew gave an average of 7·2 stigma-rays, eight flowers having 9 rays each, and only five having as few as 5 rays. The following table shows the relative frequency of the various numbers of stigma-rays in the 328 flowers examined; separate figures being given for the weeds (221 flowers) and the cultivated plants (107 flowers):—

Number of stigma-rays...	3	4	5	6	7	8	9	3–9
Percentages of flowers (weeds).	0·9	21·7	42·5	29·9	4·5	0·5	...	100
Percentages of flowers (cultivated plants).	...	...	4·7	15·0	40·2	32·7	7·5	100

In the weeds the commonest number of stigma-rays was 5, and the average 5·1; in the cultivated plants the commonest number was 7, and the average 7·2. Woodruffe-Peacock found that the stigma-rays varied from 4 to 7, with an average of 6, in 100 flowers of *P. dubium* taken at random (Journ. Bot. 1913, 48).

In 45 capsules examined by C. E. Salmon the number of rays varied from 5 to 9, with an average of 7·4 (New Phyt. xviii. 114; 1919). Figures derived from capsules only will on the whole be higher than those from flowers, inasmuch as a certain proportion of the younger flowers will be excluded owing to their never maturing.

The possibility of the existence in *P. dubium* of several races, each with a different average of stigma-rays under the same conditions, should not be overlooked. This is a matter for experimental cultivation.

SHORT NOTES.

A Correction. [The following correction relating to Dr. Barnhart's paper on "Plant Nomenclature," published in our last issue, reached us too late to prevent the publication of the passage.—Ed. Journ. Bot.] If it is not too late, I would suggest the omission of everything under Mr. Sprague's fifth point [p. 257], except the first sentence: that is, omit from the words "Hill's work of 1756" to the end of the paragraph. My remarks about Hill's double generic names were only incidental, having no bearing upon the point there discussed. I have since discovered that they are provided for under the Vienna

Rules by the third paragraph of article 54. This is to my mind an extremely foolish rule, inasmuch as it rejects *Bursa-pastoris* while it validates *Sebastiano-Schaueria*; but it is no longer true, you see, that I know of no modern rule which denies the validity of Hill's names.—JOHN HENDLEY BARNHART.

OPHIOGLOSSUM VULGATUM L. While walking from West Meon to Hambledon, Hampshire, in June last, I met with a considerable quantity of *Ophioglossum vulgatum* L. on the summit of the chalk downs near the ancient camp on Old Winchester Hill. The fern was growing with *Viola hirta*, *Cnicus acaulis*, *Thymus*, and other plants characteristic of calcareous pastures. I think this is a very unusual habitat for *Ophioglossum*, which generally affects moist alluvial meadow-land; but it is not unique, for the *Flora of Hampshire* gives another station on the chalk downs near Winchester.—H. W. RIGSLEY.

REVIEWS.

The Naturalisation of Animals and Plants in New Zealand. By the Hon. GEO. M. THOMSON, M.L.C., F.L.S., F.N.Z.Inst. Royal 8vo, pp. x + 608. Price 42*s.* net. Cambridge University Press, 1922.

IN his preface to this handsome volume, the author points out that New Zealand, owing to its isolation by over a thousand miles from any other extensive land-area, is the only country in which the attempt to trace the first introduction of every species could succeed. "We possess," he says, "a fairly accurate record of what was here when Europeans first visited these shores, and we have been able to follow the later introductions of new species with a certain measure of success."

Mr. Thomson had originally intended to confine his attention to mammals, birds, and fishes; but it seemed inadvisable to stop there, and therefore, "having some bowing acquaintance with the floras of Britain, North America, and Australia, in addition to that of New Zealand, in due course [he] added the introduced plants"—a decision for which botanists, especially those who are concerned with questions relating to distribution, will be grateful: a note on p. 503, from which we learn that he was a pupil of J. H. Balfour, his previous publications, and the present volume suggest that the author underestimates his botanical qualifications. It is, of course, with the botanical portion of the book, which occupies about a third of its bulk, that this notice is alone concerned.

The first collection of New Zealand plants brought to Europe was that made by Banks and Solander on Cook's first voyage in 1769; there is no record that on this occasion either animals or plants were introduced, but on the second visit in 1773 "a quantity of European seeds of the best kinds" were sown, though these apparently failed to establish themselves. According to tradition, however, *Lagenaria vulgaris* (which was observed by Banks in 1773) was introduced between 1150 and 1300 A.D.; *Ipomœa Batatas* about 1300; *Colocasia antiquorum* and *Cordyline terminalis* about 1400, or, according to another legend, about five hundred years ago, at which date *Corynocarpus lævigata* was also introduced. Mr. Thomson gives a short account of the various visits to the islands subsequently to Cook, whereby many of the European weeds of cultivation were brought in: the chief period of introduction seems to have been between 1800 and 1820.

Mr. Thomson has adopted Mr. Cheeseman's *Manual of the New Zealand Flora* (1906) as his standard of reference, but has also consulted Dr. Cockayne's various papers and those of other authors. The first list of introductions is that in J. D. Hooker's *Handbook* (1867), which enumerates 165 species. In the volume under notice, over 600 species are entered as introductions, though not all have established themselves. Of these, 370 are British, exclusive of those which figure in our own floras as introduced species; the representation of British species is sometimes very complete, thus all the British Buttercups and most of the British *Caryophyllaceæ* are included. To most of the names interesting notes are appended, relating to local distribution, methods of distribution, insect visitors, and the like, with dates of first record of appearance when that can be ascertained. From these notes, in so far as they relate to British species, we select the following points.

There is an interesting account of the rapid establishment and development of the Watercress, which was probably introduced soon after the settlement of Canterbury in 1850; in that district plants attained 14 feet in length and were stout in proportion, but the size is now quite normal. Mr. Thompson tells us that in narrow streams with a good flow of water, "*Elodea canadensis* tends to displace it; and I have noticed in some parts of the Avon at Christchurch, and in tributary streams, that a species of *Nitella* can strangle both of them. But watching shallow ponds near Dunedin, I have noticed that, unless kept severely in check, the water-cress can put *Elodea*, *Aponogeton* and species of *Nymphæa* right out of competition in a year or two."

The Cabbage, Turnip, and probably the Swede were introduced by Cook; the two former speedily established themselves—the Cabbage in 1839 "covered the sides of the hills with a yellow carpet." A remarkable form of wild turnip, which Mr. Thomson suggests may be a hybrid between the Swede and the Turnip, grows five and six feet high, "with heavy branching stems and leaves from two to three feet long: it never forms any bulb, but has a thick stem as much as three inches or more diameter at the base." The relation between Red Clover and humble-bees is well known. Wallace's statement that White Clover "even destroyed *Phormium tenax*" was "based on defective information" and is indeed inaccurate. The Peach was introduced in 1814: "the Maoris soon scattered the seed far and wide, so that it early established itself as a wild species, for they shifted their cultivation frequently."

The account of the Sweet-briar is interesting. "The early settlers everywhere planted this favourite shrub as a hedge plant, and everywhere, at least in the North Island, it got away from cultivation and quickly established itself as a plant most difficult to eradicate. As fruit-eating birds increased it increased more rapidly, but there is little doubt that it was largely spread by horses, which will eat the hips but are unable to digest the hard-walled achenes . . . . It was early recognised as a great pest, and is now most abundant in all parts of the country . . . . In the Noxious Weeds Act of 1900, this was one of the three plants which were declared to be such without any qualification, the others being the Blackberry and the Canadian (or Californian) Thistle (*Cnicus arvensis*). By an amendment of the Weeds Act in 1908, the Hawthorn was also stringently prohibited on account of its infection with the bacterial disease known as Fire-blight (*Bacillus amylivorus*). The Department has come to the conclusion that the disease cannot be coped with so long as the Hawthorn is allowed to remain in evidence; the planting of Hawthorn is therefore prohibited, and every person commits an offence who propagates it in any manner, or who sells any seeds, plants, or cuttings of it."

The Butterbur "noted as a garden escape by the author in 1882" was, we suspect, not *Petasites vulgaris*, as stated, but *P.* (*Nardosmia*) *fragrans*; in like manner for "*Mimulus moschatus* Linn." (p. 456) we should doubtless read *M. Langsdorffii* Don. "An auctioneer about that date advertised a plant sale, and as a special attraction notified a number of clumps of 'Chatham Island Lily.' Mr. Thomson found that they were bunches of *Petasites*, and the auctioneer withdrew them from sale." A few years since, under the name "Winter Heliotrope," an advertisement appeared in an English paper offering a dozen plants of *Nardosmia* for four shillings! It is one of the most conspicuous plants of railway-banks and roadsides in the environs of Dublin.

All the Thistles are specified by law as "noxious weeds," *Cnicus arvensis*, as was mentioned above, being the worst. Of *C. lanceolatus* Mr. Thomson says: "I passed through hundreds of acres of newly-ploughed land in the Omaru district in 1873, when the Thistles covered the ground to a height of 6 ft., and it was only possible to get through where cart-tracks had been made and the growth was not more than 3 ft. high . . . . In one patch of ground it commenced with three Thistles, and in the short space of three years ten acres have been densely covered."

Ragwort, which does not seem to have been recorded before 1874, was placed in the Second Schedule of 1900 and raised to the bad eminence of the First in 1908. It is held largely responsible for the cirrhosis of the liver which has caused considerable mortality among horses that have fed upon it; "bee-keepers complain that their summer-honey is dark-coloured, and so strongly flavoured with the nectar of the Ragwort, which is developed in great profusion, that it is almost unsaleable." Foxgloves, "purple and white, growing in profusion on the Wangamoa hills, north-east of Nelson, present a glorious blaze of colour: this noxious pest has got completely out of hand and threatens to ruin the country side. It used to be very common in places near Dunedin, but its comparative disappearance is explained by this peculiarity, that it tends to die out of pasture land when it is not pulled out of the ground. Whenever it is pulled out of the ground and the surface-soil is thus disturbed, fresh seedlings spring up. I am informed that in the Wairarapa district some farmers have expended as much as £150 a year in their endeavours to clear the land of foxglove by pulling it out. Others who have elected to leave it have been fined fifty shillings for a breach of the Noxious Weeds Act, and their land has become nearly clean by the plants dying out of the pastures."

Mr. Thomson seems doubtful as to the accuracy of the "legend" of the introduction of the Dock (*Rumex obtusifolius*), which has been a "noxious weed" from an early period. Darwin, however, mentioned it in 1835, and Colenso in 1837 visited at Poverty Bay "some young plants the natives had raised from seed, fenced in and tabooed, believing them to be tobacco," under which name they had purchased the seed. It may be noted that Sheep's Sorrel (*R. Acetosella*) really deserves its name, as, although an abundant weed, it "is mostly kept down by sheep wherever they graze freely."

There is an interesting chapter on the "Alteration in the Flora since the European Occupation": no instance can be recorded of any species which has been exterminated as a consequence, but local extermination has taken place, and of this several instances are given: *Lepidium oleraceum* Forst., for example, originally discovered by Banks and Solander during Cook's first voyage, and then so abundant that "boat-loads of it were collected and used as an antiscorbutic," is now extinct in several of the localities visited and rare in others; "its disappearance is due to cattle and sheep, which greedily eat it down in any locality they can reach." This chapter contains a valuable section on the inter-relation of the native and introduced flora; Mr. Thomson finds "little evidence in support of the opinion that a considerable proportion of the native flora will become extinct," and is "inclined to believe that the struggle between the naturalised and the native floras will result in a limitation of the range of the native species rather than in their actual extermination." The chapter on Legislation contains the schedules of "noxious weeds," to which reference has already been made.

The volume, which is in every respect a valuable and interesting piece of work, concludes with a full bibliography, an index of authorities, and one of animals and plants, each of them admirably done.

Die Vegetation der Erde. Die Pflanzenwelt Afrikas. Von A. Engler. III. Band, 1 Heft, mit 401 Textfiguren, pp. 869, 1915; 2 Heft, pp. 878, mit 338 Textfiguren, 1921. 33 & 340 Marks. Engelmann, Leipzig.

These important volumes are devoted to a systematic treatment of the Flora of Africa, especially of the tropical region, and form a valuable contribution to our knowledge of the subject. That great advances have been made in recent years may easily be seen by taking almost any genus, especially of Polypetalæ, and noting the increase in the number of species now known. Thus of the genus *Bersama*, in vol. i. (1868) of the *Flora of Tropical Africa*, only three species are given; in 1907, when the present writer revised the genus in this Journal, 21 species were known to him; but Dr. v. Brehmer in the work under review gives a clavis of 43 species. The earlier volume (1915) is as to some genera already out of date, numerous important papers, such as De Wildeman's revision of *Acioa* and *Alchemilla* in Bull. Jard. Bot. Bruxelles, having been issued since its appearance.

The work is edited by Dr. Engler, who acknowledges valuable help from numerous specialists, amongst whom we note Loesener (*Celastraceæ*, *Hippocrateaceæ*), Radlkofer and Gilg (*Sapindaceæ*), Ulbrich (*Malvaceæ*, *Bombaceæ*), Harms (*Leguminosæ*, *Araliaceæ*), Diels and Gilg (*Combretaceæ*), Brehmer (*Anacardiaceæ*, *Rhizophoreæ*, *Myrtaceæ*), Schellenberg (*Connaraceæ*); many of the Orders are provided with useful keys to the genera. The first volume begins with *Casuarinaceæ* and ends with the *Dichapetalaceæ*; the second starts with *Euphorbiaceæ* and ends with *Cornaceæ*; both have numerous figures in the text.

We regret that in the second volume certain papers published in this Journal seem to have escaped notice. As an illustration let us take the *Icacineæ*. Mr. Spencer Moore, in this Journal for September 1920, described a new genus of *Icacineæ*—*Monocephalium*—which includes two species, *M. Batesii* and *M. Zenkeri*, both from the Cameroons; he also has two new species of *Stachyanthus*, and points out that the flowers are hexamerous, not pentamerous, as given here in the clavis to the Order. The genus *Phanerocalyx* (*Olacaceæ*), described by Mr. Moore in this Journal for 1921 (p. 242), is also omitted: if these did not appear in time to be included in the text, they should at least have been indicated in an appendix. More attention also should have been paid to the *Catalogue* of the plants collected by Mr. and Mrs. P. Talbot in South Nigeria, published in 1913. The new genera *Alphonseopsis* and *Dennettia* (*Anonaceæ*) have been duly noted and incorporated, but in *Myrtaceæ* the rather striking genus *Crateranthus* is omitted; the account of the genus *Napoleona* in view of Mrs. Talbot's discoveries leaves much to be desired; *N. Talbotii* Bak. fil. and *N. Egertonii* Bak. fil., neither of which finds place, seem quite distinct from any previously-known species. In *Cola* (*Sterculiaceæ*) we find no mention of a striking species (*C. gigas* Bak. fil.) collected by Mr. and Mrs. Talbot; the flowers are crimson-purple, 7–8 cm. long, arising two or three together from the stem, and it is evidently one of the most showy species of the genus.

The account of the *Leguminosæ* is very complete, and it is only in genera such as *Craibia* and *Baphia*, which have recently been monographed, that revision will be necessary; in the latter genus Mr. Lester-Garland's careful paper in Journ. Linn. Soc. xlv. (1921) should be consulted. In *Meliaceæ* the recent paper by F. C. Vermosen in Rev. Zool. Africaine (x. fasc. 1, 1922) will also have to be consulted, especially on *Trichilia*. *Hibiscus*, revised by Dr. Hochreutiner in 1900 in Ann. Conserv. Jard. Bot. de Genève, vol. iv., has here been again revised by Ulbrich, but it will be necessary to consult a further paper by him in Notizblatt Bot. Gart. Berlin-Dahlem, no. 72, for a complete account of the genus.

Instances of omissions similar to those mentioned could be multiplied, but, as has already been stated, the volumes form a most important contribution to our knowledge of African plants, and we await the continuation of the work with much interest.

E. G. B.

Age and Area, a Study in Geographical Distribution and Origin of Species. By J. C. Willis, Sc.D., F.R.S., with chapters by Hugo de Vries, H. B. Guppy, F.R.S., Mrs. E. M. Reid, and James Small, D.Sc. 8vo, pp. x, 259. Cambridge University Press, 1922. Price 14*s*.

Dr. Willis has brought together in this volume the results of work extending over some years, with which botanists have become familiar from papers published chiefly in the *Annals of Botany*, and from various discussions at the Linnean Society. At the recent meeting of the British Association botanists and zoologists joined in a discussion of the present position of Darwinism, which was opened by Dr. Willis, who re-stated the position taken up in his book. Dr. Willis himself presents an interesting case of evolution. Trained at Cambridge in an atmosphere of Darwinism, he began his work as a naturalist, studying the adventive flora of the pollard Willows near Cambridge. His removal to Ceylon gave opportunity for an exhaustive study in field and laboratory of an apparently highly adapted family, the *Podostemaceæ*, but one which, Dr. Willis concluded, gave strong evidence of absence of particular adaptation. Many genera and species showing striking differences were found living under remarkably uniform conditions. A serious accident which hindered laboratory work led Dr. Willis to the study of the distribution of the components of the Ceylon flora. He found that the endemic species occupied on the average the smallest areas in the island, those found also in Peninsular India, but not beyond, areas rather larger, and those that ranged beyond the peninsula the largest areas of all. The theories that endemic species were either local adaptations, or relics, were considered inadequate to explain the fact that the areas occupied both by endemics and by widely distributed species, were arranged in a graduated series, the first from many small to few large, the second in the opposite direction. Some mechanical explanation was necessary, and the only simple and reasonable one seemed to be that the area occupied increased with the age of the species; that is to say, if sufficiently large numbers (not less than ten) of allied species are considered, the area they occupy in any given country depends on their age. Dr. Willis does not deny that there are many factors operating in the distribution of any given species, but the resultant effect is determined by the age of the species. The same results were obtained with other floras. Further, the area occupied bears a similar relationship to the size of genera; the large genera are widely distributed, the smaller less so. The phenomena of evolution and of geographical distribution may be represented by hollow curves which are always of the same type and are closely parallel in both plants and animals. In a word, Dr. Willis has become a statistician. Evolution and distribution follow strict mathematical laws.

As regards the origin of species, Dr. Willis accepts the mutation theory, and Dr. de Vries regards these statistical studies, contradicting as they do the belief in adaptation as one of the chief causes of the evolution of specific characters, as supplying the one great proof which the mutation theory still wanted for its acceptance in the field of systematic zoology and botany.

Dr. Willis's position met with a good deal of adverse criticism in the recent discussion at Hull. Botanists and zoologists were unwilling to accept a purely mechanical theory of evolution and distribution, and Mr. Regan, who led the opposition for the zoologists, produced precisely similar curves by taking the frequency of names in a directory. or the sizes of population of towns in an atlas. The curves are obviously the expression of certain facts, the explanation of which must be sought independently in each case. While we may admire the patience and industry with which Dr. Willis has elaborated his theory and the courage with which he maintains it, we cannot but hope that after all this is not the conclusion of the whole matter. If species originate by mutation and evolution and distribution are purely mechanical processes, what more is to be done?

A. B. R.

British Basidiomycetæ: a Handbook to the larger British Fungi. By Carleton Rea, B.C.L., M.A. Published under the auspices of the British Mycological Society. Cambridge Press, 1922. Pp. xii, 799. Price 30*s*. net.

Students of the larger fungi in this country have long desired a manual which would place them abreast of modern work without the constant necessity of reference to foreign literature. The present monograph fully meets that need.

A notable feature of the volume is the breaking away from the Friesian classification. Elias Fries, whose writings on mycology extended from 1815 to 1874, deservedly occupies a similar position in mycology to that of his fellow-countryman Carl Linné in the systematy of flowering-plants. The first British work to adopt his classification was the *English Flora*, of which Berkeley wrote the section on fungi in 1836. Cooke's *Handbook* (1871) simply followed Berkeley; and the later works of Cooke, Massee, Stevenson, and Smith are based on the *Hymenomycetes Europæi* (1874). Stevenson's volumes are admittedly translations of Fries's works; Massee gives a semblance of originality by reversing the order of the genera, but such re-arrangement is not classification. It speaks much for the insular conservatism of our older mycologists that, having adopted "the illustrious Fries," they would not allow in his classification any radical alteration called for by the increasing knowledge of microscopic detail. It may be pointed out that it was only in 1837 that Leveillé indicated the significance of asci and basidia—at a time when basidia were being figured quite frequently with internal spores! L. R. Tulasne in 1862 showed that the basidia of *Tremella* and its allies were longitudinally septate; Fries realised that this discovery necessitated the constitution of a new family—the *Tremellinei*, but included therein such genera as *Tremellodon*, *Auricularia*, *Calocera*, and *Ditiola*. It would take us too far to consider the later developments of the knowledge of the structure of the basidium—knowledge which was chiefly due to Tulasne and Brefeld. Tulasne's researches on the germination of the teleutospore with the formation of a promycelium led to the inclusion of the *Uredineæ* and *Ustilagineæ* in the *Basidiomycetæ* by Winter and van Tieghem. The promycelium of Tulasne is a heterobasidium in the terminology of Patouillard, a probasidium in that of Brefeld, and a phragmobasidium in that of van Tieghem. As is almost always the case, systematic works have lagged far behind in the adoption of modern views, chiefly because of the difficulty of re-classification where there is insufficiency of information; when knowledge of structure becomes more complete, the burden of tradition can the more easily be cast off.

"The present work is based chiefly on the excellent system set forth by N. Patouillard in his *Essai taxonomique sur les familles et les genres Hyménomycètes*, published in 1900. Since that date several alterations and additions to this scheme have been made, due to the investigations of the eminent mycologists, J. Bresadola, E. A. Burt, H. Bourdot and A. Galzin, F. von Hoehnel and Litschauer, and René Maire." Patouillard's first classification appeared in his *Les Hyménomycètes d'Europe* in 1887. In outline the classification as given in the volume under review is as follows:—The two main divisions are the Homobasidiæ and the Heterobasidiæ; the former possesses a simple usually clavate basidium bearing spores which give rise to a mycelium on germination; the basidium of the latter is usually septate, either transversely, longitudinally, or vertically, bearing spores which on germination produce sporidia. The Homobasidiæ include the parasitic Exobasidiineæ and the saprophytic Eu-Homobasidiineæ, which latter are subdivided into Gasteromycetales, Agaricales, and Aphyllophorales (Angiocarpes, Hemiangiocarpes and Gymnocarpes of Patouillard). The Gasteromycetales include the species having the hymenium still surrounded at maturity by a peridium; the Agaricales have the hymenium originally protected by a ring or volva or their analogues but fully exposed at maturity, whilst in the Aphyllophorales the hymenium is exposed from the first. The Heterobasidiæ are divided into Auriculariales with transversely septate basidia, the Tremellales with longitudinally cruciately divided basidia, Tulasnellales with simple basidia having sterigmata which are very broad when young, and Calocerales with cylindrical basidia terminated by two long, usually pointed sterigmata. (The Auriculariales include three parasitic suborders, Pucciniineæ, Coleosporiineæ and Ustilagineæ, which are not dealt with here.) An introduction of eleven pages gives a succinct account of the structure and classification of the Basidiomycetæ. This is followed by a key to the divisions and genera of British Basidiomycetæ occupying twenty pages which, by the use of different types, clearly brings out the relations of the various orders, families and so on. The characters used in the key are amplified in the body of the work.

In treating the species, synonyms are given, and a reference where possible to a figure. The descriptions are based on those of the original authors; the spore size is given where known, and the authority where the measurement is copied. Habit, season, and rarity are noted; "v. v." indicates those species—an extraordinary number,—which the author has seen in a living condition. The descriptions are mostly very full, and the salient specific characters are italicised. Those whose studies have been confined to previous British works will find the splitting-off of several genera somewhat bewildering at first, as, for example, *Boletus* into *Boletus*, *Gyroporus*, *Tylopilus*, *Phæoporus*, *Boletinus* and *Gyrodon*; but as these correspond more or less to the old sections of the genera the difficulty will soon cease to be apparent. In cases where a species is transferred from its old position, it is here given with an indication of its new location.

The generic names *Mutinus*, *Polysaccum*, *Acetabularia*, *Chitonia*, and *Trogia* are replaced for various reasons by *Cynophallus*, *Pisolithus*, *Locellaria*, *Clarkeinda* and *Plicatura* respectively: the fact that most field-workers are not likely to encounter any but the first-named renders the changes less regrettable. The only new generic name is *Glaucospora*. which replaces the already occupied name *Chlorospora* used by Massee.

A comparison with older works will show the greatest changes in the resupinate fungi. For the last quarter of a century more and more attention has been paid to these forms in all countries where mycologists abound. Very little can be made out of many of the old descriptions, which took no account of microscopic characters; and their study, like that of moulds, is an indoor one. The present account puts our British species in order and forms a basis for the addition of the numerous continental species which are certain to be found in this country.

The present work includes descriptions of all the species which have been recorded as British, excepting in cases where they are clearly identical with other species. It is perhaps doubtful whether certain of these will ever be found again, but the more experience a mycologist has the more careful is he of excluding species which have been described in any detail. The species are "split" rather than "lumped"; but as Mr. Rea is far and away our ablest authority on the group and our most experienced field worker, such splitting is to be commended.

Lack of space forbids a detailed account of the transfer of species such as *Collybia dryophila* to *Marasmius* and *Cantharellus aurantiacus* to *Clitocybe*. A very complete index will enable the novice to find his way about, and a full list of references supplies the necessary literature.

It is rare in these days to be able to commend the low price of a scientific work; that of the present volume (which is splendidly produced in the manner we expect from the Cambridge Press) was made possible by the generosity of the members of the British Mycological Society, who, as a tribute to the work of Mr. Rea for British Mycology, contributed £250 as a subsidy. In the opinion of the writer the volume is the best work on the subject since the pioneer studies of Berkeley and will take its stand with Plowright's *Uredineæ* and Lister's *Mycetozoa* as a standard monograph.

J. Ramsbottom.

Les Maladies parasitaires des Plantes: Infestation-Infection. By M. NICOLLE and J. MAGROU. Pp. 199, 8 fr. net. Masson & Cie, Paris.

DURING recent years the belief that all infectious disease, whatever the parasite and whatever the host, is one huge problem, has attracted many disciples. Possibly the experiences of war have widened our outlook on disease in general as well as given us a number of pictorial representations of what attack and defence really mean, and how a state of comparative stability may arise: it may be that the Western Front was a clearer picture of symbiosis than is the more altruistic vision of the text-books.

The problems of phytopathology differ essentially from those of human pathology in that plant-cells have walls; and related to this is the absence of circulation. As a direct consequence, we have no acquired immunity in plants, and there is no serum-therapy. In the search for generalisations, however, medical men have begun to take an interest in phytopathology. The book before us is a *précis* of parasitic diseases of plants written by two members of the staff of the Pasteur Institute. There are five sections, which deal respectively with diseases caused by insects; parasitic flowering-plants; diseases caused by cryptogams; bacterial diseases; and general problems. The book has been written from a medical standpoint, and the terminology is that of medicine rather than of plant pathology; in this way, many interesting analogies are suggested. A large number of diseases are described, together with the mechanism of infection and the lesions produced. The descriptions, however, seem far too brief to give more than an impressionist idea of the subject; and the absence of figures, jettisoned in order to keep the price within the means of students, robs the volume of most of its value for them. If the subject were placed in an examination syllabus the book would prove extremely useful for examination purposes with its numerous headings and brief sentences. We imagine that medical men in this country would prefer a book writ large.

J. R.

BOOK-NOTES, NEWS, ETC.

THE *Essex Naturalist* for April–September contains an interesting paper on the "Birch Groves of Epping Forest," the Presidential Address delivered by Mr. R. Paulson at the annual meeting of the Field Club last March. "Within the past fifty years there has been a great increase in the number of birch trees; where there were tens there are now thousands. No detailed suggestions as to the probable cause or causes for the remarkable increase" had been made until Mr. Paulson took the matter in hand; in the present paper he gives a summary of the history of the birch in the Forest, where for the last three centuries it was by no means common, and a detailed account of his observations which he sums up as follows:—"The factors that have tended to bring about the great birch invasion may be summarized as: 1. Leaching of soil, a factor of primary importance; 2. Extensive felling for many successive years; 3. A long series of fires, especially those of recent date; 4. Browsing of large herds of deer, 1800–1850; 5. Injury done to germinating acorns and beech-mast by rabbits (1870–1914, and even earlier). The young birch appears to be distasteful, even to rabbits; it was thus able to increase while the oak and beech were checked." Mr. Paulson points out that in spite of the cessation of indiscriminate felling and of the great reduction of rabbits, the primary factor—leaching of the soil—"must inevitably continue while the present climatic conditions continue"; and adds that although "it is generally conceded that birches have added greatly to the sylvan beauty of the Forest, should the great increase in the number of these trees go on unchecked, the pleasure derived from variety may in time be lost." The paper is illustrated by three excellent plates, showing seedlings in various stages and some of the more remarkable trees.

We have received the first volume of a new edition (the fourth) of Sir Wm. Schlich's *Manual of Forestry* (Bradbury, Agnew: price 15*s.* net), which may still be regarded as the standard work on silviculture in this country. As in the last edition published sixteen years ago the bulk of the volume is taken up with an account of the forestry resources of the British Empire, including India. In the earlier edition this account was avowedly incomplete, but the author has since had the advantage of being able to consult the statements received by the Imperial Forest Conference in 1920 and to obtain much new information. The result is a well-summarized and up-to-date account of the present position of silviculture in this country and elsewhere in the British Empire. In the opening chapters Prof. Schlich emphasizes the importance of an adequate state-aided forest policy in order to meet the ever-increasing demands upon our timber resources. The serious inroads made on our British woods during the War renders an extended scheme of afforestation more than ever imperative. The book will be welcomed by all who are interested in the progress of afforestation, and, in view of the increasing importance of the subject, it is to be hoped the succeeding volumes will not be long delayed.—A. B. J.

The *Annals of Botany* for July (no. cxliii.) contains a continuation of "Studies in the Physiology of Parasitism," by W. Brown; "A Note on Conjugation in *Zygnema*," by Edith P. Smith (1 pl.); "Further Studies of the 'Brown Rot' Fungi" (2 pl.), by H. Wormald; "The Distribution of Plants in Perthshire in relation to 'Age and Area,'" by J. R. Matthews; "On the Nature of the 'Blade' in certain Monocotyledonous Leaves," by Agnes Arber; "Development of Root System of Wheat," by R. Singh; "Observations on the Transpiration, Stomata, Leaf Water-content and Wilting of Plants," by R. C. Knight; "*Sequoia Couttsiæ* at Hordle, Hants," by M. E. J. Chandler; "The Soils of Blakeney Point," by E. Salisbury.

Under the title "A Potential Weed" Mr. E. P. Phillips, of the Department of Agriculture, Pretoria, describes and figures in the Journal of the Department for August *Araujia sericifera* Brot., a Brazilian Asclepiad. It was first noticed in 1903 by Mr. Burtt Davy as becoming a great nuisance in some Johannesburg gardens, but has now "spread over most of the Union and has also been recorded from

Swaziland." "The plant is a very prolific seeder, and as the seeds are so well adapted for wind distribution, it is no wonder that it is spreading so rapidly. As the plant is a climber there appears to be little danger of it invading the natural veld, but there is every possibility of it becoming a nuisance in plantations, and it certainly is a nuisance in gardens. The writer has seen poplar trees in Pretoria covered with it, and if it is allowed to go unchecked will probably smother them."

We regret to record the death of Johan Oskar Hagström, which took place at Vestra Emterwik, where he had been minister since 1910, on June 7. He was born on May 21, 1860, at Bottna in Sudermania, was educated at the University of Upsala, and was ordained in 1885. In 1891 he began to study *Potamogeton*, which he elaborated for Neuman's *Sveriges Flora* (1901) and Lindman's *Svensk Fanerogamenflora* (1918). His most important work was the *Critical Researches on Potamogeton*, published in 1916 in Konigl. Svenska Vetenskap. Handl. Band 55: this, written in Latin and English, is the fullest and most careful publication on the genus, and will always remain a tribute to his memory; it was noticed in this Journal for 1918 (p. 115), where it is described as "essential to botanists who wish to obtain a full knowledge of the genus."

The contents of the most recent number of *Malpighia* (xxix. fasc. v–vi) are mainly supplied by the editor, Dr. L. Buscalioni, who, besides a continuation of his monograph of *Sauraja*, contributes a paper "Sopra alcuni apparecchi per attenuare l'inquinamento dei pozzi delle Cisterne," and, with G. Raccella, "Intorno ad alcune singolari anomalie delle radici di una plantula di *Amygdalus communis*." In "Flora mediterranea australiore e Sahara," Dr. Nicotra continues his researches on the Mediterranean flora.

The *Archivos do Jardim Botanico do Rio de Janeiro* (1922) contains the second part of A. Ducke's account of new or little-known plants of the Amazon region. Numerous new species are described and four new genera—*Parachimarrhis* (*Rubiaceæ*, allied to *Chimarrhis*), *Jacqueshuberia* (*Cæsalpineæ*), *LeCointea* (*Swartzieæ*), and *Glycydendron* (*Crotoneæ*) are established. There are twenty-four plates, mostly impressions from dried specimens; dissections of the flowers of the new genera are intercalated in the text.

The Kew *Bulletin* (n. 6) contains a "host list" of South African *Polyporeæ* by P. A. van de Bijl, Professor of Phytopathology at Stellenbosch, and a continuation of "*Decades Kewenses*," including a new genus of Acanthaceæ (*Isotheca* Turrill) and of "Diagnoses Africanæ."

The last part of the *Contributions from the Gray Herbarium* (lxiv.; Ap. 18) is entirely from the pen of Dr. B. L. Robinson; it contains an enumeration of the Mikanias of northern and western South America, and "Records preliminary to a general treatment of the *Eupatorieæ*," these being mostly of plants which have been met with during the past year from various regions.

The *Orchid Review* for September contains a paper, with figure, on *Spiranthes Romanzoffiana*, by Col. Godfery.

THE

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BRITISH AND FOREIGN.

EDITED BY

JAMES BRITTEN, K.C.S.G., F.L.S.

LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

The Journal of Botany was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers.

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PLANT NOMENCLATURE.

Dr. Barnhart's views deserve special attention, on account of his long experience in bibliography and nomenclature. I had not intended to take any further part in the discussion, but a few of his remarks (Journ. Bot. 1922, 256–263) invite rejoinder.

1. *Revocation of Art.* 36 (*requiring Latin diagnoses*).—He considers that Art. 36 has been misunderstood, because most botanists who have conformed to it have written Latin *descriptions* instead of Latin *diagnoses* accompanied by descriptions in the language of their choice. He apparently does not realize that Latin was deliberately chosen in most cases, if not in all.

2. *Ridiculous names.*—His citation of "a manly man" as a parallel of *Cerastium cerastioides* might suggest that he did not appreciate the distinction between "manly" and "man-like." The most ridiculous generic name known to him is *Schtschurowskia.* I confess it does not strike me as ridiculous: uncouth it certainly is, owing to the cumbrous method of rendering the twenty-sixth letter of the Russian alphabet by "schtsch" instead of by "shch," but the spelling indicates the pronunciation (except that the "w" should be a "v"), which is the main point. *Loranthus tschintschochensis* from Chinchoxo, French Congo, is worse; as the name is of Portuguese origin, there is even less justification for the method of transliteration: to latinize a Romanic word by spelling it in a Teutonic manner is an idea which would not have occurred to everyone.

6. *Rejection of specific homonyms.*—Dr. Barnhart thinks that Mr. Rehder would find it difficult to discover a parallel to *Quercus lanuginosa* Lam. (1778), a mere re-naming of *Quercus Cerris* Linn. (1753). Is he not acquainted with E. H. L. Krause's edition of Sturm's Deutschlands Flora? In that edition, which contains about 750 superfluous new names (many of them homonyms), all monotypic genera are given the trivial *generalis*, on the ground that the species in such cases has the value of a genus! Can Dr. Barnhart seriously contend that such names as *Glaux generalis* and *Hippuris generalis* are liable to be revived? Among other peculiarities of Krause's nomenclature are the replacement of the trivials *intermedius*, *dubius*, and *hybridus* wherever they occur. Thus *Drosera intermedia* becomes *D. media*, *Vicia hybrida* is renamed *V. tollenda*, and *Papaver dubium* is replaced by *P. agreste*: the names *hybridus* and *dubius* being reserved by Krause for hybrids and doubtful plants respectively. Krause's names have been—perhaps rightly—ignored by most German botanists, but O. E. Schulz cites them in the *Cruciferæ* of the *Pflanzenreich.* They were not included in Index Kewensis, Suppl. 2–4, owing to no copy of the edition being available at the time, but have recently been extracted from a set kindly lent by Mr. C. E. Salmon, and will appear in Suppl. 6.

7. *Treatment as a "nomen delendum" of a new combination associated by its author in the original place of publication with specimens belonging to a different species.*—Art. 3 (*c*) of the American Type-basis Code leads to some amusing results. According to it, *Helosciadium Ammi* Britton (Fl. Bermuda, 279; 1918) is

synonymous with *Sison Ammi* Linn. But the latter is, as I have shown (see Journ. Bot. 1922, 212), the earliest binary name for an Old-World plant, *Carum copticum* (*Ammi copticum* Linn.), which should therefore be renamed CARUM AMMI (comb. nov.). The species figured and described by Britton, on the other hand, is an American plant, *Apium leptophyllum* F. Muell. The geographical distribution given by Britton is also that of *A. leptophyllum*, not of *Carum Ammi*, and even the transference to *Helosciadium* was made with reference to *A. leptophyllum*. To contend in such circumstances that *Helosciadium Ammi* Britton is synonymous with *Sison Ammi* Linn. is to travesty the facts. Most botanists will probably prefer to associate *H. Ammi* Britton with the American species of *Helosciadium* actually described and figured under that name. This example illustrates the general undesirability of making new combinations without examining the type material.

8. *Generic "nomina conservata."*—I agree that the list requires revision. *Allionia* (*Nyctaginaceæ*) may be taken as an example. Linnæus united the monotypic genera *Allionia* Loefl. and *Wedelia* Loefl. (Iter, 180, 181; 1758) under the name *Allionia*, and gave the binary names *Allionia violacea* and *A. incarnata* respectively to Loefling's species of *Allionia* and *Wedelia* (Syst. ed. 10, 890; 1759). *A. violacea* is therefore unquestionably the type species of *Allionia* Linn., as stated by Britton (Ill. Fl. ed. 2, ii. 31; 1913). But Choisy, who recognized that *Allionia* Loefl. and *Wedelia* Loefl. were independent genera, unfortunately restricted *Allionia* Linn. to the latter, and used the name *Oxybaphus* L'Hérit. (1797) for the former (DC. Prodr. xiii. sect. 2, 432, 434; 1849). It certainly seems undesirable to regularize such juggling with generic names by retaining *Allionia* Linn. emend. Choisy (1849) on the list of "nomina conservata."

Dr. Barnhart's suggestion that the list should include the names of all important genera, so that new discoveries of "nomina priora" would not upset names in current use, is excellent. As the matter stands at present, the discovery of a "nomen prius" leads to the publication of new combinations which may subsequently lapse into synonymy owing to the treatment of the later generic name as a "nomen conservatum." This happened during the interval between the Vienna and Brussels Congresses. Rehder and Schneider, for example, proposed five new combinations under *Psedera* in 1908–1909, which were invalidated in 1910 by the treatment of *Parthenocissus* as a "nomen conservatum."

10. *Orthographic correction of names.*—Dr. Barnhart's dictum that "there is no middle ground" in orthographic correction is quite in keeping with the rigid character of the American Code. Is the faculty of seeing both sides of a question "really amusing"? If more botanists possessed it, the present unhappy differences in nomenclature might not have arisen.

12. *Omission of the comma between name and authority.*—A sense of humour should have prevented an adherent of the American Code from referring to "provincialism" in connection with nomenclature. Whatever claim to recognition that Code possesses is based rather on its intrinsic merits than on the currency which it has

obtained. Has it been adopted by any botanist outside the United States, and what proportion of systematists within the States accept it?

13. *Fixing of generic types.*—Dr. Barnhart's remarks read as though he imagined that comprehension of a type-method was hardly to be found outside the ranks of the American Codists. Yet it was by Internationalists that the type-species of *Nymphæa*, *Azalea*, and *Bignonia* were determined, to mention three recent examples.

15. *A new name should not be regarded as valid unless it is proposed unequivocally and unconditionally.*—I am glad to learn that Canon 12 of the original "American Code" (Art. 37 of the Rules) was intended to cover the same class of cases. Suggestion 15 was not a new rule, but an "explanatory addition" (Schinz and Thellung in Vierteljahrsschr. Nat. Ges. Zürich, lxvi. 311, l. 19; 1921). That it was required is evident from the case of *Galbulimima* versus *Himantandra* (p. 137).

Dr. Barnhart refers to "the tendency more manifest at Kew than anywhere else of representing botanical authors as saying what they did not say." The only example which he gives of this "tendency" is the attribution by the editors of the original Index Kewensis (1893–1895) of new combinations to authors who did not make them. The undesirability of the practice was pointed out long ago, and I know of no botanist who defends it nowadays. His strictures seem a trifle belated.

Was the American Code free from nomenclatural fictions? Canon 19 reads: "A name is rejected when the natural group to which it applies is undetermined (hyponym)." So far so good. But in order to facilitate the application of the canon to genera, a fiction was introduced under 19 (*b*): "A generic or subgeneric name is a hyponym, when it is not associable, *at least by specific citation*, with a binomial species previously or simultaneously published; or when its type-species is not identified." [The italics are mine.] This amounts in such cases as *Anidrum* Neck. (Elem. i. 188; 1790) to a pretence that a genus is untypified, although the type-species is actually known. Necker segregated *Anidrum* from *Coriandrum*. "Obs. Haec. et præcedens utraque species naturalis simplex hucusque." [He termed genera "species" and families "genera."] *Anidrum* was based on "Quæd. Coriandr. Linn." Linnæus recognized only two species of *Coriandrum*, namely *C. sativum* (fructibus globosis) and *C. testiculatum* (fructibus didymis). Necker divided *Coriandrum* Linn. into two genera, *Coriandrum* (Achena subrotunda) and *Anidrum* (Achena didyma). The type-species of *Anidrum* is therefore *C. testiculatum* Linn. beyond a shadow of doubt. Yet the fiction was adopted that *Anidrum* was untypified, and the later name *Bifora* Hoffm. was used instead (Britton and Brown, Ill. Fl. ed. 2, ii. 647; 1913). A provision for rejecting such names as *Anidrum* is also contained in the Type-basis Code Art. 2 (*c*) (Science, n.s. liii. 312; 1921). Under International Rules *Anidrum* would have superseded *Bifora* had not the latter been made a "nomen conservatum."

17. *Priority of family names.*—It is satisfactory to learn that

Dr. Barnhart long ago gave up the idea of applying the principle of priority to family names, but unfortunately what he advocated in 1895 is practised nowadays by one of his colleagues. Dr. J. K. Small (Fl. Southeastern U.S., ed. 2; 1913) adopts such names as *Leucojaceæ*, *Ixiaceæ*, *Podophyllaceæ*, and *Rhinanthaceæ* in place of *Amaryllidaceæ*, *Iridaceæ*, *Berberidaceæ*, and *Scrophulariaceæ* respectively.

Adherence to Rule.

It seems desirable to refer, in conclusion, to a tendency of some systematists to accept only so much of the Rules or Code as coincides with their own views. Thus Moss "adopted, in general, the International Rules" (Cambr. Brit. Fl. iii. p. xiv; 1920); Wilmott ignored "generic names whose authors did not employ the binomial system" (Babington, *Manual*, ed. 10, p. ix; 1922); and Rydberg's nomenclature "agrees, as far as possible, with the so-called American Code" (Fl. Rocky Mountains, p. vii; 1917). What useful purpose is served by departure from the Rules (or Code)? If the intention is to bring about their amendment, would not a detailed statement of the case be equally effective? And supposing that the desired alterations in the Rules are eventually made, do they expect their fellow botanists to accept them, when they themselves have set the example of departing from the present Rules? This is irrespective of the merits of the proposed alterations, with some of which I personally am in sympathy.

T. A. Sprague.

The recent discussion on nomenclature in the *Journal of Botany* indicates an inclination on the part of British botanists to modify the International Rules along certain lines. Modifications such as suggested by Mr. T. A. Sprague may open the way for a rapprochement between the International Rules and the Type-basis Code (*Science*, n. ser. 53: 312–314, 1921). In view of the situation it may be helpful to examine the essential differences between the two codes.

1. *The Type concept*—the application of names by means of types. This is a fundamental principle of the Type-basis Code, but is ignored by the International Rules of 1905. That it is not contrary to them is shown by the emendations of 1910, in which a recommendation was added to Article 30 to the effect that in the future authors should indicate the types of groups they publish.

2. *The Type-basis Code* adopts 1753 as the starting-point for nomenclature of all groups of plants. The International Rules adopt 1753 for vascular plants and some groups of cryptogams, and later dates for other groups of cryptogams. If the type concept were introduced into the Rules, the need for later starting-points for certain groups would not be felt to the same degree. The application of names in the deferred groups through types, after the rejection of hyponyms, eliminates much of the confusion which was the chief reason for adopting later starting-points.

3. *Priority of publication* is accepted as a fundamental principle by both codes. The International Rules, in order to retain well-

established generic names in their current usage, arbitrarily conserve certain of these, even though they would be rejected under the priority rule. These conserved names are brought together in a list appended to the Rules—the list of Nomina Conservanda. The Type-basis Code includes no such list, but, recognizing that the strict application of the law of priority may in a few cases cause inconvenience by displacing well-known names, provides for exceptions through Article 6.

4. *Publication of genera.* (*a*) The Type-basis Code provides that a generic name is effectively published when there is a specific description and a binomial specific name, because the type species of the proposed genus can be determined. (*b*) The International Rules provide that a genus is effectively published when there is a generic description without the mention of included species. The Type-basis Code considers such publication to be ineffective because the type species of the proposed genus cannot be determined.

5. *Priority of position.* The Type-basis Code provides that "Of names published in the same work and at the same time, those having precedence of position are to be regarded as having priority." The International Rules provide that such names shall have equal standing. Personally I look upon this difference as a minor matter in which the Type-basis Code might readily forgo its present provision. It seems unreasonable to displace a well-established name solely through this provision.

6. *Validity of homonyms.* The Type-basis Code provides that both generic and specific names are to be rejected if there are earlier homonyms. The International Rules provide that a name shall not be rejected "because of the existence of an earlier homonym which is universally regarded as non-valid." In practice this requires the investigation of the standing of the earlier homonym, often in groups with which the investigator is unfamiliar, and is obviously unsatisfactory. Few will take the time for a real investigation; they are more likely to accept the statements of others. The Rules also provide that "When a species is moved from one genus to another, its specific epithet must be changed, if it is already borne by a valid species of that genus"—that is, if the earlier homonym is a synonym (non-valid) the transferred name can stand. The Type-basis Code, on the contrary, holds that the earlier homonym invalidates the later under all circumstances.

7. *Duplicate binomials.* The International Rules reject a specific name when it repeats the generic name, while the Type-basis Code makes no such exception to the principle of priority. This is a minor difference which need not concern us greatly.

8. *Latin diagnoses.* The International Rules provide that, after January 1, 1908, effective publication shall require the diagnosis to be in Latin. In the Type-basis Code there is no reference to the language of publication.

The chief objection to the American Code, especially from those not experts in nomenclature, centred around Nomina Conservanda, Priority of Position, and Duplicate Binomials. Many of us who follow the Type-basis Code have no inherent objection to a list of nomina conservanda. We feel, however, that the present list was not worked out upon the merits of each case but was somewhat arbitrarily selected. Moreover, the accepted and rejected names of such a list should be typified. The other two points are minor ones that should not stand in the way of agreement.

The chief item of difference is the concept of types. As this is not contrary to the spirit of the International Rules we may hope that it will be incorporated in those Rules and be retroactively applied. At least a recommendation might be added to the effect that in revising genera authors strive to establish them upon a type basis by a careful study of the original publication and by recording the species selected as the type of the genus. Items (2) and (4) above depend largely upon the type concept. Item (6) is one that in practice works so much more certainly according to the Type-basis Code that followers of the International Rules are likely ultimately to see the advantage of them, when they are examined without prejudice.

A harmonizing of the two codes appears to be impossible if it is maintained that the International Rules cannot be modified in any essential, but only added to or interpreted. This is the belief in some quarters, but I find no confirmation of this in the Rules themselves and it is contrary to the spirit of codes and laws in general. They should be modified to accord with the consensus of botanical opinion. Otherwise they will be gradually abandoned.

The typifying of genera should be done by those familiar with the groups concerned. The study of names apart from the study of the organisms to which the names are applied should be discouraged. The typification will be a gradual process like all other botanical investigation.

As recorded on p. 111, I am in favour of having an International Committee appointed by each Congress to recommend to the succeeding Congress changes in the list of Nomina Conservanda, the types of genera in questionable cases, and other matters of this sort. Such a committee should be made up of experts on nomenclature.

In this statement I am giving my personal views only.

A. S. Hitchcock.

U.S. Department of Agriculture,
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FRIEDRICH EHRHART AND HIS EXSICCATÆ.

By James Britten, F.L.S.

Some years ago, Mr. Arthur Bennett called my attention to references to Ehrhart's *Exsiccatæ* which seemed to show that the extent and history of these collections were imperfectly known, and suggested that it might be useful to publish a list of them. This I now propose to do, confining myself mainly to such details of Ehrhart's life as bear upon the *Exsiccatæ* and upon his relations with Linnæus. A full autobiography extending from his birth in 1742 until 1793—written two years before his death—was found among

Ehrhart's papers by his friend Paul Usteri, who printed it in vol. xix. (pp. 1–9) of his *Neue Annalen der Botanik* (1796).

Ehrhart's chief contribution to botanical literature was his *Beiträge zur Naturkunde* (1787–92) in seven volumes, each dedicated to six of "seinen Gönnern und Freunden"; among these we find "Doctor Smith in London" and "Herr Botaniker Davall in Orbe," from whom Smith obtained his series of the exsiccatæ. In his introductory note to the autobiography, Usteri says that he had received from Ehrhart's widow sufficient material for another volume of the *Beiträge*, which he proposed to publish with indexes to the whole collection. In his notice of Ehrhart, D. H. Hoppe (Bot. Taschenbuch for 1796, pp. 219–225) says that for this eighth volume botanists had waited in vain, nor does any later reference to it appear in the *Neue Annalen*. In the preface to the first volume of the *Beiträge*, Ehrhart tells us that the work was undertaken in response to the request of some of his friends, who, having found it "difficult to buy the books in which my little essays [Aufsätze] had appeared, begged me to bring these together and publish them separately, and also to publish nothing more in large and expensive works, but to adapt myself to the circumstances of my readers"—the reference, as we learn from his autobiography, is to papers published in the *Hannoverisches Magazin* and other periodicals. Ehrhart expresses sympathy with their request, knowing by experience how unpleasant it is to be compelled to purchase large and superfluous works in order to obtain a few small "Abhandlungen," and promises to comply with their wishes. Of this, the first "Band" of the *Beiträge* is evidence; the following volumes, he says, will contain all that he had already published or would publish in the future. The papers are reprinted in the order in which they were written, the date of each being appended; they are largely from the Hannover Magazine, an important exception being "Meine Beiträge zum Linnéischen Supplemento Plantarum" (pp. 174–192); this contains the descriptions contributed by Ehrhart to the *Supplementum*, and includes the genera and species of mosses suppressed by Linnæus fil. under circumstances to be dealt with when the Supplement comes under consideration. The importance of these reprints lies in the fact that the Hannover Magazine is extremely rare—in the British Museum Library it is represented chiefly by odd numbers. It would appear that writers have been accustomed to cite the *Beiträge* for new species in ignorance that many of these had been published in the Magazine; and when the Magazine itself appears to be quoted, this is usually at second hand, Ehrhart himself having often supplied the reference, as in the case of the genera of Mosses—*Georgia*, *Webera*, etc. (Beitr. i. 176–180) cited by Pfeiffer (*Nomenclator*).

In the *Beiträge*, which is described by Smith (in Rees, s. v. *Ehrharta*) as "full of excellent botanical remarks, with some peculiarities of opinion and style," appear most of the descriptions of the species with which Ehrhart's name is associated and lists of the Exsiccatæ with which this paper is primarily concerned. From these it is evident that Ehrhart had a wide acquaintance with botanical literature, early and recent: the synonymy quoted, with full references, is very extensive, and includes citations of figures and exsiccatæ, where these exist. They give an impression of great care and completeness, thus when describing new genera he adds a note as to the persons commemorated: of *Georgia*, for example, a genus of mosses, he notes " Maximo Botanices Promotori, Georgio tertio, magnæ Britanniæ Regi, consecravit Ehrhart" (Beitr. i. 176)—a eulogy of "Georg, unser gütiger König, und Catharina, Russlands Kaiserin," to whom *Catharinea* is dedicated, appears in the same volume (pp. 123–4). It may be noted that Ehrhart had in 1780 received a commission from the Hannoverian Government to make botanical journeys through the electorate of Braunschweig-Luneberg during a period of three years, and to compile a flora of this territory. In 1787 he received a royal patent appointing him Botanist to his Majesty.

Ehrhart's critical knowledge of plants and extensive acquaintance with their literature is even more fully exhibited in the long series of notes headed "Botanische Zurechtweisungen," which appear in each volume of the *Beiträge*. These include additions and corrections to the descriptions of various authors and numerous notes on nomenclature in which names and identificati ns made in error are assigned to their correct position. Written as they are in German, they have attracted little attention from British botanists, or, indeed, so far as I know, from botanists generally, and for this reason I must content myself with directing to them the attention of those versed in that language. It is evident that the notes contain much of interest, if not of importance, and that they would repay investigation; but unfortunately there is no index to their contents, so that it is only by going through them that the information they contain can be acquired.

An interesting account of Ehrhart is given in the preface to G. F. W. Meyer's *Chloris Hanoverana* (1836); this includes a list of the seven Exsiccatæ which I transcribe, numbers being prefixed for convenience of reference:

"[I] Phytophylaceum [*sic*] Ehrhartianum. Dec. i–x. Hanov. 1780–1785.

"[II] Plantae officinales. Dec. i–xlvi. Hanov. 1785–1792.

"[III] Calamariae, gramina et tripetaloideae L. Dec. i–xiv. Hanov. 1785–1793.

"[IV] Plantae cryptogamae L. Dec. i–xxxiv. Hanov. 1785–1793.

"[V] Arbores, frutices et suffrutices L. Dec. i–xvi. Hanov. 1787–1793.

"[VI] "Herbae L. Dec. i–xvi. Hanov. 1787–1793.

"[VII] Plantae selectae hortuli proprii. Dec. i–xvi. Hanov. 1792–1793."

I have taken this chronological arrangement as the basis of the following enumeration. It appears from the preface that Meyer's own set of the Exsiccatæ was not perfect, and he seems to have doubted whether any complete series existed: even the English botanists, he says—no doubt with special reference to J. E. Smith,—who recognized the value of Ehrhart's collections had not access to all of them. Meyer gives a detailed description of a collection in his possession which was made by Ehrhart during the three-and-a-half years that he was in Upsala as a pupil and friend of Linnæus; these Meyer regarded as in some respects of greater authority for Linnæus's species than those in the Linnean herbarium. His ground for this view is based on Ehrhart's intimate association with Linnæus, as set forth by Ehrhart himself in his *Beiträge*, conveniently summarised by Th. M. Fries in his *Linné* (ii. 23–5). A desire to hear the lectures of Linnæus had drawn Ehrhart to Upsala, where for a time he served as apothecary to the University, but subsequently maintained himself at his own expense, forming friendships with C. W. Scheele and other prominent naturalists. From the 20th of April, 1773, until Sept. 26, 1776, he was a pupil of Linnæus, though he regretted that he had not been one of his students when Linnæus himself took part with his students in their excursions into the country—"he was already," says Ehrhart, "an old man and was expecting his death," which took place in 1778: "When I asked him about cryptogams he answered frankly that thirty years ago he had known these plants, but that now he was obliged to leave them to others."

"Few of the students," continued Fries, "could have been so industrious as Ehrhart was. On week-days all hours free from lectures were spent in excursions in the surrounding country; Sundays he spent in the Botanic Garden. In the summer holidays he too excursioned, sometimes accompanied by other Linnean students, from early morning until late at night, seeking plants in the fields, woods, moors, and marshes. He reported his discoveries to Linnæus, who had conceived great affection and regard for him"; "Each plant," says Ehrhart (*Beiträge*, v. 3) "was examined on the spot where I found it, with the *Genera Plantarum* and the *Flora Suecica* of Linnæus, and such as were doubtful I compared with his herbarium. Usually I collected and dried a good number of specimens, as can be seen from the *Phytophylacium* and my other collections of dried plants, and when I found that my senior [" Alter,"—*i. e.* Linnæus] had made a mistake, I told him so; for whoever I was I showed that I was a free Swiss! He used to make large eyes at me when I told him, for instance, that his *Carex uliginosa* and *Schœnus compressus* were identical, lashing out with 'Deuce take me if that's true.' He found, however, that I was right, and when I saw him again two or three days afterwards, he called out 'You were quite right!' And when on Sept. 26, 1776, I said good-bye to him at Hammarby, seeing him for the last time, he pressed my hand and said: 'Write to me; from you I will believe everything.'"

It is probable that the "Botanische Zurechtweisungen" would supply further references to Ehrhart's association with Linnæus. One such allusion appears in the "Botanical Observations by Frederic Ehrhart," included in the volume of *Tracts Relative to Botany*, "translated from different languages" by Charles Koenig, but published (1835) anonymously; these are selected from various parts of the "Zurechtweisungen," and confirm the view already expressed that the series would repay investigation. Many of the notes selected by Koenig for translation are critical of Linnæus; among them is the following (from Beitr. i. 68):—

"*Agrostis pumila* L., which I gathered in company with my late friends Linnæus and Grüno near the Linnean villa, Hammarby, and which both acknowledged [? considered] to be a distinct species, is nothing, according to my own observations, but a diseased *Agrostis stolonifera*. I preserve specimens which are half *Agrostis stolonifera*, half *A. pumila*" (p. 272). Koenig adds a note confirming this.

Of Ehrhart's earlier life, we find interesting particulars in his autobiography published by Usteri, and in the obituary notice by D. H. Hoppe, both mentioned above. He was born at Holderbank in the canton of Bern on November 4, 1742, where his father, Johannes Ehrhart, was pastor. Johannes frequently made botanical excursions with Haller; the young Friedrich often accompanied them, and in this way acquired a taste for botany. He compiled a *Florula Holderbankensis* which attracted the notice of Haller, who offered the lad the post of amanuensis and librarian, which he declined on account of his father's failing health. Anxious to continue his botanical studies and at the same time to obtain remunerative occupation, Friedrich, after his father's death, obtained employment in an apothecary's shop in Nuremberg, where he served his three years' apprenticeship (1765–68). He then went to an apothecary in Erlangen, where he remained until Easter 1770; during this period he made botanical excursions on foot to the Fichtelberge and in Switzerland; he was afterwards employed by Andreä, with whom he remained until Easter 1773. Ehrhart's intense desire for botanical knowledge continued to increase, and nothing would satisfy him but the lectures of the great Linnæus himself; so off he went to Upsala and attended Linnæus's lectures; his career at this period has already been summarised.

For further details of Ehrhart's life, reference must be made to the sources already indicated, to which may be added an account by H. Steinworth, not seen by me, cited by Lindau and Sydow (*Thesaurus*, iii. 205) from *Hannoversche Gartenzeitung*, xii. (1902); and especially to the autobiography, from which we gather a pathetic impression of the great straits to which he was reduced by poverty. He tells us that he and his wife, whom he married in 1780, accustomed themselves to the severest privations in order that a few pence might be set aside for buying books; and it was with the same object in view that he began the publication of the *Exsiccatæ*. These privations, in conjunction with a phthisical tendency, doubtless shortened his life; he died at Herrenhausen on July 3rd, 1795.

To return to the *Exsiccatæ*, Smith acquired his series of these with Davall's herbarium in 1802; a list of these will be found among the "books quoted" prefixed to his *English Flora* (i. xxxvi; 1824), where the titles of five are given, with reference to the *Beiträge* for their contents. Those absent are the *Plantæ Cryptogamæ* and the *Plantæ Selectæ*; I think the latter may be indicated by the entry: "*Pl. Exsicc.*—*Plantæ Exsiccatæ.*—A collection of Dried Plants, published subsequently to all the foregoing, but which was not, I believe, continued to any extent." This supposition would explain the omission of *Pl. Selectæ* from Smith's enumeration—an omission otherwise inexplicable, as the plants themselves, with Ehrhart's printed labels giving name and number, are, like the rest of the Exsiccatæ, scattered through Smith's herbarium, with a reference in his hand to the series to which each specimen belonged. According to Meyer (*l. c.*) the *Plantæ Selectæ* comprised sixteen fascicles: this militates against my suggestion as to the identity of the *Plantæ Selectæ* with the *Plantæ Exsiccatæ*, which latter Smith believed "was not continued to any extent"; but Smith may have had an imperfect set. In any case, I can find no reference save that of Smith to the *Pl. Exsiccatæ*, and it may be noted that Smith says these were "published subsequently to all the foregoing," which was the case with the *Pl. Selectæ.*

Alphonse de Candolle (*Phytographie*, p. 410) states that the *Arbores* (14 fascicles) and *Plantæ Selectæ* (16) are in the De Candolle Herbarium; the *Phytophylacium* (8 decades) is in the Department of Botany and at Kew, where there is bound with it the lists prefixed to *Plantæ Selectæ*; these were received with Gay's herbarium, and the specimens corresponding with them are scattered through the general collection. The sixteen decades of the *Plantæ Cryptogamæ* are in like manner distributed through the cryptogamic herbarium of the Department of Botany. Ehrhart's own herbarium (*fide* A. DC., *l. c.*) is in the Université of Göttingen, and there are "des collections dans l'herb. de l'Univ. de Moscou, de l'Univ. de Leipzig." Lasègue (Mus. Bot. 559) says that the Moscow collection was "formée à Upsal sous l'inspection même de Linné."

I. "PHYTOPHYLACIUM EHRHARTIANUM continens Plantas quas in locis earum natalibus collegit et exsiccavit Fredericus Ehrhart Helveto-Bernas."

This contained ten decades, an index to which is given by Ehrhart in his *Beiträge zur Naturkunde*, iv. 145–49; 1789). The copies in the Department of Botany and at Kew contain, as has been said, only eight decades, each of which bears the date 1780. Th. M. Fries, in his interesting paper "Zur Kenntniss der Ehrhart'schen Flechten" (*Flora*, 1881, pp. 220–224) states that decades 9 and 10 were issued in 1785. The assertion of F. Arnold (*Flora*, 1880, p. 542) that the *Phytophylacium* contained at least 16 decades is based on the citation by Elias Fries (Lich. eur. ref. p. 245) of the Ehrhartian number "160" for *Cladonia papillosa*; this, however, was doubtless a typographical error, as the plant stands as "100. Papillaria. Lichen Papillaria Ehrh." in Ehrhart's list. The error has also been pointed out by Th. M. Fries (*l. c.*).

A "Nachricht an das Publicum," containing a detailed plan of the *Phytophylacium*, appears in Ehrhart's Beiträge, i. 70–76; this was previously issued as a four-page leaflet (in black letter), which is prefixed to the Departmental copy of the work: it is dated "Hannover, im October, 1779." Ehrhart states that only twenty-five copies of the *Phytophylacium* would be issued; each specimen was to have a label giving the number, the "nomen proprium," the Linnean synonym or that of a succeeding authority, and the place of growth. The "nomen proprium" he had previously explained as that which he had himself bestowed on the plant, consisting of one name only—a method which he considered would be for general convenience. This explains the names whose position has often been misunderstood—Pfeiffer in his *Nomenclator botanicus* quotes them as genera, and Mr. O. A. Farwell has lately endeavoured to establish their claim to that rank. The absurdity of this was shown in Journ. Bot. 1920, p. 278, and it is clear that Ehrhart had no such intention; he sometimes takes the accepted name—e. g. *Littorella* or adopts others of his own invention —e. g. *Decodon* for *Linnæa borealis.* He did not, however, persist in this method, which does not appear in any other of the Exsiccatæ, but he did not hesitate to bestow new names upon species already named and described—*e. g.* for his *Polygonum intermedium* (Beitr. vi. 142) he cites as a synonym *P. minus*, to which his plant has been generally referred by later authors, and (Beitr. vii. 164) he renames *Geranium rutilans*, the plant that had been described as *G. palmatum* Cav. and *G. anemonefolium* L'Hér., which names he cites in synonymy.

Two decades of the *Phytophylacium* appeared quarterly—the first and second on Jan. 1, 1780, and two others on the first of April, July, and October: the cost of each couple was fixed at a gulden. Each decade has a dedication to some distinguished deceased botanist: the first runs:

"CINERIBUS
CAROLI A LINNÉ
PRAECEPTORIS OPTIMI,
SACRA."

It may be noted that although the names in the *Phytophylacium* cannot be recognised as published, the specimens themselves must be accepted as typical for certain species which are based upon them, e. g. six species of *Carex*—*C. Leucoglochin*, *C. Chordorrhiza*, *C. Heleonastes*, *C. Leptostachys*, *C. Drymeia*, *C. Agastachys*,—published by Linn. fil (Suppl. 413, 414), are based on the specimens in the *Phytophylacium*, and the names there given by Ehrhart are adopted. The connection of Ehrhart with the *Supplementum* is discussed in a separate note; here it may be added that reference to others of Ehrhart's descriptions in the *Beiträge* show that specimens in his other Exsiccata are equally typical as being the only material on which the descriptions were based. Thus in "Bestimmung einiger Kräuter und Gräser" (Beitr. vi. 131–147) the only material cited for *Poa trinervata* and *Festuca elongata* is "Ehrh. cal. n. 36" and "Ehrh. cal. n. 93," the reference being to the specimens in the *Calamariæ*; the *Calamariæ* is also cited for species that, although well known to pre-Linnean writers, had not received binomials—e. g. *Geum intermedium* (p. 143) which is cited from "Ehrh. herb. [=Herbæ] n. 106." Throughout the descriptions of "einiger Bäume und Sträuche" (Beitr. vi. 85–103, vii. 127–138) "Ehrh. arb." (=*Arbores*, *Frutices*, etc.) is cited; *Betula verrucosa*, *Salix undulata*, *S. ambigua* and others in vi., *S. hexandra* and others in vii. In this last Band, under *Prunus nigricans* (p. 127) and elsewhere "Ehrh. off." (=*Plantæ officinales*) is cited in addition to "Ehrh. arb."; and there is a puzzling reference, which neither Dr. Jackson nor I can explain, to "Ehrh. plantag. p. 18": similar reference, which apparently relates to some printed list, appears on pp. 128, 129, 135. Another unexplained allusion occurs on pp. 160–164 in connection with species of *Geranium* and *Pelargonium*—"Ehrh. bergg." of which pp. 15, 16, 39 are cited.

II. "PLANTÆ OFFICINALES, quas in usum Studiosorum Medicinæ, Chirurgiæ et Pharmaceutices collegit et exsiccavit Fridericus Ehrhart, Helveto-Bernas. Decas 1–60. Hanoveræ, 1785 et seqq. In folio. Enthalten 600 Pflanzen, und kosten 7½ Ducaten."

This title I transcribe from Beitr. vii. 35–6 (1792), where it appears as a footnote to a list of the plants used in European pharmacies: the number of the plant in the Exsiccatæ is appended to the name of each species that appears therein. References to this series ("Ehrh. off.") will be found in the descriptions in Beitr. vii. pp. 127–135.

Fries (*op. cit.*) points out that it might be supposed that the whole of the decades were published by 1792, but this was not the case: it would appear from Ehrhart's autobiography that by the summer of 1793, 46 had been issued, and that the rest were to follow.

III. CALAMARIÆ, GRAMINA ET TRIPETALOIDEÆ [1785–1793]. According to the Index in Beitr. vi. 80–84, this series contained twelve decades; it may be noted that Meyer (*l. c.*) gives the number as fourteen, but this was certainly an error. To many of the species Ehrhart's name is appended, and these are sometimes quoted in *Index Kewensis*, e. g. *Carex obtusangula*—as if published here, although no diagnosis accompanies them. In this and subsequent indexes the localities where the specimens were collected is added, transcribed from the labels attached to the specimens. The citation of this series in other papers in the Beiträge has been already mentioned (p. 324).

The names and numbers of the *Calamariæ*, as well as those of the *Phytophylacium* so far as Carices are therein represented, are cited by Smith (Engl. Flora, iv. 79–125; 1828): it may be worth while to give a list of these, so far as the names differ from the accepted ones given by Smith:—

C. pulicaris L.	"Ehrh. Phytoph. 7. C. Psyllophora Ehrh. in Linn. Suppl. 413" p. 79.
C. pauciflora Lightf.	"C. Leucoglochin Ehrh. in Linn. Suppl. 413. Phytoph. 8" p. 79.
C. stellulata Gooden.	"C. echinata Sibth. 28. Ehrh. Calam. 68" p. 80.
C. curta Gooden.	"C. tenella Ehrh. Calam. 98" p. 81.
C. intermedia Gooden.	"C. disticha Huds. 403. Ehrh. Calam. 48" p. 86.
C. clandestina Gooden.	"C. humilis Leys. Hal. 175. . . . Ehrh. Phytoph. 88" p. 94.
C. pendula Huds.	"C. Agastachys Ehrh. in Linn. Suppl. 414. Phytoph. 19" p. 95.
C. strigosa Huds.	"C. Leptostachys Ehrh. in Linn. Suppl. 414. Phytoph. 48" p. 96.
C. sylvatica Huds.	"C. Drymeia Ehrh. in Linn. Suppl. 414. Phytoph. 58" p 96.

C. Oederi	Ehrh. Calam. 79. See note below "C. Oederi Retz" (Ehrh.) p. 111.
C. præcox Jacq.	"C. stolonifera Ehrh. Calam. 99" p. 112.
C. pilulifera Linn.	"C. decumbens Ehrh. Calam. 70" p. 113.
C. tomentosa Linn.	"C. sphærocarpa Ehrh. Calam. 89" p. 113.
C. paludosa Gooden.	"C. acutiformis Ehrh. Calam. 30" p. 120.
C. riparia Curt.	"C. crassa Ehrh. Calam. 59" p. 121.
C. ampullacea Gooden.	"C. obtusangulata Ehrh. Calam. 50" p. 124.
C. filiformis Linn.	"C. lasiocarpa Ehrh. Calam. 19" p. 128.

C. Œderi is cited by Smith (p. 107) as of Ehrh. Calam. 79: this is hardly a publication, and the name to be retained for the species is doubtful.

IV. Plantæ cryptogamæ L. (32 fascicles) [1785–1793]. An index of fasc. 1–24 of these (dated Oct. 1791)—"quas in Locis earum natalibus collegit et exsiccavit Fridericus Ehrhart"—is given in Beitr. vii. 94–102, with an intimation that the conclusion would follow; but no further part of the *Beiträge* appeared. The lichens of these decades and of the *Phytophylacium* and *Plantæ officinales* are enumerated but not identified by Bernt Lynge (*Index "Lichenum Exsiccatorum,"* i. 161–164 (1915). As has already been said (p. 323), the contents of the decades are incorporated in the cryptogamic portion of the National Herbarium. Fries in the paper already cited states that decades 1 and 2 were issued in 1785; 3 and 4 in 1786; 5 and 6 in 1787; 7 to 10 in 1788; 11 to 16 in 1789; the dates of the remainder were unknown to him.

V. Arbores, frutices et suffrutices L. [1787–1793]—"quos in Usum Dendrophilorum collegit et exsiccavit Fredericus Ehrhart." An "index" of twelve fascicles—the first of which was issued in 1787—dated "Herrenhausen, Nov. 1789" is given in Beitr. v. 158–162: the remaining four must have been issued between that year and 1793. This series is frequently cited in Beitr. vi. and vii. (see p. 324), and the specimens are typical for such of the species as were described by Ehrhart.

VI. Herbæ L. [1787–1793]—"quas in locis earum natalibus collegit et exsiccavit Fridericus Ehrhart": an "index" of twelve of the decades is in Beitr. v. 175–179: Names from this are cited in Beitr. vi. 143–4, vii. 153, 156.

VII. Plantæ selectæ hortuli proprii [1792–1793]. Of the sixteen decades that were issued in this series, no enumeration was published by Ehrhart, but some of the plants are cited as "Ehrh. Sel.," though always without number, in his "Bestimmungen einiger Pflanzen meines Gärtchens" (Beitr. vii. 139–168). The absence of number is curious, as the series was numbered like the rest, and in the case of all the other Exsiccatæ the number is always cited by Ehrhart. Of these fascicles, eight were ready by the end of 1792, and the remainder were issued in the following year.

This notice has extended to much greater length than I had anticipated when it was begun; I can excuse this only on account of the interest which I found in its subject—an interest which I hope my readers will share, at any rate to some extent. I am much indebted to Mr. Gepp for the help that he has given me by translating the German notices of Ehrhart and in assisting me to summarise their contents. The connexion of Ehrhart with the *Supplementum Plantarum* will form the subject of another communication which I hope will prove of equal interest; it will certainly be less lengthy.

Postscript. While the present paper was passing through the press, the following important passage from a letter of Ehrhart (Dec. 8, 1794) to Usteri (*Annalen*, ix. 105; 1794) has come to light; it gives further details about the Exsiccatæ and the proposed addition to the *Beiträge*:—

"I am now beginning to publish the continuations of my exsiccatæ. This winter you receive Decades 15 and 16 of the *Arbores*, 15 and 16 of the *Herbæ*, 13 and 14 of the *Calamariæ*, 25–32 of the *Plantæ Cryptogamæ*, and 9–16 of the *Plantæ Selectæ hortuli proprii.* The still-wanting 14 of the promised 60 Decades of the *Plantæ Officinales* I can however not deliver before Michaelmas, since I still lack some of the plants belonging thereto. At Easter also the 8th Band of my Beiträge comes out, and perhaps also soon the 9th Band."

SPITZBERGEN LIVERWORTS *.

By W. Watson, D.Sc.

During the Spitzbergen Expedition of 1921, Mr. V. S. Summerhayes collected a number of Liverworts, which were sent to me for identification. They were collected during June and July at altitudes varying from 20 ft. to 1200 ft. Their habitats were carefully noted and supplied to me by the collector, and this knowledge was of great service for ready determination. Twelve samples were packed in the usual way in paper wrappers, and 24 were placed in tubes with a solution of formalin; the latter method is unsuitable for Liverworts as it gives them a uniform dark tint, and causes them to break up during subsequent handling and dissection. Few samples had perianths, and in the determination from vegetative characters only, the colour is a great help in readily identifying the species. Another disadvantage of the formalin preservative is that it renders the plant useless for preserving in the usual way. Gemmæ were very scarce, being found in only a few plants.

Material was supplied from the following localities and habitats:—*Bear Island*: Dry tundra, below 100 ft.; rock-crevices or among boulders, 100 ft. or about 1200 ft.; wet region (drainage channel), 50–100 ft.; *Hermansen Island*: bogs, below 100 ft.; *Advent Bay*: boggy area and damp moss tundra, 30–100 ft.; *Cape Boheman*: rock-crevices, 50 ft.; bogs below 50 ft.; *Prince Charles Foreland*: damp slopes, etc., 30–700 ft.; *Klaas Billen Bay*: edge of pond, 20 ft.; *Gips Valley*: moss bog by river below 50 ft.

In the determination of a few critical plants I have had the kind

* Results of the Oxford University Expedition to Spitzbergen, No. 19.

assistance of Messrs. S. M. Macvicar, H. H. Knight, and D. A. Jones. The nomenclature adopted is usually that given in Müller's *Die Lebermoose.*

Preissia quadrata (Scop.) Nees. On dry tundra, Bear Is. With sporogonia. This is usually a plant of moist situations, and Mr. Summerhayes later informed me that the habitat was "dry tundra when compared with the mossy bogs and swamps." The plant was collected on a gritty and rather steep slope (25–30 ft.) with slight steps in it which were damper than the slope, and in these damp depressions the *Preissia* occurred.

Sphenolobus minutus (Crantz) Steph. Plants scattered amongst *Ptilidium ciliare* and *Lophozia quinquedentata* occurred on damp slopes, 100–700 ft., Prince Charles Foreland.

Lophozia quinquedentata (Huds.) Cogn. This was often present in the samples from Bear Is., Prince Charles Foreland, Advent Bay, and Cape Boheman. In wet and flat bogs at Cape Boheman, the form *turgida* (Lindb.), a larger plant with blunt postical lobes, occurred in almost pure masses. On the same ground mosses such as *Aulacomnium palustre, Camptothecium nitens, Paludella squarrosa,* and *Hypnum stramineum,* were present. Plants intermediate between *turgida* and the type were present in the gatherings from the other localities. The trigones varied in size, but usually they were large. Judging from the materials supplied, *L. quinquedentata* is the commonest and most widely distributed of the Lophozias.

L. lycopodioides (Wallr.) Cogn. No typical plant was noticed but only the var. *obliqua* K. M. In this variety the leaves are blunt and crisp, the cilia at the leaf-base are often absent, but those on the underleaves are characteristic. Some leaves are scarcely lobed, others are distinctly four-lobed, and a mucronate lobe and basal cilia are occasionally present. Bogs, Hermansen Is.

L. hatcheri (Evans) Steph. Rock-crevices, Bear Is.

L. kunzeana (Hüb.) Evans. With *Blepharostoma trichophyllum* and *Hypnum stramineum* in bogs, Cape Boheman.

L. floerkii (W. & M.) Schiffn. On a rather steep slope, 25–30 ft., Bear Is.

L. attenuata (Mart.) Dum. = *L. gracilis* (Schleich.) Steph. In small quantity on damp slopes, Prince Charles Foreland.

L. longidens (Lindb.) Macoun. Rock-crevices, Bear Is. and Cape Boheman.

L. ventricosa (Dicks.) Dum. Specimens from rock-crevices, Bear Is. and Cape Boheman seem best referable to this species, though they are scarcely typical and lack the abundant and characteristic gemmæ. In specimens from Prince Charles Foreland the gemmæ were characteristic.

L. porphyroleuca (Nees) Schiffn. In small quantity with *Webera nutans* in rock-crevices, Bear Is.

L. longiflora (Nees) Schiffn. Among boulders, Bear Is. No perianths were noticed, so that the determination of this plant rests on vegetative characters only.

L. alpestris (Schleich.) Evans. Common and very variable in the samples from rock-crevices, Bear Is., and damp slopes, Prince Charles Foreland, Gips Valley, and Advent Bay. Both Mr. Knight and I were doubtful as to the determination of one of the forms; a specimen was sent to Mr. Macvicar, who named it as "one of the numerous forms of *Lophozia alpestris*, a very common plant in Spitzbergen."

L. EXCISA var. *cylindracea* (Dum.) K. M. A plant from Bear Is. and Prince Charles Foreland may belong here, but it more probably belongs to an innovating form of another species.

L. BICRENATA (Schmid.) Dum. Klaas Billen Bay. No perianths were present, but the odour was characteristic.

HARPANTHUS SCUTATUS (W. & M.) Spruce, was present in small quantity in material from Bear Is., Hermansen Is., and Prince Charles Foreland. The specimens, as Mr. Jones remarked, were very variable in regard to infolding of leaves, frequency and size of underleaves, and amount of thickening at cell-angles, much more so than is usual in British plants.

CEPHALOZIA BICUSPIDATA (L.) Dum. Bear Is. and Prince Charles Foreland.

C. LEUCANTHA Spruce. With *Blepharostoma trichophyllum* on Bear Is.

C. RECLUSA (Tayl.) Dum. = *C. serriflora* Lindb. A small quantity of what appeared to be this species was mixed with *C. bicuspidata* and *Webera nutans* from Bear Is. As it was sterile, much broken up, and on an unusual habitat, the determination is doubtful.

CEPHALOZIELLA BYSSACEA (Roth.) Warnst. Damp slopes, Prince Charles Foreland. The plants were sterile, and the formalin had injured them so much that it is impossible to give a definite determination. The leaves were distant, two-thirds bilobed into acute segments; the apical leaves were eroded by the formation of two-lobed gemmæ; small 2–3-celled, subulate underleaves were present at the apices of the shoots. A packet from Vogel Hook contains a sterile plant which is best referred to the above species, though the lobes are not so divaricate as usual. Cephaloziellas were present in other samples, but were so much injured by the formalin that determinations would have been little more than mere guesses.

BLEPHAROSTOMA TRICHOPHYLLUM (L.) Dum. Often abundant and in almost pure masses. Bear Is., Cape Boheman, Hermansen Is., Advent Bay, Gips Valley, and Klaas Billen Bay.

ANTHELIA JURATZKANA (Limpr.) Trevis. In wet region (drainage channel), Bear Is. This had suffered so much from the formalin that it was difficult to recognise as an *Anthelia*, but Mr. Knight reassured me on that point.

PTILIDIUM CILIARE (L.) Hampe. Abundant and often in pure masses; dry tundra and among boulders, Bear Is.; damp slopes, Prince Charles Foreland and Advent Bay. In bogs, Advent Bay, the form *inundatum* Schiffn. was collected.

P. PULCHERRIMUM (Web.) Hampe. Damp slopes, Prince Charles Foreland.

SCAPANIA CURTA (Mart.) Dum. Rock-crevices, Bear Is. and Cape Boheman. From the latter locality the var. *geniculata* (Massal.) K. M. was also collected.

S. IRRIGUA (Nees) Dum. Bear Is.

No holoarctic species was found in the collection, though careful search was made for some of them, e.g., *Marsupella arctica* and *Scapania spitzbergensis.* Some plants noticeable for their absence in the collection are *Clevea hyalina*, *Sauteria alpina*, *Grimaldia* (*Neesiella*) *pilosa*, *Peltolepis grandis*, *Fimbriaria pilosa*, *Marchantia polymorpha*, *Moerckia Blytii*, *Gymnomitrium concinnatum*, *G. corallioides*, *G. revolutum*, *Marsupella condensata*, *M. apiculata*, *Prasanthus suecicus*, *Arnellia fennica*, *Alicularia compressa*, *Aplozia oblongifolia*, *Gymnocolea inflata*, *Lophozia obtusa*, *L. quadriloba*, *L. Wenzelii*, *L. heterocolpa*, *Sphenolobus politus*, *S. groenlandicus*, *Cephalozia connivens*, *Cephaloziella grimsulana*, *C. biloba*, *C. papillosa*, *Hygrobiella laxifolia*, *Pleuroclada albescens*, *Odontoschisma Macounii*, *Chandonanthus setiformis*, *Diplophyllum albicans*, *D. gymnostomophilum*, and *Scapania cuspiduligera.* All these species have been found in Spitzbergen or in similar arctic lands.

No species of Riccia, Metzgeria, Aneura, Pellia, Fossombronia, Gymnomitrium, Marsupella, Alicularia, Aplozia, Gymnocolea, Plagiochila, Lophocolea, Leptoscyphus, Chiloscyphus, Saccogyna, Calypogeia, Lepidozia, Diplophyllum, Radula, Lejeunea, Frullania, or Anthoceros were collected.

The following species, which are frequent in the alpine regions of Britain, are apparently absent from Spitzbergen:—*Pellia epiphylla*, *Marsupella emarginata*, *Alicularia scalaris*, *Anthelia julacea*, *Gymnomitrium alpinum*, *G. adustum*, and *Aplozia cordifolia.*

WILLIAM WRIGHT, A JAMAICAN BOTANIST. (1735–1819.)

By William Fawcett, B.Sc.

William Wright, who was born at Crieff in March 1735 and died in Edinburgh, Sept. 19, 1819, studied medicine at Edinburgh, during which time he made a journey to Greenland. He joined the Navy as Surgeon's mate in 1758, and sailed under Rodney for the West Indies in 1760. In 1763, at the conclusion of the Seven Years' War, Wright's service in the Navy came to an end; but he applied himself to the study of medicine, qualified as surgeon, and obtained the M.D. degree. Returning to the West Indies, he landed in Jamaica early in 1765, and settled on Hampden Estate, as partner to a former fellow-student, Thomas Steel.

Three or four years after this, Wright received an application from the University of Edinburgh to contribute to the Museum of Natural History which the University was about to establish. His first contributions were confined to ornithology and entomology, but in 1771 after he and his partner had moved into a new house which they built and called Orange Hill, he began his collection of dried plants arranged and described according to the Linnean system. He marked in his copy of the third edition of the *Species Plantarum* (1764) all those species which he examined in Jamaica to the number of 761, inserting the common names and adding references to Sloane and Browne where Linnæus had omitted to do so. He sent living plants to the Royal Gardens at Kew, and "several hundreds" of dried specimens to Banks. He was also liberal in sending specimens to all those who were interested in botanical studies. Jonathan Stokes dedicates his *Botanical Materia Medica* (1812) to Wright, and speaks of his Herbarium, which he had seen at Edinburgh, as one of the most complete collections which had ever fallen under his observation (see *Memoirs of Dr. Wright* (1828), p. 31, footnote); he cites specimens received from Wright, and refers to specimens in Banks's Herbarium. In September 1774 Wright received the honorary appointment of Surgeon-General of Jamaica from the Governor, Sir Basil Keith. In 1777 he left Jamaica, landed at Liverpool, and proceeded to London. He read a paper on *Cinchona jamaicensis* in April, and another on *Geoffræa jamaicensis inermis*, the Cabbage-bark tree of Jamaica, in May before the Royal Society, at that time under the presidency of Sir John Pringle; these were published with plates in the *Philosophical Transactions* for 1778. Shortly after this, Wright was admitted a Fellow of the Royal Society.

In 1779, in consequence of the British West Indies being menaced by a powerful armament under the French Admiral D'Estaign, a corps of infantry was raised in England, under the name of the Jamaica Regiment, for the protection of that island. Banks, now President of the Royal Society, induced Wright to accept the appointment of regimental surgeon. The transports with a fleet of merchantmen, convoyed by three frigates, were all captured by a combined Spanish and French fleet. Wright's Herbarium was taken from him, and he set to work in his captivity in Andalusia to form another. He arrived in England in 1781, and in the following year went out to Jamaica with the transports carrying the reconstituted Jamaica Regiment, now the 99th Foot, just after Rodney's victory over De Grasse. Peace released him from his military duties, and in 1784 he started again to collect plants, and was soon able not only to restore completely his former unique herbarium of Jamaica plants, but to add several new and undescribed species. He appears to have met and worked with Swartz, who was collecting in Jamaica and other West Indian islands at this time, and who refers to Wright's publications in the *Prodromus* and *Flora Indiæ Occidentalis*. Robert Brown dedicated a genus to him (*Wrightia*) in Mem. Wern. Soc. i. 73 (1809), where he says "I have dedicated to my much respected friend William Wright, M.D., F.R.S. L. & E., whose ardour in the pursuit of botanical knowledge, even while engaged in extensive medical practice in the island of Jamaica, has long entitled him to this mark of distinction."

The Governor of Jamaica, General Campbell, had made Wright Physician-General of Jamaica, but his health had suffered so much from living on the transports with his regiment at Port Royal, that he was obliged to return again to England in 1785. He settled in Edinburgh, and in 1788 he was elected a Fellow of the Royal Society, a Fellow of the Royal Society of Edinburgh, and admitted as a member of the Society of Natural History and of the Royal Physical Society of Edinburgh.

In May, 1787, Wright sent to Banks a paper containing "an account of the medicinal plants growing in Jamaica," for transmission to the editor of the *London Medical Journal*, in which it duly appeared (viii. pp. 217–295) in the same year. This account is reprinted in the *Memoir* (see below) with additional extracts "from Dr. Wright's Herbaria begun in the year 1773 and completed in 1813. . . . The whole work extends to five volumes quarto, and from a notice in Dr. Wright's handwriting, dated Edinburgh, 1st June 1813, it appears to have been carefully revised by him after his return to Great Britain."

In Feb. 1793 Wright wrote to Dr. Gartshore:—"Mr. Lindsay [see Journ. Bot. liii. 106] of Westmoreland, Jamaica, has made several communications to the R. Society of Edinburgh; and two of them, on *Quassia polygama* [*Picræna excelsa* Lindl.], and *Cinchona brachycarpa* [*Exostemma brachycarpa* R. & S.], are in the hands of the printer. At the desire of the Society, and with the author's permission, I have put them in proper order, and prepared them for the press. You may say to Dr. Woodville that I now send him specimens of *Quassia excelsa* of Swartz and Lindsay (my *Picrania amara* [*P. excelsa*] London Medical Journal); also some of the *Cortex Cascarillæ*, gathered by myself [*Croton glabellus* L.]."

In 1795 a considerable armament was to be despatched under Sir Ralph Abercromby for the protection of the West Indies; as the mortality of the troops there was supposed to be owing in part to the want of proper medical aid, special care was taken to send able physicians, and Wright was one of those chosen on account of his ability and previous experience. On arrival in the West Indies Wright had charge of all the military hospitals in Barbados, and he there acquired a large collection of the plants of the Windward Islands. Abercromby in 1797 expressed in general orders his thanks to Wright for his care of the sick, and after the conquest of Trinidad, returned to England. A general order arrived from England for the reduction of the medical staff; Wright took the opportunity to give up his appointment, and in 1798 sailed for Liverpool, and settled again in Edinburgh. In a letter to Dr. Currie in 1799 he says: "I have been very busy with West India and British Fuci. Of the latter I intend sending an assortment for Dr. Pulteney and another for the Linnean Society, which I will beg you to present through Dr. Smith. I am also occupied with ascertaining corallines by the help of Solander and Ellis. In West India corallines my collection is complete."

During the year 1800 Abercromby asked Wright to go as Physician to the Army, of which he was in command on the celebrated expedition to Egypt, but the appointment was declined. In 1801 Wright corresponded with Dr. Currie about the establishment of a Botanic Garden at Liverpool; with reference to the Herbarium, he wrote:—"Dr. Roxburgh at Calcutta has sent home a very large collection of dried specimens, of which I am to have a share. They are to be divided with Sir Joseph Banks, and Mr. A. B. Lambert, Vice-President of the Linnean Society, but I do not expect my proportion until the spring. I have complete specimens of all those which Dr. Roxburgh formerly sent to our Society, at your service." Wright's exertions on behalf of the Garden were gratefully acknowledged by William Roscoe, the founder of the Garden, in his address at its opening. In a letter to Dr. Currie (1802), Wright says :—"I have made some progress with the specimens. I look for a large collection soon from Trinidad and Guiana; but that shall not prevent me from sending you such in the meantime as I can spare."

He died in Edinbugh in the 85th year of his age, 1819.

The above notee are taken from the *Memoir* (1828) written by Dr. Mitchell, which Stokes (*Commentaries*, p. cxxx) says was published by Wright's three nieces "as a memorial of their affection"; the portrait which accompanies the memoir is said by Stokes to be a striking likeness.

The only plants of Wright now in Liverpool are contained in a volume in the Free Public Museums, lent for use in the *Flora of Jamaica* by the courtesy of the Curator, Dr. Joseph A. Chub. It is a small quarto with a MS. title page :—"Plants of Jamaica. By Will^{m} Wright, M.D., F.R.S." and an Introduction by the author, dated 29th May, 1783. It contains about 50 somewhat scrappy specimens of plants of medicinal or economic value, each accompanied by a short popular description, similar to, but differing from, the "Extracts from Dr. Wright's Herbaria" included in the *Memoir*, pp. 246–307. The specimens are arranged according to the Linnean Classes which are indicated by Roman numerals at the head of the page. The Introduction is as follows :—

"Botany is a study of such general importance to Mankind, that no line can be drawn to bound its utility.

"In a commercial country like Britain the advantages will appear great, when we consider, that her colonies and settlements, are distributed throughout every climate of the world, as by this usefull art, the produce of foreign kingdoms may be transferred to our own dominions, whose climate and soil is best adapted for their growth.

"The Botanist exercises his mind in the noblest, because the most usefull of all pursuits. His daily discoveries add to the stock of human knowledge, and his name is transmitted to future ages.

"The author of the following remarks, spent the best of his days in the West-Indies, partly in His Majesties service, and partly in private Practice. He appropriated every spare moment, from the duties of his Profession to Botany; His chief aim was to ascertain the properties of Plants; whether usefull in Medicine, in Commerce, the Arts or rural Œconomy: how far he has succeeded is not for him to say.

"He freely communicates, the substance of his discoveries and researches; and flatters himself, his labour will be of advantage to his native country.

"London 29th. May 1786."

We have been unable to find any further trace of Wright's Herbarium, which must have been an extensive one; and it seems very doubtful whether this volume is one of the quarto volumes referred to in the following note prefixed to the "Extracts" in the *Memoir*, p. 246 :—"The following Extracts are taken from the herbaries prepared by Dr. Wright during his residence in Jamaica. The whole work extends to five volumes quarto, and from a notice in Dr. Wright's handwriting, dated Edinburgh, 1st June 1813, it appears to have been carefully revised by him after his return to Great Britain. Such articles have been extracted only as could be made intelligible without the aid of engravings or of the dried plants themselves, which have all been laid down by Dr. Wright with the greatest care." As indicated above, a large number of Wright's plants are in Banks's Herbarium.

BIBLIOGRAPHICAL NOTES.

LXXXVII. Two Catalogues.

[Kalm, Pehr.] En Kårt Berättelse om Naturliger stället, nyttan, samt skötseln at några wäxter, utaf hwilka frön nyligen blifwit hembragte från Norra America, til deras tjenst, som hafwa nöje, at i wårt Climat göra försok med de sammas cultiverande. [A short statement of the localities, use, with cultivation of certain plants, of which seeds have recently been brought home from North America for the service of those who delight in attempting the cultivation of the same in our climate.]

På Kongl. Vetenskaps Academiens befallning upsatt. [Set up by order of the Royal Academy of Science.]

This small octavo pamphlet of 48 pages has no titlepage, but has a colophon "Stockholm, uplagt på Lars Salvii kostnad, 1751 [issued at Lars Salvius' expense]; the copy before me is of the same size and bound up with sundry copies of the *Lärda Tidningar*, the well-known Swedish scientific journal of the 18th century, of which it is probably a supplement. It begins with a statement that the author has drawn up this account of some of the more useful plants, of which he [Kalm] had brought back seeds from North America:—

"As the result of the command of the Royal Academy of Science I have here delivered a catalogue and short statement on some of the more useful plants, of those whose seeds I have brought with me from North America, where I have travelled under orders from the Royal Academy of Science.

"I have found it necessary to speak briefly about the localities where these plants are found and flourish, so that those who undertake their cultivation, may have certain ground to build upon, and know what soil to provide when following Nature in their culture.

"To avoid prolixity I have only given a few words about their use. Later when I come by God's will to publish my travels that shall be amply supplied with all circumstances.

"There are but few of these plants I myself had occasion to put in hand; I was constantly journeying to and fro to find and to collect seeds; it must therefore be understood that so far as regards cultivation, only a little is from my own experience; I have however diligently noted the ways Nature herself takes. Therefore those of my countrymen who have the wish to try the cultivation of these plants, but have no access to good gardening books may have something to guide them, I have, besides my own reports and experiments, extracted from the excellent English gardener Philip Miller's 'Gardeners Dictionary' the most necessary things he has on certain of the forenamed plants' sowing and care. Mr. Miller can not only rely upon 40 years' experience, if not more, but his book mentioned has both in England and abroad gained general praise and is a jewel and a masterpiece, in the whole of gardening, both in theory and practice it has hardly its equal, so that having it, one can without much harm dispense with all others. I only regret that we in our language have as yet no translation, either of the entire work or at least the most important parts; it has already been translated into both French and German."

The author then speaks of the medicinal plants brought back, which he is presenting to the Academic Botanic Garden; the seeds in succeeding pages of his catalogue may be sown in the forthcoming autumn or following spring; he ends with the hope of leisure time to draw up his account of his recent travels.

The catalogue is alphabetically arranged, beginning with three species of *Abies*, with Miller's names, presumably from the 5th edition of his *Dictionary*, 1747, as the 6th edition did not appear till the following year. In all, 126 numbers are given with comments. A few remarks on the difference between the climate in the Carolinas and that of Sweden, closes the pamphlet. A list of the modern names will be found in Hjelt's *Naturalhistoriens studium vid Åbo universitet*, Helsingfors, 1896, pp. 209–211.

I have failed to find another copy, in the British Museum at Bloomsbury or Cromwell Road, or at Kew. Pritzel does not mention it, nor is it catalogued in the last Library Catalogue of the Linnean Society, 1896. It came to light in preparing the new edition for printing in the near future, amongst the Linnean volumes, bound amongst some numbers of the *Lärda Tidningar*, 1745–52.

[La Serre, Vitalis de.] Catalogue des Plantes d'usage, suivant l'order de leurs Vertus. 68 pages, sm. 8°. [Parisiis, 1737.]

This has no titlepage, but on the top of the page Linnæus has written "La Serre Hortus plantarum officinalium privatus parisiis." This is the copy I noted in my *Student's Guide to the Literature of Botany*, p. 31, as follows:—"The only copy known to me wants the titlepage; it commences with page 1.... It quotes Boerhaave's 'Index alter' 1720, so must be somewhat later than that."

As this little volume came again into consideration for the new book-catalogue of the Linnean Society, its author naturally was the object of enquiry. There was a Dr. La Serre, spoken of by Prof. T. M. Fries, as a physician and naturalist and an intimate friend of the Jussieu family (*Linné*, i. p. 246). At a later date he is mentioned by Bernard de Jussieu in a letter to Linnæus, 20th July, 1740, as "... our friend the good Father La Serre...," printed in Sir J. E. Smith's *Correspondence of Linnæus*, ii. 212, and again on p. 216, "Father La Serre, the former companion of our journey embraces you with all his heart"; finally on p. 218 we find "the botanical surgeon La Serre embraces you with both arms."

Mr. Spencer Savage has found a MS. entry in an interleaved copy of Linnæus's *Bibliotheca botanica*, 1736, which supplies further information, thus:—"de Laserre, Vitalis. Habuit hortum officinalium parisiis. Catalogus pl. usualium. Paris, 1737, p. 60. Gallico-latine."

B. Daydon Jackson.

SHORT NOTES.

"Some Little-known Botanists." Under this heading Mr. W. Roberts, who has done so much to throw light upon the history of obscure authors, published a paper in the *Gardeners' Chronicle* for March 29, 1919 (p. 147) which contains certain names which find no place in our *Biographical Index.* The information Mr. Roberts was able to supply was so scanty that it will hardly entitle the claimants to a place in the new edition of the *Index*, which still awaits the reduction of printing and binding charges in order to be produced at reasonable cost; but it may be worth while to give a list of them, in the hope that some one may be able to afford such additional information as will justify their admission. One of them, Dr. Thomas Clarke (d. 1792), of whom Mr. Roberts gives much information, had already been noted by us for inclusion on the ground of his official position as first Island Botanist of Jamaica, although Mr. Fawcett has no knowledge of his having done any strictly botanical work; but of the others I know nothing beyond what is indicated by the slight information given by Mr. Roberts:—

Charles Chemys, Professor of Botany, Trin. Coll. Dublin (d. Dublin, 1733).

Thomas Brisbane, Professor of Botany and Anatomy at Glasgow (d. 1742).

John Wodrow, "a celebrated botanist," of Glasgow (d. 1768).

Thomas Hamilton, Emeritus Professor of Anatomy and Botany at Glasgow (d. 1782).

Rev. Thomas Green, Professor of Botany at Cambridge (d. 1788).

Dr. Moze, "a learned antiquary and botanist" (Gent Mag.: d. 1733).

In Gard. Chron. Dec. 15, 1917 (p. 235) Mr. Roberts published an interesting paper on "Some 17th and 18th Century Gardeners," "the information in which was largely taken from the six large octavo volumes published by the Harleian Society from 1899 to 1901, and generally known as Musgrave's *Obituary*." In his later paper he extended the scope of his notes and included botanists, among whom are the names above given.—James Britten.

An Early Hudson Bay Collector (p. 239). In reference to the plants collected in the Territories of the Hudson Bay Company in 1773, and now in the Banksian Herbarium, I had no idea that any such plants existed. They were collected by one Thomas Hutchins, a chief-factor in the service of the Hudson Bay Company, who visited England in or about the year indicated, bringing with him the manuscript of a volume entitled "Observations on Hudson's Bay," which is still preserved in the Library of the Company at its London offices. I have long been interested in this volume, which gives a long and valuable account of Hudson Bay, its history, natives, trade, climate, fauna, flora, etc. Many years ago my friend Mr. Ernest Thompson Seton and myself were permitted to have a copy made of it, with a view to its publication under my general editorship, and the help of a specialist in each department of knowledge treated. Unfortunately however, the work, though nearly ready for publication, has not yet been issued. On the outbreak of war, I sent the MS. to Mr. Seton in New York, where he is arranging for its publication. With this volume, Hutchins must have brought some small collections of specimens, including the plants in question; for there is, in the Fish Galleries at the Museum, at least one fish (the type-specimen of some well-known species, if I recollect rightly); and, in the Bird Galleries, there are, I believe, several birds of his collecting. Doubtless before Hutchins returned to Hudson Bay he either sold or presented these collections to Banks. In regard to the plants: it would probably be found, if one referred to Hutchin's MS., that all, or most of them, are described in the botanical section thereof. In the editing of this, I was assisted by the late Prof. John Macoun, of Ottawa, who identified, so far as was possible, the species mentioned by Hutchins; the latter was not in any sense a scientific (scarcely even a popular) botanist.—Miller Christy.

Orchis elodes Grisebach. After the appearance of Col. Godfery's article (Journ. Bot. 1921, p. 305), we thought the identity of *O. elodes* with *O. ericetorum* Linton, might be finally tested, if we could procure living specimens from Bourtanger Moor, on the Ems, whence Grisebach's specimens were taken. This attempt failed, as M. Sipkes, of Haarlem, who visited the moor in two separate seasons, tells us that it was drained during the war, and the orchids have disappeared. Dr. Schlechter, of Berlin, sent some dried specimens of *O. elodes*, which might pass as *O. ericetorum*; but the most conclusive evidence was a very clear photograph of several specimens, which M. Sipkes sent from Holland, that are certainly identical with the British *O. ericetorum*. We thought this brief note might be useful, though we do not wish to pronounce on the question of nomenclature. We note that Mr. A. J. Wilmott, in the Appendix to his addition of Babington's Manual, divides British *O. maculata* into (a) *O. ericetorum* Linton, and (b) *O. Fuchsii* Druce, very much as we did in this Journal for May 1921 (pp. 121–28).—T. & T. A. Stephenson.

Comma between Name and Authority (p. 261). I was surprised to read Dr. Barnhart's remark that, as far as he was aware, the comma in this place had never been used outside the British Empire, except by Asa Gray and those who followed his example. Unfortunately I possess only a very small botanical library at hand, but I notice the comma used in two books by authors, neither of whom can be accused of British provinciality—Wallroth's *Annus Botanicus* and Agardh's *Systema Algarum*. From these two examples, which I happen to possess, I cannot help thinking there must be many more. Those of us who advocate the use of the comma may I think fairly claim the many authors who used a full stop or enclosed the authority in brackets as supporters of the view that there should be something to separate the name from the authority, to show that the latter is no part of the name.—James Groves.

Tolypella hispanica Nordst. in France. When at Hyères in May last I found this species, in small quantity, in a shallow muddy ditch in the Presqu' Ile de Giens. In spite of the cloudy water and the presence of infesting algæ, the male plants were conspicuous by the very large bright-coloured antheridia. It occurred in company with *T. glomerata*, *Lamprothamnium papulosum*, *Chara canescens*, and *C. galioides*. So far as I know, it has not hitherto been recorded from France, though known to occur in the south of Spain, Algiers, and Tunis.—James Groves.

REVIEWS.

The Botany and Gardens of the James Allen's Girls' School, Dulwich: their History and Organisation. [By Lilian J. Clarke.] Board of Education Educational Pamphlets no. 41. 8vo, wrapper, pp. 52, illustrated. H.M. Stationery Office: 2*s*. net.

"The Botany Gardens at the James Allen's Girls' School were begun in 1896, and, as far as we know, this School was the first Secondary School in England to possess Gardens which were placed in charge of the pupils and used for the purpose of teaching botany rather than as a means of studying horticulture." Thus begins the Introduction to this most interesting little book, which contains a history of the development of the Gardens from the beginning, in 1896 to the end of 1915—the publication was delayed owing to the War. At first they consisted solely of Natural Order beds, but the scheme gradually developed and extended until in the space of about an acre it was found possible to arrange plots showing the characteristic features of salt marsh and sand dune, lane, wood, pond, and heath, with plots for pollination experiments, vegetable gardens, and order beds. It is difficult to believe that such varied aspects of vegetation could be adequately displayed in so small a space; but an inspection of the illustrations and still more of the photographs which we have been privileged to see, shows that what might have seemed impossible has been adequately accomplished.

The Report, the perusal of which cannot be too strongly recommended to all interested in ecological study, and indeed to all interested in education, contains a full account of the establishment and development of the respective plots, with information as to the localities whence the soils and plants were derived and complete lists of the species.

The soil and plants were not always acquired without difficulty—for example, the soil for the first salt marsh (1905) was obtained from near Gravesend, where it was arranged with a workman to put some of the soil in sacks and send it to Dulwich by train; the second salt marsh came from Burnham-on-Crouch; "in it were sods containing such characteristic plants as *Salicornia herbacea*, *Statice Limonium*, *Atriplex portulacoides*, *Glyceria maritima*; before the soil could be removed permission of several authorities had to be obtained." Of the scientific value of the Gardens the salt marsh affords an instance: "Dr. E. Marion Delf, one of our 'old girls' came here to finish a piece of research work on transpiration in salt-marsh plants, for which she obtained the degree of Doctor of Science."

It is pleasant to read of the interest which the pupils themselves have shown in the development of the scheme by collecting living plants, by experiments in various directions *e. g.* in the study of soils, and especially by experiments in pollination, carried on from 1910, the results of which are given in an appendix. Of the enthusiasm with which the work has been carried on, some idea may be gained from the fact that the school is for day students, and that the botanical experiments and observations are made in addition to the ordinary school curriculum. It may further be noted that it was not until 1912 that any grant for this special work was received from the Board of Education; before this, 160 girls were in charge of the Gardens, and most of the undertakings now carried on had been set on foot. From 1912 to 1915 the regular staff for botany and elementary chemistry consisted of three science mistresses and one assistant in the Gardens.

In conclusion we cannot refrain from expressing our surprise at the scanty recognition which is made of the work of Miss Lilian J. Clarke, the head of the Science Department of the School, to whom we are indebted not only for the establishment and organisation of the Gardens, but for the Report. Her name indeed is given at the end of this (p. 38), but it appears neither on wrapper nor titlepage and is not even printed at the end of the introduction, for which we believe she is responsible. The omission is, we presume, accidental; but it is to be regretted that the Board of Education should not give full credit to the author of so excellent a piece of work.

Shakespeare's Garden, Stratford-upon-Avon. By ERNEST LAW, C.B. With illustrations. 8vo, cloth, pp. 34. London: Selwyn and Blount. Price 3*s*. 6*d*.

MR. ERNEST LAW, the historian of Hampton Court, is one of the Trustees of Shakespeare's Garden at Stratford-on-Avon, and in that capacity has given us an attractive little book—whose title, by the way, was preoccupied by a not very satisfactory book about Shakespeare's flowers by Sidney Beisly, published in 1864—in which he gives an account of what has been done in the way of planting of the piece of ground attached to the house called "New Place." The ground was acquired by public subscription in 1862, perhaps the worst period of gardening taste, in compliance with which it was laid out; but in 1919 the Trustees decided to replace this with something more in keeping with Shakespearean traditions. They collected old-fashioned flowers from "the gardens of mediæval castles mentioned in the plays, and from some which were probably well known to Shakespeare, such as Warwick Castle and Berkeley Castle . . . . The owner of Cobham Hall sent specimens of the famous 'Cobham Rose,' known to have been grown in the garden there for four or five hundred years . . . . from the gardens of all the Royal palaces which were known to Shakespeare, the same sorts of flowers as grew in them when he visited them have been forwarded to Stratford-upon-Avon." Kew, of course, has not been backward in helping both with counsel and with contributions; and children of the "East End," Mr. Law tells us, have subscribed "for the purchase of favourite flowers of the dramatist, whose plays they have so often witnessed with delight at the 'Old Vic' and elsewhere"—a remark which suggests that Mr. Law is imperfectly acquainted with London topography.

With such help, it seems strange to read that of Sweet Briar "a few score would still be very welcome; also hundreds if not thousands of Violets—not the scentless giant freaks of importing foreigners—nor the cranky mongrels of experimentalizing, hybridizing, soul-less scientists and enterprising nurserymen, but our own sweet simple English Violets." Mr. Law mars the little volume by writing of this kind, and by a stupid diatribe against "horrid absurd uncouth Latin names": he is better employed in describing the long borders and flat beds, the knott garden, and the old designs, which have been, or will be, carefully followed—the illustrations from various sources are an attractive feature of the book. We venture, however, to doubt whether the hope that on the "wild bank or heath" "every species known in Shakespeare's time will eventually find a place" is capable of fulfilment; this and the gloss "oxlips" appended to Bacon's "het ground set with violets and primroses" suggest that Mr. Law, like Shakespeare, "did not trouble himself much about botany"—what, by the way, does he mean by saying that "Harrison's giant musk has entirely robbed the old common musk of our gardens of its delicious fragrance"? All the same, he has given us a pretty little volume.

The Determination of Lichens in the Field. By W. WATSON, D.Sc. Reprinted from the 'Journal of Botany.' Taylor & Francis. 28 pp. Price 2*s.* net.

As the study of Ecology advances, a knowledge that goes beyond Phanerogams becomes imperative. Plant successions and associations may, and often do, include a large and varied number of cryptogams—hepatics, mosses, lichens &c.; and the need of some method whereby these plants may be readily recognised in the field has become insistent, even though detailed knowledge may not be desired. Dr. Watson, in this publication, has met the demand, as far as lichens are concerned, by providing a simple (though artificial) key to the genera and even in some cases to the species, based on easily distinguished characters; helpful notes are also given. His one aim has been that of ready identification, and an examination of the key gives the assurance that he has succeeded. The "compleat botanist" should be more or less familiar with all forms of plant life, and Dr. Watson has surely earned his gratitude by enabling him to overcome the preliminary difficulties of lichenology, especially if time and circumstance forbid more extended study.

A. L. S.

BOOK-NOTES, NEWS, ETC.

THERE has long been a muddle in the United States over the common Polypody; and we have to thank Mr. M. L. Fernald for setting the matter straight by his careful investigations of *Polypodium virginianum* and *P. vulgare* (*Rhodora*, xxiv. 1922, pp. 125–

142). The eastern American plant has always been assumed to be the same as the European *P. vulgare*; while the western or Pacific Coast plant has acquired quite a number of specific or varietal synonyms. But, as Mr. Fernald's research proves, it is the Pacific plant that is inseparable from the variable *P. vulgare* of Europe, "in view of the similarly stout and firm, sweetish rhizome with peltately attached scales of similarly dense structure, the identical fronds with often very broad pinnæ (up to 1·8 cm. and rarely to 4 cm.) bearing medium sori, the clearly intergrading venation, and the predilection for living on dead trees, stumps, and mossy logs." It is distributed over "Europe and adjacent Asia and North Africa; Atlantic Islands; Alaska to Lower California, Arizona, and New Mexico"; and its synonymy includes *P. californicum* Kaulf., *P. intermedium* Hook. & Arn., *P. falcatum* Kellogg, *P. Glycyrrhiza* D. C. Eaton, *P. hesperium* Maxon, *P. occidentale* (Hook.) Maxon, which more or less accord with its main varieties. The eastern plant, on the other hand, varies but little; it is the *P. virginianum* of Linnæus (1753); it grows on shaded rocks and banks, seldom on trees, and it ranges from Newfoundland and Manitoba southwards to the mountains of northern Georgia and Alabama, Illinois, and eastern Missouri. It is characterised by having a rhizome rather soft and spongy, and not sweet, the scales of which are darkened on the back, loosely cellular, thick-walled, and at base cordate; the frond about half as long, one-third as wide, with pinnæ more regularly alternate, and narrow, and with sori nearly marginal.—A. G.

No. LXIII of *Contributions from the Gray Herbarium* contains Mr. M. L. Fernald's account of the Gray Herbarium Expedition to Nova Scotia in 1920, which has been appearing serially in *Rhodora* during 1921–2. The first part is a brightly written and interesting "Journal of the Expedition," during which "17,000 sheets of carefully prepared specimens representing 3,000 numbers" were collected, and is followed by an account of the noteworthy vascular plants obtained: "although the detailed results cannot yet be stated, it is now safe to say that of the indigenous vascular flora of siliceous Southwestern Nova Scotia, approximately 150 out of the 1800 known species are either isolated from the more continuous coastal plain flora of the South or are endemic derivatives from it." The second part contains an account of the more noteworthy plants collected, with critical notes, often of considerable length, on species of *Potamogeton*, *Panicum*, *Carex*, *Juncus*, *Polygonum*, *Atriplex*, and *Rubus*. We note that Moss is followed in his adoption of *A. glabriuscula* Edmonston in place of *A. Babingtonii* Woods, and its distribution in America is given. Two new species—*Lophiola septentrionalis* and *Antennaria appendiculata*—and several new varieties are described; a hybrid between *Drosera longifolia* and *D. rotundifolia*, given as new, has, we think, been previously published.

The *Transactions of the British Mycological Society*, vol. vii. part 4 (10*s*. 6*d*. n.), contains an account of last year's Spring Foray at Haslemere, with a list of the fungi and lichens found there; a couple of papers by Professor A. H. R. Buller—one, "the Basidial and Oidial Fruit-bodies of *Dacryomyces deliquescens*," in which it is held that the oidial form is *Dacryomyces stellatus* Nees: the other on "Slugs as mycophagists" with a somewhat lighter touch; Dr. B. D. MacCallum gives an account of some wood-staining fungi, and incidentally confirms Münch's suggestion that *Graphium penicillioides* Corda is a stage in the life-cycle of *Ceratostomella Piceæ* Münch; Dr. R. B. St. John Brooks, the curator, writes on the "National Collection of Type Cultures" housed at the Lister Institute (see Journ. Bot. 1921, p. 272); Mr. A. R. Sanderson has notes on Malayan Mycetozoa, containing much of ecological interest, and also a note on the parasitic habits of the plasmodium of *Physarum viride* var. *rigidum*; Miss Irene Mounce continues her studies in "Homothallism and Heterothallism in the genus *Coprinus*"—the problem is extremely complicated and the simple (+) and (−) sex theory apparently does not hold in the Basidiomycetes as it is generally assumed to do in the Mucorineæ; Mr. W. J. Dowson writes on the symptoms of wilting of Michaelmas Daisies produced by a toxin secreted by a *Cephalosporium*, in which he clearly shows that the wilt is not due to the blocking of the xylem vessels by hyphal masses, but rather to the action of a crystalloid toxin carried up by the transpiration current; Dr. H. Wormald describes a discomycete found on mummied Medlar fruits and regards it as *Sclerotinia Mespili*, though there are slight differences from Schellenberg's account; Dr. Bayliss-Elliott continues her series of studies in Discomycetes. The part contains two plates and several text-figures.—J. R.

The third part of vol. xxiv. of *Contributions from the U.S. National Herbarium* contains a key to the genus *Diplostephium*, by Dr. S. F. Blake: 41 species are recognised, of which 13 are new—the latter are fully described, the diagnostic characters of the others being given. Of eight of the new species there are excellent figures reproduced from type specimens. In part 4 of the same volume Dr. Blake gives a list of the native names of plants of Eastern Guatemala and Honduras, based on the data and specimens collected by the botanists and foresters of the Economic Survey Mission of 1919, with notes on the uses of the plants. The Latin and vernacular names are conveniently arranged in one list, with cross references from the latter to the former. Some of the uses are rather curious—*e.g.* the fruit of *Clusia utilis* Blake—one of the new species collected during the expedition—"cut across, is used by the Indians to stamp clothes, making a 6 or 7-rayed starlike figure of a permanent brown or blackish brown."

We have more than once called attention to the exceedingly useful summaries of "Recent Advances in Science" which appear in the quarterly review—*Science Progress*—edited by Sir Ronald Ross: for "Botany" Dr. E. J. Salisbury is responsible, "Plant Physiology" being treated separately by Prof. W. Stiles. We note with satisfaction that the page-headings, which hitherto have been confined to the title of the Review, now relate to the subject-matter appearing below them—a reform for which we have pleaded more than once;

we are not without hope that some day the *Kew Bulletin* will provide its page-headings with something more informing than the number of the page, which from the first has occupied the centre.

THE *Proceedings of the Royal Society of Queensland* (xxxiv. no. 1; Aug. 25) contains a "Contribution to our Knowledge of the Flora of Papua (British New Guinea)," by C. T. White, F.L.S., Government Botanist of Queensland. The collections on which the paper is based were made by the author in 1918; the enumeration is preceded by general notes on the vegetation and a brief history of botanical work in Papua, which began with Macleay's collections in 1875; a useful bibliography is appended. Numerous new species are described: Mr. White has had the help of Mr. Spencer Moore in the *Rubiaceæ* and *Acanthaceæ*; the *Marantaceæ* and *Zingiberaceæ* have been undertaken by Mr. H. N. Ridley.

THE *Kew Bulletin* (no. 7) contains a revision of the South African species of *Dianthus* by Mr. Burtt Davy: seventeen species are enumerated, of which five are new. We note that Mr. Davy recognises the identity of *D. incurvus* Thunb. (1794) with *D. albens* Ait. (1789), but retains Thunberg's name on the ground that as it "has been familiar to students of South African botany for sixty years, no good purpose would be served by restoring Aiton's name." This is the old "plea of convenience" which we thought had been abandoned.

INCLUDED in the current number of the *Bulletin of the French Mycological Society* (Tome xxxviii. Fasc. 2, 1922) are an obituary notice of Emile Borquelot, the well-known pioneer of investigation of the chemistry of fungi, and five papers on the subject of fungus poisoning. Dr. L. Azoulay has three papers: two on measures for preventing fungus-poisoning, including a proposed new law, and one contradicting erroneous assertions in books and newspapers on the edibility of fungi. Dr. J. Offner contributes an account of poisoning by dried fungi, and Drs. Dalmier and Oliveau a report of three simultaneous cases of poisoning by *Amanita pantherina*. An interesting contribution is that by L. Dufour on the prolific appearance of certain fungi after a forest fire.—J. R.

MR. WILLIAM R. MAXON (Contrib. U.S. National Herbarium, vol. xxiv. Washington: 1922, pp. viii. 33–63, 10 plates) in the seventh of his *Studies of Tropical American Ferns* publishes a valuable revision of the North American species of *Alsophila* of the subgroup *A. armata* with a key and four species. Other items of interest are:—a singular new *Alsophila* from Panama; notes on *Dicranopteris*; the Jamaican species of *Cheilanthes*; two new species of *Polystichum* from the West Indies; *Atalopteris*, a new genus of dryopteroid ferns from the West Indies; three new species of *Dryopteris*, subgenus *Stigmatopteris*. *Atalopteris* Maxon and Christensen, is characterised by dimorphic fronds, and is nearly related to *Psomiocarpa* Presl and to *Ctenitis*, a subgenus of *Dryopteris*. It contains but two species.—A. G.

Mycologia for September contains the first part of "Studies in Tropical Ascomycetes," by F. J. Seaver; the "Life-history of an undescribed Ascomycete isolated from a granular Mycetoma of Man," by C. L. Shear; the first of a series of "Notes on Some Species of *Coleosporium*," by G. C. Hedgcock and N. R. Hunt; the fourth part of a paper on Dark-spored Agarics, by W. A. Murrill; "*Urocystis agropyri* on Redtop" (*Agrostis alba* L.), by W. H. Davis; and some "New Japanese Fungi," by T. Tanaka.

Phytopathology for August includes a paper on the relation of hydrogen-ion concentration to germination of stem rust of wheat by C. R. Hursh, some notes on chemical injuries to the eastern White Pine (*Pinus Strobus* L.) by W. H. Snell and M. N. G. Howard, and a paper on lightning injury to *Hevea brasiliensis* by C. D. La Rue.

The Department of Botany of the Field Museum of Natural History, Chicago, have issued three well-produced and illustrated intensive yet popular pamphlets on "Figs," "The Coco Palm," and "Wheat."

The *Journal of the Linnean Society* (Botany, xlvi. no. 306: Sept. 30) contains an exhaustive paper by Mr. Miller Christy on "The Pollination of the Primrose." Mr. James Groves gives an account of Ceylon Charophyta, obtained by Mr. T. B. Blow, who has collected them largely in all parts of the world; twelve species are enumerated, two of which (*Nitella mucosa* and *N. leptodactyla*—the latter admirably figured by Miss Groves)—are new. Sir William Herdman gives a "Summary of Results of Continuous Investigation of the Plankton of the Irish Sea during Fifteen Years." No. 307 (Oct. 29) contains "Critical Studies of Coal-measure Plant-impressions" by the late E. A. Newell Arber, with 8 plates, and the Hooker Lecture for 1922 by A. C. Seward "A Study in Contrasts—the Present and Past Distribution of certain Ferns," with 4 plates.

The *Journal of the Royal Horticultural Society* (xlvii. parts 2 and 3; September) is somewhat lacking in papers of special botanical interest. Mr. E. J. Holland, President of the Rose Society, has an interesting paper on Scented Roses; Dr. W. Bewley writes on Tomato Diseases; and Mr. H. E. Luxmoore has a charming account of a rare Latin poem—title not specified—on Gardening, by Walafred Strabo, a monk of Weissenburg, written about 800 A.D., which deserves a place in one of our literary magazines, although its subject entitles it to its present position.

Corrections. By an unfortunate misprint, Mr. H. W. Pugsley's name is misprinted "Rigsley" at the end of the note on *Ophioglossum* on p. 301. Mr. C. H. Wright points out to us that the statement (p. 274) that Winchester is not on the G.W.R. is incorrect: a line from Didcot to Winchester through Newbury was constructed about thirty years ago. The Messrs. Stephenson send a similar correction and mention that they have seen *Senecio squalidus* in great plenty on mine-tips near Wrexham.

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LATE SENIOR ASSISTANT, DEPARTMENT OF BOTANY, BRITISH MUSEUM.

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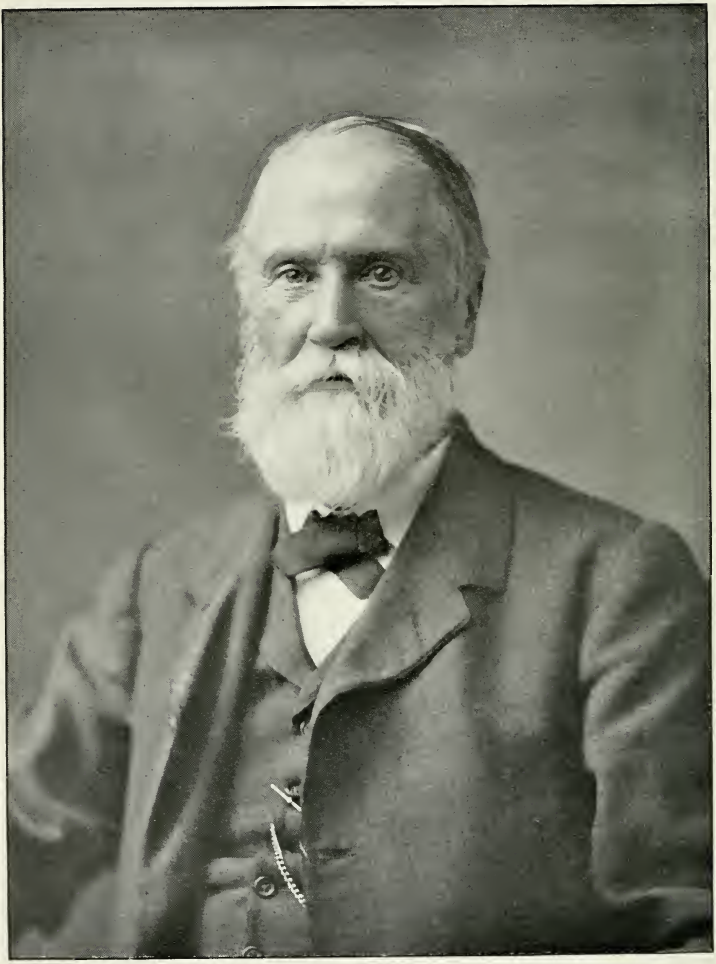

WILLIAM CARRUTHERS

1

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Will F. Taylor photo. C. E. S. anal.

STATICE ANFRACTA C. E. Salmon.

NOTES ON STATICE *.

By C. E. Salmon, F.L.S.

XIV. Statice anfracta, sp. nov.

(Plate 565.)

Amongst some *Statices* sent me for examination by Dr. A. Ginzberger of the Botanic Garden, Vienna, were three or four sheets of a plant from the coast of Dalmatia which I have been unable to place satisfactorily under any species known to me. Whilst recalling *S. remotispicula* in some respects, it seemed impossible to group these examples under that plant, and its original describer, Mr. C. C. Lacaita, agrees that I should describe the Dalmatian form as a new species.

Statice anfracta, sp. nov.

Planta altitudine mediocri, glabra, scabridula; *folia parva*, coriacea, obovato-oblonga in petiolum longe attenuata, apice obtusa vel rotundata, *ob marginem revolutam* in sicco apice pseudo-retusa. Scapus 23–33 cm. altus, *a basi ramosus, valde anfractuosus*; rami numerosi *divaricato-patuli, inferiores plurimi steriles.* Spicæ *laxifloræ breviusculæ, ascendenti-patentes vel arcuato-reflexæ*, spiculis inter se *valde remotis.* Bractea media quam exterior circa sesquilongior, interior quam exterior $2\frac{3}{4}$-*plo longior*; calyx circa 5 *mm. longus*; corolla circa 4 mm. diametro.

Root perennial, woody. *Plant* of moderate height, glabrous, ±scabrid. *Leaves* small (compared with scape), 1-veined, coriaceous, "spongy" above when dry, obovate-oblong tapering into a petiole about as long as lamina, apex obtuse or rounded, when dry often pseudo-retuse on account of the revolute margin. *Scape* 23–33 cm. high, ±erect, noticeably zig-zag, branched from the base. *Branches* many divaricate-patulous; lower sterile branches numerous, the lowest simple, ±patent. *Spikes* lax-flowered, rather short, ascending-patent or arcuate-reflexed. *Spikelets* 1–2 (3) flowered, remote from one another. *Outer bract* c. $1\frac{1}{2}$ mm. long, almost 2 mm. broad, triangular-ovate, ±acute, herbaceous in lower half with an apiculus, remainder membranous, glabrous. *Middle bract* $2\frac{1}{3}$ mm. long, c. $1\frac{1}{2}$ mm. broad, oblong-ovate, apex ±rounded or notched, hyaline with two veins, glabrous, about half as long again as outer bract. *Inner bract* 4–$4\frac{1}{4}$ mm. long, $2\frac{3}{4}$–3 mm. broad, oval, obtuse, with broad membranous margin, herbaceous portion apiculate, glabrous, about $2\frac{3}{4}$ times longer than outer bract. *Bracteole* 1, $2\frac{2}{3}$ mm. long, c. $1\frac{1}{2}$ mm. broad, irregularly oblong-obovate, apex rounded or notched, hyaline with veins, glabrous. *Calyx* c. 5 mm. long, very slightly curved, infundibuliform, pedicelled (c. 1 mm.), membranous and dilated about 3 mm. from base; calyx-lobes c. 1 mm. long, ovate, ±obtuse, with tube-veins not reaching apex; calyx irregularly hairy (more densely so near base) on ribs and spaces with ascending hairs from base to about halfway up calyx (including lobes); one side of calyx usually quite glabrous. *Corolla* about 4 mm. in diameter.

* See Journ. Bot. 1903, 65; 1904, 361; 1905, 5, 54; 1907, 24, 428; 1908, 1; 1909, 285; 1911, 73; 1913, 92; 1915, 237, 325; 1917, 33.

The nearest ally of this plant seems to be *S. remotispicula* Lacaita, but it may be separated from that by its whole habit being more divergent, its numerous sterile branches, its more zig-zag scape with branches more spreading, its ±patent and shorter spikes, its larger spikelets and bract proportions. From the numerous forms of *S. virgata* distinguished by its revolute-margined leaves, smaller and less curved and lighter-coloured spikelets, bract proportions etc.

Distribution. Jugo-Slavia. Dalmatia. Kürste bei Cannosa N.W. von Ragusa! 1906, A. Ginzberger and R. Wettstein. Dr. Ginzberger writes: "Cannosa is the Italian name of a village whose South-Sclavian name is Treteno: it is situated on the eastern coast of the Adriatic, thirteen kilometres to the north-west of Ragusa. The coast-rocks which the *Statice* inhabits fall steeply to the sea and consist of limestone."

Explanation of Plate 565.

1. *Statice anfracta* C. E. Salmon; 2, outer bract; 3, middle bract; 4, inner bract; 5, bracteole; 6, calyx—all enlarged four times.

ANTITHAMNIONELLA, A NEW GENUS OF ALGÆ.

By Lilian Lyle, F.L.S.

In October 1921 I gathered in Guernsey an epiphytic alga belonging to the *Rhodophyceæ*, which proved very puzzling. The plant branches alternately and bears in addition whorls of small ramuli at each joint, thus indicating affinity with *Antithamnion*. Farlow, indeed, in his *Marine Flora of New England* (p. 121), had used the presence of these whorls as a distinction between that and *Callithamnion*; the filaments of *Antithamnion*, he says, "are of two kinds, the main filaments being indefinite and the branches definite, so that we have indefinitely elongating stems clothed with short definite branches, or, to use the expression of Nägeli, with leaves."

The triangular division of the tetraspores, however, distinctly excludes the Guernsey plant from *Antithamnion*. With *Callithamnion* and *Spermothamnion* it agrees in the triangular division of the tetrasporanges, but from the former it is separated by the verticillate character of the ramelli, the absence of cortication in the older parts, and the presence of discoid rhizoids; from *Spermothamnion*, though it agrees in the possession of discoid rhizoids, it differs in the mode of branching and shape of tetrasporanges; the general character of the species of this genus is more rigid and lax than that of the alga in question.

It is difficult to account for the presence of this alga in British waters. The only plants approaching it in appearance or structure belong to the Southern Hemisphere, S. Africa, and Cape Horn. *A. sarniensis* belongs probably to some region hitherto unworked for algæ, and has travelled to the shores of the Channel Islands by one or other of the means of dispersal possible for algæ—*i. e.* currents, ships, intestines of birds, packing, etc.

Two rather small algæ, which resemble the new plant very closely, both in structure, verticillate nature of small branches, and character of the tetrasporanges—*Antithamnion ternifolium* and *A. verticillatum*, both from the Southern Hemisphere, doubtfully referred by De Toni to *Antithamnion*, probably on account of the two kinds of branching. These and the plant from Guernsey possess a combination of characteristics which, though agreeing in one or more points with *Callithamnion*, *Spermothamnion*, and *Antithamnion*, do not conform completely to any of the three. I propose therefore to unite these plants under a new genus, *Antithamnionella*, on account of the verticillate arrangement of the smaller branches round a central axis; only those algæ with verticils of simple ramelli have been included. Of this the following is a description:—

Frons cæspitosa, filamentosa, articulato-monosiphonia, alterne

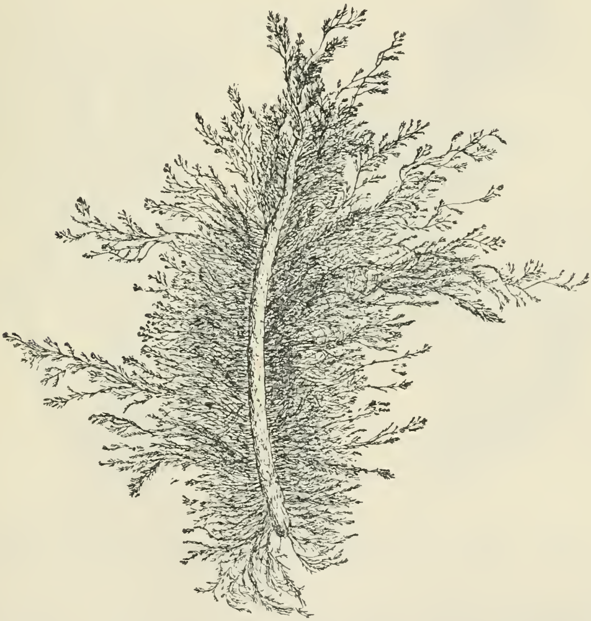


Fig. 1.—*Antithamnionella sarniensis* Lyle. × 2.

verticillatimve et fasciculatim ramosa, ramis iterum repetite divisis et sub-divisis. Cystocarpia bilobis.

Plants monosiphonous and filamentous, with irregular alternate and indefinite ramification. Whorls of 2 to 4 ramelli at each joint crowded towards the extremities. In the whorls of the older portions, one or more ramelli are occasionally replaced by discoid rhizoids. Tetrasporanges solitary, ovoid, sessile on inner angles of ramelli, triangularly divided. Cystocarps bilobed.

1. **A. sarniensis**, sp. n. Frons pellucide articulata, fastigiata, erecta, ecorticata, tenui-filamentosa, repetite secunde lateraliter ramosa ramulis fasciculatis.

About 1–1½ inch in height; epiphytic on other algæ; an exceedingly beautiful and delicate plant of a deep rose-red; first found in fine fruiting condition Oct.–Dec. 1921, in great abundance in almost every rock-pool at about half-tide; later on it was less plentiful, but doubtless persisted through the winter, as fully-grown sterile specimens were gathered in May (Fig. 1).

The main branches are widely divergent, giving off at first irregular and then alternate secondary branches from below the articulations. Each joint bears 2–3, rarely 4, ramelli, any one of which may in turn develop into a branch of indefinite growth. Towards the

Fig. 2.—*Antithamnionella sarniensis.* × 45.

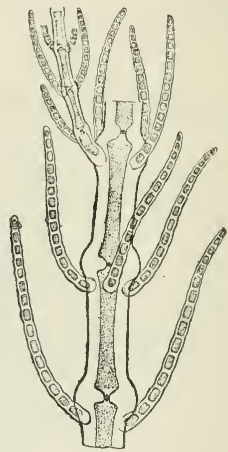


Fig. 2 *a*.—*Antithamnionella sarniensis.* Verticils with 2–4 ramelli. × 100.

extremities the whorls become very dense and ocellate in appearance; the branches are obovate in outline and tufted or plumose (Figs. 2, 2 *a*).

The older portions of the stem are naked or clothed with 2, rarely 3, ramelli, $10\,\mu \times 18\,\mu$, and about $230\,\mu$ in length, any of which may be replaced by a discoid rhizoid. The rhizoids are non-septate, irregular in outline, and almost colourless (Fig. 3).

The cells of the main branches measure $190 \times 60\,\mu$–$70\,\mu \times 50\,\mu$. The cell-membranes are pellucid, extremely thick, and laminated; in the oldest parts of the plant they vary from a quarter to nearly equal the diameter of the central lumen—12 to $15\,\mu$. The joints are perforated, a distinct pore is visible on each side of the septum.

Cystocarps and antheridia have not yet been observed. The sessile tetrasporanges are borne on the upper branches at the bases of, and in the inner angles of, the verticils. They are ovoid, divide triangularly, and measure $40\,\mu \times 30\,\mu$–$25\,\mu \times 30\,\mu$ (Fig. 4).

To the naked eye the plant has a speckled appearance, owing to the pellucid nature of the joints and the concentration of colour-matter in the verticils.

2. Antithamnionella verticillata, nov. comb., is a fragile little plant from South Africa, 6–9 millimetres in length. The branching is alternate, with whorls of 4 ramelli at each joint; the stems have the same speckled appearance as *A. sarniensis* (Fig. 5). The cells of the main stem measure $65\,\mu \times 18\,\mu$–$90\,\mu \times 20\,\mu$, and the

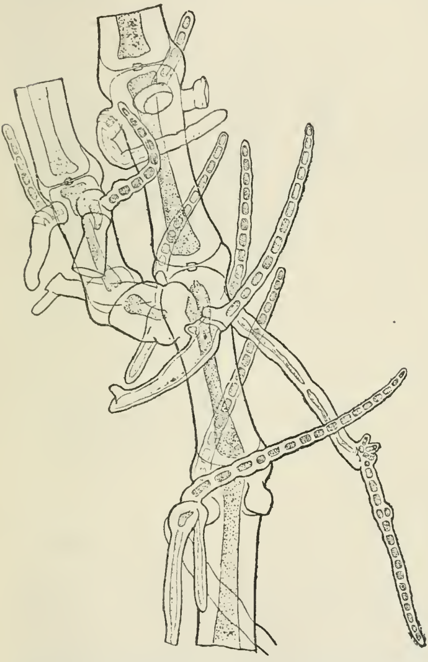


Fig. 3.—*Antithamnionella sarniensis.* Cells of main stem, showing rhizoids and ramelli. × 100.

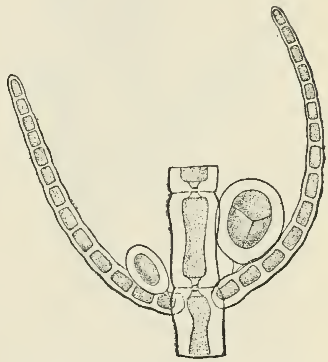


Fig. 4.—*Antithamnionella sarniensis.* Tetraspores. × 200.

ramelli of the verticils measure $155\,\mu \times 20\,\mu$. The tetraspores are sessile in the upper axils of the whorls, and measure $30\,\mu \times 50\,\mu$; they divide triangularly.

De Toni's description and references (Syll. Alg. iv. 1413; 1903) are as follows:—

"*Antithamnion? verticillatum* (Suhr). *Callithamnion verticillatum* Suhr in *Flora*, 1840, p. 290, J. Ag. Sp. ii. p. 34, Epicr, p. 28. Filo primario simplici ad geniculum quodque ramis 3–4 verticillatis obsito, ramis alterne et fasciculatim ramulosis. Hab. ad Caput Bonæ Spei, Africæ australis. Frons 6–9 millim. alta. An *Spermothamnion*?"

3. Antithamnionella ternifolia, nov. comb. (*Antithamnion ternifolium* De Toni; *Callithamnion ternifolium* Hook. & Harv.), is a deep-water epiphyte from Cape Horn; rose-red, flaccid, membranous, 0·5–12 millimetres in height. It branches indefinitely, and bears whorls of 3 (rarely 4) slender, simple, erecto-patent ramelli. Articulations of the stem 4–5 times the diameter, twice as long as broad in the branches; the tetraspores divide triangularly. Cystocarps large, bilobed.

Fig. 5.—*Antithamnionella verticillata* Lyle. ×90.

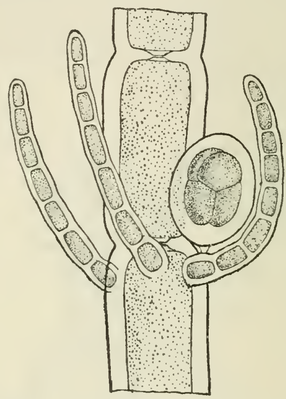


Fig. 6.—*Antithamnionella verticillata*. Tetraspores. ×400.

The original description (in Lond. Journ. Bot. iv. 272; 1845) is as follows:—

"Pusillum vage dichotomum, ramis pellucide articulatis, ramulis sæpissime ternis e quoque ramorum geniculo enatis brevibus tenuibus simplicibus subulatis erecto-patentibus, articulis ramorum diametro 4–5-plo, ramulorum subduplo longioribus; favellis magnis bilobis ad apices ramorum sitis."

My best thanks are due to Miss A. Lorrain Smith and Mr. A. Gepp, M.A., for their kind help and valuable advice, and to the latter for suggesting the name for the new genus.

FLORAL VARIATION IN VERONICA PERSICA.

By T. A. Sprague, B.Sc., F.L.S.

As a heteromeristic family, the *Scrophulariaceæ* might be expected to exhibit considerable meristic variation in individual species (see Journ. Bot. 1922, 231); and deviations from the normal number of floral leaves are in fact fairly frequent, polymerous and oligomerous flowers having been found in nearly all the genera (Penzig, Pflanzen-Terat. ed. 2, iii. 87). It has long been known that the flowers of *Veronica persica* (better known as *V. Buxbaumii*) were unusually variable; but, although numerous abnormal types have been described, their relative frequency has not been fully investigated. Yet the frequency of an abnormality may have an important bearing on its phylogenetic significance. Worsdell (*Principles of Plant Teratology*, i. 5) distinguished "reversionary" and "progressive" abnormalities; a third category seems to be required, the *inconsequent*, including such as apparently lead nowhere, being neither reversionary nor progressive. Individual inconsequent abnormalities may be expected to occur much less frequently than most individual reversionary or progressive ones, hence statistical study may lead to their recognition.

Jules Camus (Rev. Bot. v. 214, 219) considered that the presence as an abnormality of a posterior sepal in certain species of *Veronica* with a normally tetramerous calyx could not be used in support of the hypothesis of a calyx primitively pentamerous. He pointed out that an *anterior* fifth sepal had been observed in *V. longifolia* and *V. officinalis*, and assumed that this invalidated the argument from the occasional presence of a posterior sepal, since no one would regard the occurrence of an anterior sepal in *Veronica* as a reversionary phenomenon. He mentioned nothing about the relative frequency of the posterior and anterior sepals, except that the former had been observed in eight species, and the latter in two only. Out of a thousand flowers of *V. persica* examined by me during Aug.–Sept., 1922, more than 2 per cent. had a posterior fifth sepal and none had an anterior one. The frequent occurrence of the posterior sepal supports the hypothesis of a primitively pentamerous calyx in *Veronica*, whereas the undoubted rarity of an anterior sepal suggests that the phenomenon may be an inconsequent abnormality.

The 1000 flowers were taken at random from a kitchen-garden and a field of mangolds on a farm at Bicknoller, Somerset. Seventy-three (7·3 per cent.) were abnormal, 927 being normal. Flowers in which the posterior corolla-lobe was undivided, or not divided as far as the middle, were treated as "normal" in this respect, and those in which it was divided at least to the middle were classed as "abnormal." Five of the 73 abnormal flowers exhibited two kinds of abnormality each, so that the total number of abnormalities was 78. A posterior sepal appeared in 22 flowers; the posterior corolla-lobe was bilobed at least to the middle in 22 (completely divided in 14); one of the normally suppressed anterior stamens was represented by a petaloid staminode in 21, and both anterior stamens re-appeared as petaloid staminodes once. Thus if we accept the hypothesis of a primitively pentamerous flower in *Veronica*, 66 of the 78 abnormalities may be regarded as reversionary, the re-appearance of the posterior sepal and of the two posterior petals being instances of pure reversion, and the occurrence of petaloid staminodes a case of modified reversion. In 7 flowers the corolla was 3-lobed, owing to the suppression of the anterior petal. On the same hypothesis this may be regarded as a progressive abnormality. Hence at least 73 out of 78 abnormalities—that is, nearly 94 per cent.—seem to possess evolutionary significance. As will be seen later, the ratio between the reversionary and the progressive variations depends largely on edaphic conditions. The remaining 5 abnormalities were as follows:—anterior sepals foliaceous in two flowers; right-hand anterior sepal bilobed; anterior and right-hand lateral petals connate; right-hand posterior stamen represented by a petaloid staminode. The last three abnormalities occurred only once.

The five double abnormalities were as follows:—posterior sepal associated with two posterior petals in two cases; two posterior petals associated with one anterior staminode; two posterior petals with a right-hand posterior staminode; and a bilobed posterior corolla-lobe with one anterior staminode.

As it seemed desirable to study further material, 220 flowers with abnormal corolla or andrœcium were examined. Thirty-seven flowers exhibited two abnormalities each and one had three, the total number of abnormalities being 259.

A bilobed posterior corolla-lobe occurred in 46 flowers, and two posterior lobes were present in 41 flowers. A posterior sepal was associated with a bilobed posterior corolla-lobe in 9 cases out of 46 (19·5 per cent.), and with two posterior lobes in 19 cases out of 41 (46 per cent.). This seems to indicate, as might be expected, that the greater the amount of division of the posterior corolla-lobe, the greater will be the probability of the occurrence of a posterior sepal. One of the flowers in which a posterior sepal was associated with two posterior corolla-lobes had also a sixth sepal between and distinctly outside the posterior and right lateral sepals. This may be regarded as an inconsequent abnormality.

An anterior petaloid staminode occurred in 22 flowers, and was associated in four cases with the presence of a posterior sepal and in two cases with a bilobed posterior corolla-lobe.

A trimerous corolla occurred in 105 flowers, the anterior petal being suppressed in 101 cases, the right lateral in two cases, and the left lateral in one. In the remaining case the trimerous condition was due to the fusion of the anterior and right lateral petals; the right anterior sepal was almost in the antero-posterior plane, and the left anterior sepal was displaced backwards and connate nearly to the apex with the left posterior sepal. Thus trimery of the corolla was attained in three ways: by suppression of the anterior petal (101 cases), by suppression of a lateral petal (3 cases), and by fusion of the anterior petal with a lateral one (1 case). One of the flowers which had a trimerous corolla by suppression of the anterior petal had only three sepals, each 3-nerved, the anterior being slightly larger than the other two, but showing no sign of a double nature. Another flower in which the anterior petal was suppressed had the two anterior sepals connate. In the remaining 99 cases the calyx was normal.

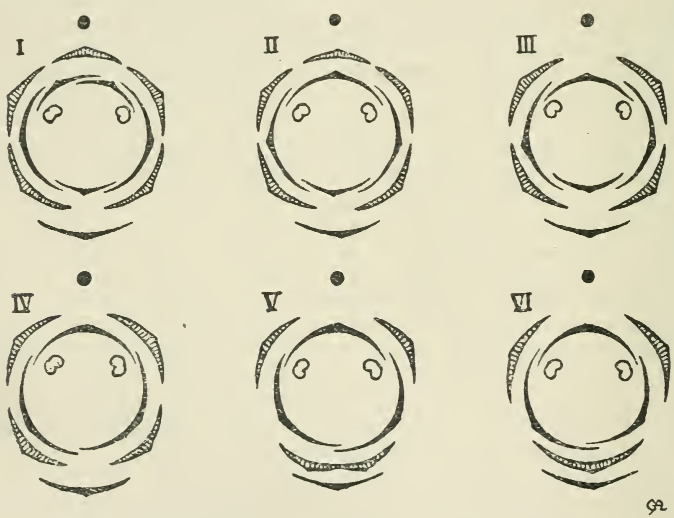
Six flowers with a dimerous corolla were found. The calyx was normal in each case, consisting of two posterior and two larger anterior segments. Both corolla-lobes were subtruncate at the base, and broader than long, the posterior lobe being dark blue, and the anterior one paler and slightly larger. Measurements from two flowers were as follows: posterior lobe 3·5 mm. long, 5·5–6·5 mm. broad; anterior lobe 3·5 mm. long, 7 mm. broad. The posterior lobe apparently represented two petals and the anterior one three petals only, as is the case in many bilabiate *Gamopetalæ.* Jules Camus stated—and I made the same observation in Somerset before reading his paper—that the posterior corolla-lobe in a normal flower of *V. persica* has no median nerve, there being two nerves near the middle, equidistant from the median line. The lateral and anterior lobes, on the other hand, have a median nerve. The absence of a middle nerve in the posterior corolla-lobe is, however, not constant. In Hertfordshire a middle nerve seems to occur just as frequently as not. But the fact that it is sometimes absent may perhaps be regarded as affording an indication of the double nature of the posterior lobe. That both lobes of the dimerous corollas represented more than one petal each was suggested by their breadth and the relatively large number of nerves—10–11 in the posterior lobe and 12–13 in the anterior one. The posterior lobe had no middle nerve, and may be regarded as composed of two petals; the anterior lobe, being slightly larger and possessing a middle nerve, probably represented three petals. The nerves of the posterior lobe were not forked, whereas 4–5 nerves of the anterior one were conspicuously forked. The assumption seems justified that the "dimerous" corollas observed by me were composed of five petals, one more than are present in the usual trimerous type. Penzig considered that only four petals were represented in the "dimerous" corollas examined by him, but gave no reasons for regarding the anterior lobe as being composed of two petals, rather than of three (Pflanzen-Terat. ed. 2, iii. 121). It should be mentioned that one half of a corolla-lobe in *V. persica* sometimes possesses one nerve more than the other half; hence there is sometimes an odd number of nerves in a lobe without a median nerve and an even number in a lobe possessing a median nerve.

The dimerous corollas and a great majority of the 105 trimerous ones were on *starved* plants, a few inches high, growing at the edge of the mangold-field, where there was a rough path and the soil was consequently trodden down and stiff. All the flowers in which additional sepals, corolla-lobes, or anterior staminodes occurred were borne by *relatively vigorous* plants in the rest of the mangold-field and the kitchen-garden, where the soil was comparatively loose. Some of these plants had about six stems, each about 18 inches long.

Bateson, who examined 1328 flowers of *V. persica* from plants growing in stubbles on heavy land round Cambridge found 93 (7 per cent.) with trimerous corollas and 14 (1 per cent.) with dimerous ones, only one corolla having an additional petal. In a plot of waste garden-land, on the other hand, 10 flowers out of 286 (3·5 per cent.) had five corolla-lobes, the remainder being normal (Journ. Linn. Soc., Bot. xxviii. 397). Taken in conjunction with my observations, these figures suggest that increase or reduction in the number of parts of the flower of *V. persica* is largely dependent on nutrition, as is the case in *Papaver dubium* (see Journ. Bot. 1922, 299). It may be noted in this connexion that 39 of the flowers examined by me exhibited deviations from the normal number of parts in two whorls. Increases in two whorls occurred in 38 flowers, and one flower exhibited decreases in two whorls. No instance was observed of an increase in one whorl associated with a decrease in another. This points to a general cause of increase or decrease.

Conclusions.

The data regarding floral variation in *Veronica persica* are consistent with the hypothesis of a primitively pentamerous flower. They point to the calyx being less variable than the corolla, and to its reduction having followed on that of the latter. Out of 108 flowers observed by me in which the anterior petal was missing, only one had the calyx reduced to three sepals.



The frequent occurrence of anterior staminodes suggests that the suppression of the anterior stamens did not long antedate—if, indeed, it did not synchronize with—the fusion of the two posterior corolla-lobes. The more recently a member has been lost, the more frequently it may be expected to recur. Starting with a hypothetical flower of the formula $K^5C^5A^4G^2$, *V. persica* appears to have undergone reduction in six stages, as illustrated by diagrams of flowers actually observed; the æstivation of the sepals is not shown, as the flowers were all expanded when examined; and the gynæceum being normal in all cases has been omitted. Stage I, suppression of the two anterior stamens; II, fusion of the two posterior corolla-lobes; III, suppression of the posterior sepal. These changes would have produced a flower of the normal type, with the empirical formula $K^4C^4A^2G^2$. Three further stages in the reduction of the flower have been observed by me: IV, suppression of the anterior petal; V, incomplete fusion of the two anterior sepals; VI, replacement of the two anterior sepals by a single anterior one, the resultant flower having the formula $K^3C^3A^2G^2$.

Two additional stages may be conceived: VII, fusion of the two "anterior" (originally lateral) petals; VIII, suppression of the anterior sepal, the final result being a flower dimerous in all four whorls.

A different type of reduction from the normal arrangement was exhibited by the pseudo-dimerous corollas observed by me, in which the empirical formula $K^4C^2A^2G^2$ had apparently been attained by the fusion of the anterior corolla-lobe with the lateral ones.

Further investigations into the floral variation of *V. persica* might be made on the following lines:—1, experimental cultivation in rich leaf-mould, stiff clay, and sandy soil, respectively; 2, examination of larger numbers of flowers (say, 10,000) in each of several different localities; 3, separate examination weekly during the flowering-season of 1000 flowers from a particular locality, in order to note any differences in the ratio between reversionary and progressive abnormalities. It seems not unlikely that the percentages of reduced flowers may be greater towards the beginning and the end of the flowering-season than in the middle.

THE GENUS PTYSSIGLOTTIS.

By Spencer Le M. Moore, B.Sc., F.L.S.

In the *Flora of the Malay Peninsula*, on p. 900 of the Gamopetalous portion (1907), C. B. Clarke published as a new genus under the name of *Leda* certain Asiatic *Acanthaceæ* assigned by Nees (DC. Prodr. xi. 379) to *Leptostachya*, and afterwards referred to *Dianthera* by Bentham and Hooker (Gen. Plant. ii. 1114). These plants were very like *Justicia* in structure, the chief difference being the absence in them of a spur from the lower or from both of the two anther-cells. In his diagnosis of *Leda* Clarke describes the pollen as ellipsoid, which is a *Justicia* character; but my own observations, backed by Clarke's own drawings in the Kew Herbarium, show plainly that the pollen is globose with rarely a very slight difference only in the two diameters. These pollen-grains are almost always quite smooth (those of one species being minutely tubercled), and are provided with two pores and very faint longitudinal banding near the pores. In these characters all the species marshalled in this paper agree.

But by a curious oversight Clarke failed to perceive that in proposing the new genus Lindau had anticipated him by more than ten years. Describing his genus *Strophacanthus* (Engl. & Prantl. Nat. Pflanzenfam. iv. 3 *b*, p. 344, 1895) the German botanist expressly mentions as the members of it three Indian species, viz. *Justicia collina* T. And. (*Dianthera collina* Clarke), *Justicia dichotoma* Bl.

(*Dianthera dichotoma* Clarke), and *Dianthera terminalis* Fawc. Other Indian species referred to *Dianthera*, however, he did not claim for his genus; their inclusion in *Leda* together with other Indian species that Clarke had placed in *Dianthera* in his earlier work (Fl. Brit. Ind. iv. 542) was left to the last named.

We are not yet at the end of the matter. In Thwaites's Enum. Plant. Zeyl. (p. 340) T. Anderson proposed his genus *Ptyssiglottis* for the reception of *Rhytiglossa radicosa* Nees. This not very well known plant is represented both at the British Museum and at Kew by unsatisfactory material; but when one compares Beddome's figure (Ic. Plant. Ind. Or. tab. cclxvii.) with some of the quondam Diantheras, it seems necessary to regard *Ptyssiglottis* as the proper receptacle for these plants, seeing that, besides identical structural characters, the pollen, as shown in a drawing at Kew, is precisely that of the Ledas. The twelve species thus included in *Ptyssiglottis* it is proposed to divide into two sections according to whether the inflorescences are made up of pedicelled or of sessile flowers. The anther-cells may also be used to a certain extent: in some species these cells stand nearly at equal height (occasionally they are quite level), in others there is a marked inequality in their position; but the transition from one condition to the extreme of the other is so gradual, as we proceed from species to species, that there seems no reason for generic separation, even if a satisfactory cleavage-point could be discovered.

The following is a key to the species:—

Sect. Euryantheæ. Flowers in open panicles, each on a distinct pedicel.
Anther-cells level or almost so.
Leaves obtuse. Inflorescence short, 1–4-flowered .... *P. radicosa* T. And.
Leaves acuminate. Inflorescence several-flowered. [comb. nov.
Corolla widened above, 15 mm. long ... *P. subcordata*,
Corolla cylindrical, 10 mm. long ...... *P. dichotoma*,
One anther-cell distinctly below the other. [comb. nov.
Corolla 20 mm. long .... *P. collina*, comb. nov.
Corolla 10 mm. long. Connective [comb. nov.
between the anthers broad .... *P. terminalis*,
Corolla 8 mm. long. Connective fili- [sp. nov.
form................................ *P. Zollingerii*,

Sect. II. Spicatæ. Flowers sessile, in spicate panicles.
Leaves 8 cm. broad, narrowed into the petiole. Inflorescence 20×2 cm....... *P. obovata*, comb. nov.
Leaves up to 6 cm. broad, rounded at base. [sp. nov.
Inflorescence at least 6 cm. broad...... *P. tonkinensis*,
Leaves up to 5 cm. broad, obtuse or rounded at base.
Leaves caudate-acuminate, rounded at base.................................... *P. debilis*, comb. nov.

Leaves obtuse or shortly acuminate, obtuse at base.
Bracts ovate, as long as the calyx or almost so .... *P. virgata*, comb. nov.
Bracts linear, about half length of calyx .... *P. bantamensis*, [sp. nov.
Bracts linear, much shorter than the calyx .... *P. leptostachya*, [comb. nov.

Descriptions of the species regarded as new are appended.

Ptyssiglottis Zollingerii, sp. nov. *Herbacea*; *caule* tetragono ad nodos tumido glabro; *foliis* petiolatis ovatis acuminatis apice obtusis margine leviter undulatis membranaceis glabris utrobique crebro microscopice cystolithigeris; *paniculis* folia longe excedentibus pluriramosis multifloris bracteis filiformibus onustis; *pedicellis* gracilibus calyce brevioribus vel eum subæquantibus; *calycis* segmentis angustissime lineari-lanceolatis acutis; *corollæ* verisimiliter albæ tubo cylindrico limbo circiter æquilongo; *antheris* subinclusis loculis connectivo filiformi conjunctis altero altero altius affixo; *ovario* oblongo glabro 4-ovulato.

Java; *Zollinger*, 2210 in herb. Mus. Brit.

Folia plerumque 5–7 × 3–3·5 cm. (summum 8 × 4 cm.), subtus pallidiora; petioli ±7 mm. long. Panicula usque 3 dm. long. etsi sæpe brevior (*e.g.* 15 cm.). Pedicelli 1–3 mm. long., bracteæ ±3 mm. Calycis tubus 1 mm. segmenta 3 mm. long. Corollæ tubus 4 mm. long.; labii antici lobi laterales 2·5 × 1 mm., lobus intermedius 3 × 2 mm. Filamenta 2 mm. long., connectivus fere 1 mm. Capsula 4-sperma, 11 mm. long., hujus pars sterilis 5 mm. long. Semina haud visa.

P. tonkinensis, sp. nov. *Suffrutex* glaber; *ramis* saltem in sicco compressis ad nodos tumidis; *foliis* sat longe petiolatis ovatis vel late ovato-oblongis breviter acuminatis apice obtusis basi late rotundatis costis lateralibus utrinque 3–4 pag. utraque eminentibus reticulo laxo parum visibili; *inflorescentia* pauciramosa ramis plurifloris; *floribus* sessilibus; *bracteis* parvulis lineari-subulatis calyce brevioribus; *calycis* segmentis linearibus glabris; *corollæ* tubo quam calyx paullo longiore sursum ampliato; *filamentis* hirsutis antheris fere æquialtis; *ovario* apice piloso; *capsula* 4-sperma.

Tonkin; Balansa, 3488, 4267 in herb. Kew.

Folia usque 10–11 × 5–6 cm. tenuiter membranacea, pag. sup. pallide nitida. Inflorescentia circa 15 cm. long. Bractea 1·5 mm. long. Calyx 2·5 mm. long. Corolla alba, 6·5 mm. long. Capsula 15 mm. long.; semina rugulosa 1·5 mm. diam.

P. bantamensis, sp. nov. *Herbacea*; *caule* ascendente ultraspithameo sparsim ramoso cito glabro; *foliis* petiolatis ellipticis acuminatis apice obtusis basi sæpe paullo obliquis obtusis membranaceis in sicco læte viridibus cito glabris; *floribus* in spicas rariramosas subremotifloras paniculam terminalem angustam foliis longiorem efficientes digestis; *bracteis* linearibus calyce brevioribus; *calycis* segmentis linearibus acutis; *corollæ* tubo calyce paullo longiore; *antherarum* loculis subæqualibus altero paullulum altius affixo basi obtusis connectivo sat lato junctis; *capsula* acuta glabra 4-sperma; *seminibus* brunneis minute scrobiculatis.

Java, Kosala, Bantam, 2000 ft. *Forbes*, 533.

Foliorum lamina summum 16 × 5 cm. sæpius 10–13 × 4–4·5 cm.; petioli plerique 1·5–6 cm. long., foliorum ultimorum modo circa 5 mm. Inflorescentia usque 20 cm. long. Bracteæ ± 1·5 mm. long. Calycis segmenta 2·5 mm. long. Corolla alba; tubus 3 mm. long., labiis circa 2·5 mm. long. Capsulæ pars sterilis uti pars fertilis 6 mm. long. Semina 2 mm. diam.

To give a complete synonymy would take up too much space; the following list will serve as a guide to that of the recognised species:—

Ptyssiglottis subcordata	= *Leda subcordata* Clarke.
P. dichotoma	= *Strophacanthus dichotomus* Lindau.
P. collina	= *Strophacanthus collinus* Lindau.
P. terminalis	= *Strophacanthus terminalis* Lindau.
P. obovata	= *Leda obovata* Clarke.
P. debilis	= *Dianthera debilis* Clarke.
P. virgata	= *Dianthera virgata* Benth.
P. leptostachya	= *Dianthera leptostachya* Benth.

Doubtful species.

Leda densiflora Clarke, *L. radicans* Clarke, and *L. Griffithii* Clarke.

The species of *Ptyssiglottis* described by Hallier fil. in Nov. Act. Nat. Cur. lxx. have with one exception been placed by Dr. Stapf, no doubt properly, in *Hallieracantha* (Journ. Linn. Soc., Bot. xxxviii. 6), to which must also be transferred three Bornean species, as below. A few other transferences are included in the following list:—

Excluded species.

Ptyssiglottis spp. Hallier fil.	= *Hallieracantha* spp. Stapf.
P. Gibbsiæ S. Moore	= *Hallieracantha Gibbsiæ*, comb. nov.
P. Hallieri Valet.	= *Hallieracantha Hallieri*, comb. nov.
P. maxima Valet.	= *Hallieracantha maxima*, comb. nov.
P. picta Hallier fil.	= *Polytrema* sp.?
P. sarmentosa Boerl.	= *Rungia sarmentosa* Valet.
Leda andrographioides Clarke	= *Justicia vasculosa* Wall.
L. lancifolia Ridl.	= *Justicia lancifolia* Ridl. MSS.
L. roseo-punctata Ridl.	= *Justicia roseo-punctata* Ridl. MSS.

As he failed to find spurred anthers when examining the flowers of these two species, Mr. Ridley suggests that the spurs may have been bitten off by caterpillars, which he says occurs frequently. Is it possible that the spur, at least sometimes, may in this way assist in the pollination of the flowers?

NOTES ON THE FERTILISATION OF ORCHIDS.

By Colonel M. J. Godfery, F.L.S.

It is comparatively easy to witness the visits of insects to spur-bearing orchids such as *Orchis morio*, *mascula*, etc., whose nectar is attractive to various bees. With spurless genera secreting no nectar, such as *Ophrys* and *Cephalanthera*, whose visitors may be confined to a single species, it is quite a different matter. One may see hundreds of flowering plants year after year, without once seeing an insect alight on them. It is useless to watch isolated specimens, and even numbers do not always bring success. Last May I watched a colony of 74 spikes of *Ophrys litigiosa* for long periods on various days, but in vain. Later I found that not a single flower had set a capsule, perhaps owing to a spell of cold weather having delayed the appearance of the necessary insect till too late. The knowledge of such a possibility, after a fruitless vigil, often in the broiling sun, makes a severe strain on the patience.

Ophrys arachnitiformis Gren. & Phil. This species, frequent in the neighbourhood of Hyères, France, is commonly called the Bee Orchid by visitors, though its resemblance to the latter is only superficial. On March 14th, 1921, I watched a group of 6 plants for a long time. I caught a bee, settled on a flower of *Anemone stellata*, bearing two pairs of pollinia, evidently those of *arachnitiformis*, as no other orchid with yellow pollinia was then in flower; later I took a bee on the wing with three pairs of pollinia. At intervals the same kind of bee came along, very quick and difficult to follow with the eye, looked at the flowers of the orchid without alighting, and passed on; two of these had pollinia on their heads, easily visible in flight by their bright yellow colour. Finally, to my great satisfaction, a bee settled on the orchid, but another bee immediately came to the same flower, knocked the first visitor to the ground, where I netted it, but, itself alarmed, flew away. The bee caught had three pairs of pollinia on its head, and was identified by Mr. Willoughby Gardner, F.E.S., as *Andrena Trimmerana* ♂. All the bees seen were of the same kind. On March 17th, 1922, at Les Salins, near Hyères, I caught 4 bees with pollinia on their heads, visiting *arachnitiformis*. These were identified at the Paris Museum of Natural History as *Colletes cunicularius* ♂. Twenty spikes gathered on this occasion proved to have had every flower visited, except the top one in each spike; in most cases both pollinia had been removed, and there was also pollen on the stigma. No spike had more than four flowers. This plant is therefore visited by at least two species of bees, and is extremely well fertilised. It presents a marked contrast to the numerous other species of *Ophrys* in the south of France, all my efforts to witness the fertilisation of which have so far been in vain.

Ophrys apifera Huds. In Journ. Bot. 1921, p. 285, I gave reasons for believing that this species is occasionally visited by insects. This year I made special efforts to obtain direct evidence of such visits. On May 8th, at Vence, near Nice, I found a spike from the lowest flower of which both pollinia had been removed. On May 13th, and again on the 14th, I found a spike from the lowest flower of which one pollinium had been taken, the other, in one case, had descended on the stigma in the usual way. On May 17th in the late afternoon, after rain, I found three spikes with both pollinia and two spikes with one pollinium, cleanly removed from one flower in each spike. This could only have been due to the agency of insects, and shows that their visits are not so rare as might be supposed.

Orchis lactea Poir. This species has been confused with *O. tridentata* Scop., but, although the similarity of the flowers suggests descent from a common ancestor, the habit and appearance of the plant are so different that one suspects that the authors who regard it as a variety of *tridentata* have never seen it growing, or compared living specimens of the two plants. As far as I have observed, they appear to grow on different geological formations, *lactea* occurring on the schist, whilst *tridentata* is abundant in some localities on limestone. I found a colony of *lactea* at Bormes, near Hyères, growing in loose gritty soil consisting of disintegrated schistose rocks. On many of the plants a small white crab-like spider was lying in wait amongst the flowers, its protective colouring rendering it inconspicuous. No bees were about, but it was a cloudy afternoon. I found on the ground, at the foot of a spike, a spider which had gripped a bee by the neck and had evidently fallen with its victim from the flower-spike. I put it in my vasculum, and on reaching home found that it still held the bee, many times larger than itself, in its jaws, always carrying it round to the opposite side of the spike to escape observation. It was identified at the Paris Museum as a young *Thomisus onustus*, and the bee as *Apis mellifica*. From this it appears probable that *O. lactea* is fertilised, at least in part, by the common hive-bee. The flowers were found to have been well visited, many pollinia having been removed and abundant pollen deposited on many stigmas.

Cephalanthera rubra Rich. With reference to my paper on the fertilisation of Cephalanthera (Journ. Linn. Soc. xlv. 511), I watched this plant in a wood at Vence, where it was frequent, without seeing any insect visit the flowers. I also at different times exposed cut flowers in various likely places, always without success, until the following happy accident occurred. On June 11th, 1922, I gathered several spikes in an open wood near Challes-les-Eaux (Savoie). My wife carried them in her hand, and, when passing the same place on our way back, a red humble-bee came to them and visited three flowers. At 8.15 a.m. on the 17th, a very wet morning, the same kind of bee came to some spikes of *C. rubra* in a mixed bunch of flowers at the open window of my room, and was so engrossed in the third flower he visited that I caught him with a pill-box. He was identified at the Paris Museum as *Bombus agrorum* F.

C. grandiflora S. F. Gray. At Mantes, near Paris, in May 1921, I found two flowers from which one pollinium, and one from which both pollinia, had been removed. Near Horsley, Surrey, on June 21st, 1921, I found two flowers from each of which both pollinia had been withdrawn, near the place where I saw this species visited by *Bombus lucorum* on June 17th, 1919. At Vence on May 9th, 1922, I found one flower with both pollinia gone. These observations, in conjunction with the above-mentioned visit of a humble-bee to the flowers, afford fair proof that this species, in spite of its almost habitual self-fertilisation, is still occasionally, over a wide extent of its range, cross-fertilised by insects.

Limodorum abortivum Swartz. This leafless saprophyte is nearly allied to *Cephalanthera*, and has large mauve flowers with a stout spur containing nectar, which can be seen to rise in the throat of the flower if the spur is squeezed. As might be expected with a plant which secretes free nectar, it is visited by at least three species of bees. The watching of this plant proved particularly wearisome, as the bees were so wary that they disappeared at the slightest movement. It was necessary to stand in the hot sun with the net ready to strike. I watched a clump of nineteen flower spikes at Vence on May 12th, 1922, and saw a grey bee visit them, but failed to catch it. After weary waiting I caught a bee with a striped abdomen and orange legs visiting the flowers with pollinia on his head, later identified at Paris as *Anthidium septemdentatum* Latr. Next day my wife and I saw two of the grey bees visit the flowers, but I failed to catch them. She, however, netted a very small bee of a different species which she saw enter two flowers, but it escaped while I was trying to box it. My almost daily efforts were unsuccessful until the 22nd, when I saw three of the grey bees visit the flowers. Two were too quick for me, but I netted the third, and rejoiced at having the elusive grey bee at last in my power. My discomfiture may be imagined when he escaped through a flaw in my new net! The plants were now nearly over, but next day I collected two or three spikes, watched them in the cool of the evening, and had the satisfaction of catching a red bee visiting them, later identified at Paris as *Bombus agrorum* var. *pascuorum* Scop.

I am much indebted to M. Lucien Berland, of the Paris Museum National d'Histoire Naturelle, and to Mr. W. Gardner, F.L.S., for their courtesy in identifying the bees referred to above.

NOTES ON JAMAICA PLANTS.

By William Fawcett, B. Sc., and A. B. Rendle, F.R.S.

(Continued from Journ. Bot. 1921, p. 226.)

Swartz; Icones et Descriptiones Ineditæ.

Some years ago Prof. Urban lent us a volume of great interest and value in the study of West Indian plants, consisting of a number of descriptions and figures by Olof Swartz of plants discovered by himself in the West Indies. All the original drawings for the plates in *Observationes Botanicæ* are included, except those for plate v., and all for the plates in *Icones Plantarum Ind. Occ.*, except those for plates i. and ii.

But the main interest in this volume lies chiefly in the 57 unpublished drawings of species described by Swartz, some of which are rare and have not been found of late years. There is a description of *Lavenia decumbens*, but no drawing, and a drawing of *Portlandia coccinea* without the description.

This interesting volume has now been acquired by Prof. C. Lindman, of Stockholm. We have referred in our *Flora of Jamaica* to the drawings it contains as "Swartz Icones Ineditæ."

Ternstrœmiaceæ.

Eroteum Swartz.

The genus *Eroteum* was founded by Swartz (*Prodromus*, 85; 1788) on two species—*E. theæoides* from Jamaica, and *E. undulatum* from the Lesser Antilles. Swartz contributed a longer description of the genus to Schreber's *Genera Plantarum*, ii. 807 (1791), but in his *Flora Indiæ Occidentalis*, 971 (1800), changed the name, which he states was originally called *Eroteum* by Solander (see Solander MSS. in Department of Botany) to *Freziera*, in memory of a botanist who travelled in South America, retaining the same two species.

These two species are now generally regarded as belonging to different genera, and are cited as *Cleyera theoides* Choisy and *Freziera undulata* Sw., most botanists having followed Swartz in neglecting his original name *Eroteum*, which, however, is retained by Baillon (Hist. Nat. Pl. iv. 265 (1873). The name *Cleyera* was given originally by Thunberg (*Fl. Jap.* 12, 224) in 1784 to *C. japonica*, a species of *Ternstrœmia*, of which *Cleyera* Thunb. is therefore a synonym.

De Candolle (in *Mém. Soc. Phys. Genèv.* i. 412, 1821) retained Thunberg's *Cleyera* and added a second species, *C. ochnacea*, also Asiatic. Choisy (Mém. Ternstrœm. 1855) also retained *Cleyera*, but extended the genus to include, besides *C. ochnacea*, several New World species, among them *Freziera theæoides* Sw.; at the same time he indicated that the original *Cleyera japonica* Thunb. was a species of *Ternstrœmia*. Choisy also retained the genus *Freziera* Sw. for *F. undulata* Sw. and several allied Tropical American species.

Presuming that the Old World species, *Cleyera ochnacea* DC. and others, are congeneric with the New World *Freziera theæoides* Sw. and allies, the earliest name for the genus is that originally given by Swartz, namely *Eroteum*, which is thus retained for a portion of Swartz's original genus. The synonymy of his original species is as follows:—

Eroteum theæoides Sw. *Prod.* 85 (1788).
  Freziera thæoides Sw. *Fl. Ind. Occ.* 972, t. 19 (1800), and *Ic. Ined.* t. 41; *DC. Prodr.* i. 524.
  Cleyera theoides Choisy in *Mém. Soc. Phys. Genève*, xiv. 110 (1855). Jamaica, Cuba, Central America.

Freziera undulata Sw. *Fl. Ind. Occ.* 974.
  Eroteum undulatum Sw. *Prod.* 85. Lesser Antilles, Trinidad.

Freziera is represented in Jamaica by *F. Grisebachii* Kr. & Urb. in *Engl. Bot. Jahrb.* xxi. 542.

Laplacea or Lindleya.

Sprague (Kew Bull. 1921, 175) has pointed out that the name *Wikstrœmia* cannot be adopted for this genus, as suggested by S. F. Blake (Contrib. Gray Herb. liii. 1918), owing to its being reserved in the list of *nomina conservanda* of the International Rules for the well-known genus of *Thymelæaceæ*. Sprague goes on to say that the genus of *Ternstrœmiaceæ* should be called *Laplacea*. There is however an earlier name, *Lindleya* Nees (Flora, iv. May 21, 1821, 299). *Laplacea* H.B.K. Gen. Nov. & Sp. v. 207, dates from February 1822, though the date on the titlepage is 1821. Nees gives a short description of his genus which he assigns to *Tiliaceæ*, and merely refers without name to his unpublished description and figure of a species. In the following number of *Flora* (June 7, 1821, 328) Nees says "*Wickstrœmia fruticosa* Schr. ist *Lindleya semiserrata* m.," thus identifying his genus with *Wikstrœmia* Schrad. published just previously (Goett. Gel. Anz. 1821, ii. 710, May 5, 1821). There is therefore no doubt as to the identity of *Lindleya* Nees.

Ternstrœmia calycina, sp. nov. *Arbor* 10–30 ped. alta. *Folia* 5–9 cm. l., obovato-elliptica, apice rotundata v. obtusissima, basi rotundata v. cuneata et subito in petiolum contracta, supra, sub lente, ruguloso-granulata, margine parum recurvata, coriacea, nervo medio supra non v. vix impresso, subtus prominulo, nervis 6–8 utrinque subconspicuis et plus minus prominulis; petioli 5–8 mm. l. *Pedunculi* 1·5–2 cm. l. *Bracteolæ* 7–9 mm. l., ovatæ. *Sepala* 17–13 mm. l., 11–9 mm. lat., ovato-elliptica, coccinea, margine glanduloso-denticulata aut integra. *Petala* non visa. *Ovarium* 2-loculare; stylo (floris petalis delapsis) 9–12 mm. l., stigmate 2-punctato.

Hab. Peckham, Clarendon, 2500 ft., *Harris* 10,979, 11,035.

The size of the crimson sepals at once distinguishes this from the other Jamaican species.

SHORT NOTES.

The Type-species of Bignonia (see p. 236). Mr. Rehder has kindly drawn my attention to an article in Mitt. Deutsch. Dendr. Ges. 1913, 262, in which he maintained that the type-species of *Bignonia* was *B. radicans*. He considered that the flower in Tournefort's plate of *Bignonia* was undoubtedly *B. radicans*: after re-examining the evidence, however, I remain convinced that it was *B. capreolata*. It seems desirable to give my reasons. Tournefort's system of classification was based on the corolla, and his figure of the corolla of *Bignonia* agrees with *B. capreolata* and differs from *B. radicans* in the relatively short tube, which is suddenly enlarged above the basal cylindric portion and bent forwards, and in the reflexed posterior corolla-lobes and patulous anterior ones. The calyx is shortly campanulate as in *B. capreolata*, whereas *B. radicans* has a tubular-campanulate calyx. The ovary is slightly sunk in the hollowed upper surface of the disc as in *B. capreolata*, instead of being conspicuously stipitate above a convex disc as in *B. radicans*. The result is the same whether we compare Tournefort's figures of the flower of *Bignonia* with herbarium specimens of *B. capreolata* and *B. radicans*, or with illustrations such as those given by Bureau (Bignon. tt. 6, 14). In the same article Mr. Rehder has pointed out that *Bignonia stans* is the type-species of *Tecoma* Juss., of which *Stenolobium* D. Don becomes a synonym, and that *Tecoma* of Bureau and Schumann (Mart. Fl. Bras. viii. pars 2, 315; Nat. Pflanz. iv. 3 *b*, 236) should be merged in *Tabebuia*. Some time ago I came independently to the same conclusions.—T. A. Sprague.

Epipactis leptochila Godfr. The editor of the Bot. Soc. & Exch. Club Report for 1921 (p. 308) represents me as saying that "*Epipactis viridiflora* var. *leptochila* (Journ. Bot. 1919, 37) is identical in its morphology and in the functions of the reproductive organs with *H. latifolia*." This is a misapprehension. It is the continental *E. viridiflora* Rchb., better known as *E. latifolia* var. *viridiflora* Irm., which is identical in these respects with *E. latifolia*. *E. leptochila* differs from *E. latifolia* both in its vegetative and reproductive organs, as well as in its method of fertilisation (see Journ. Bot. 1920, 33), for which reason it can no longer be regarded as a variety of *E. viridiflora*, and was therefore raised to specific rank.—Ophrys apifera Huds. On p. 317 of the same Report, referring to my paper on the fertilisation of this species, the following occurs:—"Contrary to preconceived belief, the author finds that it is mainly self-fertilised, although the plant is so specially organised for cross-pollination." The universal "preconceived belief" is that *apifera* is entirely self-fertilised: the object of my paper was to show that the mechanism for cross-pollination is still efficient, that insect visits occur to this day, and that its more recently acquired faculty of self-fertilisation has not wholly replaced, but only supplemented its original organisation for cross-pollination.—M. J. Godfery.

Vicia Dennesiana H. C. Watson.—A recent reference to this plant suggests that it may be worth while to put on record the origin of the name, as told me by its donor. *V. Dennesiana* is described by Watson in Godman's *Natural History of the Azores*, p. 155 (1870), the name being "adapted from the name of Mr. G. E. Dennes, who was Honorary Secretary to the Botanical Society of London at the time [1844–8] when some native specimens were sent by Mr. [Thomas Carew] Hunt for distribution through that Exchange Club. It was found by Mr. Hunt on the mountains at the east end of the island, growing on damp earthy precipices, but in one spot only, from which it has since disappeared through a landslip .... Mr. Hunt unsuccessfully sought for the plant elsewhere in the same neighbourhood." No other collector has found it in any of the isles; Watson grew it his garden from seeds sent by Hunt, and when I was at Kew in 1870 it was grown there—I think from seeds sent by Watson. So far as I am aware, the plant has not since been found; should it have been, the reason for its name, as told me by Watson, would have ceased to exist: the allusion is to the disappearance of Dennes (to Australia?) about 1856 (in which year he ceased to be secretary to the B. S. L.) wherein Watson found an analogy to that of the *Vicia*. —James Britten.

REVIEWS.

Early British Botanists and their Gardens: based on unpublished Writings of Goodyer, Tradescant, and others by R. T. Gunther, *M.A., F.L.S., Librarian and Research Fellow of Magdalen College* [*Oxford*]. With 9 plates and 21 other illustrations. Oxford; at the University Press. Demy 8vo, cloth, pp. viii, 417. Price Two Guineas.

At the meeting of the Linnean Society on March 3, 1921, the author of this attractively-produced volume exhibited and described certain manuscripts of John Goodyer which, in his capacity as Librarian of Magdalen College, he had discovered in its Library; a summary of these discoveries, so far as they had then extended, was printed in this Journal for 1921 (p. 119). It was evident that Mr. Gunther had come upon a mine, hitherto almost unworked, of information relating to an early period of British botany; his subsequent proposal to publish a volume devoted to the MSS. aroused the highest anticipations among those interested in that history. To say that these anticipations have been more than fully realised by the volume before us conveys but a feeble idea of its value and interest; our only regret is that it is impossible to do anything like justice to its merits in the limited space which this Journal affords. The rapidity with which the book has been produced is among the most remarkable features connected with it; in little more than a year from its announcement the volume was issued from the press. Nor has this rapidity of production been attended with incompleteness; we have seldom met with a work which affords such evidence of care or such intimate knowledge; in every detail moreover, although the author claims no special acquaintance with botany, the slips in that direction which sometimes disfigure works otherwise accurate are, save for one or two insignificant instances, entirely absent.

The volume is based on the manuscripts bequeathed to Magdalen College, with his botanical library, by John Goodyer in 1664, and more than half the volume is devoted to Goodyer himself—his life, his descriptions of plants, and his botanical library. In addition to his other qualifications, Mr. Gunther is possessed of an admirable literary style, and his account of Goodyer's life is additionally interesting from the care with which he has indicated his author's relation to the history of the period.

Goodyer, who was born in 1592, "contemplated the scientific study of botany in 1616"; during the winter of this year he added important works to his library in each of which he noted the price and date of purchase, an indication of the care observable throughout his work. At this time he had already devoted himself to gardens and the medicinal study of herbs; by his twenty-ninth year (1621) his botanical enthusiasm had reached its height—"more descriptions of new or rare plants were turned out in July, August, and September of that year than in all the rest of his life." From this period Mr. Gunther is able by his diary and MSS. to trace Goodyer's career almost year by year until his death in 1664; during the latter part of his life "he was evidently applying his knowledge of simples to the good of his ailing neighbours."

It was in 1632 that Goodyer sent to Thomas Johnson the descriptions and corrections of Gerard's Herbal which appeared, with due acknowledgement, in the edition of 1633. He began a further series of emendations which extended to the first twenty-two chapters of the work; these are printed by Mr. Gunther (pp. 71, 72) and, as he says, "are characteristic of the accuracy and carefulness of [Goodyer's] work." The descriptions in Gerard are here reprinted in full, with numerous others hitherto unpublished, more than 250 plants being specially noticed; arranged in the order usually followed in British floras, they extend to nearly a hundred pages, and are exceedingly full and accurate; the localities (of which Mr. Gunther gives in the index a special list) are added in most instances. Among the descriptions is one of *Monotropa Hypopitys* which is not among the Magdalen MSS. but occurs on the back of a page of Banister's herbarium (Herb. Sloane, vol. 158, p. 249 verso), where the writer of this notice was fortunate enough to find it when going through the Sloane collection.

A list (pp. 100–108), in which Mr. Gunther sums up Goodyer's botanical labours, arranged under modern names followed by the locality and name taken from the MSS., precedes the descriptions, and is so arranged as to present other information—a more judicious assortment of type and the introduction of 'clarendon' would have made this more easy of consultation. The identifications are, as is everything in the book, very carefully done, though a close examination would probably detect matter for comment. One such instance occurs in connexion with the plant described by Goodyer in Ger. emac. (p. 677) as *Acinos odoratissimum*. This Mr. Gunther (p. 166) identifies with *Ocimum basilicum* L., as he also does the plant described by Goodyer (p. 120) as "Acinos," although he adds that the description of the latter "differs essentially from that printed in Gerard." It does not seem that Goodyer regarded them as identical; he describes the flowers and leaves of *odoratissimum* as "*like* those of Basil," and says "it is to be considered whether the seedes of sweete Marjerome [among which it was found] degenerate and send forth this herbe or not."

After the descriptions comes the section (pp. 196–232) devoted to Goodyer's Library; this had attracted the attention of the late Canon Vaughan, who had sounded its praises in an article on Goodyer as "A Forgotten Botanist of the Seventeenth Century." The Catalogue of the Library is full of interest; some of the volumes contained MS. notes, here printed, others, "signatures or personal memoranda" which suggested comment and make us wish for more: *e. g.* "Ric. Downes" provokes a reference to Samuel Downes, M.D., who made the collection of dried plants presented by J. Downes in 1731 to Shrewsbury School"; does anyone know about this collection or its donor? Camerarius's *Epitome* (1586) was "perhaps Goodyer's first botany book; the marginal headings and English names may have been added by him as a boy." A facsimile page of Goodyer's notes (not botanical) from Ray's Cat. Pl. Cant. occupies p. 223; his signature and reproductions of his drawings appear elsewhere in the book.

The Goodyer Manuscripts include his translations of Theophrastus and Dioscorides, and his index to Gerard; an interleaved copy of How's *Phytologia* which came into Goodyer's possession and contains corrections and notes by him and by the author; and a copy of Johnson's *Descriptio Itineris . . . . Cantianum*, with additions and indexes in his own and Johnson's hands—"this little volume has the great sentimental interest of being the germ from which all British floras are descended." This copy is later (pp. 276–8) described at length, with facsimiles of pages showing Johnson's MS. index of the genera mentioned and How's additions, and examples of the notes of the latter.

The chapter headed "Notes on Contemporary Botanists mostly from Goodyer's books and papers," includes a vast amount of information hitherto unpublished concerning Parkinson, Lobel, Thomas Johnson, and William How, and relating to others of whom less is known—among them some who are not to be found in our *Biographical Index,* for the second edition of which Mr. Gunther supplies throughout his volume much material. It is tempting to linger over these, but to notice the book at the length to which it is entitled by its interest would extend this notice to undue proportions. We must therefore content ourselves with saying with reference to the four whom we have named that the Goodyer MSS. supply many details hitherto unpublished, and that, as has been already indicated, all students of the botany of the period must consult Mr. Gunther's volume. The care with which he has conducted his researches is exemplified by the pages of notes (pp. 267–270) "on American, Bermudan, and Oriental plants" in a hand at first unknown, which proved to be written by John Parkinson, from whom a letter, made legible by much perseverance in removing the "ink-scrawling" with which it had been covered, is reproduced in facsimile. The horticultural notes transcribed "were evidently extracted by Parkinson from Francis Bacon's *Naturall Historie*, Century v. 1627; but another possibility should not be lost sight of, namely, that Bacon may have derived part of his horticultural knowledge from the distinguished botanical writer who two years later dedicated his *Paradisus in Sole* to Queen Henrietta Maria." To How eighteen pages are devoted, the greater part of them to his MS. records which, giving as they do in many instances localities of the plants named, will afford useful material for future authors of local floras.

Among the contemporaries of whom Mr. Gunther supplies details are those who, though well known in other capacities, have not hitherto been associated with botany, in which, however, they seem to have been proficient. One of these was William Mount (1545–1602), Master of the Savoy in 1594, an expert in the making of distilled waters, whose copy of Lobel's *Icones* (1581) contains numerous MS. notes on plants, chiefly of Kent, which are here transcribed. These include, besides names and localities, references to medical and other uses and general information,—we note on p. 259 a curious misprint—one of the very few in the volume—where Turner's "Middow Saffrone" is printed "Widdowe Saffrone." Of Richard Garth (d. 1597) who filled the post of Senior Clerk in Chancery—"an accomplished botanist whose contributions to science are better remembered in the works of Clusius and other foreign botanists than in his own country"—Mr. Gunther brings together an interesting account. According to Lobel (Adv. ii. 459), Garth was the first to find *Polypogon monspeliensis*, which grew near his house, Drayton Manor, near Portsmouth; "Lobel appears to have visited [the] garden after Garth's death" in 1597, and to have found near it not only "Helxine Cissampelos altera minima Anglo-Britannica"—this is interpreted as "a variety of Bindweed," but clearly a small form of *Polygonum Convolvulus* is intended—but also *Atriplex littoralis* (Illust. 85), which Mr. Gunther does not mention, whereof this is the earliest British record.

Mr. Gunther (p. 238) writes at some length about William Salusbury, about whom something was said in this Journal for 1917 (p. 259) in the course of reviewing the reprint by Mr. Stanton Roberts of the Welsh herbal attributed to him. There seems little doubt as to the identity of this with the "Welsh Botanologia" referred to in the D. N. B. account of William Salusbury—the chain of evidence adduced in the review indicated seems sufficiently complete. Another member of the same family, Sir John Salusbury, finds no place in D. N. B., but Mr. Gunther shows that on various grounds he is entitled to appear therein. A copy of Gerard found in the Library of Christ Church contains marginal notes in Sir John's hand on the medicinal properties of some plants, with the localities of others found by him in North Wales in 1606–8; these Mr. Gunther enumerates, to the number of 29; the list ends with the following caution relating to fungi:—

> "Let my advice perswade thy mynde
> not to truste any of that kynde,
> such as be takenn for the beaste [best]
> doe prove as poisnusse as the reste."

The reader may be referred for further information concerning Sir John to the account of his garden on pp. 306–8, to which no cross-reference is made and which does not appear in the Index.

The garden continued to flourish long after [Sir John's] death; Mr. Gunther prints a letter referring to it (p. 308) contained in the Hortus Siccus of Edward Morgan in the Bodleian Library (Ashm. MS. 1797, and addressed to him at Bodeslen. Mr. Gunther is not quite convinced that this Edward Morgan is identical with the Edward Morgan of whose garden at Westminster he gives an account. The exact site of this garden, as he says, is not known, and the late Mr. H. B. Wheatley, a leading authority on the history of London, was not able to place it. In the Sloane Herbarium are three volumes of "Plants gathered by Mr. Morgan or Mr. Rusholm at the physick garden at Westminster," this title being followed by a note on the condition of the garden at the time of writing, transcribed by Matthew Maty (1718–1776)—successively Keeper and Principal Librarian of the British Museum—from the original catalogue of the Herbarium, which it has proved impossible to trace.

We regret that we are unable to do more than mention the "Early

Lists of Plants grown in English Gardens" which occupy pp. 303–357, and are of great interest not only on account of the lists themselves, but for the notes on those to whose gardens they relate. Here we meet again many who have been considered in the earlier part of the book, and here we find occasion for the only unfavourable criticism which has occurred to us while going through the volume. There was doubtless good reason for printing the garden lists separately, but the absence of cross-references—a matter to which we have already referred—from one part of the volume to the other where the same persons are discussed is a serious inconvenience. Even if it were difficult to refer from the earlier to the later portion, the converse could present no difficulty—there can be no reason, for example, why, when discussing Stonehouse's garden list (pp. 348–351) reference should not have been made to the sketch of him on pp. 271–273. The table of contents prefixed to the volume is almost ludicrously inadequate: the index itself by no means complete—the important account of William Coys's garden (pp. 312–321) finds no place in it and can only be found when going through the book—by no means supplies the deficiency. Mr. Gunther is at any rate free from the fondness for cross-references to which librarians are sometimes thought to be unduly prone—thus, although the "Notes on Contemporary Botanists" and the "Garden Plants" are each preceded by a list of the persons to be considered, in neither case is the page given on which these will be found.

We have been led astray by this grumble from noting the remaining contents of the book, which include interesting lists of exotic plants from Goodyer's MSS.—again, as always, illuminated by Mr. Gunther's notes—and has, as an appendix, a reprint of his miscellaneous papers. British botanists owe the author a heavy debt of gratitude for the care and devotion which he has bestowed upon this volume.

James Britten.

Guide to the University Botanic Garden, Cambridge. By Humphrey Gilbert-Carter, Director of the Garden, Cambridge: at the University Press, 1922. Cr. 8vo, cloth, pp. xvi, 117, illustrated. Price 3*s*. 6*d*. net.

In this attractive little volume "the sequence of the families and genera is that of the eighth edition (1919) of the Engler-Gilg Syllabus der *Pflanzenfamilien*: Orders are not mentioned . . . the word *Family* in modern use is equivalent to the *Natural Order* of the English botanists." This is in accordance with the International Rules which are generally followed, except when—as frequently happens—a writer prefers to depart from them: in this case "the practice of zoologists has been followed by writing all trivial names with small letters. In the introduction whence we quote the above passage we find the explanation of the somewhat peculiar appearance of the text owing to the presence of names in Oriental text: "It has been the happy destiny of this Garden to be loved and befriended by nearly all the notable Oriental scholars of the University. This connection between Oriental Studies and Botany has prompted the author to give certain eastern names of plants and quotations illustrating the use of these names": in this detail, help is acknowledged from various professors in the presentation of Arabic, Persian, Chinese, and Sanskrit words.

From these particulars it will be seen that the *Guide* is not trammelled by conventional lines—a certain freshness of treatment characterises it throughout; thus the "Glossary" is limited to 16 words, selected apparently at random, followed by a useful "note on leaves," the reason for which is not obvious.

Coming to the text proper, we are struck by the extent of the information given in small compass therein in an interesting way. The descriptions give evidence of much varied reading; classical authors and early botanical as well as recent writers are cited—under Elecampane we have a verse from Rudyard Kipling, and in connection with Cocoa a quotation from Prescott's *Conquest of Mexico*; geographical distribution is indicated, and there are notes of general interest. The statement that *Lycium chinense* Mill. "was sent from China along with the true Tea Plant with which it was subsequently confused" (p. 90) is new to us, and differs from the generally accepted origin of the name. Moreover, Miller (Gard. Dict.) does not say that the *Lycium* was "sent along with the true Tea plant," but that "seeds were brought to England a few years past, and the plants were raised in several gardens, and by some were thought to be the Thea."

The *Guide*, which is well printed, neatly bound, and embellished with 23 illustrations of interesting plants, contains a plan of the the Garden, and has an excellent index.

An Introduction to the Chemistry of Plant Products, By P. Haas and J. G. Hill. Vol. II. Metabolic Processes. Pp. viii, 140. Longmans. 7*s*. 6*d*. net.

In no branch of botanical study is there such a deficiency of introductory text-books in the English language as in the domain of plant-physiology. Haas and Hill's *Metabolic Processes* is therefore sure to find a warm welcome, accompanied perhaps by a slight feeling of regret that a somewhat fuller treatment was not deemed advisable. The book is, however, intended to form a basis for further study, and as such, deals more especially with the established facts and the outstanding problems awaiting solution. The authors may be congratulated on their success in dealing with this difficult task, whose magnitude perhaps only those can appreciate who know the enormous mass of literature involved and its frequent inaccessibility. The text is lucid throughout, and the chemical and physical principles underlying many of the physiological phenomena are so clearly explained as to be comprehensible to a student who has little special knowledge of these other sciences.

The book is divided into six chapters, the first of which is devoted to a brief introductory account of the living plant and a very clear exposition of the principles involved in the determination of the hydrogen-ion concentration. The next three chapters deal respectively with the synthesis of fats, carbohydrates, and proteins; then follows one on respiration; the concluding chapter is devoted to a consideration of the broad aspects of growth. The diverse problems presented by the process of carbon assimilation are treated at some length, and the chapter concludes with a critical discussion of the old hypothesis of Baeyer add its more recent interpretations, as well as of that of Willstaetter and Stoll. Respiration also receives a detailed treatment, including an admirable account of the dehydrogenation theory of oxidation. The authors conclude that there are good grounds for regarding biological oxidations as primarily due to enzymes like dehydrax which activate hydrogen in oxidisable substances to be removed by a suitable hydrogen acceptor. This may be the oxygen of the air, or possibly such a compound as glutiathone which can act alternately as hydrogen-acceptor or as hydrogen-donator. The chapter on growth is likewise fully up to date, dealing with such recent aspects as the compound interest law, hormones, and vitamins. It is, however, scarcely possible in a brief review to indicate the diversity of subjects touched upon, in spite of the relatively small dimensions of the book.

F. E. Fritsch.

Pflanzen-teratologie. By O. Penzig, Professor of Botany and Director of the Royal Botanic Garden at the University of Genoa. Second, much enlarged edition. 8vo. Vol. I. pp. xiii, 283; Vol. II. pp. 548; Vol. III. pp. 624. Borntraeger, Berlin, 1921–2.

The former edition of Dr. Penzig's work was published from 1890–1894, and contained 1134 pages, the present edition comprises 1455 pages; the increase indicates the large number of books and papers dealing with plant-teratology which have appeared in the interval. The first volume is the bibliographical list, in which publications are arranged alphabetically by the author's name; in the original edition this occupied only 166 pages: the second and third volumes are the systematic portion. The arrangement adopted is mainly that of Bentham and Hooker's *Genera Plantarum*, and the Dicotyledons precede the Monocotyledons; Gymnosperms, Ferns, and Cellular Cryptogams follow in succession after the Monocotyledons. There is an index of families and genera at the end of each volume.

Under each genus is given a list of species, arranged alphabetically, in which an abnormality has been noted, with a reference to author and place of publication.

The whole forms a very useful work of reference to a subject the literature of which is remarkably scattered.

A. B. R.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on November 16th, the first communication was by Mr. A. J. Wilmott, entitled "*Orchis latifolia*, Linn., from the Island of Öland, Sweden, obtained from the station in which it was found by Linnæus in 1741." It was pointed out that *O. latifolia* L., 1753, was a general name for Marsh Orchids, but in 1755 this name was limited without varieties, and separated from *O. incarnata* and *O. sambucina*. The diagnosis is general, and comes from Linnæus's article in Act. Upsal. 1740, where it applies mainly to unspotted-leaved plants. The plant referred to as "it. oel. 48" was *O. sambucina*, but the "O. palmata palustris non maculata" of "it. oel. 48" was *prætermissa*. This is referred by Linnæus in MS. notes to Fl. Suec. (ed. 1) no. 728 var. (728 being referred to under *O. latifolia*), and is what remains when *O. sambucina* has been separated. The herbarium specimen is also *O. prætermissa*, matching one brought back by Mr. Edwards from the identical spot in Oeland. The plant of the '*Hortus Cliffortianus*' which grew around Haarlem might possibly be *O. prætermissa*, but Linnæus said "Variat foliis maculatis & immaculatis," which indicates that hybrids with *O. maculata*, or perhaps *O. majalis*, were included. This was, however, his earliest work on the subject, being published in 1737 before he saw Vaillant's orchids or travelled in Oeland. The Vaillant plant referred to, seen *in situ* by Linnæus in 1738, was the most common one round Paris with unspotted leaves; also probably *O. prætermissa*. Of the Bauhin plants, the "type" of 1753 and the var. β, which are respectively the var. α and "type" of his 1740 paper in Act. Upsal., are both unspotted-leaved plants, the "non-maculata" and "latifolia" of the pre-Linnean authors; most likely both were forms of *O. prætermissa*. The var. ϵ of the *Species Plantarum* was probably *O. majalis*, for the figure in Rudb. Elys. is good *majalis*. All of this indicates that by *O. latifolia* Linnæus had primarily in mind *O. prætermissa*. But Linnæus, in his description of 1755, says that the leaves are slightly spotted. This may refer to the decay spots on the plant in his herbarium, for this note was made when he described *O. incarnata* in the MS. notes in his copy of the *Flora Suecica*, ed. 1, or it may refer to the hybrid forms with spotted leaves which occur where *O. prætermissa* and *O. maculata* occur together. The description of *O. incarnata* refers to the form so named by British botanists to-day. Linnæus knew *O. prætermissa*, and included it under n. 728 of Fl. Suec. ed. 1, which became *O. latifolia*. It seems fairly clear that by *O. latifolia* Linnæus in 1755 understood *O. prætermissa*, perhaps including the hybrid with *maculata*. Certainly he did not intend *O. majalis* Reichb.

At the same meeting Mr. T. A. Sprague gave a description of twin-leaves and other abnormalities in the Ash, *Fraxinus excelsior*. Specimens were shown of the following abnormalities:—1. Fasciated stems, with dichotomous branching. 2. Bud-variation, with narrow caudate-acuminate leaflets. 3. Accessory leaflets; one or both leaflets of a pair replaced by sessile or stalked bifoliolate pinnæ. 4. False accessory leaflets, by suppression of the internode above the lower pair of leaflets. 5. Confluent leaflets. 6. Twin-leaves and Triplets: occurring in various forms—Nature of leaf-twinning—Cause of this abnormality, probably hypertrophy—Significance of accessory and twin-leaves. 7. Anisophylly, the foliage-leaf having a bud-scale as its nodal companion. 8. Suppression of a leaf: examples shown of complete or partial suppression of one leaf of a pair without disturbance of the opposite-decussate phyllotaxy, which continues as though the missing leaf were present.

The twenty-sixth autumn fungus foray and annual meeting of the British Mycological Society was held at Keswick, Sept. 15–21. Various woods in the neighbourhood were worked and many interesting fungi were found, though the quantity of material was not as great as one would have anticipated, possibly owing to an early "flush." Mr. F. T. Brooks gave as his Presidential Address "Some Present Day Aspects of Mycology," in which he discussed the origin and phylogeny of fungi, the view being upheld that the group is a novel plant phylum taking its origin directly from protist organisms and not from algæ: the relation of mycology to plant pathology, suggestions of closer co-operation between systematists and phytopathologists being appealed for, and the training of mycologists and plant pathologists—both, it was urged, must have botanical training and be essentially botanists, and any tendency to divorce the subjects should be resisted. It is gratifying to find one of the real leaders of mycology taking these broad views and moreover regarding systematics as an essential part of the landscape. Mr. Somerville Hastings described the growth forms of *Anellaria separata* as met with in the Alps on excrementa of the previous year; Professor A. H. R. Buller detailed his investigations on the N. American form of *Panus stypticus*, in which both the mycelium and fruit body are luminous, the light being emitted in presence of oxygen even just below the freezing point of water; Miss E. M. Wakefield gave a brief description of the West Indian Fungus Flora and a general account of the effect of climate on the distribution of fungi; Dr. J. C. Walker, of the Bureau of Plant Industry, U.S.A., gave a short address on the ecology of fungal diseases in the States, pointing out the effect of climatic factors on the distribution of *Phoma Lingam* and *Urocystis Cepulæ*: Mr. Carleton Rea—probably our most confirmed mycophagist—gave an amusing account of edible fungi and related his experiences with about a hundred of them; Professor M. C. Potter described some preliminary experiments which indicate that, if the soil is sufficiently alkaline, wart disease does not develop in the potato. Professor O. V. Darbishire was elected President for the year 1922 and Messrs. F. T. Brooks and W. N. Cheeseman Vice-Presidents.—J. R.

About one-fifth of the handsome volume on *Mazes and Labyrinths*—"a General Account of their History and Development"—by Mr. W. H. Matthews (Longmans, 18*s*. n.) is devoted to "The Floral Labyrinth and the Dwarf Shrub Maze" and "the Topiary Labyrinth, or Hedge Maze," which are illustrated by nearly fifty figures from various sources. The former, in the construction of which dwarf box and sweet herbs were largely employed, was sometimes very elaborate, as the figures from De Vriese (1583) sufficiently indicate: of the latter, made of trees and shrubs, the maze at Hampton Court is a familiar example—these apparently date back to the fourteenth century and had become popular by the sixteenth. One of the best known was that made about 1560 for Lord Burleigh at Theobalds in Hertfordshire; that at Hatfield House—of this a photograph, taken from the roof of the house, stands as frontispiece to the book—is one of the finest examples. The volume, which is very carefully compiled, ends with a full bibliography and an excellent index.

The *Transactions of the South-Eastern Union of Scientific Societies* for 1922 contains an exceedingly interesting presidential address by Miss A. Lorrain Smith on "The History of Lichens in the British Isles." The first allusion to a lichen (*Usnea*) is in *The Grete Herball* (1526), the next (*Lobaria*) in Turner's *Herball* (1568); after this references became increasingly frequent until lichens took something like their proper place in British botanical works. Miss Smith's short account of our lichenologists down to the present time is exceedingly well done, selecting points of interest for comment; the usefulness of her references is increased by appending to the name of each author the dates (when known) of his birth and death. The initials of authors are occasionally given incorrectly—*e. g.* W. M. [H.] Leighton and W. [J.] M. Crombie; and it was not Sir Thomas Gage of Hengrove [Hengrave] Hall but his brother, who introduced and gave his name to the greengage.

Mr. J. H. Maiden's useful but extravagantly printed *Critical Revision of Eucalyptus* has reached its 56th part; it contains descriptions of nine species, four of which are new, and an essay on "Diels's Law," which Mr. Maiden derives from Diels's *Jugendform und Blutenreife im Pflanzenreich* (1906). This, he says, may be conveniently expressed by stating that "the generative maturity of plants is not connected with a definite stage of their development... A vegetative and juvenile form and a vegetative full-grown form can exist in a single species, and each form flowers and fruits, and forms (*sic*) a perfectly closed cycle of life." Mr. Maiden has noticed the "Law" in so many species of *Eucalyptus* that he thinks it will probably be observed eventually in all.

The *Bulletin of the Torrey Club* for October contains a monograph of the Central American species of *Costus* by W. W. Rowlee, in which three new species are described and figured, and an interesting note on "References to the Algæ in the Chinese Classics," by W. M. Porterfield; "from this discussion," says the author, "we begin to realise that from direct references in ancient Chinese literature and an analysis of the ideograph [the Chinese character for algæ] there is a possibility, if not a probability, that the knowledge of the algæ as a distinct morphologic unit in the plant kingdom dates back to very early times, as compared with the state of knowledge in western countries."

In *Torreya* (Sept.–Oct.) Mr. F. W. Pennell continues the researches into Rafinesque's *Antikon Botanikon* to which we referred last year (p. 184) when noticing the *Bulletin of the Torrey Club*. He now reproduces Rafinesque's names for *Scrophulariaceæ*, thus disinterring many which might well have remained in obscurity.

Fortunately the only change involved in the *Scrophulariaceæ* is the supersession of an authority—"*Ilysanthes refracta* Raf. (Ell.)"—but the "synonymy" of the order is largely (and we think needlessly) increased. Mr. Pennell's attention may be called to the paper by Rafinesque published in Loudon's *Gardener's Magazine*, vol. viii. 1832, which had been overlooked until its republication in this Journal (xxxviii. 224–229; 1900).

La Nature for July 1 contains a very interesting article by Abbé L. Parcot on "Bernard de Jussieu et le Jardin Botanique du Petit Trianon"; the garden was established by Louis XV in 1759 as an addition to the "potager" which he had founded eight years before, and was placed under the charge of M. de Jussieu, who was a correspondent of Sloane. The garden was destroyed at the death of Louis XV, but some of the trees planted by Jussieu still remain at the Trianon.

The *Annals of the Bolus Herbarium* (iii. pt. 3; Oct. 30) contains a continuation of "Novitates Africanæ," which is mainly devoted to descriptions of Mesembryanthemums by Mr. Bolus; new species of *Aristea*, *Watsonia*, *Gladiolus*, *Restio*, *Dovea*, and *Elegia* are also given: a greater variety of type would render the descriptions more easily consultable. The number also contains a paper on "The Pollination of *Satyrium bicallosum*," by S. Garside, with a plate.

It has been decided to commemorate the memory of the late Canon Vaughan (see p. 343) by a memorial tablet to be placed in Winchester Cathedral, and, if funds permit, to provide prizes to encourage the study of natural history and botany, such prizes to be offered to the school children of Winchester, Droxford, Langrish, Porchester, and Alton—towns in which Canon Vaughan spent a large part of his life. Subscriptions may be sent to E. W. Toby, Esq., 105 High Street, Winchester.

The Report for 1921 of the Botanical Society and Exchange Club of the British Isles contains papers on "British Centaureas of the Nigra group," by C. E. Britton; "Vivipary in *Festuca ovina*," by T. J. Jenkin; "Seeds of the British Dactylorchids," by T. A. Dymes; "British Batrachia," by W. H. Pearsall; and a "Flora Zetlandica," by Dr. Druce—with plant-notes and obituaries; the notice of Dr. Harley is almost textually taken from this Journal (p. 94), and its source should, we think, have been acknowledged.

Contributions from the Gray Herbarium (no. lxv., issued Sept. 13) contains the description and figure of a new genus, *Dyscritothamnus*, from Mexico, placed in *Eupatorieæ* by Mr. B. L. Robinson, who also continues his "preliminary records" of that tribe; Mr. J. F. Macbride revises the Rocky Mountains *Astragali* of the subgenus *Homalobus*, and contributes notes on the *Psoraleæ* and on various N. American Spermatophytes, both involving many changes in nomenclature; Mr. C. A. Weatherby writes on the group of *Polypodium lanceolatum* in N. America, describing four new species.

No. 8 of *The Flowering Plants of South Africa* (Reeve & Co.) contains plates and descriptions of *Daubenya aurea* var. *coccinea*, *Stapelia Pillansii* var. *attenuata*, *Mesembryanthemum crassipes* Marloth, sp. n., *Leucospermum tottum* var. *glabrum*, *Ornithogalum Roodeæ* Phillips, sp. n., *Protea recondita*, *Crossandra Greenstockii*, *Roodia digitifolia* N. E. Br., gen. nov. (Mesembryeæ), *Bauhinia Galpinii*, and *Klattia Stokoei*.

In the most recent part (vol. xxxiii. pt. 1; Sept. 15, 1922) of the *North American Flora*, P. A. Rydberg elaborates the *Ambrosiaceæ* and *Carduaceæ*, the *Vernonieæ* being undertaken by H. A. Gleason. Mr. Rydberg raises Asa Gray's section *Chorisiva* to generic rank, and similarly elevates *Franseria Bryantii* Curran under the name *Acanthambrosia*; numerous new species are described by both authors.

The *Kew Bulletin* (no. 8) is chiefly occupied by descriptions of new Siamese plants by Mr. W. G. Craib; Mr. W. H. Pearson has a note on *Jungermannia humilis* Hook. f. & Taylor, which he refers to *Leioscyphus*; incidentally he has examined four specimens, named by Stephani *Lophocolea humilis*, which he refers to four widely different species, two of them here described as new.

The Rev. Joseph Jacob has published in the *Gardeners' Chronicle* (July 2, Sept. 2, Oct. 28) three interesting papers on "Gardeners' Kalendars" ranging in date from Evelyn's *Kalendarium Hortense* (1664) to G. W. Johnson's *Gardener's Almanack* (1843). In the number for Nov. 4, Mr. R. P. Brotherston makes some additions to the list.

The October *Journal of the Department of Agriculture* of South Africa contains an article by H. A. Melle on "Hubam Clover" (*Melilotus alba* var. *annua*) which has been found invaluable as winter feed for live stock. The plant is a rapid grower, attaining in one season the height of 38 feet; as a bee-plant it is unequalled.

The *General Index to the Kew Bulletin* for 1887–1918 (Stationery Office, 7*s.* 6*d.* n.), although issued in 1920, only reached the Department of Botany last month, but its importance seems to justify this late reference to its appearance, A prefatory note, presumably by the late Director, gives some account of its inception and execution; "it was originally proposed to issue the *Bulletin* only occasionally and whenever matter of sufficient interest had accumulated; it was, however, at once found necessary to publish it regularly"—a statement which will amuse those who remember the notorious irregularity which characterised the appearance of the *Bulletin* for many years before it came under the superintendence of Sir David Prain, under whom it became the important publication which it still remains. A list of the actual dates of the issue of the numbers might usefully have been included in the present volume.

Mr. Ronald D'Oyley Good, B.A., Scholar of Downing College, Cambridge, has been appointed Assistant in the Department of Botany, British Museum.

THE DETERMINATION OF LICHENS IN THE FIELD.

By W. Watson, D.Sc.

It is often very useful to the ecologist to be able to name the lichens he finds in a particular association, and the following key is intended to help in that direction. By it many genera and some species of British lichens may be determined in the field, stress being laid on characters which can be seen by the naked eye or with the aid of a lens, though spore characters are often added for the sake of completeness. Even with the aid of such a key (an artificial one, since it takes little account of lines of classification), the determination of the genus of a lichen is not always possible in the field since so many genera have their distinguishing characters in microscopic details such as the form, colour, and septation of spores. The character of the algal symbiont can often only be rightly determined by microscopic examination, but in a general way its colour is indicated by the colour of the thallus as shown in surface view, or in a rough section more or less parallel to the surface. A gelatinous or bluish thallus usually contains blue-green algæ, whilst a yellow, grey, white, or green thallus usually indicates the presence of green algæ, and some experience in the field often enables the algal constituent to be diagnosed correctly. In some cases the colour of the thallus is almost a generic indication, as in the vivid green colours shown by the thalli of *Peltidea*, *Coriscium*, and *Solorina saccata* when they are moist.

The equipment of a field-lichenologist should include a small case containing tubes of potassium hydrate solution (equal weights of caustic potash and water) and strong calcium hypochlorite solution, with dipping rods. The case can be made of such a size and form so as to remain upright in one of the upper waistcoat pockets. A similar tube of strong iodine solution in potassium iodide is also useful in some cases.

I have used the following abbreviations:—Ap. = Apothecium. C = Chloride of lime (bleaching-powder) solution, C – indicating no reaction when the thallus is treated with the solution, and C + a positive one. K = Caustic potash solution, K – indicating the absence of a colour reaction and K + a positive reaction. I = iodine solution in pot. iod. Sp. = spore. Th. = Thallus. Usu. = usually. ± stands for more or less, or when affixed to K or C for positive or negative, thus K± means that either a positive or a negative reaction is shown after treatment with caustic potash. μ = micromillimetre or $\frac{1}{1000}$ of a millimetre.

June 22

KEY TO THE GENERA OF BRITISH LICHENS.

Typical specimens are referred to: abnormal plants cannot always be placed in their proper genera by means of the key.

Th. of leaf-like bodies or squamules ±horizontally placed	A.
Th. of filaments or cylinders, or of ±erect and strap-shaped bodies (laciniæ)	B.
Th. a granular, tartareous or powdery crust, or wanting	C.

A. Thallus foliose or squamulose.

1. Ap. borne on erect elevated cups, or on cylindrical bodies (podetia)	2.
Thecia borne on the thallus or absent	3.
2. Podetia solid, with minute squamules crowded on them. Spores septate	**Stereocaulon.**
Podetia hollow, usually without squamules. Spores simple	**Cladonia** (*a*) *.
3. Th. of large lobes, not less than 4 mm. broad, and often much broader	4 (*b*).
Th. of small or minute lobes	23.
4. Th. gelatinous when moist, with blue-green algæ (*Nostoc*) distributed in it	5.
Th. not gelatinous when moist, the algal cells forming a definite layer beneath the upper surface	6.
5. Th. with a cellular cortex. Sp. muriform (*c*).	**Leptogium** (*d*).
Th. thickish, not cellular. Sp. muriform ...	**Collema** (14–15).
Th. thin or flaccid, not cellular except in or near the ap. Sp. elongate-fusiform with 3–many transverse septa (*S. nigrescens* and *S. flaccidus*)	**Synechoblastus.**
6. Th. greyish when dry, usu. umbilicate (*e*), and with perithecia dotted on the upper surface (*D. miniatum* and *D. aquaticum*).	**Dermatocarpon.**
Th. blackish when dry, usu. umbilicate. Ap. without a thalline margin, the disc twisted or plaited (gyrose)	7.
Th. not umbilicate. Ap. usu. with a thalline margin, the disc not gyrose	8.
7. Th. pustulate (*f*). Ap. with plane disc. Sp. 1, dark, muriform	**Umbilicaria.**
Th. not or little pustulate. Ap. usu. with gyrose disc. Sp. 8, colourless, simple	**Gyrophora.**
8. Th. with whitish or yellowish depressions (cyphellæ) or spots (*g*) (pseudocyphellæ) beneath. Ap. with thalline margin. Sp. 1–3 septate	9.
Th. without cyphellæ or pseudocyphellæ beneath	10.

* The notes are to be found at the ends of the Sectional Keys A, B, &c.

9. Algal cells bright-green .... **Sticta.**
Algal cells blue-green (*Nostoc*) .... **Stictina.**
10. Th. vividly bright-green when moist. Usu. on soil.. 11.
Th. not vividly bright-green when moist ... 12.
11. Ap. sunk in depressions of the th. .... **Solorina saccata.**
Ap. not sunk in depressions of the th. ...... **Peltidea.**
12. Th. with large pits above, *or* saffron-coloured beneath, *or* with ap. sunk in pits............ 13.
Th. smooth or little wrinkled above, not saffron beneath. Ap. superficially placed . 15.
13. Th. ±orbicular smooth, saffron beneath. Ap. usu. in pits. Sp. 1-septate, brown. Alpine plant .... **Solorina crocea.**
Th. widely spreading, pitted, not saffron beneath. Ap. superficial. Sp. 1–7 septate. colourless .... 14.
14. Th. strongly reticulate-pitted. Algal cells green .... **Lobaria pulmonaria.**
Th. with less evident and more irregular pits. Algal cells blue-green (*Nostoc*) ...... **Lobarina scrobiculata.**
15. Th. with blue-green algal cells *or* in *Ricasolia* (which has green algal cells) with very large lobes (often more than 2 cms. broad) 16.
Th. with green algal cells; lobes usu. less than 1 cm. broad .... 20.
16. Th. ±orbicular-radiate, of shell-like lobes with radiating lines and with a bluish-black fibrillose surface beneath .... **Parmeliella plumbea.**
Th. not orbicular-radiate and not dark-blue beneath .... 17.
17. Th. corticate and sometimes glabrous beneath. 18.
Th. without cortex beneath, but usu. with nerves and rhizinæ .... 19.
18. Th. with blue-green algal cells (*Nostoc*); under surface glabrous or nearly so except in the very rare *N. resupinatum* .... **Nephromium.**
Th. with green algal cells; under surface ±covered with tomentum and rhizinæ ... **Ricasolia.**
19. Th. green when moist, with cephalodia (*h*) and green algal cells .... **Peltidea.**
Th. grey, brown or dark when moist, without cephalodia and with blue-green algal cells (*Nostoc*) .... **Peltigera.**
20. Th. yellow, becoming purple with K. Ap. small with colourless polarilocular spores. **Xanthoria parietina.**
Th. not yellow, or if so, not becoming purple with K. Sp. simple and colourless or 1-septate and brown .... 21.
21. Th. usu. distinctly stellate or radiate-orbicular. Sp. 1-septate and brown .... **Physcia** (*i*).

Th. seldom distinctly stellate or radiate-orbicular. Sp. simple and colourless ...... 22.

22\. Under surface of th. usu. with rhizinæ. Ap. and spermogones on upper surface of th.... **Parmelia** (*j*).

Under surface of th. without rhizinæ. Ap. and spermogones on margin of th. .... **Platysma** (*k*).

23\. Th. ±orbicular, appressed to substratum, with radiating lobes at the circumference ...... 24.

Th. not having radiating and appressed lobes 36.

24\. Algal cells blue-green (*Nostoc* or *Rivularia*). 25.

Algal cells green .... 26.

25\. Margins of pale th. and reddish ap. silvery-white .... **Pannaria rubiginosa.**

Th. brown or dark. Very rare plants. Algal cells *Rivularia* .... **Pterygium.**

26\. Th. yellow, purple with K. Ap. yellow or reddish, purple with K. Sp. 8, polarilocular. 27.

Th. yellow, K—, not corticate nor rhizinose beneath (*l*). Ap. yellowish, K—. On rocks. 28.

Th. usu. greyish or whitish (if yellowish, corticate and rhizinose beneath). Ap. not yellow .... 29.

27\. Th. with cortex and rhizinæ beneath (*l*)... **Xanthoria parietina.**

Th. not corticate (except in *P. elegans*), nor rhizinose beneath .... **Placodium** (*m*).

28\. Sp. 8, simple or polarilocular (=*Candelariella m.* of the Monograph) ....**Placodium medians.**

Sp. many in ascus, simple.................. **Candelariella crenata.**

29\. Th. with cortex and rhizinæ beneath. Ap. with thalline margin........................... 21 (*n*).

Th. without cortex and rhizinæ beneath. Ap. with or without th. margin .... 30.

30\. Th. leprose K—, white or yellowish-white... **Crocynia lanuginosa.**

Th. not leprose, minutely radiate at circumference .... 31.

Th. not leprose, distinctly radiate at circumference .... 33.

31\. Ap. black .... 32.

Ap. reddish K+purple. Sp. polarilocular. Th. greyish K— [*P. teicholytum* (=*P. erythrocarpum*) & *P. lallarei.*] .... **Placodium.**

32\. Th. greyish K+purple. Sp. polarilocular. **Pyrenodesmia chalybæa.**

Th. whitish K—. Sp. simple... **Lecanora** (Galactina group).

Th. white K—. Sp. muriform .... **Rhizocarpon** (8 & 14).

33\. Th. white or almost so. Ap. dark. Sp. 1-septate .... 34.

Th. greyish or brownish. Ap. dark or coloured. Sp. simple and colourless ...... 35.

34\. Th. K—. Ap. with a thalline margin. Sp. colourless .... **Placolecania candicans.**

Th. K+ yellow. Ap. without a th. marg. Sp. brown. (Also the rare *B. epigæa.*) ... **Buellia canescens.**

35. Usu. on rocks. Th. closely appressed. Ap. with a th. marg. .... **Squamaria.**
On soil. Th. less closely appressed. Ap. orange-red or testaceous, without a th. marg. but with a proper paler margin...... **Lecidea testacea.**

36. Th. of small lobes or squamules (under 4 mm. broad) .... 37.
Th. of minute or indistinct lobes or squamules; usu. much less than 1 mm. broad (*o*) .... 50.

37. Th. dark and gelatinous when moist. Algal cells blue-green (*Nostoc*) and scattered ... 5 (*p*).
Th. not gelatinous when moist. Algal cells forming a definite layer and usu. green ... 38.

38. Th. with small perithecia dotted about on the upper surface .... 48.
Perithecia absent. Thecia (when present) with open disc (apothecia) .... 39.

39. Th. bright bluish-green. Usu. on turf ...... **Coriscium.**
Th. not green, or if so, without the bright bluish appearance .... 40.

40. Th. usu. dark or with a bluish appearance. Algal cells blue-green .... 41.
Th. variable but seldom dark. Algal cells green, though *Nostoc* cells may be present in tubercles (cephalodia) .... 42.

41. Algal cells *Nostoc*. Ap. with thalline margin (usu. crenulate). Sp. usu. simple .... **Pannaria.**
Algal cells *Nostoc*. Ap. without thalline margin. Sp. usu. simple .... **Parmeliella.**
Algal cells *Scytonema*. Ap. without th. marg. Sp. 1-septate .... **Massalongia carnosa.**

42. Th. with cephalodia containing *Nostoc*. Ap. usu. sunk in the th. .... **Solorina.**
Th. without cephalodia. Ap. not sunk in thalline pits .... 43.

43. Th. yellow, K+ purple. Sp. 8, polarilocular and colourless .... **Xanthoria.**
Th. of yellow ±imbricated laciniæ, K−. Sp. many and colourless. (On trees.) ...... **Candelaria concolor.**
Th. not yellow, or if so, K−. Sp. 8 not polarilocular .... 44.

44. Th. of thickish squamules without cortical cells or rhizinæ beneath.......................... 45.
Th. of leaf-like lobes or laciniæ with cortical cells and rhizinæ beneath, though these may be imperfectly developed and sometimes absent .... 47.

45. Ap. without a thalline margin. Squamules scattered and often free from each other... **Lecidea (Psora).**

Ap. with a thalline margin. Squamules usu. imbricate .... 46.

46. Th. lurid-brown or chestnut. Sp. 1–septate. **Placolecania holophæa.**

Th. pale, often yellowish. Sp. simple......... **Squamaria.**

47. Sp. 1-septate and brown .... **Physcia.**

Sp. simple and colourless .... 22.

48. On trees. Th. grey, often concentrically wrinkled. (Perithecia rare.) .... **Normandina** (*q*).

On earth or rocks. Th. not concentrically wrinkled .... 49.

49. Algal cells present in hymenium. Sp. muriform .... **Endocarpon.**

Algal cells not present in hymenium. Sp. muriform .... **Dacampia.**

Algal cells not present in hymenium. Sp. simple... **Dermatocarpon.**

50. Ap. on a slender black stalk and asci dissolving so that the spores are free. On trees and wood. Rare .... **Chænotheca** (2 & 4).

Ap. not stalked and asci not dissolving ...... 51.

51. Th. dark and ±gelatinous when moist. Algal cells (*Nostoc* or *Rivularia*) scattered. 52.

Th. not gelatinous when moist. Algal cells in a definite layer .... 54.

52. Algal cells *Rivularia*. Very rare plant. **Pterygium kenmorense.**

Algal cells *Nostoc* .... 53.

53. Th. with cellular cortex. Sp. septate-muriform. **Leptogium** (*r*).

Th. non-corticated. Sp. septate-muriform ... **Collema** (1, 3 & 5).

Th. non-corticated. Sp. simple .... **Physma.**

54. Th. of ±imbricated yellow laciniæ K –. Sp. many in ascus. Usu. on trees .... **Candelaria concolor.**

Th. of yellow laciniæ or lobes K+ purple. Sp. 8 in ascus.. **Xanthoria.**

Th. usu. greyish or brownish, K+ or –. Sp. 2–8. Usu. on rocks .... 55.

55. Th. having dark perithecia. Sp. muriform and large ....**Polyblastia** (11 & 17).

Th. with dark perithecia. Sp. simple. **Verrucaria macrostoma.**

Thecia always open (apothecia). Sp. not muriform .... 56.

56. Algal cells blue-green (*Nostoc*). Sp. usu. simple.. 57.

Algal cells green. Sp. simple or septate...... 58.

57. Ap. with thalline margin (usually crenulate). **Pannaria** (2–3).

Ap. without thalline margin.................. **Parmeliella** (2, 3, 5).

58. Th. yellowish, entirely cellular, K – ; algal cells bright-green. Ap. with thalline margin. Sp. 8 simple. On mosses .... **Psoroma hypnorum.**

Th. greenish-yellow with citrine-yellow soredia **Lecanora epanora.**

Th. not yellowish and not entirely cellular ... 59.

59. Ap. with thalline margin. Sp. 8 or many in ascus .... 60.
Ap. without thalline margin. Sp. 8 in ascus, colourless .... 61.

60. Th. ±appressed. Sp. small, colourless, many in ascus. On rocks .... **Acarospora.**
Th. usu. ±imbricate. Sp. 1-septate, colourless, 8. On rocks or ground (*P. holophæa* and *P. leucospeirea*) .... **Placolecania** (*u*).
Th. isidioid-squamulose. Sp. 1-septate, brown, 8 in ascus. On trees. Rare .... **Rinodina isidioides.**

61. Sp. simple. Th. variable in colour; squamules often discrete .... **Lecidea (Psora)** (*s*).
Sp. 1-septate. Th. ±glaucous-grey, thickish and rounded (*B. cæruleonigricans* and *B. candida*) .... **Biatorina.**
Sp. with 3 or more septa. Th. greyish or brown .... 62.

62. Sp. fusiform, about 4 times as long as broad, 3 or more-septate .... **Bilimbia** (*t*).
Sp. acicular, more than 10 times as long as broad, pluriseptate (*B. pulvinata* and *B. polysita*) .... **Bacidia.**

(*a*) When *Cladonia* and *Stereocaulon* have no apothecia on the podetia they will come in Group B. They may also come in Group C when the th. is granulose. If they are sterile and without podetia they cannot be determined by the key, though they have a peculiar facies which usu. enables them to be recognised.

(*b*) 4 mm. is only an approximate measurement and sometimes plants with a large thallus (10 cms. or more in diameter) may be included here, though the majority of the individual lobes may be less than 4 mm. Many plants (e. g., *Lobaria pulmonaria*, *Ricasolia amplissima*, *R. lætevirens*, *Peltigera canina*, *Parmelia perlata*, *P. scortea*) included here may have a thallus exceeding 20 cms. in diameter.

(*c*) A spore is said to be muriform when it has longitudinal as well as transverse divisions. In order to see the true septation of a spore it is often necessary to treat the microscopic preparation with K, otherwise simple spores with two or many globules present in them may be mistaken for 1-septate or muriform spores respectively.

(*d*) The species of *Leptogium* which would be referred here are those numbered 21–25 in *A Monograph of British Lichens* by Miss A. L. Smith. In other cases where numbers are given they refer to the numbers prefixed to the species in that work, which should be consulted for further information. In some cases the names given in the Monograph are used, though other views as to nomenclature may be held. Large specimens of *L. scotinum* and *L. lacerum* may also be referred here.

(*e*) Umbilicate. Affixed to the substratum by a central point.

(*f*) Pustulate. With many swellings and depressions.

(*g*) *Lobaria* and *Lobarina* have pale swellings beneath, which must not be confused with pseudocyphellæ.

(*h*) Cephalodia are tubercles containing filaments of the normal fungal constituent but with a foreign algal constituent (usually *Nostoc*). They may be externally or internally placed.

(*i*) Only large specimens of some Physcias (e. g. *P. aipolia*) have lobes broader than 4 mm.

(*j*) Many species (1, 3, 9, 10, 15–19, 23, 24, 30, 31, 34) of *Parmelia* may have lobes broader than 4 mm. Other species not enumerated may exceptionally have large lobes. *P. physodes* has no rhizinæ beneath. When soredia are present in *Physcia* they usually occur as rounded bodies (soralia) on the surface of the thallus; in *Parmelia* they are seldom orbicular in form and often occur on the margins or at the apices of the thalline lobes. Soralia are present in *Parmelia mougeotii*, *P. ambigua*, *P. dubia*, and *P. reddenda*. In *Physcia grisea* the margin of the thallus is sorediate.

(*k*) Platysma (Cetraria) 1, 2, 4, 5 and sometimes 7.

(*l*) Corticate and rhizinose beneath—having the lower surface of the thallus formed of cells and with rhizinæ.

(*m*) *Placodium* here refers only to *Euplacodium* of the Monograph. *P. xantholytum* is leprose (or scurf-like) and sterile, whilst *P. fulgens* has simple spores, but otherwise they agree with the characters given in the key.

(*n*) In some species of *Physcia* the lower cortex is imperfectly cellular. The species of *Physcia* would nearly always be referred here, except in the case of the ±fruticose species 1–3.

(*o*) In laciniate plants the laciniæ can only be seen under a lens with a small magnifying power. In squamulose plants the width of the squamules may approach 1 mm. but the squamulose character is indistinctly shown.

(*p*) *Collema* 5–13. *Leptogium* 18–20.

(*q*) The th. is sometimes larger than indicated by the key.

(*r*) *Leptogium* 1–7, 9–12, 14–16, varieties of 20.

(*s*) Besides the *Psora* section, other Lecideas (e. g. *L. gagei*, *L. coarctata*, *L. demissa*, *L. wallrothii*, *L. endomelæna*, and *L. nigroglomerata*) have minutely squamulose forms.

(*t*) *Bilimbia* 1–4, 6–8, and 26.

(*u*) Some Lecanoras, e. g. *L. gangaleoides*, *L. frustulosa*, *L. argopholis*, may have a similar subsquamulose appearance, but the spores are simple. The three examples given have a yellow reaction with K.

B. THALLUS FRUTICOSE (*a*) OR CYLINDRICAL OR FILAMENTOUS.

1. Th. of long cylinders or of ±erect strap-shaped bodies, not gelatinous (*b*) .... 2.
   Th. of small or short cylinders, dark (often olive) and ±gelatinous (*c*) .... 14.
   Th. of minute filaments or cylinders, dark (often olive) and ±gelatinous (*d*) .... 23.
2. Th. of branching, ±entangled cylindrical (or semi-cylindrical) bodies, concolorous on all sides. Ap. parmelioid (*e*) .... 3.
   Th. of ±upright cylindrical bodies (usu. little branched). Ap. various (*f*) .... 7.

Th. of ±upright or ascending strap-shaped bodies. Ap. parmelioid	12.
3. Th. yellow, K+ purplish. Sp. polarilocular, colourless	**Teloschistes.**
Th. grey or dark (occasionally reddish) K— or + yellowish. Sp. simple, colourless or brownish	4.
4. Th. light-grey (occ. reddish) with firm medullary axis of closely-packed fungal filaments (hyphæ)	**Usnea**
Th. light-grey to black with medulla of loosely-packed hyphæ	5.
5. Th. usu. shining chestnut-brown (sometimes darker) and with small spines	**Cetraria aculeata.**
Th. grey or blackish (chestnut-brown in *Alectoria divergens*) and without spines .	6.
6. Th. small, black, ±shining, beneath sometimes paler and sometimes with a few rhizinæ	**Parmelia pubescens.**
Th. larger, whitish to dull-black, beneath concolorous and without rhizinæ	**Alectoria** (*g*).
7. Cylinders hollow and often ±tapering at the apices	8.
Cylinders solid and little tapering at the apices	9.
8. Cylinders expanded at the apex into a cup, or branched with the axils of branches ±perforated	**Cladonia** (*h*).
Cylinders white, simple or almost so, and tapering upwards	**Cerania.**
9. Cylinders with many small squamules or granules on them	**Stereocaulon** (*h*).
Cylinders without squamules or granules on them	10.
10. Th. of small, dark, ±erect lobes. Ap. parmelioid. Alpine or subalpine	**Parmelia corniculata.**
Th. larger, whitish or greyish	11.
11. Th. of greyish branches, ±sorediate. Algal cells *Trentepohlia*. Ap. lateral. Maritime only	**Roccella.**
Th. of whitish branches, not sorediate. Algal cells green. Ap. terminal	**Sphærophorus.**
12. Th. truly fruticose (*a*). Sp. colourless, 1-septate	**Ramalina,**
Th. not truly fruticose (points of attachment many, under surface different from upper).	13.
13. Subfruticose, greyish or whitish above, white or blackish below. Sp. colourless, simple .	**Evernia.**
More or less spreading, paler below, villose above or with cilia at margins. Sp. brown, 1-septate	**Physcia** (1–3).

Concolorous or almost so on both sides, often spiny at margin. Sp. colourless, simple ... **Cetraria** (*i*).

14\. On tidal rocks. Th. dichotomously branched like a small *Fucus*, with *Stigonema* algæ . **Lichina.**
Not on tidal rocks and plant not fucoid ...... 15.

15\. Thalline lobes or cylinders much branched with uneven or nodulose surface. Algal cells not *Nostoc* (*j*) .... 16.
Little branched, the surface usually even (*k*). 18.

16\. Thalline cylinders cellular, alga *Scytonema*. Ap. sessile .... **Polychidium.**
Not or vaguely cellular, alga *Stigonema*. Ap. innate .... 17.

17\. Branchlets spiny. Paraphyses distinct. Sp. simple, colourless .... **Ephebeia.**
Branchlets not spiny. Paraphyses none. Sp. 1-septate, colourless .... **Ephebe.**

18\. Th. with cellular cortex .... 19.
Th. without cellular cortex. Tubes swollen at apices.. 20.

19\. Algal cells mostly bright green. Ap. in thalline pits .... **Solorina spongiosa** (*l*).
Algal cells blue-green (*Nostoc*). Ap. not sunk in th. pits .... **Leptogium.**

20\. Algal cells *Nostoc*, in chains. Thalline section red with iodine. Sp. septate .... 21.
Algal cells *Scytonema* or *Glœocapsa* (*m*). Sp. simple .... 22.

21\. On trees in upland districts. Th. section blood-red with iodine. Sp. 1–3-septate, 4–5 times as long as broad...... **Synechoblastus fascicularis.**
On mossy rocks in alpine places. Th. section wine-red with iodine. Sp. muriform, less than twice as long as broad............... **Collema ceraniscum.**

22\. On decayed mosses on alpine rocks. Algal cells *Scytonema* .... **Schizoma lichinodeum.**
On rocks, usu. in little tufts on calcareous rocks. Algal cells *Glœocapsa* .... **Synalissa.**

23\. Th. ±gelatinous; filaments or lobes prostrate or erect. Algal cells blue-green (*n*) ...... 25.
Th. not gelatinous, of interlacing and prostrate filaments. Algal cells *not* blue-green. 24.

24\. Th. with filaments ±constricted. Hyphæ much twisted. Algal cells reddish (*Trentepohlia*) .... **Cœnogonium.**
Th. with filaments little constricted. Hyphæ little twisted. Algal cells green (*Cladophora*) .... **Racodium.**

25\. Th. of tangled filaments. Algal cells *Scytonema* or *Stigonema* .... 26.
Th. of ±erect lobes. Algal cells *Nostoc* ... 28.

26. On trees. Cortical cells present	**Leptogidium.**
On rocks or other lichens on rocks. No cortical cells	27.
27. Filaments sparingly branched. Alga *Scytonema*	**Thermutis.**
Filaments with frequent branches. Alga *Stigonema*	**Spilonema.**
28. Very rare plants having perithecia (opening by a pore)	**Pyrenidium.**
Commoner plants with apothecia (open discs).	**Leptogium.**

(*a*) Fruticose. Attached by a basal point to the substratum, the divisions of the thallus having a radiate (similar on all sides) structure.

(*b*) Algal cells are green except in *Roccella* with reddish *Trentepohlia*. *Parmelia pubescens* and *P. corniculata* are included here, because their thalli are not gelatinous and their algal cells are green, though they have small or short cylinders or lobes. Narrow-lobed Parmelias (e. g. *P. encausta*, *P. alpicola*, *P. stygia*), with their thalli appressed to the substratum, are included in the Sectional Key A.

(*c*) Algal cells blue-green. *Solorina spongiosa* (which may possibly be placed here) has bright-green algal cells in the general thallus, but also contains groups of blue-green algæ.

(*d*) The thalline divisions are so minute (less than 100 μ diameter) that they can only be seen under a strong lens. The algal cells are blue-green except in *Racodium* (with green *Cladophora*) and *Cœnogonium* (with reddish *Trentepohlia*).

(*e*) A parmelioid apothecium is ±shield-shaped, large, and has a thalline margin.

(*f*) Some Cladonias, which would be placed here when they are without squamules at the base, are much branched.

(*g*) Including *A. thrausta*. The rare plant, *Physcia intricata*, may be found here.

(*h*) When specimens of this genus are without squamules at the base they may be found here.

(*i*) Some forms of *Platysma* may possibly come here.

(*j*) In *Polychidium muscicolum* the cylindrical th. is often almost even, but is much-branched. The *Scytonema* algal cells in this and other plants can easily be taken as *Nostoc*, the sheath being often wanting or indistinct. They are more irregular in outline than *Nostoc* cells, and seldom form long chains.

(*k*) *Leptogium microscopicum*, which is little branched but is usu. ±nodulose, will generally be found under the group with "minute cylinders" (23) since the thalline lobes are usu. under 100 μ thick.

(*l*) Scarcely likely to be found here.

(*m*) In the rare plant *Synalissa intricata* the algal cells form chains.

(*n*) Some forms of *Placynthium nigrum* may possibly be found here. The thallus is scarcely gelatinous though it contains blue-green algæ (*Scytonema*).

C. Thallus crustaceous, granular, or wanting (*a*).

1.	Th. often gelatinous and dark. Algæ blue-green, Myxophyceæ (*b*)	D.
	Th. not gelatinous. Algæ belonging to *Chlorophyceæ*, usu. green, but sometimes reddish (*Trentepohlia*)	2.
2.	Plants without apothecia or perithecia (*c*) ...	J.
	Plants with apothecia or perithecia............	3.
3.	Ap. or perithecia immersed in pits formed in the rocky substratum (usu. calcareous rock)	E.
	Thecia not in pits of the rock	4.
4.	Th. usu. yellow to purplish, or ap. yellowish to purplish, with polarilocular spores (*d*)...	6.
	Plant without these characters	5.
5.	Thecia often stalked, ±closed. Asci dissolving so that the spores are loose and form a powdery mass.................................	F.
	Asci not dissolving. Spores not forming a powdery mass.................................	7.
6.	Ap. with thalline margin	**Callopisma.**
	Ap. without thalline margin............	**Callopisma (Blastenia).**
7.	Thecia borne on podetia (sometimes very short)	31.
	Thecia not borne on podetia	8.
8.	Thecia elongated, or linear, or radiate, or irregularly roundish (sometimes simulating perithecia or lecideoid (*e*) ap.); disc ±open.	G.
	Thecia (perithecia) closed or opening by a minute pore (ostiole).........................	H.
	Thecia (apothecia) circular with ±plane (when young) and open disc	9.
9.	Fertile warts (verrucæ) present, 1–many ap. in each wart. Sp. large ($50\,\mu$ or more), colourless or nearly so. Algal cells green...	10.
	Ap. not in fertile warts. Sp. seldom over $30\,\mu$ long	11.
10.	Sp. simple, large (usu. over $100\,\mu$ long), 1–8 in ascus	**Pertusaria.**
	Sp. 1-septate, very large (about $300 \times 100\,\mu$), 1 in ascus	**Varicellaria.**
11.	Ap. with two margins, an outer thalline one surrounding an inner proper one	28.
	Ap. with only one margin or without a margin .	12.
12.	Ascus containing many spores. Sp. simple, colourless, usu. minute	13.
	Ascus containing 8 or fewer spores (*f*). Sp. various	16.
13.	Ap. with thalline margin	14.
	Ap. without thalline margin....................	15.

14. Th. of bright yellow granules (g). Ap. superficial, distinctly marginate, yellow (g). Sp. about $13 \times 5\mu$ .... **Candelariella vitellina.**
Th. not formed of bright-yellow granules. Ap. ±immersed, not yellow, margin less distinct. Sp. minute, about $4 \times 1{\cdot}5\mu$ ...... **Acarospora.**
15. Th. often present. Ap. usu. dark both externally and internally, and with prominent proper margin .... **Biatorella** (**Sarcogyne**).
Th. often absent. Ap. often soft, coloured, pale internally and with indistinct proper margin .... **Biatorella.**
16. Ap. with thalline margin or with gonidia beneath hymenium .... 17.
Ap. without thalline margin or without gonidia beneath hymenium .... I. (h).
17. Ap. sunk in the th. (innate). Sp. simple, colourless, often large and broadly ellipsoid. Algal cells green or reddish .... 18.
Ap. superficial or not so distinctly innate. Algal cells green .... 19.
18. Algal cells yellowish or reddish (*Trentepohlia*). Sp. less than 20μ.................. **Jonaspis.**
Algal cells green. Sp. often much larger ... **Aspicilia.**
19. Sp. simple, colourless, often about twice as long as broad .... 21.
Sp. septate, colourless, 3-10 times as long as broad .... 27.
Sp. 1-septate, or polarilocular; often rather less than twice as long as broad .... 20.
20. Sp. colourless, polarilocular (*P. chalybœa* and *P. variabilis*) .... **Pyrenodesmia.**
Sp. dark, 1-septate .... **Rinodina.**
21. Ap. usu. large (2 or more mm.). Sp. large, usu. over 40μ .... **Lecanora** (Tartarea group).
Ap. usu. small (1 mm. or less). Sp. smaller, usu. less than 20μ.............................. 22.
22. Th. usu. ±yellowish C±, K+yellowish. (If the th. is whitish the reaction with K is yellowish.) On rocks, trees, etc. **Lecanora** (Varia group, 36–53).
Th. and ap. brown to black K−C−. On rocks .... **Lecanora** (Badia group).
Th. whitish or greyish (rarely greenish). On rocks, trees, etc. K±C−.............. 23.
23. Th. K+yellow .... 24.
Th. K−.. 26.
24. Ap. internally dark with robust violet paraphyses... **Lecanora atra.**
Ap. not internally dark with paraphyses not violet .... 25.

25. Ap. ±pruinose .... **Lecanora** (Pallida group, 27–32).
    Ap. not pruinose .... **Lecanora** (Subfusca group, 11–19).
26. Th. normally subeffigurate at the margin. On rocks .... **Lecanora** (Galactina group, 33–35).
    Th. not subeffigurate at the margin. On rocks, etc. .... **Lecanora** (Umbrina group, 21–25)
27. Sp. ellipsoid, 1–3-septate, usu. less than 20 μ long and about three times as long as broad. **Lecania** (*i*).
    Sp. fusiform, 1–3-septate, $13–27 \times 4–6\ \mu$, and usu. about 4 times as long as broad ... **Icmadophila.**
    Sp. acicular, 3–7-septate, usu. over 40 μ long and about 10 times as long as broad......... **Hæmatomona.**
28. Algal cells *Trentepohlia*. Sp. colourless, fusiform, many-septate and slightly muriform. On trees................................ **Thelotrema.**
    Algal cells green. Sp. and habitat various... 29.
29. Sp. colourless, elongate cylindrical, 30–40 septate, about $100 \times 4\ \mu$. On trees .... **Conotrema.**
    Sp. colourless or dark, distinctly muriform, ellipsoid. Habitat various .... 30.
30. Sp. colourless, often large (over 50 μ long). On trees .... **Phlyctis.**
    Sp. dark, usu. less than 40 μ long. On rocks, lichens, or mosses .... **Diploschistes.**
31. Th. thin, having a varnished appearance or wanting. Podetia very short. Sp. filiform, many-septate, $180 \times 2\ \mu$. .... **Gomphillus.**
    Th. granular. Sp. simple or with few septa, never filiform...................................... 32.
32. Podetia solid or nearly so. Sp. colourless, simple or septate .... 34.
    Podetia distinctly hollow. Sp. colourless, simple.. 33.
33. Podetia very short, papilla-like, ±club-shaped, inflated .... **Pycnothelia.**
    Podetia usu. well-developed, sometimes cup-shaped at apex .... **Cladonia.**
34. Podetia granular or minutely squamulose ... 35.
    Podetia without granules or squamules. Thalline squamules K+yellow. Usu. on earth .... **Bæomyces.**
35. Podetia finely warted, simple (unbranched). Ap. black .... **Pilophorus.**
    Podetia minutely squamulose, often ±branched. Ap. brown .... **Stereocaulon.**

(*a*) It is often impossible to determine crustaceous lichens in the field, but this and the following keys have been arranged with their use in the field kept constantly in view.

(*b*) Occasionally the myxophycean alga appears to be reddish or yellowish.

(*c*) Only a few plants are determinable in this case..

(*d*) Also includes forms of *Placodium lobulatum* and *P. miniatulum* in which the th. is scarcely radiately-squamulose at the margin.

In *Callopisma* (including *Blastenia*) there is a certain amount of variation in the colour and reaction of the th. and ap., and occasionally the spores do not appear to be polarilocular (*C. nivale*, *C. luteo-album*, *C. cerinellum*, and *C. rupestre*). In *C. epixanthum* (sometimes placed under *Candelariella*) the reaction with potash is negative both for the th. and ap. The ascus usu. contains 8 spores, but 16 may be present in *C. cerinellum.* The spores may be ±polarilocular in *Candelariella vitellina*, the ascus of which usu. contains 16 or more spores.

(*e*) A lecideoid ap. has no thalline margin and is without algal cells at its base.

(*f*) *Lecanora sambuci* is an exception. It has 12–32 spores in the ascus.

(*g*) Rarely the th. is greyish and the ap. darker.

(*h*) Table I does not include plants given in previous parts of the key, e. g., *Opegrapha* is given in Table G, and *Biatorella* is included with the many-spored lichens.

(*i*) In *Lecania* the spores are often simple in part, and may thus be confused with *Lecanora,* which usu. has relatively shorter spores (about twice as long as broad). The septum is often only apparent after treatment with K.

D. Thallus granular or crustaceous (often gelatinous) with blue-green algal cells, Myxophyceæ (*a*).

1. Th. ±gelatinous when moist, corticate or not. Algal cells usu. scattered throughout the th. .... 3.
   Th. not (or slightly) gelatinous when moist, corticate. Algal cells in a definite layer under the cortex .... 2.
2. Ap. with a thalline margin .... **Pannaria.**
   Ap. without a thalline margin ...... **Parmeliella (Pannariella).**
3. Algal cells *Nostoc* or *Scytonema* .... 4.
   Algal cells *Rivularia*, *Glœocapsa*, or *Chroococcus* .... 9.
4. Algal cells *Nostoc* .... 5.
   Algal cells *Scytonema* (*b*) .... 8.
5. Th. with a cellular cortex (*c*) .... 6.
   Cortex not cellular .... 7.
6. Sp. simple. Ap. with a proper margin ...... **Lemmopsis.**
   Sp. septate and muriform. Ap. with a thalline margin .... **Leptogium.**
7. Sp. simple .... **Physma (Lempholemma).**
   Sp. septate-muriform .... **Collema** (*d*).
8. Th. not corticate. Ap. with thalline margin. Sp. simple .... **Porocyphus.**
   Th. corticate, often minutely coralloid. Ap. without thalline margin. Sp. septate...... **Placynthium** (*e*).

9. Algal cells. *Rivularia*. Th. corticate. Ap. without thalline margin. Sp. 1–3-septate. **Pterygium.**
Algal cells *Glœocapsa* or *Chroococcus*. Th. not or slightly corticate. Ap. with or without thalline margin. Sp. simple ...... 10.
10. Algal sheath yellow. Th. slightly corticate. Ap. usu. innate and ±closed. Paraphyses unseptate .... **Psorotichia.**
Algal sheath reddish. Th. not corticate ... 11.
11. Ap. usu. innate (*f*) and ±closed. Paraphyses unseptate .... **Pyrenopsis.**
Ap. open or plane. Paraphyses septate ...... **Euopsis.**

(*a*) If the reproductive organs are perithecia, see Table H. Not corticolous except in some species or forms of *Leptogium*, *Pannaria*, and *Parmeliella*.

(*b*) See note *j* on Sectional Key B.

(*c*) In some species of *Leptogium* (*Collemodium*) the cellular nature of the cortex is often indistinct. Granular forms of *Collema cheileum* may have the fungal filaments and algal cells so closely packed that the structure may be mistaken for a cellular one.

(*d*) *Collema* 1–8 (or forms of these species).

(*e*) *P. nigrum* is a very common lichen on calcareous rocks. When typical it is easily distinguished by its hypothallus extending as a dark-blue band from the margin of the subdeterminate, minutely-coralloid, dark th.

(*f*) An ap. is said to be adnate when its base is surrounded by the th., innate when surrounded by the th., and immersed when deeply seated in the th.

E. Thallus crustaceous or wanting. Apothecia or perithecia immersed in pits of the rocky substratum.

1. Thecia with open discs (apothecia) .... 2.
Thecia with disc opening by a minute pore (perithecia) .... 4.
2. Ap. flesh-coloured or dark, with thalline margin .... 3.
Ap. dark, without thalline margin. Sp. simple, colourless............ **Lecidea immersa** and **L. metzleri.**
3. Ap. flesh-coloured. Sp. simple, colourless . **Aspicilia prevostii.**
Ap. dark. Sp. 1-septate, brown or dark. **Rinodina bischoffii** v. **immersa.**
4. Sp. simple .... 5.
Sp. 1–3-septate or muriform .... 6.
5. Perithecium with fissured apex. **Verrucaria (Limborina) calciseda.**
Perithecium without fissured apex .... **Verrucaria** (*a*).
6. Sp. 1-septate .... 7.
Sp. 3-septate (occasionally with a longitudinal septum .... **Thelidium incavatum.**
Sp. muriform............ **Polyblastia schraderi** and **P. deminuta.**

7. Sp. brown, 2 in ascus. Pits shallow ... **Microthelia dispora.**
   Sp. colourless, usu. 8 in ascus. Pits often deep .... 8.
8. Frequent plant of calcareous rocks. Algal cells green. Perithecia minute. Sp. about $30 \times 15\,\mu$ .... **Thelidium immersum.**
   Rare plants, often on shells. Algal cells *Trentepohlia*. Perithecia minute. Sp. about $18 \times 6\,\mu$ .... **Arthopyrenia foveolata** (*b*).

(*a*) *V. rupestris*, *V. integra*, *V. dolomitica*, *V. marmorea*, and *V. parva*. When the th. of *V. muralis* is evanescent the perithecia may leave slight pits.

(*b*) *A. litoralis* and *A. saxicola* may have their perithecia in shallow pits.

F. Thallus crustaceous or wanting. Spores becoming free in the apothecium. Coniocarpineæ.

1. Ap. stalked. Sp. dark or yellow. Habitat various (*a*).. 3.
   Ap. sessile or almost so. Sp. dark. On wood or parasitic on other lichens .... 2.
2. Sp. septate (usu. 1-septate). Ap. sessile with thalline margin. On wood (except *C. stigonella*, which is parasitic on *Pertusaria*) .... **Cyphelium** (*b*).
   Sp. simple. Ap. sessile (or shortly-stalked), without thalline margin. Usu. parasitic on *Pertusaria* (*c*)............................ **Sphinctrina.**
3. Sp. spherical, simple, yellowish in the mass . **Coniocybe.**
   Sp. spherical, simple, dark in the mass ...... **Chænotheca.**
   Sp. oblong, 1-septate, dark .... **Calicium.**
   Sp. oblong, 3- or more-septate, dark .... **Stenocybe.**

(*a*) The habitat is usually trees or worked wood. *Coniocybe furfuracea* sometimes occurs on ground, decaying mosses, or rocks. *Calicium arenarium* is present on the yellow th. of the saxicolous *Lecidea lucida*, and *Stenocybe trajecta* Nyl. (=*S. septata* Rehm.) may be parasitic on the th. of *Thelotrema lepadinum* and *Graphis elegans*. *Calicium debile* has been recorded from rocks.

(*b*) *C. notarisii* has the sp. 1–5-septate and slightly muriform.

(*c*) *S. kylemorensis* is found on *Lecanora*. *S. microcephala* Koerb. (=*S. anglica* Nyl.) is found on bark and wood.

G. Graphidineæ. Thallus crustaceous or wanting. Thecia elongate or irregular or radiate. (*a*) Algal cells usu. Trentepohlia.

1. Th. corticate above, determinate, white, C+ red. On rocks .... **Dirina.**
   Th. not corticate above. On rocks, wood, etc. .... 2.

2. Ap. immersed and aggregated in wart-like portions of the th. (*b*). Sp. septate	13.
Ap. not aggregated in specialized portions of the th. (*c*), which is usu. thin	3.
3. Ap. with a proper margin, except in abnormal cases or in old plants	5.
Ap. without proper margin	4.
4. Ap. usu. roundish, little divided, and with a spurious thalline margin. Sp. 3-septate...	**Platygrapha.**
Ap. usu. difform, often divided and without a spurious thalline margin. Sp. 1–6-septate.	**Arthonia** (*d*).
Ap. usu. difform and little divided. Sp. muriform	**Arthothelium.**
5. Ap. irregularly roundish with dark hypothecium. Sp. 1–5-septate, colourless......	**Lecanactis.**
Ap. typically ±linear, often much elongated (*d*)	6.
6. Th. with green algal cells. Ap. oblong to oval. Sp. simple or 1-septate	7.
Th. with orange algal cells. Ap. usu. elongate. Sp. 1–many-septate	10.
7. Sp. 1-septate, dark brown (colourless when young), 15–23 × 8–12 μ. On calcareous rocks	**Encephalographa.**
Sp. simple, colourless	8.
8. Ap. elongate with 2–4 parallel hymenia. On wood	**Ptychographa.**
Ap. with simple hymenium. On rocks or wood	9.
9. Ap. black with narrow disc and prominent margin. Hypothecium dark. Usu. on rock (*e*)	**Lithographa.**
Ap. dark brown or reddish with a dilated disc and less prominent margin. Hypothecium colourless or brownish. On trees and palings..	**Xylographa** (*f*).
10. Sp. 1-septate, colourless or brown. On trees (*g*)..	**Melaspilea.**
Sp. 3–many-septate, colourless or brown. On trees, rocks, etc.	11.
Sp. muriform, colourless. On trees	**Graphina.**
11. Ap. superficial. Paraphyses with transverse connections. Sp. colourless, 3–many-septate (*h*)	**Opegrapha.**
Ap. immersed. Paraphyses vertically parallel without transverse connections. Sp. colourless or brown, 5–many-septate	12.
12. Sp. colourless (*h*), 7–many-septate. Disc of ap. usu. narrow	**Graphis.**
Sp. brown (*h*), 5–8-septate. Disc. of ap. usu. ±dilated. Paraphyses usu. less distinctly shown..	**Phæographis.**

13. Ap. with dark margin, longly elliptical, forming little labyrinths of dark lines. Paraphyses unbranched. On wood	**Glyphis.**
Ap. immarginate, often oblong or elliptical. Paraphyses branched. On wood or rock...	14.
14. Hypothecium thick and black. Sp. colourless, 2–many-septate. Th. not limited by a black line	**Chiodecton.**
Hypothecium colourless or with a thin black line below. Th. often limited by a black line. Sp. colourless or brown	15.
15. Sp. colourless, 5–13-septate, $25–40 \times 3–5\ \mu$. Ap. minute. On trees or rocks	**Enterographa.**
Sp. dark brown, 4–7-septate, $20–25 \times 5\ \mu$. Ap. small. On rocks	**Sclerophyton.**

(*a*) When the thecia are minute and little elongated they may be confused with perithecia.

(*b*) The ap. are minute and crowded together in specialized portions of the th., which are not always wart-like.

(*c*) Some plants belonging to *Opegrapha* and *Arthonia* have the ap. crowded, but not on specialized portions of the th.

(*d*) The ap. are sometimes roundish and may be mistaken for those of plants with lecideoid ap. (Table I.). They are, however, ±difform even in *Lecanactis*. The th. is often little visible and developed beneath the bark.

Some forms of *Opegrapha*, when the margin is practically absent (e.g., *O. atra* var. *arthonoidea*, *O. herpetica* form *arthonoidea*) may be mistaken for *Arthonia*.

(*e*) The rare *L. flexella* and *L. dendographa* occur on trees.

(*f*) *X. parallela* has its ap. arranged in parallel rows and can thus be easily recognised. Some forms of *Graphis scripta*, *G. elegans*, and *Opegrapha atra* also have parallel ap., but they are usu. much longer.

(*g*) *M. vermifera* is parasitic on *Pertusaria*. *M. interjecta* occurs on rock, and is sometimes placed as a *Lithographa* on account of its dark hypothecium. *M. patersoni* is a peculiar species with many-septate spores.

(*h*) The spores of some species of *Graphis* and *Opegrapha* may become brownish when old. The spores of *Phæographis* are colourless when young.

H. Thallus crustaceous (or wanting) with perithecia (Pyrenodineæ) (*a*).

1. Perithecia simple and scattered (*b*)	2.
Perithecia ±united together	16.
2. Algal cells (gonidia) green	3.
Algal cells (gonidia) orange or reddish, usu. *Trentepohlia*	8.
Algal cells (gonimia) blue-green, *or* ap. parasitic on plants with blue-green algæ	14 (*c*).

3. Horizontal th. wanting. Perithecia yellowish and surrounded by a yellowish-green gonidial sheath. Ascus with many minute sp.	**Thelocarpon.**
Perithecia brown or black, usu. scattered on a horizontal th. (*d*). Ascus with 1–8 spores	4.
4. Paraphyses disappearing. Algal cells present in hymenium. Sp. muriform	**Staurothele.**
Paraphyses disappearing. Algal cells not present in hymenium. Sp. various..........	5.
Paraphyses persistent. Algal cells not present in hymenium. Sp. various..........	7.
5. Sp. simple, colourless (rarely brownish), 8 in ascus. Ostiolar filaments usu. present ...	6.
Sp. 1–3-septate, colourless (rarely brownish), 8 in ascus. Ostiolar filaments usu. absent.	**Thelidium.**
Sp. muriform, colourless or brown, 1–8 in ascus. Ostiolar filaments sometimes distinct	**Polyblastia.**
6. Sp. cylindrical with clavate ends, $30–40 \times 3–4\ \mu$	**Sarcopyrenia.**
Sp. ellipsoid or subglobose	**Verrucaria.**
7. Sp. simple, colourless or brownish, 2–3 times as long as broad	**Thrombium.**
Sp. many-septate, colourless, acicular, about 30 times as long as broad..........	**Gongylia.**
Sp. muriform, colourless or brownish, 2–5 times as long as broad	**Microglæna.**
8. Perithecia often coherent. Sp. muriform, $50–110 \times 20–40\ \mu$. On hazel	**Anthracothecium.**
Perithecia scattered. Sp. 1–many-septate, usu. much smaller..........	9.
9. Paraphyses branched or entangled, or indistinct or wanting	10.
Paraphyses unbranched and distinct (*e*)......	12.
10. Asci cylindrical, elongate, narrow with 1-septate colourless spores arranged vertically or obliquely	**Acrocordia.**
Asci clavate or ovate. Sp. ± massed, colourless or brown, 1–many-septate..........	11.
11. Sp. colourless, 1–5-septate, 2–5 times as long as broad (*f*)..........	**Arthopyrenia.**
Sp. colourless, 1–many-septate, 7–10 times as long as broad. On bark of trees	**Leptorhaphis** (*g*).
Sp. brown, usu. 1-septate (rarely 3–5-septate), 2–3 times as long as broad	**Microthelia.**
12. Sp. 8, brown, 3-septate, each cell with an oil-drop. Perithecia black. Th. with a ± oily appearance, often yellowish	**Pyrenula.**
Sp. colourless. Ap. frequently coloured......	13.

13. Ascus with 8 spores. Sp. 1–many-septate ... **Porina.**
Ascus with many spores. Sp. 1-septate...... **Thelopsis.**

14. Th. dark brown with whitish cephalodia and fertile tubercles each with 8–50 perithecia. On turf .... **Lophothelium.**
Th. wanting. Perithecia on a lichen with blue-green algæ .... 15.

15. Sp. 1-septate, colourless .... **Didymosphæria** (*h*).
Sp. simple or 3–5-septate, colourless .... **Obryzum** (*i*).
Sp. 3-septate, brown .... **Pyrenococcus** (*i*).

16. Algal cells blue-green. Th. with fertile tubercles, each containing 8–50 perithecia. On turfy ground .... **Lophothelium.**
Algal cells orange or green. Th. often absent or almost so. On trees......................... 17.

17. Perithecial walls distinct. Algal cells *Trentepohlia* .... 18.
Perithecial walls wanting or imperfect. Algal cells *Trentepohlia* or *Palmella* .... 19.

18. Perithecia minute. Paraphyses confused or indistinct. Sp. 1–3-septate .... **Melanotheca.**
Perithecia larger. Paraphyses unbranched, free. Sp. 1–5-septate and also muriform . **Anthracothecium.**

19. Algal cells *Palmella*. Sp. 3–5-septate and slightly muriform .... **Mycoporum.**
Algal cells *Trentepohlia*. Sp. 1–3-septate... **Mycoporellum.**

(*a*) Some Graphidineæ (Table G) with minute thecia may be confused with this group. Spermogonial conditions of other lichens have been described as species of *Verrucaria*. A number of plants which are now considered to be fungi were at first described as species of genera belonging to Pyrenodineæ.

(*b*) Occasionally the perithecia are in small groups, but not really joined together (e.g., *Arthopyrenia pyrenastrella*).

(*c*) *Thelidium sparsulum*, *Polyblastia subviridicans*, *Arthopyrenia arenicola*, and *A. halodytes* also have been described as containing blue-green algal cells.

(*d*) As in Graphidineæ the th. is often developed beneath the bark.

(*e*) Some species of *Arthopyrenia* (e.g., *A. fallax*) have the paraphyses distinct and may be mistaken for species of *Porina*, but the asci of the latter are more elongate.

(*f*) The spores sometimes become brownish when old, may be 7-septate in *A. platyrenia* and *A. chlorococca*, and are 6 times as long as broad in *A. taylori*. *A. cerasi* has ±elliptical perithecia.

(*g*) *L. epidermidis* is usu. considered to be a fungus.

(*h*) A fungus. *D. pulposi* is sometimes present on *Collema pulposum*, and other species are occasionally found on other members of Collemaceæ.

(*i*) A doubtful lichen.

I. Thallus crustaceous, granular, or wanting. Apothecium without thalline margin (*a*). Ascus 8-spored.

1. Algal cells reddish or yellow (*Trentepohlia*). Sp. septate, colourless	2.
Algal cells green. Sp. various..................	4.
2. Ap. dark, often somewhat irregularly roundish	3.
Ap. brightly coloured, cup-shaped, the proper margin well-developed and usu. paler	**Gyalecta.**
3. Ap. with a proper margin, often pruinose ...	**Lecanactis.**
Ap. without a proper margin (a pseudo-thalline margin is sometimes present), not pruinose	**Platygrapha** (*b*).
4. Sp. colourless and simple	**Lecidea** (*c*).
Sp. colourless (or nearly so) and septate......	5.
Sp. brown or dark, septate	7.
5. Ascus containing 8 (sometimes fewer) spores.	6.
Ascus containing only 1 large spore, occasionally somewhat brownish.................	8.
6. Sp. 1-septate, ellipsoid, usu. less than 3 times as long as broad..................................	**Biatorina** (*d*, *e*).
Sp. 3- or more-septate, fusiform, usu. about 4 times as long as broad	**Bilimbia** (*e*).
Sp. 3–many-septate, acicular, usu. more than 10 times as long as broad.....................	**Bacidia.**
Sp. muriform, oblong, often large and usu. about twice as long as broad	**Rhizocarpon** (*f*).
7. Sp. muriform, oblong, often large and usu. about twice as long as broad	**Rhizocarpon** (*f*).
Sp. 1-septate, about twice as long as broad. Seldom parasitic	**Buellia** (*g*).
Sp. 3-septate, about three times as long as broad. Parasitic on other lichens or on liverworts	**Leciographa.**
8. Sp. 7–10-septate, very large (usu. over 100μ long). On trees or rocks.....................	**Bombyliospora.**
Sp. muriform, large (usu. less than 100 μ long). On mosses	**Lopadium.**

(*a*) Some plants belonging to Graphidineæ, but having roundish ap., may be confused with this group. Some plants belonging to *Lecanora*, *Aspicilia*, *Jonaspis*, *Rinodina*, and *Lecania* have the thalline margin of the ap. evanescent or little evident, and so may be confused with plants of this group, in which there are no algal cells beneath the ap. and the hypothecium is frequently dark.

(*b*) Some other plants belonging to Graphidineæ (e.g., *Arthonia lurida*) may be found here. (See Sectional Key G.)

(*c*) Including *Lecidea dicksonii*, which is often placed under *Aspicilia*. Some Aspicilias and Lecanoras may be found here. In *Aspicilia* the ap. are innate ; in *Lecanora* gonidia are present beneath the ap. *Bæomyces rufus* (when the apothecia are sessile) may be found here.

(*d*) The septum is often thin, so that the spore appears to be simple—in fact, some of the spores are really simple. There are sometimes more than 1 septum present (1–3) in *B. cyrtella* and *B. episema*.

(*e*) Species of *Lecania* with lecideoid ap. may be found here.

(*f*) The longitudinal or oblique septa are sometimes indistinctly shown, especially in young spores.

(*g*) Species of *Rinodina* with lecideoid ap. may be found here.

J. Plants with thallus crustaceous, granular, or wanting, without apothecia or perithecia (*a*).

1. Th. usu. dark, ±gelatinous. Algal cells blue-green (Myxophyceæ)	**Tables D & H.**
Th. of ±spherical greenish mucilaginous granules aggregated together. Algal cells ±ellipsoidal (*Coccomyxa*), forming a central mass surrounded by fungal filaments. Usu. on ground	**Botrydina.**
Th. not gelatinous, seldom dark. Algal cells green or reddish (Chlorophyceæ)............	2.
2. Th. with roundish soredia or with minute ±cylindrical projections (isidia)	3.
Th. forming white powdery patches, 1–4 inches (or more) in diameter, K+ yellow then red, C− I−. On trunks of trees ...	**Phlyctis.**
Th. with whitish soredia tasting of quinine .	**Pertusaria amara.**
Th. without such characters......................	7.
3. Medulla of th. becoming blue with I	4.
Medulla of th. not becoming blue with I ...	5.
4. Medulla I+ dark blue. Th. white-sorediate, K− C−. On trees (rarely rocks)	**Pertusaria multipuncta.**
Medulla I+ pale blue. Th. whitish, papillose, K+ yellow then ferruginous-red C−. On rocks	**Pertusaria dealbata.**
Medulla I+ blue. Th. greyish, sorediate, K− C−, with black hypothallus. On rocks...	**Lecidea sorediza.**
5. On trees or rocks (if on ground or mosses C−)	**Pertusaria.**
On ground, encrusting mosses and other vegetation; soredia or th. having a reddish coloration with C. Alpine plants	6.
6. Th. greyish, effuse, papillose, K+ yellowish.	**Lecidea arctica.**
Th. greyish, subeffuse, papillose, at length sorediate, K+ yellowish-red............	**Lecanora geminipara.**
Th. white, effuse, K+ yellowish, white-sorediate	**Pertusaria bryontha.**
7. Th. yellow (sometimes pale or greenish) or reddish	8.
Th. white, grey, brown, or dark (seldom greenish)..	23.

8. Th. reddish or ferruginous .... 9.
Th. yellow (often somewhat greenish) ...... 10.
9. Th. with a blue or violet coloration with I. (Also forms of *Lecidea confluens* and *Aspicilia cinereorufescens.*) .... **Rhizocarpon œderi.**
Th. without a blue or violet coloration with I. (Also forms of *Lecidea contigua*, *L. lithophila*, *Biatorina lenticularis*, *Aspicilia lacustris*, and *Acarospora rufescens.*).. **Lecidea dicksonii.**
10. Th. a citrine-yellow powdery crust on mortar and surrounding rock, K+ purplish, C− I− .... **Callopisma citrinum.**
Th. yellow, on trees, rocks, etc., K+ purplish or crimson C−I− .... 11.
Th. without a purplish or crimson coloration with K .... 12.
11. Th. ochraceous-yellow, at first yellow with K and then crimson. Rare plant on rocks... **Lecidea armeniaca.**
Th. immediately purplish or crimson with K. On rocks, trees, etc. .... **Callopisma.**
12. Th. of a sulphur-coloured or greenish-yellow powder, K− C− I−. Algal cells oblong and unnucleated. On ground, decayed vegetation, or dead wood (rarely on rocks). .. **Coniocybe furfuracea** (*b*).
Algal cells nucleated and globular .... 13.
13. Th. bright yellow, K−C−; medulla blue with I. Hypothallus black. On rocks. .. **Rhizocarpon geographicum.**
No reaction with I .... 14.
14. Th. having a reddish reaction with C. On trees and pales .... 15.
Th. having a reddish reaction with C. On rocks .... 16.
Th. without a colour reaction with C .... 17.
15. Th. greenish or dark verdigris-green. (Also some varieties of *L. parasema.*) .... **Lecidea flexuosa.**
Th. sulphur-coloured to greenish-yellow, usu. pulverulent and effuse .... **Lecanora expallens** (*c*).
16. Th. sulphur-coloured, thickish, verrucose, often ±sorediate, K+ yellow .... **Lecidea protrusa** (*d*).
Th. yellowish-green, smoothish, K− ... **Buellia verruculosa** (*e*).
17. Th. without a colour-reaction with K. On rocks .... 18.
Th. without a colour-reaction with K. On trees .... 19.
Th. with a yellow (sometimes turning red) reaction with K .... 20.
18. Th. of small egg-yellow granules......... **Candelariella vitellina.**

Thalline granules large (almost squamules), bright greenish-yellow with citrine soredia. **Lecanora epanora.**
Th. a citrine-yellow or yellowish-green powder .... **Lecidea lucida.**
Sterile plants without such characters not usu. determinable (*f*).

19. Th. of small egg-yellow granules......... **Candelariella vitellina.**
Th. of an effuse greenish-yellow powder. **Calicium hyperellum** (*g*).
Sterile plants without such characters not usually determinable (*h*).

20. On trees or pales. Th. yellowish-green (often pale), K + yellow .... 21.
On rocks. Th. K + yellow, at length orange-red. Rare plants .... 22.
On ground. Th. greenish (K + yellow). **Icmadophila æruginosa.**

21. Th. usu. pale and very powdery (*L. symmictera* is similar and also a fairly common plant).. **Lecanora conizaea.**
Th. forming a more continuous crust .... **Lecanora varia.**

22. Very rare alpine plant with bright yellow th. **Buellia alpicola.**
Th. yellowish-white, thin, cracked areolate, smooth. (Also see *Lecidea lactea.*) ... **Lecanora subcarnea.**

23. On ground, often encrusting decaying mosses or other vegetative debris..................... 24.
On trees or old wood .... 28.
On rocks .... 33.

24. Th. having a reddish coloration with C. Frequent .... 25.
Th. without a reddish coloration with C. On ground. Common .... 27.

25. Medulla blue with I. Th. greyish K –, on mosses or lichens .... **Diploschistes bryophilus.**
Medulla not blue with I. Th. K + yellowish. 26.

26. Usu. on peaty ground. Th. usu. whitish, granulate or powdery .... **Lecidea granulosa.**
Usu. encrusting mosses. Th. usu. grey or darker, granulate or powdery .... **Bilimbia lignaria.**
Usu. encrusting mosses. Th. greyish and ± spinulose or verrucose .... **Lecanora tartarea** (*i*).

27. Th. of greyish (or greenish) minute granules, K + yellow.. **Bæomyces rufus.**
Th. of small pinkish (or whitish) granules, K + faint yellow .... **B. roseus.**
Th. of dark minute granules, K –. Common on peaty ground .... **Lecidea uliginosa.**
Sterile plants without such characters usu. not determinable.

28. Th. reddish or orange with C .... 29.
Th. not reddish or orange with C .... 31.

29. Algal cells *Trentepohlia*. Th. whitish, effuse, ± pulverulent and pruinose, K + yellow C + rose .... **Arthonia pruinata.**
Algal cells green .... 30.

30. Common plant with whitish th. (K + yellow) of verrucose granules, the apices of which become red with C .... **Lecanora tartarea.**
Infrequent plant with whitish, determinate, smoothish th. K − C + red .... **Pertusaria velata.**
Infrequent plant with greyish, minutely squamulose th. K + yellow C + orange-yellow .... **Bilimbia caradocensis.**

31. Th. with a purplish or violet coloration with K. (Also see *Rinodina colobina*.) .... **Callopisma.**
Th. without a purplish or violet coloration with K .... 32.

32. Th. whitish, with algal cells of *Trentepohlia*, and having whitish-grey globoid spermogones with large spermatia (12–16 × 3–4 μ) .... **Lecanactis abietina.**
Th. whitish or pale yellow (algal cells green), and having large black spermogones with small (2–3 × 1 μ) spermatia .... **Biatorina graniformis.**
Sterile plants without such characters usu. not determinable.

33. Th. having a reddish coloration with C ...... 34.
Th. not having a reddish coloration with C . 41.

34. Algal cells *Trentepohlia*. Rare. *Dirina repanda*. [Also see *Lecanactis* (4–5) and *Opegrapha grumulosa*.]
Algal cells green .... 35.

35. Medulla blue with iodine. Th. whitish or greyish K − .... **Diploschistes** (1 & 4).
Medulla not blue with iodine .... 36.

36. Th. copper- or chestnut-coloured, determinate, areolate K − .... **Lecidea fuscoatra.**
Th. whitish or greyish (sometimes ± greenish) or brownish .... 37.

37. Th. whitish with reddish cephalodia K − or faint .... **Lecidea panæola** (*j*).
Th. without cephalodia (superficial granules with blue-green algæ) .... 38.

38. Th. yellow with K .... 39.
Th. having a negative or only a faint coloration with K .... 40.

39. Th. whitish, thickish, granular-areolate ...... **Lecidea latypea.**
Th. whitish, granulate-verrucose, the apices of the verrucæ becoming red with C. (*Rinodina atrocinerea* and *Lecanora subradiosa* also occur on rocks and become yellow with K and reddish with C.) ...... **Lecanora tartarea.**

40. Th. determinate, smooth, greyish or whitish, subeffigurate at the circumference .... **Pertusaria lactea.**
Th. thin, effuse. (Also see *L. prærimata* and *L. illita.*) .... **Lecidea coarctata.**
Th. thick, white, pulverulent. On calcareous rocks.................................... **Diploschistes candidus.**

41. Th. (C −) having a colour-reaction with iodine .... 42.
Th. (C −) not having a colour-reaction with iodine .... 45.

42. Th. greyish, areolate, K + yellowish, then red; medulla bluish with iodine. On alpine mica-schist .... **Aspicilia alpina.**
Th. K −, or only yellowing the medulla...... 43.

43. Th. subdeterminate, usu. of dark areolæ; medulla reddish with iodine and yellowish with K....................................... **Lecidea griseoatra.**
Th. whitish or greyish K −. Medulla violet or dark violet with iodine. (Also see *L. prominescens*) .... **L. confluens.**
Th. K −. Medulla bluish with I .... 44.

44. Th. and hypothallus whitish. Frequent...... **L. cinerascens.**
Th. and hypothallus dark. Rare. **L. tenebrans** and **L. atrofuscescens.**

45. Th. crimson or purplish with K .... **Callopisma.**
Th. not crimson or purplish with K, though occasionally a reddish coloration comes after some time .... 46.

46. Th. with cephalodia (containing blue-green algæ).. **Lecidea consentiens.**
Th. without cephalodia .... 47.

47. Th. grey or dark (K −) with a dark fimbriate marginal hypothallus. (Also see *Rinodina umbrinofusca* and *Lecanora præpostera.*) .... **Rhizocarpon confervoides.**
Th. shining (as if oiled) dark, granulate-areolate, K − .... **Lecanora badia.**
Th. greyish K + yellow, then rusty-red ...... **Aspicilia cinerea.**
Sterile plants not having such characters are usu. not determinable.

(*a*) Only a few lichens can be determined by this key, which only gives rare lichens when they have fairly definite vegetative characters. In some cases the plants included here are scarcely likely to be found without reproductive organs. In some other cases the reproductive organs are rarely found.

(*b*) *Chænotheca æruginosa* is somewhat similar, but has a more powdery th. and is a much rarer plant.

(*c*) *Lecanora symmicta* is similar, but has a more determinate th. *Lecidea quernea* usu. has a more orange or brownish tint. *L. dubia*, *L. sporadiza*, and varieties of *L. parasema* are usu. in smaller patches.

(*d*) The rare plants *Lecanora fugiens*, *Bacidia carneoalbens*, and *Buellia saxorum* also have yellowish thalli, becoming reddish with C and yellow with K.

(*e*) The very rare plant *Lecidea callicarpa* also has a yellowish th. K –, C at length reddish.

(*f*) *Lecanora sulphurea* and *L. polytropa* are common plants, but are scarcely determinable without ap.

(*g*) *Chænotheca chrysocephala* is more granulate and is comparatively rare.

(*h*) Mostly rare plants. *Lepraria flava* is a name which has been given to a yellow sterile th.

(*i*) The rare plants *Lecanora geminipara*, *Pertusaria bryontha*, and *Lecidia arctica* are usu. papillose or sorediate, and therefore have already been given in the key.

(*j*) The reddish coloration is faint with C alone, but is definite when the th. is treated previously with K.

Additional Notes.

Insert in (*d*) on p. 7.—In some cases the names given in the Monograph are used, for convenience of reference, though other views as to nomenclature may be held.

Insert in (*y*) on p. 8.—Soralia are present in *Parmelia mougeotii*, *P. ambigua*, *P. dubia*, and *P. reddenda*. In *Physcia grisea* the margin of the thallus is sorediate.

Insert in (*d*) on p. 15.—The ascus usu. contains 8 spores, but 16 may be present in *C. cerinellum*. The spores may be ± polarilocular in *Candelariella vitellina*, the ascus of which usu. contains 16 or more spores.

Some Lecanoras—e. g., *L. gangaleoides*, *L. frustulosa*, *L. argopholis*—may have a similar subsquamulose appearance to *Placolecania* (see 60, p. 7), but the spores are simple. The three examples given have a yellow coloration with K.

Owing to the high cost of printing, the publication of this Key has been delayed for over two years.

INDEX.

For Classified Articles, see—Journals; Obituary; Reviews. New genera, species, and varieties published in this volume, as well as new names, are distinguished by an asterisk.

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THE

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BRITISH AND FOREIGN.

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THE JOURNAL OF BOTANY was established in 1863 by Seemann. In 1872 the editorship was assumed by Dr. Henry Trimen, who, assisted during part of the time by Mr. J. G. Baker and Mr. Spencer Moore, carried it on until the end of 1879, when he left England for Ceylon. Since then it has been in the hands of the present Editor.

Without professing to occupy the vast field of General Botany, the Journal has from its inception filled a position which, even now, is covered by no other periodical. It affords a ready and prompt medium for the publication of new discoveries, and appears regularly and punctually on the 1st of each month. While more especially concerned with systematic botany, observations of every kind are welcomed. Especial prominence has from the first been given to British botany, and it may safely be said that nothing of primary importance bearing upon this subject has remained unnoticed.

Bibliographical matters have also received and continue to receive considerable attention, and the history of many obscure publications has been elucidated. Every number contains reviews of new and important books written by competent critics: in this as in every other respect a strictly independent attitude has been maintained. While in no way officially connected with the Department of Botany of the British Museum, the Journal has from the first been controlled by those whose acquaintance with the National Herbarium has enabled them to utilize its pages for recording facts of interest and importance regarding the priceless botanical collections which the Museum contains.

Until the beginning of the late War the Journal paid its way and even allowed a slight margin of profit; but during that period the subscribers were reduced in number, and the continental circulation almost ceased. It has now regained its position, but the increased cost of production, which has not as yet been substantially reduced, has resulted in an annual deficit which at one time became so serious that the continuance of the Journal was threatened. By the generosity of those who felt that its cessation would be a misfortune, especially for British botanists whose principal organ it has always been, the deficit has been met and an appeal is now made for an increased number of subscribers.