THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN

EDITED BY

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VOL. LXXIV.

LONDON
TAYLOR AND FRANCIS, LTD.
RED LION COURT, FLEET STREET
1936.

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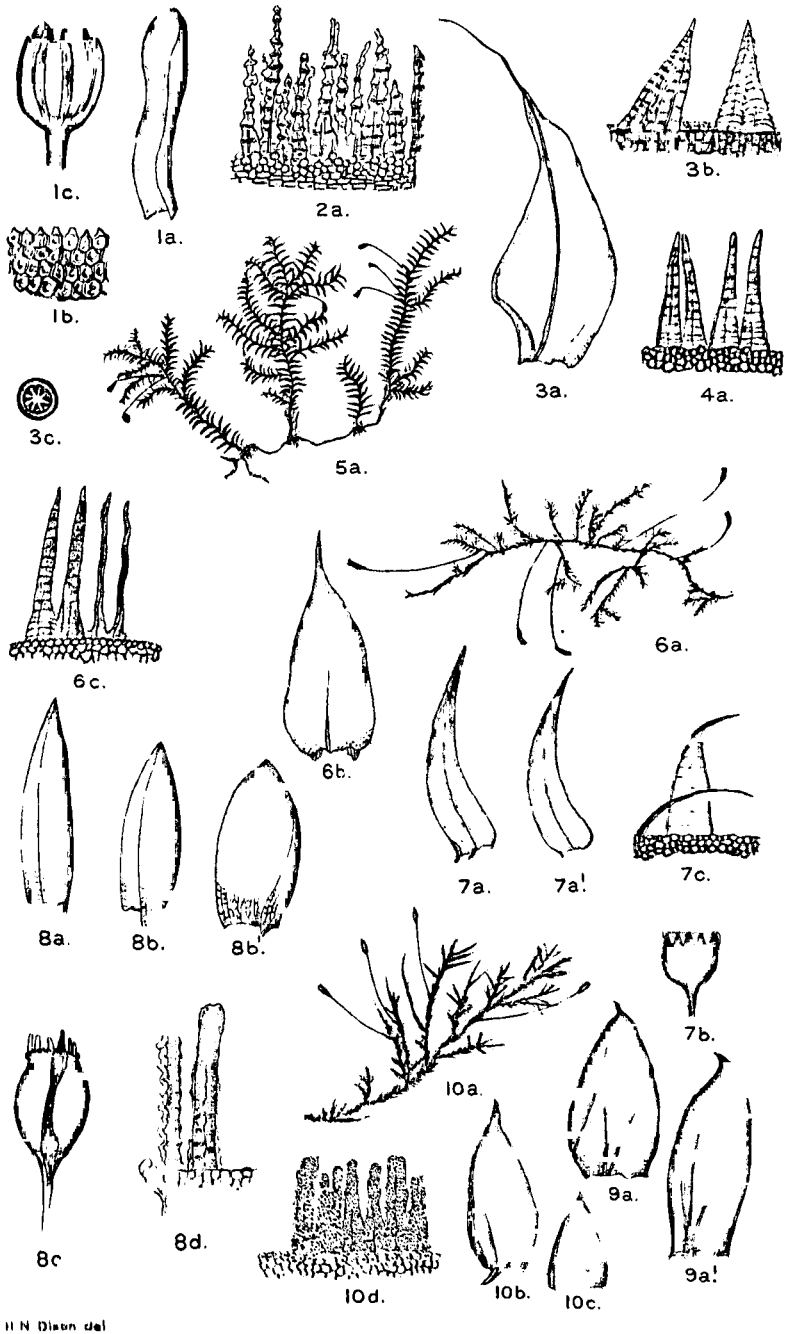
CORRECTIONS.

P. 88, line 19, *for* Stamer *read* Staner.

P. 205. The name of the *Vernonia* should read *V. Thodei* Phillips not *V. Thodei* (Schltr.) Phillips.

P. 220, line 4 from bottom, *for* 3859 *read* 3159.

P. 228, line 8, *for* Herb. Kew. *read* Herb. Mus. Brit.



DECAS GENERUM NOVORUM MUSCORUM.

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DECAS GENERUM NOVORUM MUSCORUM.

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

(Plate 610.)

OCTOGONELLA Dix., gen. nov. Orthotrichacearum.

Corticola; pusilla. Caulis erectus, simplex vel furcatus, foliosus. Folia e basi oblonga vaginante, concava, pallida, sensim latiuscule spathulata, obtusa, sæpe apiculata. Costa tenuis, sub apice evanescens, areolatio laxiuscula, marginibus et dorso grosse tuberculata. Perichætii folia erecta, elongata, intima prælonga, convoluta, setam sæpe fere obtegentia. Seta vix 2 mm. alta. Theca minuta, erecta, madida subglobosa, leptodermica, pallida, 8-costata. Operculum conicum. Annulus evolutus. Peristomium simplex, e dentibus octo fuscis fortiter incurvis latis, linea media notatis, arcte lamellatis, lævibus, instructum. Spori ovales, circa 20–22 μ longi, læves. [Stomata haud visa. Calyptra ignota.]

Octogonella scabrifolia Dix., sp. unic. (Pl. 610, fig. 1.) Gregaria videtur. Caulis perbrevis, 2–3 mm. altus. Folia circa 1 mm. longa, 0·25 mm. lata, basi pallida subspathulata, apice late rotundato obtuso vel apiculato. Margines plani, superne alte eroso-papillati. Cellulæ basilares perlaxæ, rectangulares, inanes, parietibus tenuibus, dimidiam partem folii implentes; superiores distinctæ, pellucidæ, subhexagonæ, haud incrassatæ, juxtacostales circa 14 μ latæ, versus marginem sensim decrescentes; omnia dorsaliter papilla unica (raro duabus) magna, sæpe bifida munita. Seta carnosula, crassiuscula, pallens. Theca madida turgide ovalis vel subglobosa, leptodermica, subpellucida, costis octo flavidis leniter ruguloso-papillosis prædita, reliquo leptodermica. Cetera generis.

Hab. On tree, Kasauli, near Simla, India, 1929 (?); coll. *P. Tiwary*; comm. *R. P. Foreau* (11 *b*).

Clearly allied to *Rhachithecium* Broth., but well marked in the coarsely tuberculate areolation; the peristome also appears somewhat different; the teeth in that genus are described as

16, in pairs, and are figured as more or less split at the apex; here I have not been able to detect any sign of this; they are distinctly 8 in number, and quite entire. The seta also, which there is slightly curved, is here quite erect. The ribs of the capsule are irregularly and minutely, but often quite markedly, corrugate or papillose.

MACROSPORIELLA Dix. & Thér., gen. nov.
Leucodontacearum.

Habitus omnino Leucodontaceus. Folia plicata, enervia; areolatio superior perangusta. Seta ad basin lævis, inde supra sensim magis papillosa, apice una cum thecæ basi valde scabra. Peristomium albidum, e dentibus valde irregularibus cruribus duabus nunc cohærentibus nunc hic illic sejunctis, laxiuscule lamellatis, fortiter irregulariter nodosis, marginibus plus minusve cristatis, dorsaliter nodulosis, dense papillosis; endostomium rudimentarium, fere nullum. Spori magni, irregulares, ovoidei vel oblongo-ovoidei, læves, 60–80 μ longi, 40–50 μ lati.

Macrosporiella scabriseta Dix. & Thér., sp. unic. (Pl. 610, fig. 2.) Corticola. Caulis stolonaceus, flexuosus, parce ramosus; rami irregulares, nonnulli flagellacei; flexuosi, dense foliosi. Folia circa 3 mm. longa, e basi brevi erecta, dilatata, subauriculata, aurantiaca, patentia, profunde plicata, oblongo-lanceolata, breviter latiuscule acutata, marginibus inferioribus latissime subreflexis vel explicatis, haud recurvis, ubique integris, ad apicem tantum tenuiter denticulatis. Costa nulla. Cellulæ superiores anguste lineares, apicibus obtusis; versus margines atque apud summum apicem paullo latiores, rhomboideo-lineares; alares numerosæ, Leucodontoideæ; omnes læves. Perichætium magnum, bracteæ internæ raptim in cuspidem robustum, sæpe curvatum, integrum, angustatæ. Seta 1·5 cm., purpurea, crassiuscula; superne æque ac theca basi dense muricata. Theca ovoidea, circa 2 mm. longa (deoperculata), collo brevi, fusca, lævis; exothecium e cellulis laxis, isodiametricis, irregularibus, parietibus curvatis instructum. Peristomium infra orificium oriundum, valde nodosum et cristato-papillosum. [Operculum et calyptra haud visa.] Vaginula elongata, nuda. [Stomata haud visa.]

Hab. On tree, Mimidu, Prov. Hyuga, Kyusyu, Japan, 10 Mar. 1928; coll. *H. Sasaoka* (4781).

With habit of *Leucodon*, and long-exserted capsule, this differs essentially in the scabrous seta, very large spores, and in the character of the outer teeth The areolation is also unusually narrow, and the leaf-base peculiar; the expanded erect base almost forming auricles, which when the leaf is flattened become strongly undulate at margin. The lower basal margins of the leaf are broadly "platter-edged."

RIGODIADELPHUS Dix., gen. nov. ? Pterobryacearum.

Stirps robustus, rigidulus, habitu *Rigodii*. Folia e basi lata concava decurrente lanceolata, acumine integerrimo, subpilifero; costa unica, in acumine soluta. Cellulæ superiores lineares, incrassatæ; alares permultæ, ad margines alte adscendentes.

? Dioicus. Seta elongata. Theca erecta, æqualis, turgide elliptica, pachydermica. Peristomium pallidum, e dentibus per paris octo cohærentibus, sparsim papillosis, pellucidis, lamellis haud prominentibus. [Operculum et calyptra haud visa.] Endostomium nullum nisi membrana brevissima papillosa.

Rigodiadelphus octoblepharis Dix., sp. unic. (Pl. 610, fig. 3.) Arboricola. Caules rigidi, lignosi, 4–5 cm. alti, subpinnatim distanter ramosi, ramis vix 1 cm. longis, tenuibus flexuosis, apicibus sæpe attenuatis. Folia laxe imbricata, sæpe falcata, flexuosa, 2·5 mm. longa, e basi longe decurrente ovata concava sensim longissime acuminata, filiformia, integra. Margines plerumque plani. Costa sat valida, in acumine soluta. Cellulæ læves, marginales breviores, alares subquadratæ vel ovales, parvæ, subpellucidæ.

Dioicus videtur. Perichætium majusculum, bracteæ internæ erectæ, sensim acuminatæ, integræ. Seta circa 2 cm. alta, rubra, lævis. Theca deoperculata 2 mm. longa, badia, sine collo; exothecii cellulæ irregulares, subquadratæ, valde incrassatæ, haud collenchymaticæ. Stomata pauca, minuscula, phaneropora. [Operculum et calyptra haud visa.]

Peristomium pallide flavescens; dentes omnino per paria conjuncti, haud rimosi, sparsim papillosi, infra læves; linea media et dissepimenta dorsalia sat crassa. Spori minuti, circa 8 μ.

Hab. On dead tree, Mt. Oodaigahara, Prov. Yamato, Japan, Aug. 1929; coll. *H. Sasaoka* (5376).

A remarkable plant, with something the habit of *Hylocomium umbratum* or *H. himalayanum*, but less branched, and the leaves totally distinct. The erect symmetrical capsule and the very unusual peristome suggest Pterobryaceæ. The vaginula, so far as can be seen, is without hairs.

It has no close relationship with *Rigodium* or *Rigodiopsis* Dix. & Thér., except in the habit and rigid stems. The affinity is probably with *Pterobryum*.

ISOTHECIADELPHUS Dix. & Thér., gen. nov.
Lembophyllacearum.

Caulis sæpe subdendroideus. Habitus et foliorum structura *Isothecii*. Dioicus. Theca erecta, breviter cylindrica, æqualis. Peristomium simplex. Dentes angusti, pallidi, haud striolati, vix marginati, læves vel teneriter papillosi, humiliter lamellati.

Isothecladelphus Sasaokae Dix. & Thér., sp. nov. (Pl. 610, fig. 4.) Subdendroideus, sat gracilis, nitidus. Caulis rigidus, erectus, superne dense irregulariter fasciculatim ramosus, ramis iterum ramulosis, sæpe teneris, curvatis. Folia ramorum primariorum circa 2 mm. longa, ovata-oblonga, sensim breviter acuminata, concava; margines ad infimam basin brevissime angustissime recurvi, ceterum plani, ubique fere tenuissime, supra fortius denticulati. Costa ad basin sat valida, supra sensim angustata, versus 2/3 folii longitudinem attingens; nonnunquam furcata. Folia ramulorum angustiora, lanceolata, longius tenuius acuminata, fortius denticulata. Cellulæ superiores breviter sigmoideo-lineares, dorso læves vel sparsim spiculosæ; inferne sensim elongati, lineares, ad basin parum mutatæ, ad angulos plures breviter rectangulares, latiores, obscuræ. Perichætii bracteæ erectæ, robuste acuminatæ, subintegræ; vaginula sparsim pilosa. Seta 1 cm. longa, lævis; theca deoperculata 2 mm. longa, cylindrica, badia. Exothecii cellulæ anguste rectangulares, 2–3×1, incrassatæ. Peristomii dentes flavidi, circa 0·25 mm. longi, media altitudine circa 22–25 μ lati, tenerrime sed distincte papillosi. [Cetera ignota.]

Hab. On dead tree, Mt. Kinpo, Prov. Sinano, Japan, 25 May, 1929; coll. H. Sasaoka (5343).

With something the habit and very much the leaf-structure and form of *Isothecium eu-myosuroides*, this is quite distinct in the simple peristome, with non-striolate teeth.

I have made the present the type-species of the genus. The following two Japanese species also belong here.

Isothecladelphus variabilis Dix., sp. nov. Paullo robustior, haud dendroideus, cæspitosus, rami breviores, crassiores, subteretes, vix nitidi. Folia similia, sed brevius acuminata, ramulina latiora, raro lanceolata. Theca paullo latior, elliptica, exothecii cellulæ latiores, circa $1\frac{1}{2}\times1$. Peristomii dentes angustiores, versus medium circa 13–16 μ lati, omnino læves. Spori 10–14 μ.

Hab. Mt. Mino, Prov. Lettyu, Japan, 16 Mar. 1934; coll. *N. Ui*; comm. *E. Ihsiba* (7), type. Ad rupes, Prov. Higo, Kyusyu, 17 Feb. 1935; coll. *N. Tokaki*, comm. *K. Sakurai* (4514).

In habit markedly different from *I. Sasaokae*, densely cæspitose and not dendroid; the leaves vary greatly, sometimes long-acuminate with a half-twisted point, but more usually broad, concave, with a very short acumen. The capsule is slightly wider, and the teeth markedly different, much narrower above, and quite smooth.

No. 4524 has some operculate capsules, with lid narrowly obliquely rather longly rostellate.

Isothecladelphus obtusifolius Dix., sp. nov. Habitu inter *I. Sasaokae* et *I. variabilem* ludens, sordide viridis, haud nitens. Folia paullo laxiora, unde rami et ramuli minus turgidi, subcatenuati, sæpe leniter falcati. Folia paullo breviora, perconcava, late ovata; ramulorum minora, paullo angustiora, omnia rotundato-obtusa, integra vel subintegra. Costa multo latior, sub apice soluta, male definita et interdum furcata. Cellulæ multo breviores, ellipticæ, irregulares; alares obscuræ, alte ad margines adscendentes, unde folia sæpe sublimbata. Theca elliptica; cellulæ exothecii eis *I. variabilis* similes, sed laxiores, parietibus minus incrassatis. Peristomii dentes perangusti, valde attenuati, versus medium circa 13 μ lati, omnino lævis.

Hab. Mt. Hakkoda, Prov. Mutu, Japan, 15 July, 1933; coll. *S. Musai*; comm. *E. Ihsiba* (25).

Quite distinct in the rounded-obtuse leaves, thick nerve, short cells, etc.

HELICODONTIADELPHUS Dix., gen. nov. Fabroniacearum.

Gracilescens, habitu fere *Rhynchostegiellae*. Caulis repens, parce ramosus, ramis complanatis, fere simplicibus. Folia uninervia. Autoicus. Theca cylindrica, leniter curvata, sicca sub ore paullo constricta. Peristomium duplex. Dentes angusti, fusci, papillosi; processus e membrana brevissima subæquilongi, lineares, fusci, papillosi, integri. [Operculum haud visum.]

Helicodontiadelphus australiensis Dix., sp. nov. (Pl. 610, fig. 6.) Flavo-virens, subnitens. Caulis circa 3 cm. longus, ramis percomplanatis, curvatis, circa 1 cm. longis, obtusis. Folia percomplanata, patentia, 1·5 mm. longa, ab insertione constricta subdecurrente ovata, vel ovato-lanceolata, sat cito in acumen breviusculum peracutum angustata. Margines ad basin leniter recurvi, ceterum plani, supra teneriter argute denticulati. Costa tenuis, supra medium folium attingens. Cellulæ anguste lineares, apud infimam basin laxiores, ad insertionem et alares seriebus 1–2 latæ, ellipticæ, pellucidæ.

Perichætii bracteæ erectæ, subconvolutæ, in cuspidem integrum loriforme breviusculum angustatæ. Seta 1 cm., tenuis, lævis. Theca cylindrica, leniter sed distincte curvata. Exothecii cellulæ angustæ, irregulares. Peristomium circa 0·5 mm. longum; dentes angusti, e basi paullo latiore lineares, marginibus subintegris, ubique papillosi; processus subæquilongi, latiusculi, integri, haud perforati, papillosi.

Hab. Kangaroo Valley, N.S.W., on rocks; coll. *R. Collie*; Herb. Hort. Bot. Reg. Edin. (428).

This was labelled "*Helicodontium Colliei* W. Mitt., ex herb. *W. Smith*, Arbroath." The non-striolate peristome precludes *Helicodontium*, of which, moreover, it has not the habit. The curved capsule is against Fabroniaceæ, but the peristome seems to belong here, and there is nothing in the leaf-structure to preclude it. The habit and foliation, as well as the capsule-form,

suggest *Rhynchostegiella*, but this is quite negatived by the peristome and exothecial structure, as is *Ishibaea*. There is also a slight resemblance to the South American *Eriodon* Mont. and *Mandoniella* Herz. Unfortunately no lids remain on the capsules.

ECTROPODON Dix., gen. nov. Fabroniaccarum.

Habitus fere *Pylaisiae* vel *Amblystegii*. Folia curvata, lanceolata, uninervia, integra. Autoica. Seta circa 0·75 cm. alta; theca turgide ovata, sicca urceolata; peristomium simplex, e dentibus latis triangulari-lanceolatis papillosis leniter lamellatis, madidis fortiter incurvatis, siccis reflexis et ad thecæ murum applicatis, instructum. Spori minuti.

Ectropodon urceolatus Dix., sp. unic. (Pl. 610, fig. 7.) Dense cæspitosus; aurantiacus. Caulis prostratus, ramis adscendentibus, foliis incurvo-falcatis, 1 mm. longis vel paullo ultra, e basi perbrevi lanceolatis, stricte angusto acuminatis, concavis. Margines erecti, integerrimi; costa unica, variabilis, sæpe latiuscula, sed tenuiuscula, in acumine soluta. Cellulæ superiores latiuscule rhomboideo-lineares, pellucidæ; alares sat numerosæ, bene definitæ, sub-isodiametricæ, pellucidæ, majorem partem latitudinis basis implentes.

Perichætia turgida, bracteæ e basi lata subconvoluta raptim in cuspidem longam strictam integram erectam angustatæ. Vaginula magna. Seta crassiuscula, lævis, apice crassiore. Theca erecta, turgide ovata, 1 mm. longa, collo brevissimo in setam defluente; sicca urceolata, infra orificium late dilatatum valde contracta, fusca, lævis; [operculum haud visum]. Exothecii cellulæ laxæ, hexagonæ, parietibus tenuibus, curvatis; apud orificium seriebus pluribus minores, parietibus firmis, intense fuscis. Peristomii dentes superne perangusti, ubique æqualiter regulariter minute papillosi; pertenues, sine lamellis; margines integri; linea media et dissepimenta tenerrima.

Hab. On tree, Sendai, Prov. Rikuzen, Japan, 16 May, 1920; coll. *H. Sasaoka* (5232), type. Koyanosawa, Prov. Rikuzen, 16 July, 1932; coll. *S. Musai*, comm. *E. Ihsiba* (9). Takayamamura, Prov. Lettyu, Nov. 1934; coll. *N. Ui*, comm. *E. Ihsiba* (5).

A very marked little plant, the position of which is rather difficult to determine. The capsule recalls *Anacamptodon*, but the leaves are different from most of the Fabroniaceae, though not unlike *Juratzkaea*. The position of the leaves recalls *Homomallium incurvatum*.

Nos. 5 and 9 are of an olive-green colour, with rather less finely acuminate leaves. No. 5 shows one or two very immature, but rather large, slightly curved calyptræ. It is recognizable at sight by the habit and the urceolate capsules, with strongly

reflexed peristome teeth when dry. The papillæ in the lower part of the peristome teeth sometimes show a slight tendency to arrange themselves in lines.

DENDROCYATHOPHORUM Dix., gen. nov. Hypopterygiacearum.

Gracilescens; caulis complanate pinnatim, nunc bipinnatim ramosus, subdendroideus. Folia elimbata, uninervia. Autoicum. Seta elongata; theca parva. Peristomii dentes flavi, densissime striolati. Processus æquilongi, pallidi, papillosi, cilia breviora, irregularia, papillosa.

Dendrocyathophorum assamicum Dix., sp. unic. (Pl. 610, fig. 5.) Stirps pulcherrima, læte viridis; caules 2–3 cm. alti, complanate ramosi, ramis hic illic ramulosis. Folia caulina circa 3 mm. longa, asymmetrica, percomplanata, squarrosula, e basi angustata, ovata, sensim anguste acuminata. Costa unica, nunc perbrevis, nunc ad tertiam partem longitudinis folii attingens. Margines plani, e basi fere argute, haud grosse dentati. Areolatio pulchre regularis, e cellulis hexagono-rhomboideis, circa 50 μ longis, 16 μ latis, chlorophyllosis composita. Amphigastria recurva, e basi angustiore cordata, acuminata, unicostata, dentata.

Autoicum. Flores ♂ axillares, infra flores femineos siti, majusculi, subcylindrici; antheridia pauca. Perichætia majuscula, cauligena, cylindrica, bracteis erectis, convolutis, sensim stricte anguste acuminatis. Vaginula magna, elliptico-cylindrica. Seta 5–8 mm. longa, tenuis, apice cygnea vel geniculata, unde theca subpendula. Calyptra (juvenis) conica, parva, lævis. Theca turgide elliptica, leptodermica, sicca contracta, ore dilatato, pallide fusco-viridis, minuta, deoperculata circa 1 mm. longa. Operculum haud visum. Exothecii cellulæ pulchre seriatæ, laxæ, late rectangulares, parietibus tenuibus curvatis, sed ad angulos fortiter collenchymaticis; stomata numerosa. Peristomium pallidum. Dentes lanceolati, conferti, flavidi, densissime striolati, apice tantum papillosi, pallidi; processus æquilongi, plerumque integri, pallidi, papillosi. Cilia brevia, irregularia, latiuscula, papillosa.

Hab. Him Parbat, Assam, alt. 2000 m., 21 Mar. 1934; coll. *N. L. Bor* (95).

A remarkable and very pretty genus, distinct at once from *Cyathophorum* (incl. *Cyathophorella*) in the branched subdendroid stems and the elongate seta with minute subpendulous capsule.

CYMBIFOLIELLA Dix., gen. nov. Entodontacearum.

Gracilis, dense conferta, repens. Caules arcte intricati, rigidi, dense subpinnatim ramosi. Folia valde complanata, subdisticha, cymbiformia, ovato-oblonga, obtusa vel obtuse

acutata, raro late, breviter obtuse acuminata. Areolatio Entodontoidea. Folia costata vel subecostata, integra.

Autoica. Perichætia alta, foliis erectis; seta longiuscula; theca erecta, e collo longe defluente late vel anguste elliptica, parva; sub ore contracta. Columella exserta. Peristomium fusco-rubrum; dentes oblongo-lanceolati, indistincte marginati, extus et intus alte lamellati, haud striolati, sublæves; endostomium e processubus brevibus, linearibus, rudimentariis instructum, membrana basilaris nulla vel indistincta. Spori majusculi.

Cymbifoliella Sasaokae Dix., sp. nov. (Pl. 610, fig. 8.) Humilis, dense cæspitosa, pallide viridis, nitidiuscula. Caulis prostratus, complanate subpinnatim ramosus, ramis irregularibus, 3–4 mm. longis. Folia variabilia, caulina sæpe elongata, lanceolata, sensim late subobtuse acuminata; alia, præcipue ramea, multo breviora, latiora, rotundato-obtusa, nonnunquam apiculata; omnia confertissime, regulariter complanata, subdisticha, cymbiformia vel conduplicata. Margines plani, integri. Cellulæ anguste lineares, alares numerosæ, subquadratæ, pellucidæ, totam fere basin occupantes. Folia perichætii erecta, convoluta, subobtusa. Seta 5–6 mm. Theca deoperculata, cum collo 1·5–1·75 mm. longa, matura sub ore contracta. Spori 16–20 μ. [Operculum et calyptra haud visa.]

Hab. On dead tree, Sendai, Prov. Rikuzen, Japan, 15 May, 1920; coll. *H. Sasaoka* (5225).

A remarkable little plant, the only doubt of its generic status being its relationship with *Sakuraia* Broth. That is a much larger plant, with finely acuminate leaves, and in any case could not be conspecific. It has, however, many characters in common with the present. The peristome characters, however, seem markedly, if not very widely distinct; the capsule there is subglobose, and the spores are more than twice the diameter of those of the present species. There is no mention in the description of *Sakuraia* of the exsertion of the columella, a marked feature here. A striking character of the peristome in the plant now described is found in the prominent lamellæ, both on the dorsal and ventral faces of the teeth, scarcely seen except in profile. The capsules in Sasaoka's plant are old, and the peristome not in very good condition.

RETIDENS Dix., gen. nov. Entodontaceaarum.

Pylaisiobryo Broth. generi africano peraffinis. Differt folii marginibus haud revolutis, inflorescentia autoica, annulo revolubili, peristomii dentibus dorsaliter sæpe tenerrime irregulariter reticulatis, sporis minoribus.

Retidens Stewartii Dix., sp. unic. (Pl. 610, fig. 9.) Corticola. Habitu *Entodontis*, gracilis, a *Pylaisiobryo cameruniae* Broth. affini foliis minus conferte imbricatis patentibus subcomplanatis,

marginibus planis vel apud basin tantum anguste recurvis valde distinctus. Costæ binæ, longæ, ad tertiam vel fere dimidiam partem folii attingentes. Cellulæ alares numerosæ, pellucidæ, laxæ, ad margines alte adscendentes. Autoicus. Perichætium polyphyllum, bracteis erectis, convolutis, apice breviter acuminato, reflexo, integro. Seta 1 cm. vel paullo ultra, rubra. Theca cylindracea, subsymmetrica, leniter curvata vel gibbosa, badia. Columella haud exserta. [Operculum et calyptra haud visa.] Peristomium rufum, dentes sicci patuli, late pallidius marginati, dorso papillosi, indistincte tenerrime reticulati, intus altiuscule lamellati. Endostomium rudimentarium, processus brevissimi, irregulares, e membrana basilari brevissima oriundi. Spori 13–18 μ.

Hab. On wood, near Landour, Mussooree, India, alt. 2150 m., July 1931; coll. *R. R. Stewart* (12,268 A), type. Dharmsala, Punjab, 2500–2750 m., June 1929; coll. *R. R. Stewart* (10,277).

Quite distinct from any Asiatic genus, and nearest to the Cameroons *Pylaisiobryum cameruniae*. It differs, however, in the autoicous inflorescence, well-developed annulus, and smaller spores, as well as in other characters which are marked, but scarcely of generic value. The peculiar anastomosing of the dorsal surface of the peristome teeth is very indistinct, extremely delicate, only visible with careful focussing, and possibly not constant. The papillæ sometimes tend to be arranged in lines towards the base of the teeth.

SYNODONTELLA Dix. & Thér., gen. nov. Entodontacearum.

Stirps rigida, habitu *Tripterocladii*, fructu Pylaisioideo. Caulis rigidus, dense ramosus, ramis iterum ramulosis, omnibus perstrictis, subteretibus. Folia ovalia, concaviuscula, dimorpha. Autoica. Seta circa 1 cm. Theca parva, erecta, elliptica; operculum oblique rostellatum. Peristomium simplex, e dentibus fuscis, brevibus, infra orem oriundis, ad basin plus minusve cohærentibus, inde cruribus valde irregularibus, nunc rimosis, nunc perforatis, hic illic anastomosantibus; teneribus, papillosis, vix lamellatis. Endostomium nullum. Spori parvi.

Synodontella japonica Dix. & Thér., sp. nov. (Pl. 610, fig. 10.) Rupestris. Dense intertexta, cæspites latos compactos formans. Folia dimorpha; caulina subcomplanata, sat laxa, circa 1 mm. longa, pallida, ovato-lanceolata, sensim acuminata, acuta; ramea et ramulina sæpe fusco-vinosa, conferte imbricata, haud complanata, multo breviora, deltoidea-ovata, breviter acutata; omnia concava, marginibus erectis, integris. Costa bina, variabilis, nunc brevissima, plerumque circa quartam vel tertiam longitudinem folii attingens. Cellulæ læves, anguste lineares, pellucidæ, alares numerosæ, subquadratæ, inanes.

Perichætia turgidiuscula ; bracteæ internæ suberectæ, breviter late acuminatæ, integræ. Theca operculata circa 1·5 mm. longa, elliptica, fusca ; exothecii cellulæ late hexagonæ ; annulus latus, persistens. Peristomium vix 0·25 mm. altum, intense fuscum ; dentes pertenues, inferne dorso papillosi, interne et superne læves, valde irregulares. Columella interdum exserta.

Hab. On stone, Musasino, Prov. Musasi, Japan, 8 Mar. 1929 ; coll. *H. Sasaoka* (4799), type. On rock, Inogasira, Prov. Musasi, 8 Mar. 1929 (4800).

A very distinct plant, both vegetatively, resembling *Tripterocladium* in the rigid, dense, subfiliform ramification, and in the fruit, which is Pylaisioid in form, with very distinct peristome-characters. The teeth are not much more than twice the height of the compound persistent annulus, of the same colour as the capsule, and very irregularly perforated, split, or anastomosing, usually coherent at base so as almost to form a continuous cylindrical membrane.

Explanation of Plate 610.

Fig. 1. *Octogonella scabrifolia*. *a*, leaf, 20 ; *b*, cells, ×200 ; *c*, capsule, ×20.
Fig. 2. *Macrosporiella scabriseta*. *a*, peristome, ×40. The tooth on the right is in profile, showing the dorsal thickenings.
Fig. 3. *Rigodiadelphus octoblepharis*. *a*, leaf, ×20 ; *b*, peristome, ×40 (two teeth, left dorsal, right ventral view) ; *c*, peristome, viewed from above, ×3.
Fig. 4. *Isotheciadelphus Sasaokæ*. *a*, peristome tooth, ×50.
Fig. 5. *Dendrocyathophorum assamicum*. *a*, plant, nat. size.
Fig. 6. *Helicodontiadelphus australiensis*. *a*, plant, nat. size ; *b*, leaf, ×20 ; *c*, peristome, ×50.
Fig. 7. *Ectropodon arcolatus*. *a*, *a'*, leaves, ×20 ; *b*, capsule (dry), ×8 ; *c*, peristome tooth (moist), ×50.
Fig. 8. *Cymbifoliella Sasaokæ*. *a*, stem-leaf, ×20 ; *b*, *b'*, branch leaves, ×20 ; *c*, capsule, 15 ; *d*, peristome tooth, ×100.
Fig. 9. *Retidens Stewartii*. *a*, *a'*, leaves, ×20.
Fig. 10. *Synodontella japonica*. *a*, plant, nat. size ; *b*, stem leaf, ×20 ; *c*, leaf of toroto branchlet, 20 ; *d*, peristome teeth, ×100.

SPERMACOCE REMOTA Lam.

By A. B. Rendle, F.R.S.

In my note on the Linnæan species of *Spermacoce* in this Journal (1934, 329) I wrote (p. 333): "The earliest valid name for *S. tenuior* Auct. non L. would seem to be *S. remota* Lam. Encycl. vii. 313 from S. Domingo." I had not seen Lamarck's specimen, but *S. remota* was quoted as a synonym for *S. tenuior* by K. Schumann in Martius, Flor. Brasil. (vi. 6, p. 33), and by Urban in his 'Symbolæ Antillanæ' (viii. 690), and Lamarck's description fitted it fairly well. I have recently been able, by the courtesy of the authorities at the Paris Herbarium, to examine the type, which proves to be a distinct species. It is labelled by Lamarck "Spermacoce remota e Domingo (I. Martin)."

The specimen consists of a single shoot about 3 dm. long with a quadrangular *faintly ribbed very sparsely hispidulous* stem, about 2 mm. thick below ; leaves linear-lanceolate, spreading, *sessile*, about 3 cm. long by 6 mm. broad, midrib prominent beneath and hispidulous, as are the few ascending lateral veins ; upper face rather rough. Flowers shortly stalked in dense axillary *not unilateral* rosettes. The plant is in fruit, but I was allowed to detach a young fruit bearing a withered flower which is here described and figured.

Sepal-lobes 4, narrowly triangular acute, unequal, 0·75–1 mm. long with short hairs on back and margin. Corolla funnel-shaped, 2 *mm. long* (tube about 1 mm. long), lobes spreading, blunt, tipped with a few minute transparent hairs. Filaments of stamens thread-like, apparently attached to the corolla-tube, *becoming free at the mouth and exserted*, slightly shorter than the corolla ; anthers small, reniform. Ovary ellipsoid, shortly stalked, bearing *short soft white hairs above the middle*. Fruit *ellipsoid, 4 mm. long, minutely hairy above the middle*, dehiscing into two valves capped by the persistent calyx-lobes ; one valve open, the other closed by a membrane. Seed dark brown, 1·5 mm. long.

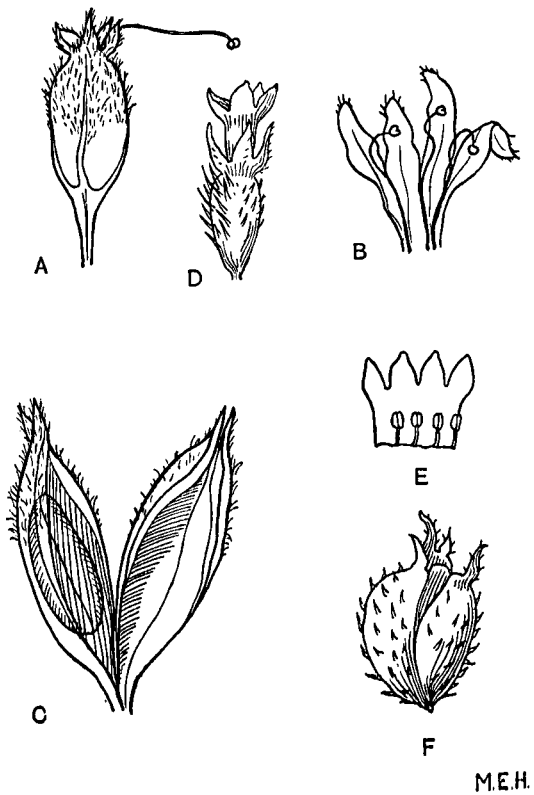
Characters distinguishing *S. remota* from *S. tenuior* Auct. are italicised, and reference to the accompanying figures will show striking differences in flower and fruit between the two species. Neither Schumann or Urban can have examined the specimen or they would not have placed it in *S. tenuior* Auct.

The larger flower with exserted stamens, of a very different type from the small flower with short included stamens of *S. tenuior* Auct. (figs. D, E) and *S. tenuior* L. (*S. glabra* Auct. non Michx.), and the longer elliptical fruit, resemble those of *S. Chapmanni* Torr. & Gray (Fl. N. Amer. ii. 27 ; 1841). These differences are certainly of sectional and might even be regarded as of generic value from the standpoint of generic characters which has been accepted in the tribe Spermacoceae. The floral and external fruit-characters of *S. remota* suggest those of *Hemidiodia*, but the fruit has not the characteristic dehiscence.

K. Schumann (Fl. Bras. vi. 6, p. 34) wrongly cites *S. Chapmanni* as a synonym of *S. tenuior* Auct. The name has been dropped in more recent American Floras, but it is apparently, judging from descriptions, the *S. tenuior* of Chapman's 'Flora of the Southern United States' (ed. 3, 193) and of Small's 'Flora of the S.E. States' (ed. 2, 1117), which it should replace.

I regret that I can find no published name for *Spermacoce tenuior* Auct. A specimen from Mexico, *Galeotii* 2611 (in Herb. Kew.), is the "*Sp. echioides* ? H. B. K. fide Mart. & Gal. in Bull. Acad. Brux. xi. 1, p. 131 (1844)." It is typical *S. tenuior* Auct. But I think there can be no doubt that the original

description of *S. echioides* H. B. K. (Nov. Gen. et Sp. Plant. iii. 434) does not refer to *S. tenuior* Auct., but probably to *Borreria laevis* (Lam.) Griseb., as suggested by the lanceolate leaves, veins subparallel with the median vein, flowers verticillate and capitate with whorls the size of a pea. The flowers are not described, as the specimen was not available when the description was drawn up.



A, B, C, *Spermacoce remota* Lam. A, B, unripe fruit bearing withered flower- the corolla, shown opened in B, became detached in examination; C, fruit open, showing, right, the open valve from which the seed has fallen, and, left, the closed valve containing a seed.
D, E, F, *Spermacoce tenuior* Auct. (*S. confusa*, nom. nov.). D, flower; E, corolla opened; F, fruit. All 8.

It is, therefore, necessary to suggest a name for the widespread *S. tenuior* Auct. non L., namely, **S. confusa**, nom. nov. Its distribution, as indicated by specimens in the Kew and British Museum Herbaria, is from Florida southwards through the West Indies and Central America to equatorial South America.

AN INVESTIGATION OF THE VIABILITY OF FUNGAL SPORES AND BACTERIA IN THE CONTENTS OF A SEALED CANOPIC JAR (*circa* 1800 B.C.).

By Hugh Dickson,
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While it is generally accepted that spores of bacteria and fungi can remain alive for prolonged periods of time under conditions which preclude growth, the amount of critical research work which has been undertaken in this field is comparatively small. Not infrequently positive results have been obtained from materials of undoubted age, but on investigation it is generally difficult to prove that the material had not been recently exposed to chance contamination, previous to being examined.

Perhaps the only reliable material for such an investigation is that which has been hermetically sealed for a known period, and such materials (of sufficient age) are not often available. Miss McCrea (4) on opening test-tubes containing dried spores of *Aspergillus Oryzae* and *Rhizopus nigricans* which had been sealed for twenty-two years found that both fungi were still alive. The same author (5) also records the survival of twelve species of fungi belonging to the genera *Aspergillus*, *Penicillium*, *Mucor*, and *Fusarium* which had been kept for periods ranging from eight to ten years on media in unsealed test-tubes. Lipman (1) claims to have found viable bacteria in anthracite coal, the surface of which he had previously sterilised in various ways. Of these three records, the first is the only one in which the materials for experiment were sealed hermetically.

The tomb of Tut-ankh-Amen when first opened provided an excellent opportunity for investigation, as the various chambers were sealed off from the entrance passage (which was itself filled with stones and rubble), and consequently from the only connection with the open air, by means of a cemented stone wall. Bacteria must have been present on the various materials in the tomb at the time of the burial and dead fungal hyphæ were found on the sarcophagus (6). Brown patches covering the walls of the burial chamber, which were originally thought to be due to fungal colonies, are now believed to have been caused by other agencies (6).

The morning following the opening of the tomb swabs were taken by Mr. A. Lucas (2) from the walls, the base of the outer shrine, and from under some reeds. These on examination gave negative results, apart from what was obviously an air contaminant which appeared in a culture from one of the swabs. Some 3000 years had elapsed between the time when the tomb was sealed and the occasion of its subsequent opening, and it must

be concluded that neither the fungi nor the bacteria present were able to survive such a period of time.

The present investigation was made possible owing to the courtesy of Dr. Englebach and Mr. Brunton of the Museum of Egyptian Antiquities, Cairo, and to the assistance and many helpful suggestions given me by Mr. A. Lucas, to each of whom my sincere thanks are due.

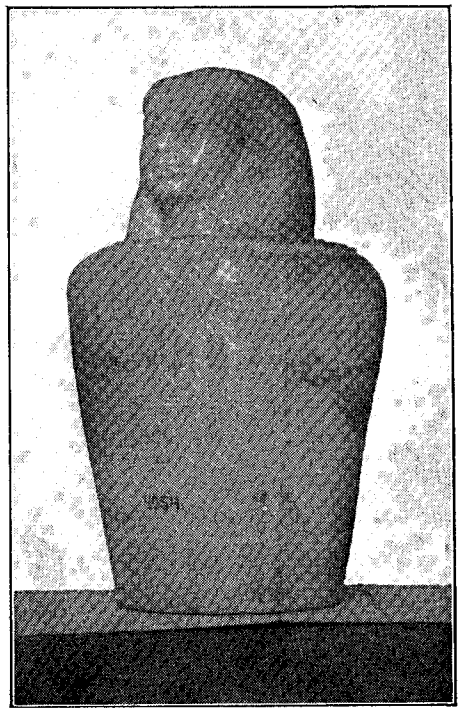
An exhaustive search of the numerous objects in the museum revealed the fact that very few of these contained an enclosed volume, and that such articles as jars, complete with lids, which at first sight appeared to be sealed were in reality open to the air. Eventually a canopic jar dating from 1800 B.C. was found, which, so far as could be ascertained with a hand lens, was hermetically closed. It was decided therefore to examine the contents of this jar for viable bacteria or fungi.

The jar was some 40 cm. high and 23 cm. at its widest point. It was made of alabaster and consisted of a hollowed-out base which was closed with a well-fitting lid, on which was mounted (but did not penetrate through it) a carved head also of alabaster (see figure). The lid was luted into place by means of a paste, which on analysis was found to consist of calcium carbonate and some sodium carbonate together with a considerable amount of organic matter. The latter may have been resin, as this substance has been shown to have been used anciently for such purposes in Egypt, in some cases mixed with calcium carbonate, as in the present instance (*2*). The luting material had formed a hard seal on the outside of the join. When opened the jar was found to be about half full. The upper part of the contents consisted of brown and very friable cloth wrappings, below this was a hard brown mass with many irregular cavities in it, though what part of the viscera this mass had been it was (as is not infrequently the case) impossible to tell. At the bottom of the jar was a hard black substance also full of air-holes; this appeared to have been fluid in nature when put into the jar, as it exactly followed the contour of the latter.

It appears that the most probable method of embalming the body in ancient Egypt was to dehydrate it by means of dry natron (3), a naturally occurring compound of sodium carbonate and bicarbonate found in various localities in Egypt, where it always contains as impurities variable amounts of sodium chloride and sulphate. Of the method employed with smaller objects such as the viscera less is known, but it is not unlikely that they were either treated similarly or else dried in the sun. The brown substance found impregnating the viscera is probably the decomposition product of either resin or wood pitch, substances known to have been used as ceremonial unguents. On opening the jar a not unpleasant aromatic odour was apparent, and on heating some of the material with water the same smell

was obtained, but more strongly. It will be seen from the above description that none of the contents of the jar was necessarily lethal to any spores present in the jar, and experiments to be described below support this contention.

It was originally proposed to open the jar in a chamber closed to the air by means of a water-trap, the object being to exclude all possibility of chance contamination. Before the jar was placed in the chamber all superfluous luting material was



Photograph of the canopic jar used in the experiments described above. The luting material has formed a hard seal on the surface at the juncture of the lid with the body of the jar.

removed from round the lid; the jar was then placed in the chamber and water containing mercuric chloride was splashed over it and the walls of the chamber to render the air and surfaces sterile. When this was done, it was found that bubbles were arising from one point where the lid joined the jar. As it could no longer be guaranteed that the jar had been hermetically sealed—though it is probable that the hole only developed when the superfluous luting material was removed,—the jar was taken

from the chamber and the lid was subsequently removed in the open. Considerable force was found necessary to get the lid off, and it is not improbable that it would have been impossible to have accomplished this in the confined space of the chamber.

Immediately on opening the jar pieces of the cloth wrappings were taken and placed in test-tubes containing various culture media. The remaining wrappings were then removed, and as the contents of the jar were gradually withdrawn pieces of the hard brown and finally the black materal at the bottom were placed on media in test-tubes. 2 per cent. malt-agar was used as a good general medium for fungal growth and Loeffler's serum, glucose broth, nutrient agar, and Dorset's egg medium, together with Robertson's cooked meat medium for anaerobic organisms were employed for bacteria.

As it was not possible to remove the jar from the museum, the experiment had to be carried out in a room permanently open on one side to the air, with the result that the possibility of chance contamination—always a major factor of cultural work in Egypt—was increased by air currents.

Altogether 47 tubes were inoculated, 30 of which contained malt-agar and the rest the various bacterial media. The tubes were incubated for three weeks, during which time they were examined frequently for signs of growth. In only three of the 47 tubes were living cultures obtained, one of these was *Aspergillus niger*, the second a species of *Penicillium*, and the third a *Micrococcus*. All of these were apparent within four or five days from the time of inoculation of the tubes. Unfortunately, it has not been possible to determine the species of the *Micrococcus*, but all three types are common air-contaminants and, considering the conditions under which the transfers were made, contamination of 6 per cent. of the tubes is well below what might have been expected.

It may be pointed out that, as the museum is not heated and there is a considerable difference in day and night temperatures in Egypt, spores would have been drawn into the jar in large numbers owing to the changes in pressure of the air in the jar, had a hole existed for any length of time through the luting material of the lid. As the number of colonies actually obtained was only 3 out of 47 inocula, all of which were of considerable size, it is concluded that these were air-contaminants and that the hole found in the join was only formed on removal of the superfluous luting material.

In order to test the effect of the resinous contents of the jar on fungal growth, some of the brown material was taken and boiled for an hour in water, when the solid material was filtered off. The pH of the solution was found to be 6·2. To each 100 c.c. of the solute 2·0 gm. of malt extract and agar respectively were added, and the whole sterilized and made up as test-tube

slopes. A number of fungi were then inoculated on to the medum so formed, and after incubation the following results were obtained, plain malt-agar being used for comparison :—

Chaetomium cochliodes.—Growth slower, perithecia and aerial mycelium more plentiful than on plain malt-agar.

Penicillium glaucum.—Similar in growth-rate and appearance on both media.

Aspergillus niger.—Growth-rate unchanged, but sporing increased on the canopic jar agar medium.

Coprinus macrorhizus.—Growth-rates similar on the two media, but aerial mycelium more plentiful on the canopic jar agar medium.

Coprinus sphaerosporus.—Both haploid and diploid cultures were used and in each case the growth-rates were less and the aerial mycelia thinner on the canopic jar malt-agar than on plain malt-agar.

It is deduced from these results that there is nothing (within a reasonable period of time) essentially lethal to fungal growth in the contents of the jar.

It is concluded from the experiments described above that the canopic jar which was examined had been hermetically sealed, that the three cultures obtained were contaminants from the air which entered the tubes during the transfer of inocula, that the contents of the jar were in no way lethal to the survival of spores, and that there was nothing alive in the jar previous to its being opened.

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NOTES ON THE FLORA OF ANGOLA.—II.

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

Ritchiea Noldei Exell & Mendonça, sp. nov. (Capparidaceae). *Frutex* volubilis, ramulis verruculoso-lenticellatis ceteroque glabris. *Folia* petiolata, petiolo 3·5–6 cm. longo glabro, trifoliolata, foliolis petiolulatis, petiolulo 4–5 mm. longo glabro, lamina folioli terminalis anguste elliptica apice breviter acuminata

apiculata basi cuneata, 11–15×4·5–5 cm., laminis foliolorum lateralium brevioribus basi parum inæqualibus, costis lateralibus folioli terminalis utrinque 12–15 supra subtusque prominulis, reticulatione supra conspicua, omnino glabra. *Flores* pedicellati, pedicellis 2–2·5 cm. longis, in racemos 6–7 cm. longos pseudo-umbelliformes dispositi. *Sepala* elliptico-lanceolata, 20–23×6–8 mm., margine ciliolata. *Petala* 4, lineari-elliptica basi sensim attenuata, 25×3–3·5 mm., glabra. *Stamina* numerosa, filamentis 13 mm. longis, antheris oblongis 2 mm. longis. *Gynophorus* 15 mm. longus. [*Fructus* ignotus.]

Hab. Angola: in rain-forest, Quola, Malango, *Nolde* 296. (Typus in Herb. Berol.).

A small climbing shrub with yellowish-white flowers.

This species is nearest to *R. ageliifolia* Gilg, from which it differs in having longer and usually narrower leaflets with more numerous lateral nerves and a more conspicuous reticulation on the upper surface. The lateral leaflets are much more acute at the base and much less oblique than in *T. ageliifolia* and the flowers are more crowded at the apex of the peduncle. *R. ageliifolia* is apparently endemic to the Cazongo rain-forest in the Cuanza Norte District, while *R. Noldei* was collected from a similar formation in Malango.—A. W. E. & F. A. M.

Rinorea Youngii Exell & Mendonça, sp. nov. (Violaceae). *Suffrutex* 1 m. altus, ramulis juvenilibus primo brunneo-tomentosis demum pilosis. *Folia* alterna ad apicem ramulorum nonnunquam conferta, breviter petiolata, petiolo crassiusculo 2–7 mm. longo pubescente, stipulis lanceolato-subulatis mox deciduis circa 6 mm. longis brunneo-pilosis, lamina oblanceolata vel oblanceolata-elliptica breviter acuminata acuta margine irregulariter serrulata basi rotundata vel plerumque subcordata, 10–25×4–9 cm., supra ad costam mediam denso pilosa ceteroque glabra, subtus ad nervos pilosa, costis lateralibus utrinque 10–14. *Flores* pedicellati, pedicello 2–3 mm. longo basin versus articulato minutissime pubescente, in cymas compositas subcorymbosas terminales bracteatas, bracteis ovatis 2–3 mm. longis brunneo-pilosis, dispositi. *Pedunculi* denso brunneo-pubescentes. *Sepala* ovata, 3·5×2·2 mm., minutissime pubescentia. *Petala* ovato-lanceolata apice breviter recurva, 4·5–5×2·5 mm. *Staminum* filamenta basi connata, tubo stamineo 2 mm. alto, apice per 3 mm. libera vix complanata, antheris 1·7×0·8 mm. appendicibus duobus liberis 0·4 mm. longis instructis, connectivo in laminam ovatam producto. *Ovarium* subglobosum 2×1·8 mm., suturis carpellaribus oxtus ciliolatis ceteroque glabrum, stylo 3 mm. longo glabro. [*Fructus* ignotus.]

Hab. Angola: undershrub about 3 ft. high, in gallery-forest, Dundo, R. Luachimo, Lunda, *R. G. N. Young* 545. (Typus in Herb. Mus. Brit.)

This is nearest to *Rinorea dentata* (Beauv.) Kuntze, from which it can be distinguished by the more strongly pilose leaves, which are subcordate at the base. The leaves resemble those of *R. castaneoides* (Welw.) Kuntze, but the flowers of the latter are considerably larger.—A. W. E. & F. A. M.

Baphia Marquesii M. A. Exell, sp. nov. (Leguminosae). *Caulis* lignosus juventute pubescens, glabrescens. *Folia* unifoliolata, elliptica vel oblongo-elliptica vel ovato-elliptica, basi rotundata vel subcuneata, apice obtuse acuminata, 4·5–9·5×1·2–4·6 cm., glabra vel subglabra, petiolo longo, cum petiolulo in toto 12–22 mm. longo, pubescente sed demum subglabro. *Flores* 3–5 in axillis foliorum, pedicellis brevibus, pubescentibus, ad 6 mm. longis; bracteolis parvis, late suborbicularibus, pubescentibus; calyx breviter pubescens, spathaceus, circa 12 mm. longus; vexillum suborbiculare, 17 mm. longum, circa 18 mm. latum; alæ late oblongæ circa 15 mm. longæ; carina 12 mm. longa. *Ovarium* præcipue ad margines hirtum, ovulis +6. [Legumen ignotum.]

Angola: near River Lovua, Lunda, *Marques* 242. (Typus in Herb. Conimbr.; Herb. Mus. Brit.)

This species is allied to *B. laurifolia* Baill. (*B. crassifolia* Harms). It differs in having a more slender acumen to the leaflets, much longer petioles, and shorter stouter pedicels. The midrib of the leaflets is thick and prominent below, pale-coloured in the dry state, in contrast to the dark petiolule.—M. A. E.

OBITUARY.

Fergusson Escombe

(1872–1935).

Fergusson Escombe was born September 14, 1872, at Bursledon, Hants, the elder son of William and Eliza Escombe of Bishopstoke in the same county. He was educated at Haileybury and King's College, London, and took his B.Sc. degree at London University with honours in Botany. He studied for a time at Downton Agricultural College and from 1894 to 1896 in Germany, first at Heidelberg, and then at the Kaiser Wilhelm University, Strasburg, where he published his first paper on the chemical nature of the cell-membrane of Fungi and Lichens. Only in *Peltigera canina* was chitin detected and cellulose in the algal cells of *Evernia prunastri*.

In 1897 Escombe started his collaboration with Horace Brown at the Jodrell Laboratory, Kew, on the physiology of germination and photosynthesis. The important results obtained were published in the 'Proceedings and Transactions of the Royal Society' between 1897 and 1905 (a list is appended to this notice).

In their study of germination it was shown that resting seeds could retain vitality at very low temperatures for an indefinite period, the protoplasm being inert. In the germination of barley the relative *rôles* of the embryo and endosperm were investigated and the importance of the aleurone layer in the erosion of the starch grains was demonstrated. The work on static diffusion of gases, on determination of atmospheric carbon dioxide, and the influence of varying amounts on photosynthesis, and on the physiological processes of green leaves marked a distinct advance.

Between 1902 and 1906 Escombe reviewed in 'Nature' a number of important works on biochemistry by Emmerling, F. N. Schulz, Czapek, Wieder.

In July 1901 Escombe joined Messrs. Guinness and Co. in their Scientific Research Laboratory in Dublin under Horace Brown. His work was concerned with improving the malting qualities of barley, and papers were published in their 'Transactions,' which, though unsigned, may be identified by references to German researches familiar to Escombe. He was there for three years. He then took up teaching at the South-Eastern Agricultural College, Wye, being Lecturer in Botany and Head of the Botanical Dept. He also gave County Council lectures in Kent and Surrey, and organized at Wye the botanical part of the "Lectures to Schoolmasters in Kent and Surrey," which were very popular. He was at Wye from July 1905 to July 1907. In 1910 he returned to the Jodrell Laboratory, Kew, to do some physiological work. Escombe was elected a Fellow of the Linnean Society in 1896, but withdrew in 1912.

In the Great War, Escombe, who had suffered from heart trouble, and was in ill-health, placed his services at the disposal of the Admiralty, and was a temporary assistant from April 1917 to March 1920, and subsequently in the Historical Section of the Committee of Imperial Defence until March 1922, being engaged in the examination of Admiralty telegraphic records, and their compilation into volumes for historical purposes. After this Escombe returned to live with his family at Bishopstoke, Hants, until 1927, and in 1928 for a year at Exton in the same county. From 1929 until his death (October 12, 1935) he lived at East Meon, near Petersfield. He took an active interest in the life of the village, reorganizing the Library (as he had done at Bishopstoke), and spent much time in walking and exploring the district, its botany, and zoology. He made an intensive study of the two Arums, the larger and rarer Arum in particular; he mapped its occurrence in detail locally, and made an exhaustive study of its requirements, soil, aspect, temperature, and other matters connected with its ecology and life-history. He held some original ideas as to its relation to and association with the commoner species. Escombe sent large collections with copious notes thereon to Kew, which it is hoped

to publish in due course. Later the Elms of the district were studied in the same way.

Escombe's interests apart from natural history lay in reading and walking. He read and re-read the Classics, and took a great interest in philosophy. His scientific work was characterized by thoroughness and avoidance of hurry. He had a good knowledge of chemisty, which was of great assistance in his work on plant physiology, biochemistry, and biophysics.

Fergusson Escombe was very reserved, but properly understood was a charming companion. Of an original turn of mind, he often held views the reverse of orthodox. Ill-health over a long period prevented him making a greater mark in science. But what he achieved whilst actively engaged in important research work will preserve a place for him in the annals of botanical progress.—A. R. Horwood.

(1) "Beitrag zur Chemie der membranen der Flechten und Pilze." Hopp.-Seyl. Zeitsch. Phys. Chem. xxii. 288–306 (1896). *See* Ann. Bot. x. 293–4 (1896).
(2) "Note on the Influence of very low Temperatures on the Germinative Power of Seeds" (with Horace T. Brown). Proc. Roy. Soc. lxii. 160–5 (1897).
(3) "Germination of Seeds.—I. The Vitality of Dormant and Germinating Seeds." 'Science Progress,' 585–608 (1897).
(4) "On the Depletion of the Endosperm of *Hordeum vulgare* during Germination" (with Horace T. Brown). Proc. Roy. Soc. lxiii. 3–25 (1898).
(5) "Germination of Seeds.—II. The Hydrolysis and Regeneration of Proteins." 'Science Progress,' 219–236 (1898).
(6) "Static Diffusion of Gases and Liquids in relation to the Assimilation of Carbon and Translocation in Plants" (with Horace T. Brown). Proc. Roy. Soc. lxvi., and Phil. Trans. cxc. B, 223 (1900).
(7) "The Influence of varying Amounts of Carbon Dioxide in the Air on the Photosynthetic Process of Leaves and on the Mode of Growth of Plants" (with Horace T. Brown). Proc. Roy. Soc. lxx. 397–413, pls. 5–10 (1902).
(8) "Researches on some of the Physiological Processes of green Leaves with special reference to the Interchange of Energy between the Leaf and its Surroundings" (with Horace T. Brown). Proc. Roy. Soc. lxxvi. B, 29–111 (1905).
(9) "On a new Method for the Determination of Atmospheric Carbon Dioxide, based on the Rate of its Absorption by a free Surface of a Solution of Caustic Alkali" (with Horace T. Brown). Proc. Roy. Soc. lxxvi. B, 112–117 (1905).
(10) "On the Variations in the Amount of Carbon Dioxide in the Air of Kew during the Years 1898–1901" (with Horace T. Brown). Proc. Roy. Soc. lxxvi. B, 118–121 (1905).

Edgar Thurston, C.I.E.

(1855–1935).

The sudden death at Penzance on October 5 of Edgar Thurston at the age of 80 years will be keenly regretted by the many Cornish botanists and horticulturists with whom he had been long associated.

Thurston was born in London on July 14, 1855, the second son of the late Mr. C. B. Thurston of Kew. He was educated at Eton, and subsequently studied medicine at King's College, London, where he qualified as L.R.C.P. in 1877. Eight years later he was appointed Superintendent of the Government Museum, Madras, a position he held for nearly twenty-five years. During his residence in India he carried out important anthropological researches, and between 1902 and 1909 conducted an ethnographical survey of the Madras Presidency. His most important work, 'Castes and Tribes of Southern India,' in seven volumes, was published in 1909.

After his retirement in 1910 he went to reside in Cornwall, where he took up the study of the Cornish flora with his characteristic energy and thoroughness. The results of his field-work were published in collaboration with Dr. C. C. Vigurs as a supplement to Davey's 'Flora of Cornwall' in 1922, which contains many additional plant localities. Subsequently he planned a comprehensive survey of British exotic trees and shrubs in Cornish gardens. This task occupied him several years, and involved visits to all the more important Cornish gardens. The outcome of this was the issue in 1930 of 'British and Foreign Trees and Shrubs in Cornwall,' which was brought out under the auspices of the Royal Institute of Cornwall. This attractive and interesting volume, compiled from various sources, constitutes a detailed history of Cornish parks and gardens, and their folk-lore, as well as providing a catalogue of their arboricultural and horticultural wealth.

Thurston was of a genial and kindly disposition, and excellent company. He always gave any botanist who called on him a warm welcome. The writer spent two most enjoyable holidays with him, exploring Cornish gardens, and found him a most delightful companion.

He was buried in Penzance cemetery.—A. B. Jackson.

SHORT NOTES.

Plantago lanceolata var. anthoviridis Wats.—Mr. Rilstone's comments in last year's Journal (p. 234) on this plant are quite correct. The pollen-grains in the type are, according to my drawings, 30–34 μ in diameter, whilst the imperfect pollen-grains in var. *anthoviridis* are 18–20 μ. In most flowers of the latter the pollen remains imperfect and unshed, but in those with the filaments longer some of the pollen becomes mature, similar in size to that of the type, the anthers open and the pollen is shed. Mr. Rilstone does not suggest that the greenish-yellow colour of the anthers and the shortness of the filaments in var. *anthoviridis* are due to retardation or absence of the ripening processes which occur in the type, though this explanation is a possible one which I had previously considered.

Viable seeds are formed in the variety, but experiments on germinating these seeds have been inconclusive owing to contamination with pollen from the type-plant. The majority of the seedlings gave rise to type-plants, but the proportions of type to variety suggested that the factors causing greenness of anthers and shortness of filaments were recessive. Further experiments and observations are being made in the hope of obtaining seeds which have been fertilized by the pollen of the variety. It is difficult in a small garden, about which the type grows, to screen in an efficient manner so that pollen is not carried from the anthers of the type to the stigmas of the variety. Another cause of confusion is that seeds of the type are present in the soil of the garden. One plant of the variety has been growing in my garden for many years and has remained constant. Some botanists have suggested that the vegetative characters of the variety are slightly different from those of the type, the leaves being relatively longer and more narrowly lanceolate. This may be so in a general way, but no reliance can, in my opinion, be placed on these vegetative differences. The variety has been found in many of the western counties of England and Wales and was seen this year in S.W. Ireland.—W. Watson.

Euonymus europaeus L. with white Fruits.—Mr. C. Nicholson of Truro reports a small bush of Spindle growing near here with cream-coloured fruits, some of which have a thin pinkish line at the junctions between the carpels. The seeds are of the normal orange colour. There are several seedlings round the bush and at least two of these also bear the creamy-white fruits. The type is abundant.

White-fruited Spindle was reported in this Journal for 1912 (p. 377) near Bristol and near Guildford, and is also reported in Berkshire. The Editor in 1912 adds "the form, though unusual, is by no means unknown," and quotes Withering (1776) "fruit purplish sometimes white."

PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA.

Botany of the South Haven Peninsula, Dorset.—Ronald Good ('Journal of Ecology,' xxiii. 361–405) has made a detailed botanical survey of the interesting area well known to botanists as Little Sea and Studland Heath. The topography, geology, climate, and history of the area are described. There are three distinct botanical regions. The first or shore region on Poole Harbour, a narrow strip consisting of an outer zone of salt-marsh vegetation in which *Spartina Townsendii* is abundant, and an inner zone of species characteristic of damp, sandy, and often slightly saline habitats. The second region, the Western Plateau, has like the shore-line a stable vegetation and

is heath-land, replaced, in the valleys or where soil drainage is impeded, by damper communities culminating in acid bog or swamp. The heaths are practically constant throughout, the bogs are typical of the Dorset heathlands; there is also some woodland. The third region, the Eastern Sands, is of greatest interest—except in the oldest (first deposited) parts it is everywhere dynamic. It has been formed by the accumulation, since the end of the seventeenth century, of successive sand ridges, roughly parallel to the original peninsula, now represented by the Western plateau; these ridges interfering with the escape of drainage water from the plateau caused the formation of the Little Sea. The dry sand-ridges are separated by damp, level, low-lying slacks, and the result is an extremely complex mosaic of successional vegetation states. The author's detailed description and analysis of the vegetation of the peninsula are of much interest.

CRITICAL PLANTS OF THE UPPER GREAT LAKES REGION OF ONTARIO AND MICHIGAN.—M. L. Fernald ("Contributions from the Gray Herbarium of Harvard University," cviii., reprinted from 'Rhodora,' xxxvii. 1935). British botanists should find matter of interest in this publication. Part I. "The Pre-Wisconsin Flora of the Upper Great Lakes Region" is an attempt to substantiate the presence of ice-free areas (nunataks) during the period of general glaciation, based more especially on geological and botanical investigation on the Keweenan Peninsula on Lake Superior. The isolated occurrence on the Peninsula of western types, which in the Rocky Mountains or on the Pacific Slope are in country that they undoubtedly occupied before Pleistocene time, associated with absence of indication of glacial action, compels the conclusion that this region, like others about the Upper Great Lakes, did not suffer a complete extermination of its flora in the Pleistocene, at least during the later glacial developments called the Wisconsin glaciation. Prof. Fernald's argument will well repay perusal. Part II., consisting of taxonomic and floristic notes, contains a full discussion as to the relations of *Cryptogamma crispa* and *C. acrostichoides*. The genus was based by Robert Brown on the latter species from North-West America, and he doubtfully included the European and Asiatic *Pteris crispa* L. Prof. Fernald gives a *résumé* of the views of pteridologists from Hooker onwards, and in conclusion recognises an aggregate circumpolar species with well-marked geographical varieties, *C. crispa* var. *typica* Europe and adjacent Asia, var. *Brunoniana* (*C. Brunoniana* Wallich) Himalayas and Southern China, and var. *acrostichoides* North America. A study of *Geranium carolinianum* and allied species in north-eastern North America includes naturalized European species—*dissectum*, *pyrenaicum*, *pusillum*, and *molle*. A key to the species is included.

REVIEWS.

British Stem- and Leaf-Fungi (*Coelomycetes*). Vol. I. *Sphaeropsidales*. By W. B. GROVE, M.A. Pp. xx, 488, 31 text-figs. Cambridge University Press, 1935. Price 21*s*.

THE veteran author of this work is to be congratulated on having written a clear account of a group of fungi which has been somewhat neglected in this country. It is perhaps unfortunate that the unrelated conidial forms were ever called Fungi Imperfecti, for this has meant that very often they have been assumed to have no related perfect forms, and more often still that they are not worth serious attention, whereas they are most important from the standpoint of plant and animal disease, and also as causing rots of various kinds. Moreover, many interesting phenomena are most easily studied amongst these forms, and it is possible that it is from them that we shall come to a clearer knowledge of fungal species and their origin. Also it is worth remark that the relating of one or more conidial forms to a perfect stage as one life-cycle is never without considerable taxonomic value.

The present volume is the first of two dealing with Coelomycetes defined as Imperfect Fungi, "which bear their spores *within some cavity* of the matrix on which they grow"; the name was proposed by the author in 1919. It is unnecessary, but it is not misleading, which is more than can be said for the proposed "popular" name "Stem- and Leaf-Fungi."

The introduction occupies only two and a half pages. It is followed by a key to the families and genera. The genera and species are then described on the pattern which has been usual in systematic works for a century. The descriptions are clear and concise, and there are thirty-one illustrative line-drawings.

The localities where the species have been recorded are usually given, but this is really of little interest, for most species can be found on the appropriate hosts in all parts of the country: it would have been better to mention any special points known about distribution, such as abundance near the coast. Notes in smaller type are added to a good proportion of the descriptions. These often give points of interest about additional species on the same host, or about the appearance or structure of the fungus.

The genera are arranged in the usual sequence. *Phyllosticta* is the first, and as usual there is some difficulty in distinguishing it from *Phoma*. "The true distinction is rather a biological one—*Phyllosticta* is usually a parasite (holoparasite), and *Phoma* is a saprophyte or a facultative parasite (generally, if not always, a wound-parasite)." It would be best once for all to recognise that these two genera are sub-divisions of the one form-genus, and are no more distinct than are *Ascochyta* and *Diplodina*. For the most part the species are arranged in the alphabetic

order of the genera of the hosts—a convenient and frequent arrangement.

The author has " ventured to correct the spelling of the names wherever the rules of etymology seemed to require it," and has further disregarded the International Rules of Botanical Nomenclature by ignoring the very useful method of double citation.

The account of each species is mainly morphological, and few pathological or cultural details are included except very briefly. This the author says is intentional. Truth to tell, he is more than a little impatient with laboratory workers in spite of a pious sentence in the preface. He is very scathing about the genus *Polyopeus* and its species, which he excludes entirely—" The Petripatellist ought to correlate his museum of freaks with previously known species, before indulging in such a futile orgy of nomenclature." It would be quite open to the Petripatellist to ask what justification there is for stating categorically that certain forms are the pycnidial stages of named Pyrenomycetes, for at best this is merely intelligent guess-work.

The mycorrhizal Phomas are dismissed in a footnote as doubtful members of that genus, except *Phoma radicis-Callunae* Rayner, which is not mentioned.

The volume will be very useful, particularly for those who are not able to consult continental books. In the two volumes there will be more than 2,000 species against just over 200 in M. C. Cooke's Handbook (1871).

Of the making of new " species " in Fungi Imperfecti there is abundance—twenty-four are diagnosed in this volume. But all this is preliminary to something much more fundamental, and it would be unfair to judge such work on standards other than it professes.

The volume ends with an " Index of Hosts " and one of " Binomial Names." It is well printed and well got up.

For me the most surprising thing about the book is that it was written by one who has recently celebrated his 87th birthday.—J. R.

Illustrations of new Conifers. Containing Descriptions of new and rare Conifers cultivated in the British Isles. By H. Clinton-Baker and A. Bruce Jackson, A.L.S., V.M.H. Illustrated by life-sized photographs in sepia heliotype of cones and foliage. Roy. 4to, pp. x, 78, frontispiece, 78 pls. Privately printed: Simson & Co., Hertford, 1935. Price £4 4*s.* 0*d.*

This handsome volume forms a Supplement to the three volumes of 'Illustrations of Conifers cultivated in the British Isles' that were issued by Mr. Clinton-Baker between 1909 and 1913. It is planned on the same lines, but shows a marked superiority in the illustrations, which are in heliotype in place

of the half-tone plates of the earlier editions. Not only is the result more pleasing, but the perspective is better and greater detail has been brought out.

The botanical explorations of Wilson, Forrest, and Farrer have added much to our knowledge of the Conifers of the Far East since 1913, and many species raised from seed collected and sent home by them have proved to be of considerable cultural value. The present volume contains life-size illustrations of branches and cones of all the species recently brought into cultivation. The photographs are mainly of authentic living specimens, from the Bayfordbury Collection and elsewhere, supplemented occasionally, when living material was not available, by herbarium specimens from Kew or the British Museum. A number of species have been included which are not generally hardy or which can only be reared under glass.

There are representatives of many other countries besides temperate Eastern Asia. Australasia is represented, for instance, by species of *Agathis, Araucaria, Callitris, Dacrydium, Microcachrys,* and *Podocarpus*; South and tropical Africa by *Podocarpus* and *Widdringtonia*; and the Andine region by *Libocedrus* and *Podocarpus.*

Seventy-three species and varieties, representing twenty genera, are included, and four hybrids, *Abies Vilmorinii, Cupressus Leylandii* (*C. macrocarpa* × *nootkaensis*) which originated twice in cultivation near Welshpool, *Larix eurolepis* (*L. decidua* × *Kaempferi*), and *Pinus Holfordiana* (*P. Ayacahuite* × *excelsa*).

Podocarpus holds pride of place with sixteen species and one variety, but few are hardy in Britain; the majority must be grown under glass or in a specially mild climate. There are thirteen species, two varieties, and one hybrid of *Abies*; the first in the alphabetical arrangement is *Borisii-regis* Mattf. from the Balkans, which has alternately been regarded as a hybrid between *A. alba* and *A. cephalonica*, or as a polymorphic species from which the other two species have segregated. *A. Vilmorinii* Masters (*A. cephalonica* × *Pinsapo*) was raised artificially in 1868 by Vilmorin—only one fertile seedling was obtained, from which numerous seedlings have been raised.

The arrangement throughout is alphabetical. Reference is given to the original publication of the species and to a few standard works. A synonym is occasionally cited, but without reference to the place of publication; the insertion of the latter would have been helpful, and would not have encroached on the space. In the case of *Libocedrus Doniana* Endl. a footnote states that the correct name according to the Rules is *L. plumosa* (Don) Sargent—a reference to Silva N. Amer. x. 134 might have been given, or better *plumosa* might have been adopted and *Doniana* relegated to synonymy. Similarly under *Araucaria Cookii* R. Br., the correct name of which is *A. columnaris* as

stated in a footnote. A description of the habit and botanical characters of each species is followed by notes on its distribution and the possibilities of cultivation in the British Isles. In a few of the subjects there has been some confusion in the numbering of the plates, the order being reversed (see, for instance, *Abies recurvata* and *A. Georgii*). The photo of "*Diselma Aucheri*," plate 49, is *Juniperus bermudiana*; the plant at Glengariff had been wrongly identified. *D. Aucheri* is not in cultivation.

A pathetic interest attaches to the volume, which contains a brief "In Memoriam" notice by Mr. Jackson of his co-author, who died in April last before the publication of the work. Mr. Clinton-Baker had carried on and developed the fine Bayfordbury collection of Conifers that he inherited from his grandfather, and one must regret the dissolution of a partnership which allowed the production of so elaborately illustrated and at the same time technically accurate work. For if, as Mr. W. J. Bean writes in a "Foreword," the preparation has been entirely in the capable hands of Mr. Jackson, it has been Mr. Clinton-Baker's interest in the Conifers that has made the production possible.

The book is intended for those who with little or no botanical knowledge wish to identify their conifers, but it is also, with its wealth of carefully selected original illustrations, a valuable addition to Conifer literature.—A. B. RENDLE.

Manual of the Grasses of the United States. By A. S. HITCHCOCK, Principal Botanist, Division of Plant Exploration and Introduction, Bureau of Plant Industry. 8vo, pp. 1040, text-figs. 1696. United States Department of Agriculture, Washington, 1935. Price $1.75.

ONE always associates Dr. Hitchcock with Grasses. He is a well-known visitor at our great London Herbaria; one finds him abroad in Paris, Berlin, Geneva, or elsewhere, and he informs you with his cheery smile that he is "working at Grasses"; or one meets him in South Africa as the guest of the British Association collecting Grasses, or in his home in the National Herbarium at Washington where with his devoted assistant Mrs. Agnes Chase he is busy as ever working at Grasses.

Dr. Hitchcock's interest in Grasses is world-wide, but the present volume is a home-product, and American botanists will be grateful for an authoritative handbook to the family as represented in the States. The sequence of tribes and genera is that adopted in the author's "Genera of Grasses of the United States" published by the Department of Agriculture in 1920.

Keys are given to the tribes, under the tribes to the genera and under the genera to the species. The value of a work for identification of specimens depends largely on the usefulness of the keys. Grasses are not easy subjects, and anyone who

has seriously studied them will appreciate the difficulty of preparing a key, for instance to such genera as *Festuca* or *Poa*, which shall be helpful to the less experienced worker. I well remember my feeling of despair, when a neophyte at taxonomy I was set by my chief to arrange *Festuca* Section *Ovina* by Hackel's Monograph. In his introduction Dr. Hitchcock (p. 11) mentions pubescence as "a trivial distinction" (using trivial in a popular, not botanical, sense), but one may criticise his frequent use of hairiness as a character, for instance, in his key to *Festuca*. Remembrance again recalls a remark of Sir Joseph Hooker *à propos* of Indian Grasses—he did not mind "whether they had their clothes on or off." It is inevitable, too, that specialists in the family will not always agree on limitation of species or even of genera.

The descriptions of the species are supplemented by the lavish use of text-blocks, by which much information as to habit and floral characters is given often in small compass. The general distribution as to States is indicated by small inset-maps, but these are not well arranged and may be one or two pages ahead of the main description. It is easy to criticise, but why do American botanists call *Agropyrum repens* "Quack-grass"? Quack is a meaningless error for "Quick." And why does Dr. Hitchcock, who is a leading supporter in America of the International Rules of Botanical Nomenclature, desecrate personal trivial names with a small letter?

The volume opens with an informative Introduction on uses, distribution, morphology, classification, and nomenclature. An appendix on Synonymy is a list, with references, of the different names used for the Grasses in American botanical literature.

The last verdict on the Manual will rest with the American worker in the field or herbarium, but he will certainly find it a helpful guide. And its publication at what must be much less than cost price will put it within the reach of most. May Dr. Hitchcock long continue working at Grasses!—A. B. RENDLE.

The Botanical Society and Exchange Club of the British Isles. Report for 1934.

THE first part of the Report, by the Secretary, Mr. W. H. Pearsall, is shorter than in recent years, but presents the usual features. It also contains a set of new rules for the club members, some of which may be considered rather stringent. The plant-notes include two new species of *Rubus* by Mr. Watson, and no *Taraxaca*; and there is an interesting short article on the *Poa annua* group by J. A. Nannfeldt. Among the obituary notices are accounts of the late T. J. Foggitt and John Fraser. The "New County and other Records" have been compiled as in last year's Report, and a large number of astonishing

items are again printed, such as "*Ranunculus ophioglossifolius*—near Cheltenham," "*Trifolium Molinerii*—Lizard," etc. A doubt seems to have been felt respecting the rival claims of *Sorbus* and *Pyrus* as generic names, for *Sorbus porrigens* is followed by *Pyrus Aria* and *P. torminalis*. Among succeeding articles Mr. Pearsall has some notes on the Umbelliferae that may invite criticism. Do *Foeniculum vulgare* and *Smyrnium Olusatrum* grow near or in water? And is *Chaerophyllum sylvestre* a plant of bogs and marshes? A further paper by Mr. Pearsall on the British species of *Callitriche*, apparently adopted from Samuelsson's work on the Swiss forms, is likely to be useful, as is also the translation from Gluck's paper on *Limosella aquatica* var. *tenuifolia*. Additional articles are Mr. C. E. Britton's discussion on the British representatives of the forms of *Melampyrum pratense*, as elaborated by Beauverd, and Mr. G. W. Temperley's contribution to the problem of a relict flora in Britain, with which probably few botanists will wholly agree. The survey of the British Orchidaceae has not been continued from last year's Report. The final twenty-five pages are occupied by Mr. Rilstone's key to the British *Rubi*. This paper has evidently involved considerable labour, and its value can only be tested by actual use. It is artificial throughout, and gives no information respecting the natural generic subdivisions; and whether it will prove more useful to students than Moyle Rogers's 'Handbook' with which alone (without specimens for comparison) the writer was able to identify successfully twenty-five years ago about 90 per cent. of a large number of gatherings, is perhaps doubtful. But it should be valuable as an auxiliary to the 'Handbook.'

The second part of the Report, by the Distributor, Mr. N. Y. Sandwith, shows that 2879 specimens were contributed by 29 members, a slight increase on the numbers for 1933. It contains, as usual, a number of interesting notes on critical form, by Messrs. Britton, Lousley, Pearsall, Turrill, and others, as well as by the late John Fraser and the distributor, who adds some well-timed criticism of the archaic nomenclature current among British botanists.

The printing of the Report maintains its customary excellence, and the flimsy covers formerly in use have at length been discarded. —H. W. Pugsley.

University of California Publications in Botany.—XIX. University of California Press and Cambridge University Press, 1935.

No. 2, pp. 129–139, pls. 13–15. Price 1*s.* 3*d.* *Notes on* Microdictyon.—III. By William Albert Setchell.

This consists of important information additional to Dr. Setchell's valuable monograph 'The Genus *Microdictyon*.'

He records: the rediscovery of the type-species of the genus by Dr. Cyril Crossland in the Red Sea; further observations on *M. umbilicatum* (Velley) Zanard, based on specimens from the type-locality; increase of the range of *M. Okamurai* Setch. to include the Taumotu or Low Islands; acceptance of Dr. Howe's substitution of *M. Setchellianum* Howe for *M. Velleyanum* Decaisne; remarks on *M. Montagnei* Harv., especially concerning its connection with *Boodlea paradoxa* Reinb. From observations made in Australia, I entirely agree with Dr. Setchell's idea that "*Boodlea paradoxa* Reinbold is only a state of *Microdictyon Montagnei* Harv.," but agree less about the conditions in which the two states are to be expected. I agree that the flat lamina of *Microdictyon* is a quiet-water condition, but I do not agree that "boiling surge or even moderately rough water" is the reason for the *Boodlea* state. I have seen *Boodlea paradoxa* Reinb. dominant (to the point of making an appearance of a green field) on a well-sheltered reef-flat where rough water was very rare. I incline to think that the degree of emergence is the determining factor.—G. Tandy.

No. 3, pp. 141–158, pls. 16–19. Price 1*s.* 3*d.* Acroblastum *vs.* Polyplethia: *a Complex of the Balanophoraceae*. By William Albert Setchell.

A review of the taxonomy of the Balanophoraceae and especially of the standing of *Polyplethia* originally proposed as a subgenus or section by William Griffith. As a genus *Polyplethia* dates from Van Tieghem (1907), and is antedated by *Acroblastum* Solander founded on a plant collected in Tahiti on Cooke's first voyage and figured by S. Parkinson in the unpublished drawings made on the voyage, also at the British Museum. Solander's name remained unpublished until 1866 (Seemann, 'Flora Vitiensis,' 100). The author gives a synopsis of the nine species, which range from Assam to eastern Polynesia.

No. 4, pp. 159–186, pls. 19–21, 11 text-figs. Price 2*s.* 3*d.* *Comparative Histogenesis of Foliar Transition Forms in* Carya. By Adriance S. Foster.

A comparative study of the morphology and histology of the transitional leaves in four species of *Carya*. The author concludes that Goebel's interpretation of transition forms as arrested formations of foliage leaves is inconsistent with the facts of development. "In *Carya* they pursue from the beginning a divergent course of development characterized by localization and restriction of meristematic activity and a consequent maturation and senescence of all tissues."

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on December 5, Dr. W. T. Calman, C.B., F.R.S., in the Chair, fourteen Fellows were elected; among the number was General the Right Hon. Jan Christiaan Smuts. There followed a series of communications entitled "Changes in the British Fauna and Flora during the past Fifty Years," in which botany was represented by Mr. A. J. Wilmott for Flowering Plants, Mr. A. D. Cotton for Marine Algae, and Mr. J. Ramsbottom for Fungi. The subject proved to require more time than the evening allowed, and no discussion was possible. Some more drastic method of keeping speakers within their allotted time seems called for.

'STUDIES IN THE BROMELIACEAE.' Lyman B. Smith's "Studies," vi. (Contributions from the Gray Herbarium, no. cvi., reprinted from Proc. Amer. Acad. Arts. & Sci. lxx, no. 5) is a monographic synopsis of those species of *Tillandsia* which have a simple distichous- or single-flowered inflorescence and a caulescent habit. The forty species are described with full synonymy and details of distribution.

'ORCHID REVIEW.' In the November number Dr. Itaru Tsuchiya, Imperial University, Tokio, describes experiments on air fertilization of Orchid seedlings. The process consists in aerating the seedlings to increase the percentage of Carbon dioxide. Considerable difficulties are being experienced, but there is promise of good results.

ROYAL HORTICULTURAL SOCIETY. The Society's annual awards include Veitch Memorial gold medals for help in advancing the science and practice of horticulture to Mr. A. D. Cotton, Prof. E. J. Salisbury, and Lord Wakehurst. The Victoria Medal of Honour given to those deserving special recognition is bestowed on Sir Daniel Hall, for scientific work, and Mr. W. B. Cranfield, "a raiser of new plants" and a specialist in Ferns. Dr. A. Rehder of the Arnold Arboretum, well known for his work on trees and shrubs, and whose writings have added much to our knowledge of rhododendron, has been awarded the Loder Rhododendron Cup.

SOUTH-WESTERN NATURALISTS' UNION.—The Fourteenth Annual Conference of the Union will be held at Bristol from May 29 to June 1. The President of the Union is Dr. Stanley Smith, M.A., D.Sc., of Bristol University, and the Hon. Secretary Mr. Michael Blackmore, Uplands, Torrs Park, Ilfracombe.

NOTES ON LABIATAE. III. *CERATANTHUS*, A COLLATION OF CERTAIN SPECIES ALLIED TO *PLECTRANTHUS*.

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

INCLUDED in a collection of Labiatae made by the Archbold Expedition of the American Museum of Natural History to Papua (British New Guinea) and submitted by the New York Botanical Garden for identification at the British Museum was a specimen which is referable to *Plectranthus longicornis* F. Muell. and thus represents an interesting extension in the distribution of a species which has hitherto been recorded only from northern Queensland. Critical examination of the plant shows that in several particulars it does not satisfy the definition of typical *Plectranthus*, a genus which, as commonly interpreted, contains many discordant elements. The most noticeable feature of *P. longicornis* is the presence of a prominent posterior spur at the base of the corolla-tube, and while this character alone would not be sufficient to exclude it from *Plectranthus*, since the type-species of that genus (*P. fruticosus* L'Hérit.) has a pronounced corolla-spur, the plant shows several associated characters not usually found in the genus. These are to be observed in the calyx, of which the lower lip is truncate, rounded, or emarginate at the apex, and in the androecium. The anterior filaments are inserted near the mouth of the corolla-tube, whilst the posterior filaments are inserted at its base, being slightly decurrent into the spur and minutely pubescent at least towards the base. *Plectranthus*, as the name implies (πλῆκτρον, spur, and ἄνθος, flower), was originally described as having a spurred corolla, but in all the species examined, with the exception of the type-species and those considered in the present paper, the "spur" is only a slight dilation or gibbosity. Further, the lower lip of the calyx is divided into two prominent teeth, and the filaments are typically all glabrous and inserted at the same level in the corolla-tube. The propriety of giving *P. longicornis* separate generic status rests on these differences. Reference to the original description of the species shows that its author was himself uncertain of its generic position, for while he founded a new section *Cornigera* for its reception he also suggested that it might form a distinct genus for which he proposed the provisional name *Ceratanthus* * which I have adopted here. In subsequent treatments of the family (Benth. in Benth. & Hook. Gen. Plant. ii. 1175, 1876; Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3 *a*, 352, 1897) Mueller's suggestion has not been

* F. Muell. Fragm. Phytogr. Austral. v. 52 (1865). "*Species propriam generis sectionem nisi genus peculiare (Ceratanthus) efformat, cornu procero floris et forma calycis memorabilem.*"

accepted, and even his section *Cornigera* of *Plectranthus* has not received recognition.

Search through the available described species of *Plectranthus* reveals two (*P. calcaratus* Hemsl. from southern Yunnan and Burma and *P. Garrettii* Craib from north-western Siam) in which the corolla-tube is produced into a prominent spur at the base, and which have also the associated characters of a truncate lower calyx-lip and pubescent posterior filaments (although in both species these have been described as glabrous) inserted at the base of the corolla-tube. These two species certainly appear to be congeneric with *P. longicornis*, despite their geographical isolation from it.

In his recent account of the Labiatae of China and Japan, Kudo (in Mem. Fac. Sci. & Agric. Taihoku Univ. ii. 118 *et seq.*, 1929) has resolved all species from that area hitherto included in *Plectranthus* into the three genera *Isodon* Schrad. ex Benth., *Hemsleia* Kudo, and *Dielsia* Kudo, the two latter being described as new. The monotypic genus *Hemsleia* was founded to accommodate *P. calcaratus*, and although no differential diagnosis was given it may be inferred that Kudo was most influenced in his treatment by the presence of the long corolla-spur ("*Corolla longe calcarata, tubo angusto, calcare acuto tubo aequilongo*") and the shape of the lower calyx-lip ("*labio . . . . inferiore trapezoideo apice emarginato*"). He did not, however, recognise the further diagnostic feature of the genus, the pubescence of the posterior filaments, but repeated the erroneous observation of Hemsley, who stated that all the filaments were glabrous. Both of Kudo's new names are invalidated by the earlier homonyms *Hemsleya* Cogn. (Cucurbitaceae) and *Dielsia* Gilg (Restionaceae).

While this investigation was in progress I had the opportunity of examining material of the family from French Indo-China by courtesy of Dr. Doan Khac Thinh who is shortly to enumerate the Labiatae of that country. Among his specimens are three which show the same associated characteristics as the species already discussed. Dr. Doan had already recognised these plants as new species and has most generously allowed me to describe them in the present paper.

The six species thus brought together have the following features in common: (*a*) the presence of a well-defined posterior spur at the base of the corolla-tube, (*b*) the calyx-lips widely divergent at time of flowering with the lower lip more or less truncate, (*c*) the glabrous anterior filaments inserted near the mouth of the corolla-tube, and the posterior filaments, pubescent at least towards the base, inserted at the base of the corolla-tube and slightly decurrent into the spur, (*d*) the finely pitted nutlets. Thus in several characters *Ceratanthus* diverges from typical *Plectranthus*. Although *P. fruticosus* shows the development of a posterior spur at the base of the corolla, in all other species

of the genus the corolla-tube is at most gibbous at the base, and the lower calyx-lip is divided into two more or less prominent teeth. The filaments in *Plectranthus* are generally glabrous and inserted at the same level in the corolla-tube, while the nutlets are smooth or minutely punctate.

Ceratanthus is to be inserted in the subtribe *Plectranthinae* of the subfamily Ocimoideae according to the classification of Briquet. It appears to be most closely related to *Plectranthus*, and particularly to several former members of that genus now referred to *Isodon*. The species which most closely approaches *Ceratanthus* is perhaps *Isodon macrocalyx* (Dunn) Kudo, in which the corolla has a very small spur and the posterior filaments are glandular-pubescent and inserted in the base of the corolla-tube. In fruit, however, the calyx of *I. macrocalyx* is more or less campanulate with the lower lip deeply bilobed, while the lateral calyx-teeth are subequal to the posterior non-decurrent upper segment and ranged with it to form a 3-lobed upper lip. In the structure of the calyx *Ceratanthus* shows a strong resemblance to the genera *Platostoma* Beauv. and *Solenostemon* Thonn. of the same subfamily.

The genus shows a strikingly discontinuous distribution, and of the six known species five are from very circumscribed areas. *C. calcaratus* (Hemsl.) G. Tayl. is known from southern Yunnan and Southern Shan States, Burma; *C. Garrettii* (Craib) G. Tayl. has been found once on the Doi Kar Range in north-western Siam; of the three species from French Indo-China one is found in each of the three protectorates Annam, Laos, and Cambodia. *C. longicornis* (F. Muell.) G. Tayl. forms an interesting outlier, and extends from Papua to northern Queensland. The accompanying map (fig. 1, p. 36) shows the distribution of the genus, and the locality of each specimen examined is indicated. It is of interest to notice here the almost converse distribution found in the genus *Calotis* (Compositae). In a recent account Merrill (in Bull. Soc. Bot. France, lxxvii. 340, 1930) has observed that in this genus seventeen or eighteen species are confined to Australia, while one is found in Indo-China.

CERATANTHUS F. Muell. [Fragm. Phytogr. Austral. v. 52 (1865) in obs., *nomen provisorium*].

Plectranthus sect. *Cornigera* F. Muell. *tom. cit.* 51 (1865).

Hemsleia Kudo in Mem. Fac. Sci. & Agric. Taihoku Univ. ii. 142 (1929), non *Hemsleya* Cogn. [ex Forbes & Hemsl. in Journ. Linn. Soc., Bot. xxiii. 490 (1888), *nomen nudum*] in Hook. Ic. Plant. xix. sub tab. 1822 (1889).

Calycis tubus brevissime campanulatus, in fructu leviter antice saccatus et accrescens, extus plus minusve dense glanduloso-pubescens et pellucido-punctatus; labia per anthesin hiantia, in fructu accrescentia clausa, posticum convexo-subquadratum

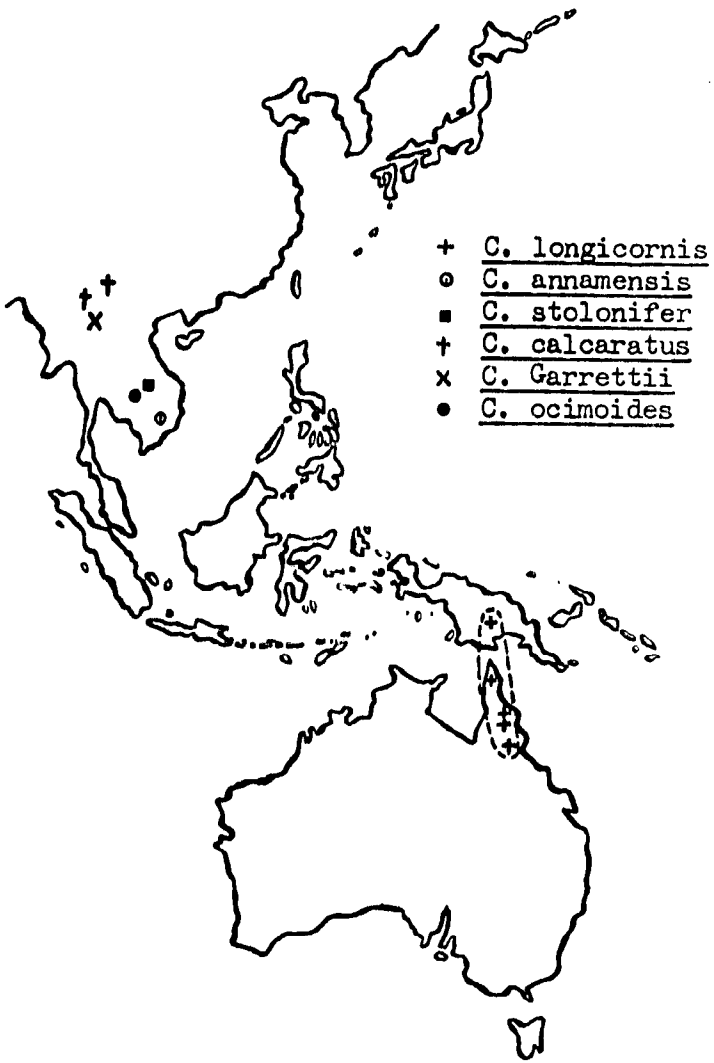


Fig. 1.—Map of distribution of species of *Geratanthus*.

vel suborbiculare extus saltem pellucido-glandulosum intus glabrum basi in tubum decurrens margine ciliatum, anticum concavo-quadratum extus plerumque pilosum et pellucido-glandulosum apice truncatum præmorsum vel emarginatum margine ciliatum; dentes laterales plus minusve triangulares. *Corolla* extus parce et minute pubescens et pellucido-glandulosa; tubus elongato-cylindraceus, basi postice calcaratus, calcare recto vel leviter curvato apice rotundato; limbus bilabiatus, labio postico subquadrato apice 4-lobato (lobis subæqualibus apice rotundatis), antico plerumque cochleare. *Stamina* 4, declinata, vix exserta; filamenta libera complanata, postica corollæ basi inserta saltem basin versus minute (plerumque glanduloso-) pubescentia et gradatim dilatata basi in calcar decurrentia, antica glabra prope corollæ faucem inserta; antheræ reniformes, uniloculares, medifixæ. *Discus* antice in glandulam productus. *Ovarium* ad basin 4-partitum. *Stylus* glaber vix exsertus ab ima basi declinatus, apice breviter bilobatus, lobis aliquantulum crassis apice rotundatis. *Nuculæ* basifixæ, ambitu oblongæ vel oblongo-ellipsoideæ, subtiliter scrobiculatæ.

Herbæ perennes vel annuæ, interdum subacaulescentes stoloniferæque. *Verticillastri* 4–10-flori. *Flores* parvi, pedicellati.

Species 6, in south-eastern Asia, one extending from Papua into Queensland, Australia. Type-species: *C. longicornis* (F. Muell.) G. Tayl.

Key to the Species.

Plants scapigerous with the leaves subradical or at least aggregated towards the base of the stem, sometimes with smaller leaves developed on elongated shoots.
  Plants perennating by a woody rootstock; leaves chartaceous, more or less densely pubescent; pubescence on scapes (or at least on the pedicels) spreading.
    Corolla-tube never exceeding 5 mm. in length; spur upcurved at right-angles to the corolla-tube.... 1. *longicornis.*
    Corolla-tube 10–12 mm. in length; spur straight or at most slightly upcurved..... 2. *annamensis.*
  Plants creeping, rooting at the nodes and producing stolons; leaves membranous, very sparsely pubescent; pubescence on scapes and pedicels closely appressed ..... 3. *stolonifer.*
Plants with well-developed leafy stems.
  Leaf-pubescence sparse, of short appressed hairs..... 4. *calcaratus.*
  Leaf-pubescence dense, of long more or less spreading hairs.
    Lower lip of calyx in fruit ribless, entire at the rounded apex; corolla-spur long (up to 10 mm.), straight or only slightly upcurved; leaves conspicuously petiolate (petiole up to 1·8 cm. in length) ..... 5. *Garrettii.*
    Lower lip of calyx with prominent longitudinal ribs, denticulate at the truncate apex; corolla-spur short (up to 2 mm.), sharply upcurved; leaves shortly petiolate (petiole up to 3 mm. in length). 6. *ocimoides.*

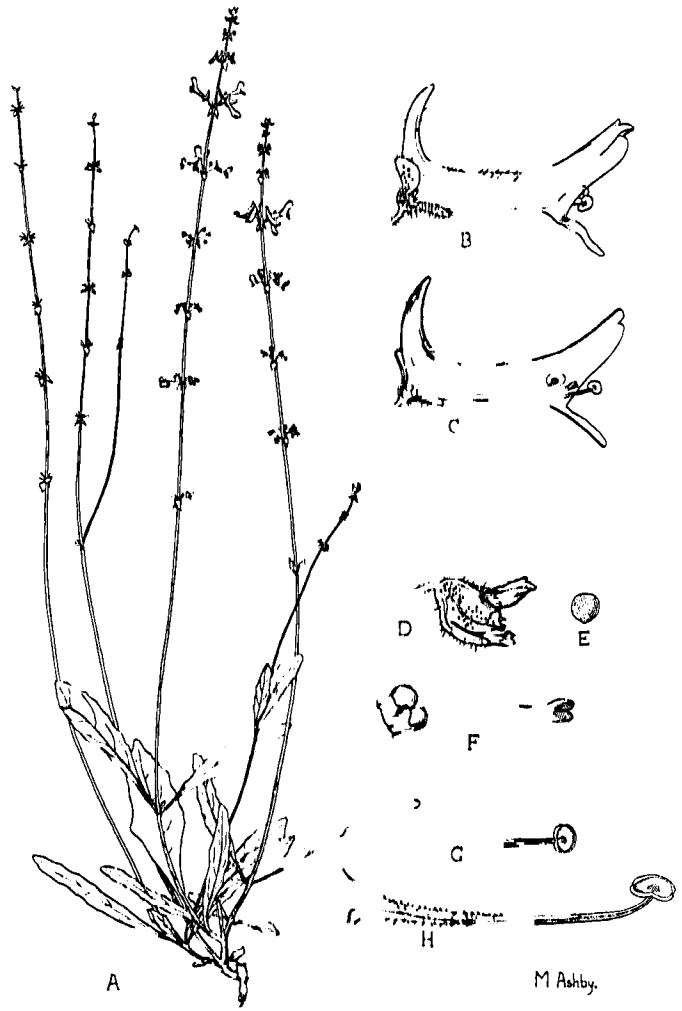


Fig. 2.—*Ceratanthus longicornis* (F. Muell.) G. Tayl. A, entire plant, ×about ½. B, single flower, ×about 4. C, flower in longitudinal section. D, fruiting calyx, ×about 4. E, nucule, ×about 4. F, gynœcium, ×10. G, anterior stamen, ×8. H, posterior stamen, ×8.

1. **Ceratanthus longicornis** (F. Muell.), comb. nov. (Fig. 2.)
Plectranthus longicornis F. Muell. Fragm. Phytogr. Austral. v. 51 (1865).

GEOGRAPHICAL RANGE.—Southern Papua and north-eastern Queensland. Originally described from Rockingham Bay, Queensland.

PAPUA. Western Div.: Wuroi, Oriomo River, alt. 10–30 m., common amongst grass all over savannahs; stems, peduncles, and leaf-midribs purple-tinged; flowers violet; Jan.–Mar. 1934, *Brass* 5692 (Herb. New York Bot. Gard.; Herb. Brit. Mus.).

QUEENSLAND. Cook Distr.: Somerset County, Cape York, Nov. 17, 1849, *MacGillivray* (Herb. Kew); Banks County, Cooktown, flowers violet, 1891–1893, *Podenza* (Herb. Brit. Mus.); Nares County, Myola, flowers blue, Feb. 4, 1892, *Podenza* (Herb. Brit. Mus.). North Kennedy Distr.: Cardwell County, Rockingham Bay, *Dallachy* (type; Herb. Kew).

2. **Ceratanthus annamensis**, sp. nov. *Herba* scapigera, scapo usque ad 25 cm. altitudinis attingente quadrangulo dense pubescente. *Folia* radicalia vel subradicalia, petiolata (petiolo tomentoso usque ad 1 cm. longo); lamina obovata vel oblonga, basi cuneata, apice obtusa vel rotundata, margine serrata vel late crenata, usque ad 6 cm. longa et 3 cm. lata, chartacea, utrinque (subtus præsertim in costa nervisque) dense hispidulosa. *Bracteæ* ovatæ, apice acutæ vel apiculatæ, margine ciliatæ, 4 mm. longæ et 3·75 mm. latæ, extus dense pubescentes. *Flores* pedicellati (pedicellis dense glanduloso-pubescentibus usque ad 7 mm. longis) in verticillastros 8–10-floros dispositi, verticillastris basalibus inter se usque ad 1·5 cm. distantibus superioribus congestioribus. *Calyx* extus dense glanduloso-pubescens; labium posticum suborbiculare basi decurrens apice obtusum margine ciliatum per anthesin 2 mm. longum et 2 mm. latum, anticum concavo-ovatum apice late rotundatum per anthesin 2 mm. longum et 1·5 mm. latum; dentes laterales late triangulares. *Corollæ* tubus 10–12 mm. longus, ore diametro circ. 1 mm., extus glanduloso-pubescens, calcare leviter curvato usque ad 7 mm. longo; labium posticum 3 mm. longum et 4 mm. latum, anticum leviter concavum 4 mm. longum et 1·5 mm. latum. *Filamenta* postica 7 mm. longa basin versus pubescentia, antica 2 mm. longa. *Stylus* 11 mm. longus. [*Nuculæ* maturæ non adhuc visæ.]

GEOGRAPHICAL RANGE.—Known only from the type-locality.

ANNAM. Yabak, alt. 800–900 m., Oct. 23, 1917, *Chevalier* 36,445 (type in Herb. Mus. Paris).

3. **Ceratanthus stolonifer**, sp. nov. *Herba* acaulescens reptans et stolonifera, nodis radices emittentibus; stolones graciles usque ad 30 cm. longi plus minusve dense pubescentes. *Folia* radicalia vel subradicalia; lamina elliptica vel oblanceolata, basi in petiolum decurrens, apice obtusa, margine late crenata,

usque ad 12 cm. longa (petiolo pubescente 2·5 cm. longo incluso) et circ. 4 cm. lata, membranacea, supra sparse pubescens (pilis multicellulis plus minusve regulariter dispositis) subtus aliquantulum glaucescens costa nervisque dense appresso-pubescens alibi fere glabra. *Scapus* 18 cm. longus dense (? apicem versus glanduloso-) appresso-pubescens, verticillastris inter se 1·3 cm. distantibus. *Bracteæ* sessiles, ovatæ vel subrotundatæ, apice acuminatæ, margine ciliatæ. *Flores* pedicellati (pedicellis dense appresso-pubescentibus maturitate circ. 5 mm. longis), in verticillastros 4–8-floros dispositi. *Calyx* extus dense pubescens et pellucido-glandulosus; tubus in fructu 2 mm. longus et ore 2 mm. latus, prominenter longitudinaliter pluri-costatus; labium posticum subrotundatum leviter convexum, basi levissime decurrens, apice rotundatum, margine ciliatum, per anthesin 1·75 mm. longum et 2 mm. latum, in fructu 2 mm. longum et 2 mm. latum; anticum oblongum concavum, apice emarginatum vel late rotundatum, per anthesin 1·75 mm. longum et latum, in fructu 2·5 mm. longum et 2 mm. latum; dentes laterales late et oblique triangulares, in fructu 0·5 mm. longi et basi 1·5 mm. lati, apice obtusi. *Corollæ* violaceæ tubus cylindraceus, extus glanduloso-pubescens et pellucido-glandulosus, circ. 4 mm. longus, calcare leviter curvato 2 mm. longo apice obtuso; labium posticum quadratum, circ. 2·5 mm. longum et latum; anticum concavum, 2·5 mm. longum et 2 mm. latum. *Filamenta* postica 4·5 mm. longa omnino glanduloso-pubescentia, antica circ. 1 mm. longa. *Stylus* circ. 6 mm. longus. *Nuculae* oblongæ.

GEOGRAPHICAL RANGE.—Known only from Laos.

LAOS. Boloven Plateau near Bassac between Mong Bok Kao and Phong Tham, alt. 900 m., "plante semi-rampante; fl. violets, très jolies; forêt terre rouge," Oct. 6, 1928, *Poilane* 15,852 (type in Herb. Mus. Paris).

4. **Ceratanthus calcaratus** (Hemsl.), comb. nov.

Plectranthus calcaratus Hemsl. in Hook. Ic. Pl. xxvii. tab. 2671 (1900).

Hemsleia calcarata (Hemsl.) Kudo in Mem. Fac. Sci. & Agric. Taihoku Univ. ii. 142 (1929).

GEOGRAPHICAL RANGE.—Southern Yunnan and the adjacent region of eastern Burma.

CHINA. Yunnan: Szemao, alt. c. 1370 m., in forests, lilac flowers, semi-prostrate branching herb, *Henry* 12,339 (type in Herb. Kew; Herb. Edinb.); mountains west of Szemao, alt. c. 1520 m., flowers purple, *Henry* 12,339 A (Herb. Kew).

BURMA. Southern Shan States: Mar.–Apr. 1910, *MacGregor* 841 (Herb. Kew).

5. **Ceratanthus Garrettii** (Craib), comb. nov.

Plectranthus Garrettii Craib in Bull. Misc. Inf. Kew, 1914, 132 (1914).

GEOGRAPHICAL RANGE.—Only known from the type-locality.

SIAM. Payap Circle: Doi Kar (Intanon) Range of the Pah Ngeam, lat. 18° 40′ N., long. 98° 32·5′ E., alt. 1142 m., small stoloniferous plant, Oct. 1, 1910, *Garrett* (type in Herb. Kew).

6. **Ceratanthus ocimoides**, sp. nov. *Herba* ramosa, altitudinis usque ad 34 cm. attingens; caules sulcati, tomentosi, deinde plus minusve glabrescentes. *Folia* opposita; lamina lanceolata vel rarissime oblonga, basi cuneata vel obtusa, apice acuta subacuta vel obtusa, margine distanter serrata ciliata, usque ad 3 cm. longa (petiolo tomentoso usque ad 3 mm. longo incluso) et 1 cm. lata, chartacea, utrinque pubescens (supra strigillosa), nervis lateralibus pinnatis supra inconspicuis subtus ut costa prominentibus. *Inflorescentia* terminalis, per anthesin usque ad 10 cm. longa, dense glanduloso-pubescens. *Bracteæ* sessiles, lanceolatæ vel ovatæ, apice acutæ, margine ciliatæ, extus dense glanduloso-pubescentes. *Flores* pedicellati (pedicellis dense glanduloso-pubescentibus, 2–4 mm. longis) in verticillastros 6-floros dispositi, verticillastris inter se usque ad 1·6 mm. distantibus. *Calyx* primum dense glanduloso-pubescens ultimo fere glabratus, in fructu deflexus; labium posticum orbiculare, basi leviter decurrens, apice rotundatum vel breviter apiculatum, in fructu circ. 2·5 mm. longum et 2·5 mm. latum; labium anticum rectangulare, apice præmorsum, prominenter longitudinaliterque nervosum nervis ad apicem in 4–5 dentes minutos productis, in fructu circ. 2 mm. longum et 1·5 mm. latum; dentes laterales anguste triangulares, apice spinescentes. *Corollæ* tubus sparse pubescens, usque ad 7·5 mm. longus, calcare breviter cylindraceo apice rotundato circ. 2 mm. longo subabrupte curvato; labium posticum quadratum 2 mm. longum et 2 mm. latus, anticum concavum circ. 2 mm. longum. *Filamenta* postica 6·5 mm. longa, basin versus pubescentia, antica 1·25 mm. longa. *Stylus* circ. 7 mm. longus. *Nuculæ* oblongo-ellipsoideæ.

GEOGRAPHICAL RANGE.—Known only from the type-locality.

CAMBODIA: Préacan, in forest clearings, Aug. 1873, *Harmand* (type in Herb. Mus. Paris; Herb. Brit. Mus.).

The most distinctive feature of this species is the rectangular lower lip of the calyx, which has more or less prominent nerves produced into minute teeth at the apex.

I am indebted to Dr. Maurice Ashby for the drawing of *Ceratanthus longicornis* (fig. 2) accompanying this paper.

As this paper was going to press, I received from Dr. Doan fragments of the inflorescence of what appears to be an additional species of *Ceratanthus*. Since it has not been possible for me to examine complete specimens of this plant, which has flowers smaller (corolla-tube about 3 mm. in length) than any known species, I am unable at present to describe it.

NOTES ON THE FLORA OF THE BERMUDAS.

By A. B. Rendle, F.R.S.

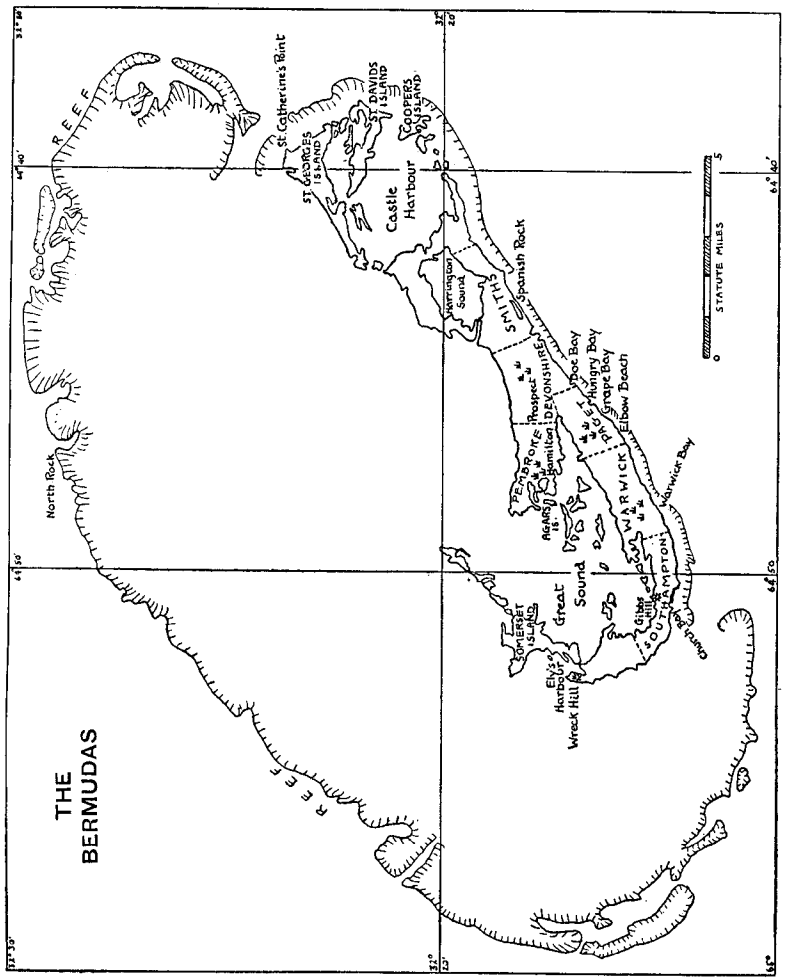
We owe to the late Dr. N. L. Britton a complete descriptive list of the Flora of Bermuda ('Flora of Bermuda,' New York, 1918). In the following notes, the product of ten weeks' stay in the islands, from early March to the middle of May 1933, I have tried to give a general idea of the vegetation as it is at present. Unless some steps are taken for the preservation of special areas, some of its most characteristic features will soon be things of the past. In the course of my rambles I collected all the plants that were showing and determinable, but doubtless missed some of the later-flowering species. There is no break in the vegetation, as frost is unknown, but a gradually increasing number of species come into flower after the winter months. The mean temperature varies from 63° F. in January to 80° F. in July. The rainfall of about 60 inches is distributed through the year; July to September are generally the wettest months. Persistent rain is unusual; heavy showers are followed by warm sunshine, which soon dries the ground. The only checks to vegetation are the strong winds that may break or uproot trees and shrubs, and the salt spray that they carry and which may damage growing crops.

The land-surface consists of a long narrow main island, with smaller islands scarcely separated from it at each end, the whole in the form of a fish-hook, and sheltering in the enclosed Sounds numerous small islands varying in size from a few acres to barren rocks. The group is surrounded by a coral reef in the form of an ellipse, which on the north encloses a large area, up to ten miles greatest width, full of innumerable rocks and shoals; approach through the navigable channel is possible only in daylight. On the south the reef closely follows the coast-line. The Gulf Stream sweeping from west to east to the north of the Islands is largely responsible for the mildness of the climate and ameliorates the cold north-easterly winds.

The islands consist of aeolian limestone, forming a cap extending to more than 300 feet in depth on a volcanic base. On the north outside the reef there is a steep slope falling 1250 fathoms in six miles; the slope is less steep on the south side. The islands surrounded by deep abysses of ocean have always been completely isolated. The nearest land is Cape Hatteras on the American coast, 568 nautical miles distant; the Bahamas lie about 700 miles to the south-west, and St. Thomas about 800 miles to the south-east.

The islands have been subject to alternate uplifts and depressions, and there is evidence of a recent depression in the presence of upstanding trunks of Junipers found on dredging 45 feet below sea-level, and in the stalactites rising through thirty feet of water

in some of the beautiful limestone caverns which are plentiful at the north-west end of the main island. The present total land-area of about 19 square miles is the remains of a much larger area of Pliocene times, perhaps represented by the limits



of the encircling coral reef. At its widest no part of the land-surface is more than a mile and a half from the sea.

The soil is calcareous, formed from disintegration of the limestone. It is sometimes sandy and, especially on the southern shores, there are sandy beaches and low sand-dunes. The land-surface consists of low rounded hills, recalling its formation from

blown sand—the highest is about 250 feet. Between the hills are broad valleys and in places fresh- or brackish-water marshes or pools. The soil on the hill-sides is poor, but in the valleys there is a good depth of fertile, reddish, slightly clayey soil, which supports the industry of the islands, cultivation of the Bermuda Lily (*Lilium longiflorum* var. *eximium*), and early vegetables for the American market.

The native marine flora is far richer than that of the land, the broken rocky coast-line and the shallow rock-strewn Sounds affording ideal localities. Dr. Britton gives the following numbers for native species :—

Flowering plants	146,	including	11	endemic.
Ferns and fern allies ..	19	,,	4	,,
Mosses and hepatics ...	51	,,	2	,,
Lichens	80	,,	10	,,
Algae	238	,,	22	,,
Fungi, at least	175	,,	12	,,
Total	709	,,	61	,,

There are, in addition, many introduced species that have become wholly or partially naturalized, and without reference to records it may be impossible to decide whether a given species is native or introduced ; and early records are very incomplete. Some of the introduced species are replacing natives, and some of the rarer natives are on the verge of extinction. Extending cultivation and enclosure for golf links and luxury hotels also threaten the original vegetation.

The most characteristic feature is supplied by the endemic "Cedar "—*Juniperus bermudiana*,—the only native gymnosperm, which covers the low hills, sometimes forming nearly pure forests, and extending to the coast, where individual trees maintain a precarious hold, often growing in the naked limestone rock. In the valleys the trees may reach 70 feet in height with a diameter of 4 feet, but, as the result of deforesting for cultivation, clearance for building, and indiscriminate felling for general use as timber since the colonization of the islands in 1612, the finest trees have disappeared. The famous ancient tree in Devonshire Churchyard that measured 15½ feet in circumference in 1912, referred to by Dr. Britton, no longer exists. During the 18th and early 19th centuries the Bermudans did much of the carrying trade between the north and south coasts of the United States, and their ships were built of the native " Cedar." In 1789, we are told, forty ships were built, with a total tonnage of 3200. Trees allowed to grow freely on enclosed estates form shapely specimens, pyramidal when young, forming a spreading crown when older ; the stringy grey bark contrasts pleasantly with the soft green foliage. The wood is red in colour, easily worked, and

takes a fine polish. Indiscriminate felling is, I understand, now forbidden.

The Juniper is threatened, especially near the capital, Hamilton, by the Fiddle-wood, *Citharexylum spinosum* (Verbenaceae), native of the Lesser Antilles, introduced about 1830. It is a rapidly growing deciduous tree, propagating freely from seed. Seedlings flourish in the shelter of the Juniper, and by their rapid growth kill out the lower branches, and will ultimately destroy the tree. Fortunately, the wood is very brittle, and a gale which has no effect on the endemic tree will cause havoc among the Fiddle-wood. It is useful for fire-wood and shade, and the red coloration of the leaves before falling early in the year is effective.

Another naturalized introduction, the Pimento or Allspice (*Pimenta officinalis*), is locally threatening the Juniper, especially on the hill-sides in Warwick.

On many of the hills, especially near the capital, the shrubby undergrowth is represented mainly or almost entirely by the common Sage-bush, *Lantana involucrata*, the most abundant shrub in the island, which, as Britton remarks, has every appearance of a native. It is native in Florida and the West Indies, which have supplied most of the native flora of Bermuda. Lefroy, however, states that it was introduced from the Bahamas prior to 1800, with the idea that it would be good for firing ; but, though it burns readily on a bonfire, it makes very little wood. It spreads rapidly, but is easily uprooted. The fact that in the less frequented parts of the islands it has played less havoc with the admittedly natural undergrowth may support the view of its introduction. It would certainly not have been introduced for its beauty, as it is a poor-looking shrub with small dull green leaves and small heads of lilac or whitish flowers. *L. Camara* (Red Sage-bush), also naturalized, but less frequent and preferring more open situations, is a generally taller, decorative shrub, the larger heads of flowers, yellow to orange or red, showing often combinations of colour on the same head. But the most decorative is the Prickly Sage, *L. aculeata*, which is locally abundant by the South Shore Road, Devonshire, where, according to Britton, it was first noticed in 1905. The long, often scrambling branches bear stout hooked prickles ; the flower-heads, larger than in *Camara*, show a similar, but brighter, variety in colour. It is a native of tropical America, and may be a garden escape, but does not seem to be spreading.

A second endemic tree, the Palmetto (*Sabal bermudana* L. H. Bailey) is also a characteristic feature of the vegetation, and occurs generally throughout the islands. It varies in the height and diameter of the trunk, which is often comparatively short, not exceeding 20 feet, and stout, often inclined, and sometimes variously constricted or is swollen at the base. Taller

trees, with a more slender trunk, may reach 40 feet in height. The small black fleshy pyriform-globose fruits contain a hard endosperm, which when ground was used as flour by Admiral Somers's crew when shipwrecked on the islands in 1609. It is, unfortunately, threatened by a scale-insect which ultimately destroys the tree, and for which no remedy has yet been found. L. H. Bailey ('Gentes Herbarium,' iii. fasc. vi.; 1934) shows reason for discarding the name *Sabal Blackburniana*, which it has borne since Hemsley described the Botany of Bermuda in the 'Challenger' Report (1888).

The third endemic tree, *Elaeodendron Lanceanum* A. H. Moore (Celastraceae), a slow-growing shapely evergreen, up to 45 feet high, with a crown of fresh green leaves on a short trunk of very dense wood and olive-like fruits, is threatened with extinction. A few trees are still left in the original locality on the rocky hill-side between Harrington Sound and Castle Harbour.

Britton enumerates the following eight flowering plants also as endemic :—

Sisyrinchium Bermudiana L., the national flower, produces its bright violet starry flowers everywhere in dry sunny places in spring; white-flowered specimens are occasionally found.

Erigeron Darellianus Hemsley, a small perennial herbaceous or somewhat shrubby Composite with pretty white Daisy-like flowers, is abundant in rocky situations, by roadsides, or on the rocky coasts.

Chiococca bermudiana S. Brown, Bermuda Snow-berry (Rubiaceae). A very attractive shrub, 2 to 6 feet high, with light green leaves, racemes of small yellow fragrant campanulate flowers, and small white shining berries. Britton describes it as "frequent on hill-sides," but apart from the Harrington Sound ridge I saw but little of it.

Ascyrum macrosepalum S. Brown. A small erect shrub with slender branches, small narrow leaves, and small bright yellow fugacious flowers. Occurs in marshes and on hill-sides; but I did not find it frequent, as described by Britton.

Phaseolus lignosus Britton. "Rocky woodlands between Castle Harbour and Harrington Sound." I did not find this. It may be extinct, as the locality is being rapidly destroyed.

Peperomia septentrionalis S. Brown. Still occurs in the Harrington Sound locality and Paget Marsh, but will disappear if and when these two localities are improved away.

Carex bermudiana Hemsley. Described from the original specimen in the Sloane Herbarium, xxxii. fol. 83, collected by J. Dickinson about 1699 (Journ. Bot. xxi. 260, t. 239, 1883), and not noted again until found by Britton in 1905, who states that it is "very rare and presumably on the verge of extinction." I found it fairly abundant in Paget Marsh in April 1933, but saw it nowhere else.

Eleocharis bermudiana Britton. "Occasional along borders of marshes." I did not find this, but may have been too early.

Four of these endemic species were collected by Dickinson. His small collection was given to Petiver, from whom it was acquired by Plukenet, who figures some of the species in his 'Phytographia.' An account of the collection, which is in Herb. Sloane, was given by Hemsley in the *Journal of Botany*, 1883 (where he describes *Carex bermudiana*); Hemsley does not include the *Ascyrum* which is on the same page (vol. xxxii. fol. 82) as Dickinson's specimen of *Relbunium bermudense* Britten, but is without a ticket. Beside it is a very imperfect specimen of a grass, which is, I think, the common Bermudan Crab-grass (*Stenotaphrum secundatum* Kuntze), also without a ticket. Petiver's labels were written on very small scraps of paper attached to the plant, and some have certainly been lost in course of time. We may probably also add the common Bermudan Golden Rod (*Solidago sempervirens*) to Hemsley's list, as there is a specimen in Herb. Sloane, cclxiv. fol. 3 (which is indicated as containing plants from Bermuda), mounted by the side of the endemic *Erigeron Darellianus* collected by Dickinson. Hemsley includes also *Erigeron linifolius*, but the specimen (Herb. Sloane, xxxii. 81) is merely an inflorescence of *E. Darellianus*, beside which it is mounted. He also (see 'Botany of the 'Challenger,'' i. 40) includes *Eupatorium macrophyllum* L. on the ground of a specimen in Herb. Sloane, labelled "Eupatorium Bermudense latifolium flosculis pallescentibus, *Silverweed* nostratibus vulgo, Pluk. Tab. 243, fig. 2." There is no doubt as to the identity of the specimen, but there is no indication of locality, and it has not since been recorded from Bermuda. I agree with Britton, who refuses to admit it as Bermudan.

Dickinson's collection, as thus revised, contained the following:

Sisyrinchium Bermudiana L. (H. S. clix. f. 3). Endemic.
Carex bermudiana Hemsl. (H. S. xxxii. f. 83). Endemic (type-specimen).
Ascyrum macrosepalum S. Brown (H. S. xxxii. f. 82). Endemic.
Erigeron Darellianus Hemsl. (H. S. xxxii. f. 81). Endemic.
Stenotaphrum secundatum Kuntze (H. S. xxxii. f. 82).
Relbunium bermudense (L.) Britten (H. S. xxxii. f. 82) (type-specimen).
Solidago sempervirens L. (H. S. cclxiv. f. 3).
Erigeron canadense L. (H. S. cclxiv. f. 3).
Verbena urticifolia L. (H. S. clix. f. 47).
Melilotus parviflora Desv. (H. S. xxxii. f. 83).

The last three are regarded by Britton as introduced. There can be no question as to the European *Melilotus*, and its introduction is not surprising in view of the frequent communication

between Bermuda and England before 1699. *Erigeron canadense* may also have been an early introduction. But there seems no reason for excluding the *Verbena*; its distribution in the Southern United States and West Indies corresponds with that of the majority of the native species.

Most of the land is enclosed, but some idea of the character of the original vegetation may be gained from less frequented portions such as St. David's Island and Cooper's Island at the northern end, the broken rocky ridge on the neck of land between the two almost land-locked pieces of water, Castle Harbour and Harrington Sound (the Walsingham tract), the few remaining marshes, and the south shore line. Except in such localities botanizing is generally of little interest. Governor Lefroy regarded the Walsingham tract as the oldest portion of the land-area. Britton writes of it (1918), "Many of the native plants are now restricted to this region, presumably because it has been less modified by man than other parts, and also because the numerous pockets of soil in dense shade provide a suitable home for many of the rarer species." But since Britton wrote a large luxury hotel with its grounds has occupied much of the area, and the remainder has been cut into by the Public Works Department quarry, the harder rock being specially suitable for road metal. What remains is still covered with dense vegetation, and the extremely irregular rocky ground is broken by holes and caves. The rock crevices and caves were the home of species of fern mainly confined to this district and including three endemic species. Of the latter *Diplazium Laffanianum* had become very rare in 1905, and Britton was unable to find it at a known locality in 1913, but Mr. Nauen of the Department of Agriculture showed me cultivated specimens at the Agricultural Gardens in 1933. *Dryopteris bermudiana* and *D. speluncae* were not found by me, but Mr. Nauen informed me that he knew of one locality for the latter in Smith's parish. Of the native, but not endemic, species, *Anopteris hexagona*, *Polystichum adiantiforme*, and *Asplenium monteverdense* are either very rare or extinct—I did not find them. *Polypodium Plumula* is seen occasionally, and Mr. Nauen and I found a few specimens of *Asplenium dentatum* in one cave. It is probable that, in addition to the destruction of the district already referred to, the ferns have been pillaged to supply gardens in the recently developed adjoining district of Tucker's Town. *Nephrolepis exaltata* and *Psilotum nudum* were not uncommon; both of these are still fairly plentiful also in Paget Marsh. *Asplenium heterochroum*, fairly common in the islands, and the still more common endemic *Adiantum bellum* were frequent on shaded rocks.

Trees are represented on this ridge by the Juniper, Palmetto, Buttonwood (*Conocarpus erecta*, Combretaceae), and a few specimens of the endemic *Elaeodendron Laneanum*. Britton notes

that there are very few seedlings of the *Elaeodendron*, as the sweet olive-like fruits are eaten, presumably by rats, as fast as they fall. But seedlings would now have little chance of developing, as the area is overrun by *Jasminum simplicifolium*, an introduction from Australia about 1840, which forms a dense tangle of tough ropes above the ground, killing out the undergrowth and throttling the trees into which the long branches climb. It has converted much of what remains of the area into an almost impenetrable jungle. Of shrubs, specimens of the beautiful endemic Snowberry, *Chiococca bermudiana* still persist, with the Wild Coffee (*Psychotria ligustrifolia*, Rubiaceae), *Forestiera segregata* (Oleaceae), *Trema Lamarckiana* (Urticaceae), *Eugenia axillaris*, and *Dodonaea jamaicensis*. Of these the *Psychotria* still occurs in Paget Marsh, and the *Forestiera* and *Eugenia* are plentiful on St. David's and Cooper's Islands. *Dodonaea jamaicensis* is still generally common on hill-sides. The endemic *Peperomia septentrionalis*, a perennial herb with fleshy spreading branches, still persists on shaded rocks, but I saw no sign of the large clusters mentioned by Britton. The Yellow-wood (*Zanthoxylum flavum*), a valuable West Indian timber tree, once widely distributed in the Bermudas, was practically exterminated by felling for export to England; felling was restricted as long ago as 1632. Now it is represented only by one tree and some seedlings in the grounds of the Castle Harbour Hotel, where, however, it is protected. In a few clearings, made apparently for grazing, and on waste ground, *Indigofera suffruticosa* (said to have been introduced in the seventeenth century) was common; the native *Solanum nigrum* was also seen.

On some shaded rocks close to the water, not far from Tom Moore's old house, a patch of *Aloe vera* (a Mediterranean species) was naturalized. It has escaped from cultivation and is found on waste ground and in woodlands.

The marshes are of most interest to the botanist. Of these, Paget Marsh, an area of a few acres which has up to the present kept its natural facies, should at all costs be preserved from encroaching cultivation. Here the endemic palmetto is the dominant tree, its short sturdy cylindrical trunk bearing a crown of large palmatifid leaves, the older withering ones in this sheltered locality hanging for some time before dropping and untidily strewing the ground. On the stout bulbous base *Psilotum nudum* may be found, the only native representative of the Lycopodiales, and small patches of *Peperomia septentrionalis*. The Palmetto bases and the stout densely fibrous stocks of the ferns are the home of species of moss and hepatic, which are also plentiful on the damp ground. Several of the Palmettos were badly attacked with the scale-insect.

Myrica cerifera and *Baccharis glomeruliflora*, a small flowered Composite, form tall dense bushes up to 10 feet high, and ferns

luxuriate—*Osmunda regalis*, the beautiful *O. cinnamomea*, the giant fern, *Acrostichum excelsum*, *Pteris caudata* scrambling high over the undergrowth, *Dryopteris normalis*, *Neprolepis exaltata*, and *Adiantum bellum*. I was pleased to find several patches of the endemic *Carex bermudiana*. On the drier ground in the marsh I found *Randia aculeata*; this is noted by Britton as "also abundant in sandy soil, Paget and Warwick"—a few poor specimens were seen, but it is by no means now abundant.

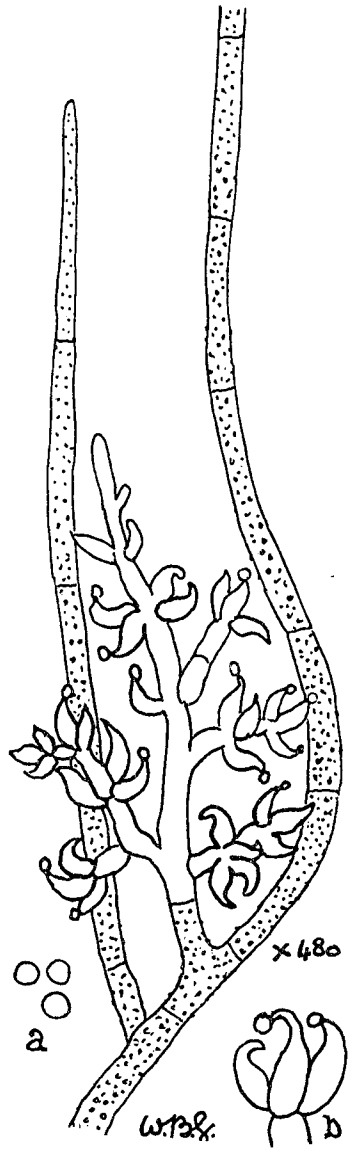
Besides the Palmetto and Juniper there were several old trees of *Laurocerasus caroliniana* and a number of young ones; this was noted here by Britton in 1905, and seems well established: it is a native of the South-eastern United States. Several young plants of *Ardisia escallonioides* in berry were noted. Britton does not include the genus nor does he recognize any member of Myrsinaceae as native or naturalized. The species is native in Florida, the West Indies, and Central America. As it is unlikely that so conspicuous a plant would have been overlooked, it is probably a recent introduction. The common Surinam Cherry (*Eugenia uniflora*) and *Psidium Guava*, both introductions, formed shrubs or small trees in the drier parts of the marsh with the native *Psychotria ligustrifolia* and the endemic *Ascyrum macrosepalum*. Climbers were *Cissus sicyoides*, not found elsewhere in the islands, and a small passion-flower, *Passiflora suberosa*, generally frequent in shady localities. Among the species in the wetter parts were tall groups of *Mariscus jamaicensis*, *Typha latifolia*, an attractive little sedge, *Dichromena colorata*, with a star-like involucre of white-based bracts, *Hydrocotyle verticillata*, *Centella asiatica*, and other marsh-loving species. A small prostrate grass, *Oplismenus hirtellus*, is also frequent on shaded hill-sides.

(To be continued.)

A HANDSOME HYPHOMYCETE.

By W. B. Grove, M.A.

This fungus came into my possession in a remarkable way. The little tuft, growing on moss, was sent from Latvia to my friend Dr. W. T. Elliott, who studies Mycetozoa. It was sent as a Mycetozoon, but Dr. Elliott recognised it at once as a Fungus and kindly sent it on to me. I was so charmed with it that I made a drawing of its gracefulness. It seems to be always rare, but is widely distributed, being found in most parts of Europe, in Cuba, and in North America. The Rev. M. J. Berkeley, who knew it as *Botrytis Tilletii*, thought so highly of its beauty that he acclaimed it as "one of the most splendid species of the genus." As there does not appear to be a published figure of it, I think the one accompanying this note will be useful to mycologists.



Pachybasium Tilletii (Desm.) Oud.
a, the spores; *b*, the phialides, × 800.

One of the characteristics of it is that it produces its spores on the apex of flask-shaped cells, which have of late become notorious under the name of "phialides." It is the belief of some mycologists (following Vuillemin) that the possession of phialides is a mark of high rank among the tribe of the Mucedineæ.

PACHYBASIUM TILLETII (Desm.) Oud. forms little whitish-fawn tufts on a hypnoid moss etc. On using a lens or the microscope, it is seen to consist of two very different parts, the densely tufted spore-bearing portions being pure shining white (glittering and sparkling), while growing up around them and overarching them are seen long slender whip-like yellowish-fawn-coloured unbranched straight or gently curving sterile hyphæ, of a very different character, and forming, as it were, a delicate veil shading the fertile tufts.

Conidiophores erect, septate, smooth, branching closely, but somewhat irregularly; branches tending to be verticillate, often in threes or fours, but sometimes opposite or alternate; ultimate branches short, flask-shaped, with a swollen base tapering into a neck about half as long, the apex of the neck being bent in a sharp curve backwards or downwards toward the base and ending in a sterigmatic point on which is seen seated a single globose conidium 3·5 4·5 μ in diameter. The whole of these branches are colourless and smooth, and septa are seen only here and there.

The sterile portion of the tuft is composed of very different multiseptate hyphæ. They have a yellow-fawn colour and a rough surface, being densely studded with minute hemispherical warts; their cells are elongated, 20–60 μ or more long and 8 μ or more thick; they branch only at the base and the ends rise unbranched to twice (at least) the height of the tufts of fertile hyphæ; the colour and the warts extend even to the apex of the whip.

VIABILITY OF CLOVER SEEDS.

By J. H. TURNER.

IN the *Journal of Botany*, 1935, 104, there is an account of the discovery of a box containing packets of seeds which belonged to Charles Darwin. The "find" was reported to Kew by the British Association, and the Director, Sir Arthur Hill, agreed to have a portion of the seeds tested to see if any were still viable. Species belonging to macrobiotic families were principally selected, and also seeds of *Mimulus*, in the vain hope that, should seeds of the latter germinate, some of them might prove to be those of the musk-scented kind, now lost to cultivation. Most of the packets bear some particulars as to their origin, and a few are dated. Some are marked "Kew," but an examination of

Darwin's correspondence with Sir W. J. Hooker gives no clue as to the year in which the seeds were despatched from the Gardens. The earliest-dated packet tried at Kew bears the legend "Wild Cabbage, Derby, Aug. 1855," and the latest "*Anchusa lanata*, Coteaux d'Alger, 1876." It is doubtful if Darwin did much of this work during the last six years of his life, and it is probable that all the packets are 60 or more years old. The seeds were tested on filter paper in Petri dishes in the Jodrell Laboratory at Kew, this method having been found by past experience to be satisfactory, and in spite of every precaution, most of the seeds became mouldy within a few weeks. The leguminous seeds were treated with concentrated sulphuric acid for 20 to 35 minutes—a period of sufficient length to accelerate the absorption of water in certain species with a thickened testa,—then thoroughly washed and neutralized with lime water.

Thirty-eight packets were tried, which included horticultural varieties of borecole, such as purple, variegated, and cut-leaved forms from Robertson & Co., of Edinburgh, various species of *Papaver* collected at Antibes in 1866; *Nicotiana Tabacum*, Hort. Kew.; *N. Tabacum* from Manila and Havana, 1869; *Nicotiana rustica*, Hort. Kew.; White *Antirrhinum*, 1861; *Convolvulus major*; *Nolana grandiflora* Lehm., Freiburg, Prof. Hildebrand; *N. atriplicifolia* (Carter); *Mimulus* mixed; *M. cupreus*; Candy-tuft, white, Essex; *Melilotus caeruleus*, Kew; *M. italicus*, Kew; *Ononis minutissima*, Mentone, Nov. 7, 1866; *Lathyrus odoratus*, Rollisson & Son, Tooting; *Viscaria oculata*; *Trifolium fragiferum*, Europe, Kew; *T. ochroleucum*, Europe, Kew; *T. pannonicum*, Europe, Kew; *Lotus ornithopodioides*, Europe, Kew; *Hibiscus Trionum*, Freiburg.

The only seeds found to be viable were those of three species of *Trifolium* from Kew, still in their pods, from which they had to be separated before treatment.

Trifolium fragiferum L.—141 seeds, 15 germinated, that is 10·6 per cent.

Trifolium ochroleucum Huds.—102 seeds, 4 germinated, that is 3·9 per cent.

Trifolium pannonicum Jacq.—140 seeds, 8 germinated, that is 5·7 per cent.

The resulting plants are now (November 1935) growing in the Herbaceous Department, Royal Botanic Gardens, Kew.

A. J. Ewart, Proc. Roy. Soc. Victoria, xxi. (n.s.), pt. 1 (1908), obtained negative results with thirty seeds of *Trifolium fragiferum* L., 55 years old. As Charles Darwin died in 1882, these clover seeds must have been at least 53 years old. This appears to be a viability record for these three species.

OBITUARIES.

Dr. A. S. Hitchcock

(1865–1935).

Dr. A. S. Hitchcock, the eminent American agrostologist, died of heart failure December 16, 1935, on board the 'City of Norfolk,' returning from Europe. He attended the International Botanical Congress at Amsterdam as a delegate and remained to study the grasses in various herbaria. He visited Leiden, Utrecht, Brussels, Paris, Geneva, Berlin, London, Cambridge, and Oxford.

Albert Spear Hitchcock was born in Michigan, September 4, 1865, grew up in Kansas and Nebraska, and attended Iowa State College, where he received his bachelor's, master's, and doctor's degrees. After about thirteen years of teaching he became agrostologist in the U.S. Department of Agriculture, in 1901. Besides travelling throughout the United States he carried on botanical exploration from Alaska to Chile, Labrador to British Guiana, the West Indies, Hawaii, the Philippines, Japan, China, and Indo-China. In 1929 he was invited by the British Association for the Advancement of Science and the South African Association for the Advancement of Science to attend the joint meetings in Cape Town and Johannesburg. After the meetings and official excursions he botanised in Kenya and Uganda. He was the author of a large number of works on grasses, the latest being 'Manual of Grasses of the United States,' an illustrated volume of 1040 pages, published in 1935.—Agnes Chase, Associate Agrostologist, U.S. Department of Agriculture.

I would add a tribute to the memory of a friend of many years' standing. It was a grievous shock to hear that the author of the 'Manual of Grasses,' which I had just reviewed for the January number of the *Journal*, had died suddenly on the way home. My recollections of Dr. Hitchcock include his periodical visits to the British Museum Herbarium and association in discussions on the Rules of Nomenclature at Ithaca, Cambridge, and Amsterdam. He joined our party of British botanists on the passage to Cape Town to attend the British Association meetings in 1929, and we collected together on the botanical excursions.

I think he thoroughly enjoyed the recent Congress at Amsterdam, where he was a helpful colleague in the discussions at the Section of Nomenclature. After the Congress he visited various European herbaria, and I met him again when visiting the Paris Herbarium at the end of September.

He was a grass enthusiast, and the results of his thirty-five years' work on the family are an invaluable legacy. A kindly and cheery soul, his friends in this country will deeply regret his passing.—A. B. Rendle.

The announcement of the death of Florence Helen Woolward on January 3, at the age of 81, recalls her work in the British Museum Herbarum in the early 'nineties on the orchid genus *Masdevallia*. She drew the plates and wrote the descriptions for the folio monograph of the genus issued by the Marquess of Lothian, in nine parts, from 1890–96. She was a careful and conscientious worker, whom it was a pleasure to help. The Museum acquired later a small collection of her drawings of twigs and foliage of poplars.—A. B. Rendle.

SHORT NOTES.

Angiosperm Phylogeny on a Chemical Basis.—James B. McNair (Bull. Torrey Botan. Club, Dec. 1935) discusses some phylogenetic theories in the light of chemical analysis. Some chemical plant products are influenced by climate. Fats (glycerides) produced in the tropics have lower iodine values than fats formed in temperate regions. Similarly, alkaloids have smaller molecular weights and volatile oils lower specific gravities and higher refractive indices. In other words, more complex chemical products are formed in the temperate regions than in the tropics. When these three classes of substances appear in plants of the same climatic zone, the chemical properties vary with the degree of evolution of the order or family according to the Engler and Gilg system; the more highly evolved the plant the larger are the molecules of its chemical products.

According to chemical evidence, herbs may have been derived from trees, monocotyledons may have preceded dicotyledons, polypetaly is more primitive than gamopetaly, few carpels preceded many carpels, and free carpels united carpels, and the Ranunculaceae may have been preceded by the Berberidaceae and Lardizabalaceae.

Whereas the serum diagnostic method of Mez and the electrophoretic method of Moyer may give correct taxonomic sequences, the use of alkaloids, glycerides, and volatile oils gives in addition some idea as to the relative degree in evolution of various groups, and has the advantage that results may be obtained from dried herbarium material.

Charophyte Notes.—In October 1934 I found *Nitella translucens* Ag. growing freely in one of the ponds at Keston. This plant does not appear to have been previously recorded from Kent.

I originally found *Chara canescens* Lois. on the Birchington marshes (E. Kent) in April 1923, and have searched for it off and on ever since. Last July I came on a fine patch of it at a slightly different spot on the marshes. This is only the female plant of course, the male never having been recorded from the British Isles.—G. O. Allen, Bromley, Kent.

RUMEX CUNEIFOLIUS Campd.—In this *Journal*, 1933, p. 16, the occurrence of *Rumex rupestris* Le Gall at Kenfig was recorded. It has since been proved that what were at first thought to be two forms of *R. rupestris* were in reality two distinct species, *R. rupestris* Le Gall and *R. cuneifolius* Campd., a native of S. America. The latter dock was found first, by Miss Thomas, who sent a small piece, with other plants, to Miss Vachell. A few days later, when searching for more satisfactory specimens at Miss Vachell's suggestion, Mr. Gilmour came across a colony of *R. rupestris*, which appeared to be the plant to which he had been directed. It was not until some months later that it became clear that two quite distinct dock colonies had been visited by Miss Thomas and Mr. Gilmour—a fact which led to considerable confusion *. *R. cuneifolius* Campd. occurs plentifully in several localities on the Kenfig Dunes, in each of which are several groups of plants forming round massed colonies of a dwarf and rather untidy growth. The species is easily distinguished by its thick crowded heads of flowers and creeping root-stocks; also by its fleshy leaves and striated stems that turn a bright red in the autumn, making it a striking feature of the Kenfig Dunes.

The history of *R. cuneifolius* in Britain is interesting. It was first recorded from Wallasey sandhills, Cheshire, in 1913 (G. E. Barker, Kew Herb.). Subsequent records are (1) Glasgow Docks, 1919 (R. Grierson, Herb. Druce †), (2) Leith Docks, 1921 (J. Fraser, Herb. Druce. In Rep. B.E.C. 1922, 621, it states that Mr. Fraser had known the plant at Leith for nearly twenty years), (3) Phillack Sand-dunes, Cornwall, 1921 (Rilstone & Thurston, Herb. Druce), (4) Avonmouth Docks, 1923 (C. & N. Y. Sandwith, Rep. B.E.C. 1932, 357), (5) Cardiff Docks, 1925 (C. & N. Y. Sandwith, Herb. Druce †), (6) Braunton Burrows, N. Devon, 1929 (F. R. E. Wright, Herb. Druce and Herb. Brit. Mus.), (7) Kenfig Sand-dunes, 1932. It also occurs, though rarely, as an alien in W. Europe and N. America.

Presumably this species was introduced *via* the dockyards, and has subsequently spread (perhaps by the agency of birds) to the sandhills where it now occurs. It is interesting to note that its native habitat in South America is also sandhills, and it seems possible that in course of time it may well spread to further suitable localities round our coasts.

J. S. L. GILMOUR.
E. MARY THOMAS.
E. VACHELL.

* It should be stated that the remarks made in the previous note regarding the stouter and more bushy habit, and larger tubercles (but not the leaf-characters, which refer to *R. cuneifolius*) of the Kenfig plants of *R. rupestris*, as compared with those from other localities, still hold good, and were not due to confusion with *R. cuneifolius*. The persistence of these characters is still being investigated.

† Recorded as *R. magellanicus* Griseb.

REVIEWS.

Pflanzengeographische Studien im nordwestlichen Teil der Eichenregion Schwedens, I. *und* II. By F. HÅRD AV SEGERSTAD. Arkiv f. Bot. K. Svensk. Vetenskap. Akad. xxvii. A, no. 1, pp. 1–405, 275 text-figs, 1 map. Almqvist & Wiksells, Stockholm, 1935.

THE composition, history, and structure of the Scandinavian flora is of peculiar interest to botanists studying the problems of plant-life in the British Isles. Not only is there a close taxonomic relationship, such as is clearly indicated by the species listed in the above paper, and possibly historical connections which have not yet been unravelled, but the post-glacial history of Scandinavia has been much more firmly established than it has been for the British Isles. The classical geological work of De Geer, the extensive research on the pollen-grain content of post-glacial deposits by von Post and his associates, and the intensive taxonomic and ecological investigations of many Swedish and Norwegian botanists have resulted in the accumulation of considerable data which have been synthesized into a scheme of which the different parts conform well with one another.

The long paper noticed here is in two parts. It contains a mass of details regarding the distribution and life conditions of the plants growing in a part of western Sweden. The area chiefly studied, and for which numerous distributional maps are given, is to the west of Vänern or, as it is called in 'The Times' Atlas, Vener Lake. Four other areas, one to the north and three to the south, are used mainly for comparative purposes. The absence of clearly formulated general conclusions makes it difficult to evaluate the work or to give a concise account of its contents.

The soils of the district are mainly derived from ancient igneous and metamorphic rocks, but the influences of the Glacial Period and Postglacial modifications, especially changes in the level of the Vener Lake, are largely responsible for the distribution of the different soil-types. The postglacial geological and climatic history is considered and correlated with the immigration and modification of the flora. The existing climatic conditions are briefly outlined and a summary is given and illustrated by a considerable number of photographs, of the ecology, under the title 'Pflanzentopographie.' Nearly half the work is occupied by an account of the distribution and habitat relationships of the individual species, arranged alphabetically. The details and references in this part should be of much value to all botanists working on the North European floras and the distribution of European plants. This analysis is followed by a discussion of the general distribution of many of the species, classified as eastern, western, northern, and southern.

The area investigated is a transitional climatic region between the Atlantic and Continental types of climate. The climatic peculiarities are reflected in the flora, since the distribution of eastern and western species in the area depends more on local conditions than on longitude. There is, however, a more or less marked change in the general character of the flora from north to south between the "Urgebirgsgebiet" of the Vener Lake district and the Kymen, the latter a district some 80 km. to the north. This change is particularly recognizable by the dying out of southern species in the northern direction, and marks the northern, somewhat indefinite, limit of the oak region.—W. B. TURRILL.

RECENT BOOKS ON FUNGI.

Monographia Discomycetum Bohemiæ. By JOS. VELENOVSKÝ. 2 vols., 8vo, pp. 436, pls. 31. L. Soucek: Prague, 1935. Price 26 R.M.

THE name of Professor Velenovský, the veteran Czecho-Slovakian botanist, has become very prominent in mycological writings since the war. His large work on Bohemian Fungi (Ceské Houby), published 1920–22, dealt mainly with Basidiomycetes, but as it was written in his native language there has been much difficulty in understanding his descriptions of new species, of which there were a very large number; only the larger Discomycetes were treated in this work.

His 'Monograph of Discomycetes' is written in Latin, except for the thirty-page introduction in German. This is very gratifying, for there are 41 new genera described and about 900 new species. The descriptions are concise and illustrated by over 1200 figures. Many of these new species are very small, and the author and those who have assisted him in collecting have obviously combed a number of habitats which are usually disregarded. Consequently one would expect that a large number of undescribed species would be found, especially in an area previously unworked, but it is probable that some at least of the new species have been proposed with insufficient attention to variation or older literature. However this may be, the 'Monograph' will warrant serious attention for a number of years.

The families and their arrangement are based on Rehm's classification, but, owing to there being no splitting up of the grouping, it is very difficult to find one's way about, especially as there are so many new genera.

The introduction to the volume contains much information about the habitats of Discomycetes and points of general interest. The author is certainly very virile for his seventy-five years. His ideas on Congresses and nomenclature are worth quoting.

"Ich lasse mir auch von keinem botanischen Kongresse etliche Gesetze über die Priorität und die Publicationsweise diktieren. Die wissenschaftliche Arbeit muss in jeder Beziehung frei sein. Die botanischen Kongresse sind schon überlebt und werden selten von ernsten, älteren Botanikern besucht. Dieselben dienen vielmehr zur persönlichen Bekanntmachung, aber niemals zur Lösung der wissenschaftlichen Fragen."—J. R.

Le Genre Galera *(Fries) Quélet.* By ROBERT KÜHNER. 8vo, pp. 240, 75 figs. (Encyclopédie Mycologique, vii.). Paul Lechevalier: Paris, 1935. Price 75 fr.

THE publication of this monograph is another sign of the fact that we have still to regard French mycologists as the foremost workers on Basidiomycetes. R. Kühner is well known for his illuminating thesis on the structure of Hymenomycetes and for detailed studies of Agarics, and his monograph on *Galera*, on which he has been engaged for about ten years, has been eagerly awaited.

Galera is a genus of small Agarics with brown spores; mostly found in grass or amongst moss. Many of them are so similar that it has not been considered profitable to depict them in colour as in the corresponding monograph on *Inocybe* by R. Heim. Fries divided the genus into three sections. The two main sections, *Concocephali* and *Bryogeni*, are macroscopically distinguishable and microscopically different. Fayod separated the first section as a genus *Conocybe*. The name *Galera* so far has been retained (either for the whole or the remainder), although it is common knowledge that Fries used it as a sectional name and that by the time Quélet raised it to generic rank there was already Blume's *Galera* in Orchidaceae. Kühner uses *Galerina* Earle in its place, rejecting *Galerula* Karsten on somewhat questionable nomenclatural grounds. It is paradoxical that the title should need to be illegal for the purpose of the monograph to be understood.

The fact that the microscopic structure of the covering of the pileus is used as a basis for the generic distinctions is of considerable interest: such anatomical details are not frequent in taxonomic works, even in monographic studies.

Several species of Ochrosporeae Fries himself recognised are difficult to place with certainty. A few of these have been transferred by Kühner into "*Galera*" from *Pholiota* and *Naucoria*.

Forty-four species are described, the descriptions being clear and illustrated by line-drawings of the fruit-body and microscopic features. Seven new species are included, and several new varieties and forms. The author is to be congratulated on a most useful piece of work.—J. R.

A Monographic Rearrangement of Lophodermium. By Leo Roy Tehon. Illinois Biological Monographs, xiii. no. 4. Pp. 151, 5 pls. University of Illinois Press, 1935. Price $2.00.

The genus *Lophodermium* is one of the old group Hysteriales characterised by a slit-like fruit-body, which are regarded by some as Discomycetes and by others as Pyrenomycetes. Considerable attention has recently been paid to the group, but we are still without very clear ideas about its relationships. *Lophodermium* itself is of some economic interest, as certain species are associated with the premature leaf-fall of conifers.

The first thirty pages or so of the present monograph deal in a somewhat discursive manner with general points of structure and classification. The nature of the slit which forms the opening of the fruit-body is considered to be a true ostiole. Seventy species of the old genus *Lophodermium* are fully described. Twenty-three of these are retained under *Lophodermium*, fourteen are placed in a new genus *Dermascia*, distinguished by being intra-epidermal, nine in *Lophodermellaria* v. Hoehn., and twenty-four in *Lophodermina* v. Hoehn. Eight new species are described. This section is followed by a list of eighteen excluded species. Four fungi "not classifiable in the categories given in the sytematic and descriptive sections" provide two new genera, *Epidermella* with *Hysterium commune* Fr. as type and *Locelliderma* to lodge *Hypoderma Ampelodesmi* de Ces.

The monograph is illustrated by five plates, four of which give very clear drawings of structures and the fifth illustrates "type-specimen packets of Spegazzinian species of *Lophodermium*" with his notes and drawings on the outside of the packets. The work appears to have been done carefully and will be valuable both to mycologists and lichenologists.—J. R.

Die Pilze Mitteleuropas.

The numbers of this atlas are appearing more regularly, and with the present reduction of 25 per cent. on the prices of German books there should be an increased sale.

Parts 14 and 15 of 'Die Röhrlinge' (Boletaceae) by F. Kallenbach have now appeared. The letterpress and the plates are of the usual high standard. Part 14 continues with the description of *Boletus radicans* and gives that for *B. auriporus* Peck (shown to be synonymous with *B. sanguineus* var. *gentilis* Quél.); that of the much-named *B. placidus* is begun, and completed in the next part. The two coloured plates depict *B. placidus* and *Gyrodan lividus*; there is also an uncoloured general plate. Part 15 has coloured plates of *Boletus pseudo-scaber*, sp. n., and *B. sanguineus* With., but the letterpress only gets as far as the beginning of *G. lividus*.

There is also a new species, *Exidia villosa*, in W. Neuhoff's 'Die Gallertpilze' (Tremellineae), of which Part 2 is to hand.

In the letterpress the description of *Exidia repanda* is completed, and those of *E. cartilaginea* Lundell & Neuhoff (*Tremella albida* Sommerf.), *E. villosa*, and *E. albida*. The two plates show the last three species and also *E. gemmata*. The standard both of letterpress and plates is excellent.—J. R.

Magische Gifte: Rausch- u. Betäubungsmittel der neuen Welt. By Professor Victor A. Reko, Mitglied der Akademie der Wissenschaften, Mexiko. Cr. 8vo, pp. viii, 160. Ferdinand Enke: Verlag Stuttgart, 1936. Price (paper) R.M. 5.

As the editor of this little brochure remarks, while the intoxicating drugs of the Old World are well known, those of South America, with the exception of Coco, have hitherto been little studied. This account of some of them is therefore a valuable addition to our knowledge of toxicology. Professor Reko gives a full description of the origin and effects of twelve Mexican plant-drugs used in intoxication, narcotism, and general poisoning, their methods of use and mental and cerebral actions, extending in some cases to the sayings of persons under their influence. The poisons so described are Ololinqui (seeds of *Datura meteoloides*), Peyotl (*Anhalonium Lewini*), Marihuana (*Cannabis indica*), Toloachi (*Datura discolor*), Ayahuasca (*Banisteria Caapi*), Colorines (seeds of *Erythrina americana*), Sinicuihi (*Heimia* (*Nesaea*) *salicifolia*), Coztic Zapotl (*Lucuma salicifolia*), Nanacatl (*Amanita mexicana*), Xomil Xihuite (*Gelsemium sempervirens*), Colombrillo (dry extract of *Ecbalium Elaterium*), and Camotillo (tubers of *Ipomoea bracteata*). This last drug is particularly interesting, as it is a remarkably slow poison, taking six months to cause a fatal termination.—H. N. Ridley.

The Species of Tradescantia *indigenous to the United States.* (Contributions from the Arnold Arboretum of Harvard University.—IX.) By Edgar Anderson and Robert E. Woodson. 8vo, pp. 132, 12 pls. Arnold Arboretum of Harvard University, Mass., U.S.A., 1935. Price $2.25.

In view of the facts that the genus *Tradescantia* is eminently suitable for cytogenetic study and that "conclusions as to the evolutionary importance of the cytogenetic phenomena will not be possible until they can be viewed against a background of intensive morphological and taxonomic research," the authors have revised the species occurring in the United States north of Mexico. The taxonomic history of the genus is traced from Caspar Bauhin's 'Pinax' (1623) to the establishment of the genus by Linnaeus on *T. virginiana* in 1737 (not 1537!). C. B. Clarke's Monograph (de Candolle's 'Monographia,' 1881)

is severely criticised in comparison with the previous "critical if eccentric observations of Rafinesque." J. K. Small, the late J. N. Rose, who contemplated a general revision, and B. F. Bush have done much helpful work on the genus.

The general morphology is described with special reference to characters of taxonomic value, such as persistence of root-hairs, relative breadth of leaf-sheath and blade, nature and distribution of pubescence, texture and colour of sepals, and seed-sculpture. A section entitled "Speciation" (horrible word!) summarizes experimental work in sterility, fertility, and cytology as bearing upon taxonomy. Hybridization is general between the species, and is dealt with in full. Taxonomy occupies the largest part of the memoir. A detailed key of the twenty-two species recognized is given. The species are fully described in English, except for the Latin diagnoses of five new species, with details of synonymy and distribution. The range of each species is indicated by an inset map. The name *Tradescantia subaspera* Ker-Gawler, Bot. Mag. 1597 (1813), replaces the familiar *T. pilosa* J. G. C. Lehmann (1827) for the largest of the American species, of which the southern plant *T. montana* Shuttlew. is regarded as a geographical variety. *T. cordifolia* Sw. (*T. floridana* Wats., *Tradescantella floridana* Small) is transferred to the genus *Callisia*.

The plates illustrate the new species and also specific characters derived from the root-system, leaf-surface, flower-buds, calyxes, and seeds.

This intensive study of the species should be welcomed by all who are interested in the genus.—A. B. R.

Practical Botany. By WILLIAM LEACH, D.Sc. Sm. 8vo, pp. x, 160, 23 text-figs. Methuen & Co.: London, 1935. Price 4*s*.

THIS handy and attractive little book is a practical guide to laboratory work in elementary botany of Inter. B.Sc. standard. Chapter II., which forms the greater part of the book, is a series of thirty-one schedules such as might be put into the hands of students at the beginning of each class, giving directions and hints in technique and drawing attention to the chief features to be observed. Appendix II. gives a list of the material required. Chapters I. and III. and Appendix I. give an adequate list of re-agents, stains, and mounting media, some of them original, with full instructions for their preparation and use. The author is at his best in Chapter IV., where he gives clear and concise instructions for the setting up of thirty-eight practical experiments in plant physiology. This is an original set of experiments, easy to carry out with a minimum of apparatus. The book is worth buying for this chapter alone.

In producing a junior practical botany it is hard to compete with Professor Bower's excellent 'Practical Botany' of 1891, and this new 'Practical Botany' could not, as can Bower's, be put safely into the hands of a student working alone. Nor does the author intend that it should be. There should be a teacher at hand to amplify the schedules, and, indeed, to criticise some of the statements made and terms used. While there is originality in technique, there is but little in the choice of plant-material; and it is disappointing to find maize and wheat, both of the specialised family Gramineae, given as types of monocotyledonous seeds. Onion, hyacinth, and date seeds, easily obtained and germinated, are instructive and more typical of the class. The date seed is here used only for sections of endosperm. One would have liked more encouragement given to dissection of plant-organs, to maceration of tissues, and sectioning of living material. There is, however, originality in treatment of the green leaf and the root-tip. Also a commendable attempt to keep in mind the conception of plant-organs and cells in the solid rather than as sections—but surely an endodermal cell is not "barrel shaped"!

The book is well produced with good photographs and a good index. There are few misprints, but in a second edition, lamallae (p. 79) and elators (pp. 84, 86, 100, 155) should be corrected.—E. M. BLACKWELL.

BOOK-NOTES, NEWS, ETC.

THE GARDENS' BULLETIN, STRAITS SETTLEMENTS.—Vol. viii. pt. 4 (October 1935) contains further Notes on Malayan Dipterocarpaceae by C. F. Symington, an exhaustive critical examination and description of nine species of *Shorea* (six new), and two of *Hopea* (one new), illustrated by full-page plates. R. E. Holttum gives a revision, illustrated by eight plates, of the tree-ferns of the Malay Peninsula, comprising sixteen species of *Cyathea* (including *Alsophila* and *Hemitelia*); a poor representation of the family as compared with Sumatra, no doubt largely due to the lack of high mountains. One new species and one new variety are included. C. X. Furtado continues his work on Malayan Palms ('Palmae Malesicae'):—No. iv. is an attempt to identify the Rattans described by Manuel Blanco in his 'Flora de Filipinas' (1837) and No. v. Notes on some Malayan Species of *Daemonorops*, with descriptions of five new species. The twenty-three full-page plates included in the number are a very helpful addition.

THE GARDEN'S BULLETIN, STRAITS SETTLEMENTS.—Vol. ix. pt. 1 (December 1935) is dedicated to Mr. H. N. Ridley on the occasion of his 80th birthday. An excellent photograph is the

frontispiece, and a number of articles by various contributors describe the different aspects of his work during his twenty-three years of service in Singapore. The dedication refers to his work as a field botanist which added more than that of any other individual to our knowledge of the flora of the Malay Peninsula, to his 'Flora,' the foundation for future work, to his experimental cultivation of agricultural plants at a time when agricultural interests in Malaya were at a low ebb, his persistent advocacy of the planting of Para Rubber and his pioneer tapping experiments, and his reports on timbers and other forest products. A bibliography of his publications, by M. R. Henderson and C. G. G. J. van Steenis, covers the work of sixty-three years and fills twenty-six pages, and two pages are occupied by a list of plants named in his honour. Special articles deal respectively with his work for tropical agriculture (by F. W. South), for Rubber (by B. J. Eaton), and for the flora of the Netherlands Indies (by D. F. van Slooten). There are also articles on "Some Malaysian Phytogeographical Problems," by E. D. Merrill, "The Dispersal of Plants by Fruit-eating Bats," by W. M. Docters van Leeuwen, and "Open-air Hothouses in the Tropics at 3100 m. altitude" by C. G. G. J. van Steenis; the last describes the response of some plant species to the action of fumaroles in the highlands of Java and Bali. E. J. H. Corner writes on the seasonal fruiting of Agarics in Malaya, and H. J. Lam on the "Phylogeny of Single Features." R. E. Holttum discusses the gregarious flowering of *Fagrea fragrans* Roxb. in Singapore from 1928-35; and there are also several short articles of taxonomic interest.

THE EDITOR thanks the President, Council, and Members of the Botanical Society of America for the honour of his election to Corresponding Membership of the Society.—A. B. RENDLE.

A purely scientific journal can add little to the general expression of regret at the passing of our beloved King. A brief note and an external mark of respect must suffice to indicate our sympathetic share in a great national sorrow.

CORRECTION.—In the list of plants from Jan Mayen (*Journal of Botany*, 1935, 121 124) there are two errors:—(i.) *Cerastium cerastioides* (pp. 121, 122) is not a new record for the island; (ii.) in the introductory paragraph (p. 121) it is said we did not obtain *Cerastium trigynum*; this is incorrect, as *trigynum* is synonymous with *C. cerastioides*.—C. J. BIRD.

NOTES ON THE FLORA OF THE BERMUDAS.

BY A. B. RENDLE, F.R.S.

(Continued from p. 50.)

Paget Marsh enables us to form some idea of the original vegetation of much of the low-lying land in the islands, and is almost the only piece now worth preserving. It is private property, but some effort should be made to preserve it in its present condition and from the draining which is eliminating former marsh-land. Of these part of Devonshire Marsh still retains some original characters, but with less variety than Paget, and lacks the dense growth of Palmetto. A fringe of Palmetto and Juniper, and dense growth of *Myrica*, *Baccharis* and the characteristic ferns, borders an open wet fern meadow, 5 to 6 feet high, mainly of the two Osmundas and the scrambling *Pteris caudata* with occasional bushes of the *Baccharis* and *Ilex vomitoria*, and in the wetter parts *Typha*. Here and there were gaunt trunks of dead Junipers, and in Pembroke Marsh also most of the Junipers were dead. Had they got down to brackish water? Other species noted were *Eclipta erecta*, an annual Composite with short white ray-florets, *Rhynchospora stipitata*, and on the wet mud, *Proserpinaca palustris*. Also the alien *Eichornia crassipes*.

Britton refers to Pembroke and Warwick Marshes. Part of the former is still undrained, but it is more open and lacks the interest of Paget Marsh. *Salvinia Olfersiana* (tropical continental America), first noticed by Britton in 1905, is plentiful on the black mud and in shallow water, with *Lemna cyclostasa*. *Eichornia crassipes* is also spreading. Little is left of Warwick Marsh except an open piece of water that afforded little of interest. *Scirpus Olneyi*, noted by Britton in 1905, is still plentiful; and *Panicum virgatum* grew at the edge of the marsh; also *Juncus bufonius*, which Britton notes as naturalized in Pembroke Marsh in 1909. *Typha angustifolia* and *Scirpus validus* are general in the marshes, and *Cyperus alternifolius* (African: naturalized in the West Indies) forms occasional clumps. I searched in vain for the only native orchid *Spiranthes tortilis*, said by Britton to be locally abundant in grassy places, Devonshire and Pembroke marshes. I may have been too early.

Mangrove swamps were formerly more plentiful, but much has been reclaimed; a good example still remains at Hungry Bay on the south shore. *Rhizophora Mangle* and *Avicennia nitida* form a dense growth together, on the land side, with the Button-wood, *Conocarpus erecta* (Combretaceae). *Salicornia perennis* and *Sesuvium Portulacastrum* grow freely on the black mud on the margin.

The south shore exposed to the warm damp southerly winds contrasts with the north-easterly exposure of the northern shore, and is more interesting to the botanist. The line of cliffs includes many picturesque sandy bays, and there are also stretches of sand rising on the land side into low dunes. *Ipomoea Pes-Caprae* and *Canavalia lineata* (Leguminosae) are effective sandbinders with apparently interminable creeping stems. Where the sand is no longer shifting grow large clumps of *Scaevola Plumieri* (Goodeniaceae) with thick spoon-shaped leaves, Lobelia-like flowers, and black juicy berries; the Sea-Lavender, *Heliotropium gnaphalodes*, a beautiful bush with dense tufts of narrow silvery pubescent leaves and small purplish flowers; and, in places, the Sea Grape, *Coccoloba uvifera*. Here also are Spanish Bayonet (*Yucca aloifolia*), and *Croton punctatus*. The universal Sage-bush (*Lantana involucrata*) is at home on the rough ground behind the beach, and less frequently *L. Camara*.

Herbaceous plants are *Heliotropium curassavicum* (an annual rather fleshy herb), *Portulaca oleracea*, *Cakile lanceolata*, *Gnaphalium purpureum*, and *Oenothera humifusa* growing decumbent in patches at Warwick Bay, where also *Matthiola incana* is naturalized, as are various grasses, *Koeleria phleoides*, *Chloris petraea*, and *Cynodon Dactylon*; the two last are common in dry places in the islands.

The Sea-Grape is seen at its best at Grape Bay on the south shore, forming shapely round-headed trees which may reach 30 feet in height on the level cliff, sometimes mixed with the Juniper which becomes dominant in the rear. Among the rocks on the cliff and in dry soil near the coast grows the only native Cactus, *Opuntia Dillenii*, often forming clumps a few feet in height; the red-purple fruit resembles that of the Prickly Pear.

The hard, much weathered rocks with innumerable holes and crevices give foothold to clumps of a yellow-flowered Composite, *Borrichia arborescens*, a much branched shrub, the thick spathulate leaves of which are sometimes grey with a silky canescence, sometimes green and glabrous; both kinds may occur on the same plant. Junipers find a precarious foothold, sometimes more or less erect, but showing the effect of the wind in their one-sided contour, often straggling more or less prostrate on the rock. More remarkable is the prostrate form of the Buttonwood, the branches spreading over a large area to a height of a few feet only. The Tassel-plant, *Suriana maritima* (Simarubaceae), a tall graceful shrub, with clustered narrow softly pubescent leaves and short flower-clusters, is common on beaches and rocks. It was described by Linnaeus from a Bermuda specimen.

Various small herbs creep on the irregular rock-surfaces—*Parietaria floridana*, *Euphorbia buxifolia*, and *E. Blodgettii* are common; here also are *Sesuvium Portulacastrum*, and

Anagallis arvensis (naturalized) with fleshy leaves; the last species is common in waste and cultivated ground, and on St. David's Island the blue-flowered form is frequent along with the scarlet form. *Erigeron Darrellianus*, a lover of rocky situations generally, also thrives by the sea, as does the generally distributed Golden-rod, *Solidago sempervirens*, one of the showiest native herbs.

On many of the rocks near Spanish Rock, one of the highest cliffs on the south shore, are pure growths of *Euphorbia buxifolia*. The damp ground behind the rocks in this locality is one of three localities cited by Britton for *Alsine Baldwinii*; whether it still grows in the other two, Tucker's Town and Castle Point, which are suffering from improvement, I do not know, but I found it at two other localities on the south shore—Doe Bay and on Wreck Hill behind Ely's Harbour.

Spanish Rock has a steep approach from the land side, and shelters a large shallow pool of brackish water, Spittle Pond. The surface of the water was green with *Ruppia maritima* and a thread-like green alga (*Enteromorpha*) which covered the black foul-smelling mud. On the short green turf near the pool were two introductions, *Juncus bufonius* and *Poa annua*, the latter common in waste places. Growing with them were a few patches of *Sagina maritima*; this is the only recorded locality for Bermuda, where it was noted by Britton in 1908; he regards it as native, and says "presumably brought to Bermuda through the ocean, perhaps recently, as it is not recorded by previous authors." Near by, behind broken rocks, a European Spurge, *Euphorbia Peplus*, was growing in masses; it is common in waste and cultivated ground.

The hill-sides, especially around Hamilton, are often almost bare of undergrowth beneath the Junipers, except for the Sage-bushes that have either supplanted the original growth or become established after clearing. On what one may regard as a natural hill-side more or less shaded by the Juniper are *Myrica cerifera* and *Baccharis glomeruliflora*, the taller bushes overgrown in more open situations with the beautiful purple-flowered *Ipomoea cathartica*; occasionally *Randia aculeata* and *Chiococca bermudiana*; seedling Junipers in plenty, seedling Palmettos, and, where established, the Fiddlewood. With the native are naturalized species—Bitter Orange (*Citrus vulgaris*) and Lemon (*Citrus Limonum*), once extensively cultivated, but destroyed by a scale-insect, introduced with a cargo of oranges in the middle of the last century; their cultivation is now being revived with the aid of the Department of Agriculture; *Eugenia uniflora* with small edible cherry-like fruits; Pigeon Berry (*Duranta repens*), a pretty sight when in fruit, its drooping or trailing branches bearing racemes of yellow berries; Pimento; and *Ilex vomitoria*, an evergreen with red holly-like drupes used for decoration.

In more shaded spots are the ferns *Dryopteris normalis* and *Adiantum bellum*, and *Ascyrum macrosepalum*. *Triumfetta semitriloba*, an annual with persistently clinging fruits, sometimes grows 4 to 5 feet high. *Poinsettia heterophylla* is a very poor relation of the widely cultivated *P. pulcherrima*. In shade on the ground are the prostrate grass *Oplismenus hirtellus*, *Commelina longicaulis* (Chicken-grass, beloved by fowls) common in damp places, and the tiny creeping *Dichondra carolinensis* (Convolvulaceae) with slender-stalked reniform leaves and small greenish-white flowers, about 4 mm. in diameter, which grows everywhere in shaded grassy spots. Common on hill-sides are *Relbunium bermudense*, the Bermudan Bedstraw; an allied species, *Vaillantia hispida* (Europe) is naturalized in grassy places. *Borreria laevis* (Rubiaceae), a straggling inelegant herb grows everywhere in dry situations, as does also the small creeping *Lippia nodiflora*. In dry open situations *Dodonaea jamaicensis*, a viscid shrub, sometimes arborescent, attractive with its winged red fruits, is plentiful.

Climbing in thickets one may find *Cardiospermum microcarpum* and *Passiflora suberosa* (also on walls). In a shaded valley road the rocky banks are green with *Adiantum bellum*, the endemic *Trichostomum bermudanum*, common on walls and rocks, and other mosses; around Hamilton the fern *Pteris longifolia* (introduced about 1875) is abundantly naturalized. In such a valley grow the Composites *Erigeron philadelphicum*, *Polymnia Uvedalia*, a coarse herb with large deltoid leaves and sparse bright yellow flower-heads two inches across, *Bidens pilosa* *, *Eupatorium riparium* * (Happy Valley, Devonshire, noted by Britton in 1911), *Turnera ulmifolia* (Orange Valley, Devon), *Maurandia antirrhinifolia*, and the stouter *M. scandens*, climbing Scrophulariaceae, both escapes from cultivation, the European grasses *Briza minor* (Orange Valley, not included by Britton), and *Lolium multiflorum*.

The roadside flora is often attractive, especially where it cuts through the native rock, often deeply. *Adiantum* is common in the shade, and in sunny exposures the endemic *Erigeron* forms bright patches; introduced species are *Crepis japonica*, *Capraria biflora* (Scrophulariaceae), *Oenothera rosea*, *Ipomoea dissecta* (occasional). Roadside grasses are *Sporobolus Berteroanus**, *Sphenopholis obtusata*, *Chloris petraea* *, *Polypogon littorale* *, *Echinochloa Crus-Galli**, *Bromus unioloides**, and *Briza maxima* *. *Pilea microphylla* (native of the West Indies and Southern Florida, the sources of most of the native flora, but regarded by Britton as naturalized in Bermuda) is common on walls, where it grows with the omnipresent moss, *Trichostomum bermudanum*, and the common thalloid liverwort, *Reboulia hemispherica*, *Euphorbia Blodgettii*, *Scleropoa rigida* *, and occasionally *Linaria Cymbalaria* *.

* To avoid repetition, the asterisk indicates a species not regarded as native.

The flora of the waste ground—that is, unoccupied land which has been cleared, and in some cases has probably been at some time under cultivation—is a remarkable mixture of native and naturalized species. The commonest herb in the islands is the Life-plant, *Bryophyllum pinnatum* (introduced in 1813), which is almost ubiquitous. Though described as a pernicious weed, owing to its remarkable capacity for vegetative reproduction, it is a decorative plant, the tall panicles of reddish flowers sometimes shading to yellow or cream-colour, contrasting well with the fresh green leaves. I saw it growing freely by the roadside on the way up to Newcastle in the Blue Mountains in Jamaica—the coloured driver of my car called it fittingly "Chinese lanterns."

The following species are more or less common on waste land:—*Ranunculus muricatus* * and *parviflorus* *, *Urtica membranacea* *, *Chenopodium murale* *, *Amarantus hybridus* * (tropical American, naturalized in temperate N. America), *Arenaria leptoclados* *, *Argemone mexicana* *, *Papaver Rhoeas* * and *dubium* *, *Fumaria muralis* *, *Lepidium virginicum* *, *Senebiera didyma**, *Konigia maritima**, *Capsella Bursa-pastoris* *, *Medicago lupulina* *, *Melilotus indica* *, *Indigofera suffruticosa* (W. Indies), *Vicia sativa* *, *Geranium carolinianum* * (E. North America), *Oxalis cernua* * ("Bermuda Buttercup," S. Africa, a garden escape), *O. corniculata**, *Phyllanthus Niruri** (tropics), *Mercurialis annua* *, *Ricinus communis* *, *Euphorbia hypericifolia* * (S. United States, W. Indies, &c.), *E. prostrata* * (tropical America), *E. Peplus**, *Triumfetta semitriloba*, *Malva parviflora* *, *Sida carpinifolia* * (S. United States and tropical America), *Oenothera rosea** (S. United States to S. America), *Torilis nodosa**, *Ammi majus**, *Apium leptophyllum**, *Anagallis arvensis**, *Erythrea Centaurium**, *Asclepias curassavica* * (W. Indies, tropical America), *Verbena officinalis* *, *V. bonariensis* * (S. America), *V. rigida* * (garden escape), *Stachytarpheta jamaicensis*, *Lamium amplexicaule* *, *Stachys arvensis* *, *Salvia serotina* * (Florida, W. Indies), *Solanum nigrum*, *Verbascum Thapsus* *, *Veronica arvensis* *, *Plantago major* *, *Sherardia arvensis* *, *Centranthus macrosiphon* *, *Cichorium Intybus* *, *Taraxacum officinale* *, *Crepis japonica* *, *Sonchus oleraceus* *, *Ambrosia elatior* * (N. America), *Aster squamatus* * (S. America) *, *Erigeron pusillum* * (E. United States, W. Indies, and tropical America), *Senecio vulgaris* *, *Parthenium hysterophorus* * (S. United States, tropical America), *Bidens pilosa* * (tropical America), *Chrysanthemum Leucanthemum* *, *Setaria viridis* *, *S. glauca* *, *Koeleria phleoides* *, *Poa annua* *, *Commelina elegans* * (Florida, W. Indies, tropical America), *Nothoscordum fragrans* *.

* These species are regarded by Britton as not native. A large proportion are European, but a few are temperate North American, West Indian, or tropical American. Some European species may have reached Bermuda from the United States where they are also naturalized, but it must be borne in mind that there has been constant communication between Bermuda and England since the early 17th century.

Some of the most striking features of the vegetation are introduced species that have become completely naturalized. First and foremost, the Oleander (*Nerium Oleander*), recorded as introduced in 1790, is wild almost everywhere, and is also extensively used for hedges. It blooms from the spring onwards, the colour ranging from white through shades of pink to deep crimson, and is one of the most effective floral features. *Tamarix gallica* has been planted as a screen, especially on the north coast, and is also widely naturalized. Wild Sisal, *Furcraea macrophylla* (native of the Bahamas), is abundant in thickets, crushing other vegetation beneath its huge rosette of thick spine-edged leaves. The flowering "poles" may reach 30 feet in height, and bear, besides flowers, numerous ovoid bulbs by which the plant is freely propagated. Papaw (*Carica Papaya*), generally cultivated, has become naturalized. The aggressive Sage-bushes (*Lantana*), *Eugenia uniflora*, and Pimento have already been mentioned as conspicuous features in the vegetation. *Russellia equisetiformis* (Scrophulariaceae), known locally as Heath, is a garden escape on roadsides and banks. *Tropaeolum majus* and *Freesia refracta* are showy and flourishing escapes from cultivation. *Hibiscus rosa-sinensis*, a persistent flowerer, is widely planted and may occur in waste places. A fine specimen of *Strelitzia augusta* was growing in the muddy edge of Hamilton Harbour.

It will be obvious from these notes that the present flora of the Bermudas owes much of its character to introduced species, many of which have made themselves at home at the expense of the natives. Britton estimates the number of introduced and completely or partially naturalized species (mainly flowering plants) which have reached the islands through human activities and have perpetuated themselves at about 300—that is, about twice the number of native species.

A few examples will indicate the proportions of presumed native and naturalized (excluding introductions which have not yet become naturalized). Grasses, 18 native, 25 naturalized; Cyperaceae, 22 native, none naturalized †; Compositae, 11 native, 11 naturalized; Rubiaceae, 7 native, 6 naturalized; Cruciferae, 1 native (*Cakile lanceolata*), 12 naturalized; Leguminosae, 4 native, 10 naturalized; Verbenaceae, 4 native, 10 naturalized.

Dr. Britton's list of the vascular plants is a very complete one, including the results of his own and other botanists' work, and I can add only three species, all presumably recent introductions—*Ardisia escallonioides* Cham. & Schl. (Florida, West Indies, Mexico) in Paget Marsh, and two grasses, *Briza minor* L. in Devonshire (Orange Valley and on the dry edge of the Marsh) and *Sphenopholis obtusata* Scribn. (south-eastern United States), by roadsides at Prospect and Warwick. My notes suggest

† So Dr. Britton; but *Cyperus alternifolius* seems well established in Pembroke Marsh and elsewhere.

an increasing balance on the debit side. To native species already mentioned as threatened with extinction or already extinct may be added *Rhacoma Crossopetalum* L. (Celastraceae), found by Lefroy about 1875 and not subsequently, and *Callicarpa americana* L., recorded as surviving only in Paget Marsh in 1913; I did not find it. Britton records *Celtis mississippiensis* from the rocky woods at Walsingham (*C. occidentalis* of Hemsley and other authors). I found two small trees of *occidentalis* only. Britton also includes *Triumfetta Lappula* L., of which he says Bermuda is the type-locality but that it has not been found by collectors subsequent to Moseley. But, as we showed in our 'Flora of Jamaica' (iv. 83), the Plukenet specimen that Linnæus cites from Bermuda (in Herb. Sloane) is *T. semitriloba* Jacq., and does not agree with the specimen of *T. Lappula* L. in the Linnean and Clifford's herbaria. Moseley's specimen cited by Hemsley is also *T. semitriloba*.

Britton also includes in his 'Flora' cultivated plants, which either grow now or are recorded as having grown in Bermuda, to the number of 864. The absence of frost and almost unbroken mild climate allow the cultivation of semi-tropical or tropical plants, and in the many beautiful gardens familiar species of our own gardens flourish with those of warm climates.

In conclusion, I have to thank Mr. J. C. Nauen of the Agricultural Department for his company and help on several of my excursions, Dr. and Mrs. L. R. Blinks who introduced me to the study of the Seaweeds, and Dr. Wheeler of the Biological Institute, St. George's, for facilities for collecting in and around Castle Harbour. And my son, Captain D. A. Rendle, R.E., with whom I stayed and who made it possible for me easily to visit the various parts of the Islands.

I am indebted to the Trustees of the British Museum for a grant from the Godman fund towards the expenses of my combined trip to Jamaica and Bermuda.

(To be continued.)

NOTES ON BRITISH EUPHRASIAS.—IV.

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

(Continued from Journ. Bot. 1933, 90.)

During the past two years a large number of British Euphrasias from different sources have been examined and further information obtained. Two new forms seem sufficiently distinct to merit description.

6. Euphrasia Marshallii Pugsl.—In June, 1934, a plant that can only be referred to this species was collected by Dr. G. Taylor at the Mull of Galloway, Wigtownshire. The gathering, not a small one, seems homogeneous, and except

that the indumentum of the foliage is less dense, agrees well with the typical plant growing in Sutherlandshire.

The former occurrence of *E. Marshallii* on the "coast of Aberdeen" was noted in this Journal in 1933 (p. 87). In September, 1934, Dr. Taylor found a form on Buchan Ness that has the aspect of a hybrid of this with either *E. borealis* or *E. brevipila*. It thus seems likely that *E. Marshallii* may still be found on the Aberdeenshire coast.

8. EUPHRASIA CAMBRICA Pugsl. f. **elatior,** form. nov.

Exsicc. Pugsley, no. 523 (Snowdon, 1935, coll. *J. E. Lousley*).

Caulis ad 15 cm. longus, internodis folia sæpe superantibus, simplex vel ramis paucis præditus. *Folia* ad 8 mm. longa, patentia vel arcuato-recurvata, satis hirsuta, floralia utrinque dentibus remotis nonnunquam undulatis. *Corolla* ad 6 mm. longa.

Stem up to 15 cm. high, flexuous, with internodes often exceeding the leaves, simple or with few branches. *Leaves* to 8 mm. long, spreading or arcuate-recurved, often more hirsute than in the specific type, the floral with 3, or in luxuriant examples 4 ±distant and sometimes waved teeth on each side. *Corolla* larger than in the type, about 6 mm. long dorsally. *Capsule* retuse rather than emarginate. Otherwise like the type.

This very distinct Eyebright was collected by Mr. Lousley on Snowdon in the neighbourhood of the typical species, from which at first sight it appears widely different. Upon examination, however, it can be seen to possess the same essential features, the rather narrow, bright green, hirsute foliage, the small pale flowers, and the large broad fruits—and it is evidently only a luxuriant form resulting from stimulating environment. The indumentum of the leaves somewhat recalls that of *E. curta*, but the difference in their outline (like the flexuous habit) is more evident in the new form than in the specific type. The habit of f. *elatior* is not unlike some states of *E. confusa*, but otherwise the two plants are widely different, and *E. cambrica*, as a whole, seems best regarded as intermediate between *E. curta* and *E. frigida*, and nearer the former, as treated in the 'Revision.'

On seeing this new form with typical *E. cambrica* it becomes clear that the plant collected by Mr. Barton at Craig Gleisiad, Brecon, referred to at p. 491 of the 'Revision,' as well as a part of Wheldon's Llanberis material (*l. c.* p. 527), are allied to f. *elatior*. Their habit and foliage are much the same, but they differ in their larger and more highly coloured corollas, perhaps the result of hybridity. I have also a similar form from Cwm Idwal (in fruit only), which I collected on the rocks of Twll Du in September, 1921; and Mr. Catcheside's plant from Moel Ogof, sent to the Watson Exchange Club and referred to *E. curta* f. *piccola* in the Report for 1925–26, p. 344, is practically identical.

10. EUPHRASIA NEMOROSA (Pers.) Löhr. ζ. **obtusata,** var. nov.

Exsicc. Pugsley, no. 525 (Alciston, Sussex), type; *Lousley*, Shoreham, Sussex, 1932; *Lousley*, Morden Decoy, Dorset, 1933.

Planta præcox, typo humilior, 6–15 cm. alta, internodis breviusculis satis ramosa. *Folia* subpatentia haud recurvata, caulina superiora floraliaque inferiora dentibus obtusis subacutisve obtusa.

Early flowering and rather dwarf; stem 6–15 cm. high, moderately branched with rather short internodes. *Leaves* scarcely spreading and not recurved, the upper cauline and lower floral ±ovate, obtuse, with the teeth (except the basal) obtuse or subacute. Otherwise as in the type.

This variety, which comes into flower during May, is notable for its relatively obtuse foliage. It somewhat resembles the Scottish variety *sabulicola*, but lacks its peculiar habit and produces larger flowers. The variety *calcarea* is readily separable by its more deeply and acutely cut floral leaves. The typical species, and the varieties *collina* and *transiens*, are normally taller plants with sharply toothed foliage, and, in the case of the varieties, larger flowers.

The habit and obtuse foliage of var. *obtusata*, combined with its early flowering, recall a plant frequent in Jersey which has been referred to *E. occidentalis* var. *calvescens*. But the Jersey plant seems to differ sufficiently in its lower branching and larger floral leaves and capsules, and to have been rightly named.

The new variety has been seen only from Sussex and Dorset.

13. EUPHRASIA BOREALIS (Towns.) Wettst.—A plant lately received from Mr. R. H. Corstorphine, collected on the rocks of Canlochen Glen, Forfarshire, August 12, 1934, may prove to be a distinct form. In its slender, unbranched stem, with small foliage, flowering from the 3rd or 4th node, it differs greatly from other British examples of *E. borealis*, but it closely resembles some smaller specimens included in Dörfler, Herb. Norm. no. 4575 (*E. borealis*) from the Faeroes.

It is also very like authentic material of *E. suecica* Murb. & Wettst., from which it seems to differ chiefly in its broader capsules. Further investigation of this plant at Canlochen is desirable.

20. EUPHRASIA SALISBURGENSIS Funck var. HIBERNICA Pugsl.

I have recently examined a large series of this plant collected in 1935 by Dr. W. A. Sledge and Mr. N. D. Simpson in counties Galway, Clare and Limerick. The tallest example seen was 13 cm. high, the majority being very much dwarfer. The specimens generally showed the slender, much-branched habit characteristic of the variety, and the branches were usually,

but not uniformly, more or less spreading; occasionally they were almost divaricate. The small foliage was notable throughout. The leaves were commonly not more than 5 mm. long, though of variable breadth, and there were but 2 (rarely 3) teeth on each side of the apex. The capsules of these specimens were obscurely rather than distinctly retuse, and so not very distinct from those of the typical species.

The following are additional vice-county records :—

E. micrantha Rchb.—11. S. Hants: Beaulieu (*Phillips*); 79. Selkirk: Elibank (*Callen*); 83. Edinburgh: Balerno (*Callen*); 86. Stirling: Dumgoyne (*Callen*); 90. Forfar: Isla (*Corstorphine*); 104. N. Ebudes: Skye (*Callen*).

E. scotica Wettst.—62. N.E. Yorks: Goathland (*Fisher*); 64. M.W. Yorks: Austwick (*Phillips*); 110. Outer Hebrides: Barra (*Callen*).

E. frigida Pugsl.—97. Westerness: Ben Nevis (*Simpson*).

E. Marshallii Pugsl.—74. Wigtown: Mull of Galloway (*Taylor*).

E. curta (Fr.) Wettst.—23. Oxford: Headington—f. *glabrescens* (*Chapple*); 82. Haddington f. *glabrescens* (*Taylor*); 104. N. Ebudes: Raasay (*Miss Blackburn*).

E. occidentalis Wettst.—15. E. Kent: Folkestone (*Lousley*); 62. N.E. Yorks: Saltburn—v. *calvescens* (*Callen*); 95. Elgin: Findhorn (*Marshall*).

E. nemorosa (Pers.) Hbr. 53. S. Lincoln: Grantham—v. *collina* (*Fisher*); 66. Durham: Seaton Carew—v. *collina* (*Taylor*); 67. Northumberland S.: Rothley—v. *collina* (*Miss Armitage*); 68. Cheviotland—v. *collina* (*Taylor*); 75. Ayr: Stevenston—v. *collina* (*McKechnie*); 78. Peebles: Whim Lamancha—v. *collina* (*Burdon*); 80. Roxburgh: Melrose—v. *collina* (*Callen*); 82. Haddington: Aberlady—v. *collina* (*Callen*); 83. Edinburgh: Balerno—v. *collina* (*Callen*); 84. Linlithgow—v. *collina* (*Callen*); 85. Fife: Crossgates—v. *collina* (*Callen*); 95. Elgin: Culbin Sands—v. *transiens* f. *procumbens* (*Corstorphine*); 110. Outer Hebrides: N. Uist (*Waterston*).

E. confusa Pugsl. f. *albida*.—1. W. Cornwall: Carnmarth (*Miss Todd*); 3. S. Devon: Salcombe!; 9. Dorset: Bryanston (*Good*); 11. S. Hants: Pennington (*Fisher*); 13. W. Sussex: (*Fisher*); 27. E. Norfolk: Sheringham (*Fisher*); 41. Glamorgan: Kenfig (*Chapple*); 45, Pembroke: St. David's (*Alston*); 53. S. Lincoln: Grantham (*Fisher*); 68. Cheviotland: Rothbury (*Burdon*); 74. Wigtown: Torr's Warren (*Taylor*); 77. Lanark: Leadhills (*Corstorphine*); 78. Peebles (*Taylor*); 81. Berwick: Lammermuir Hills (*Taylor*); 83. Edinburgh: Glencorse (*Callen*); 84. Linlithgow (*Callen*); 87. W. Perth: Loch Vennachar (*Callen*); 90. Forfar: Clova (*Corstorphine*); 98. Argyll:

(*Taylor*); 100. Clyde Is.: Arran (*Callen*); 104. N. Ebudes: Skye (*Callen*); 106. E. Ross: Dornoch (*Corstorphine*).

E. borealis (Towns.) Wettst.—90. Forfar; Glen Fee (*Foggitt*).

E. brevipila Burn. & Grl.—3. S. Devon: Manaton (*Stephenson*); 57. Derby: Fallinge Moor (*Proctor*); 76. Renfrew: Kilmacolm—f. *gracilior* (*Callen*); 78. Peebles: Ettrick (*Callen*); 79. Selkirk: Elibank (*Callen*); 82. Haddington: Luffness (Callen); 86. Stirling: Dumgoyne (*Callen*); 104. N. Ebudes: Skye (*Callen*).

E. Rostkoviana Hayne, v. *obscura* Pugsl.—40. Shropshire: Wyre Forest (*Miss Todd*).

E. montana Jord.—72. Dumfries: Moffat (*Duncan*).

E. anglica Pugsl.—9. Dorset: Varwood (*Good*); 20. Herts: Rickmansworth (*Fisher*); 45. Pembroke: Mynydd Carningle (*Alston*).

E. hirtella Jord., v. *polyadena* (Gren. & Roux) Pugsl.—55. Leicester: Charnwood (*Fisher*).

PRINCIPAL DECISIONS ON NOMENCLATURE AT THE VIth INTERNATIONAL BOTANICAL CONGRESS (1935).

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

(1) General acceptance of the text of the 'International Rules of Botanical Nomenclature,' ed. 3 (1935), as representing the decisions of the Fifth International Botanical Congress, Cambridge (1930).

(2) Special acceptance of the date, Jan. 1, 1935, recommended (instead of Jan. 1, 1932) by the Editorial Committee of the 'International Rules,' ed. 3 (1935), as the starting-point for obligatory Latin diagnoses of new groups of living plants (Bacteria excepted).—Syn. Prop. 29, Art. 38.

(3) Addition to Art. 20 of a paragraph to the effect that the two volumes of Linnæus, 'Species Plantarum,' ed. 1 (1753), are treated as having been published simultaneously.—Syn. Prop. 16, Art. D 20.

(4) Treatment of provisional names (*nomina provisoria*) as not validly published.—Prop. Brit. Bot. (1929), 16, Art. 44, Briq. Rec. Syn. 41, Art. 37 ter, amended wording, excluding the words "*seu eventuale*."

(5) Treatment of alternative names (*nomina alternativa seu eventualia*) as validly published.—Example: The names *Cymbopogon Bequaerti* De Wild. and *Andropogon Bequaerti* De Wild., proposed simultaneously as alternative names for a new species described in Bull. Jard. Bot. Brux. vi. 8 (1919), are both treated as validly published.

(6) Replacement of Art. 54, paragraph 2, by a paragraph to the following effect :—

" When, on transference to another genus, the specific epithet has been applied erroneously in its new position to a different plant, the new combination must be retained for the plant on which the epithet was originally based, and must be attributed to the author who first published it."—Syn. Prop. 39, Art. B 54, amended wording.

(7) Textual amendment of Art. 60. The second sentence to read as follows :—

" The publication of an epithet in an illegitimate combination must not be taken into consideration for purposes of priority, except as indicated under Art 61."—Syn. Prop. 46, Art. A 60. [This brings the text of Art. 60 into conformity with Art. 61.]

(8) Addition to Art. 61 of a paragraph to the following effect :—

" When an author simultaneously publishes the same new name for more than one group, the first author who adopts one of them, or substitutes another name for one of them, must be followed."—Prelim. Opin. 18, Art. A 61. [The same principle of selection is already embodied in Art. 56, where two or more names have been published simultaneously for the same group.]

(9) Addition to Art. 70 of a note to the following effect :—

Note 2 bis.—" The liberty of correcting a name must be used with reserve, especially if the change affects the first syllable, and above all the first letter of the name."

" Example : The spelling of the generic name *Lespedeza* must not be altered, although it commemorates Vicente Manuel de Céspedes."—Syn. Prop. 52, Art. D 70 ; Rhodora, xxxvi. 130–132, 390–392 (1934).

(10) Rec. XLIII amended to read as follows :—

" Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are taken from generic or vernacular names (substantives or adjectives)."

Additional examples : " *Schinus Molle* (Peruvian vernacular name), *Astrocaryum Tucuma* (Brazilian vernacular name)."—Syn. Prop. 55, Rec. B XLIII.

(11) Art 72, Section (1), to be replaced by the following :—

" A Greek or Latin word adopted as a generic name retains its classical gender. In cases where the classical gender varies, the author has the right of choice between the alternative genders. In doubtful cases, general usage should be followed.

" The following names, however, whose classical gender is masculine, are treated as feminine in accordance with historic usage : *Adonis, Orchis, Stachys, Diospyros, Strychnos. Hemerocallis* (m. in Sp. Pl. : Lat. and Gr. *hemerocalles* n.) is also treated as feminine in order to bring it into conformity with all other generic names ending in -is."—Syn. Prop. 58, Art. C 72.

(12) (*a*) Rejection of the principle of *Nomina specifica conservanda* by a majority of 208 : 61.—Syn. Prop. 18, Art. A 21, 21 bis.

(*b*) Appointment of a Special Committee to draw up a list of names of economic plants in accordance with the International Rules. This list may remain in use for a period of ten years. [See Note below.]

(13) A resolution was passed recommending the adoption by botanists of the standard-species (*species lectotypicæ*) of Linnean generic names printed in ' International Rules,' ed. 3, pp. 139–143, unless there is clear reason for rejecting any species in favour of another. Any changes considered desirable should be communicated to the Secretary of the Special Committee for Phanerogamae and Pteridophyta, Miss M. L. Green, The Herbarium, Royal Botanic Gardens, Kew.

(14) The list of " Standard-Species " of *Nomina generica conservanda* printed in ' International Rules,' ed. 3, pp. 143–146, was referred to the Special Committee for Phanerogamae and Pteridophyta.

(15) The lists of *Nomina generica conservanda proposita* printed in ' International Rules,' ed. 3, pp. 118–138, ' Synopsis of Proposals,' pp. 66–73, and ' Preliminary Opinions,' p. 25, were referred to the appropriate Special Committees appointed at Amsterdam.

(16) Acceptance of the list of *Nomina familiarum conservanda* printed in Syn. Prop. pp. 64–65.

(17) The following four resolutions concerning Algae were adopted :—

1. In describing new species of Algae special importance should be attached to the provision of illustrations and to maintenance of cultures of the species concerned.

2. The desirability of adopting further monographs as the starting points of particular groups of Algae, as in the Oedogoniaceae, should be investigated.

3. A list of *Nomina dubia* of species, genera and families should be prepared, and also lists of *Nomina conservanda* and *rejicienda* of genera and families.

4. The desirability of retaining the Latin language for diagnoses of new Algae should be investigated.

(18) All proposals concerning Mycology, submitted to the Amsterdam Congress, were referred to Subcommittees to be appointed by the Special Committee for Fungi.

(19) Additions concerning Palæobotany to be made to the rules and recommendations for the following objects :—

1. To recognise as taxonomic groups, organ genera and artificial or form genera.

2. To ensure that the names originally given to detached organs or parts of plants shall only be used in their original

signification, and shall not be employed in the designation of different organs, or of the plant as a whole.

3. To provide for the naming of an entire plant when it has been possible to reconstruct it by the association of its different organs.

4. To define how the names of the artificial genera are to be used.

5. To set up a permanent committee to consider the interpretation of the rules; to adjudicate in cases of dispute or difficulty; to draw up lists of *Nomina generica conservanda*; and to make such further recommendations as may prove necessary, including rules for the determination of types.

(20) Appointment of a Special Committee to report on the effects of the adoption of the proposed Art. A 19 and Appendix "IX," dealing with the rejection of certain works.—Syn. Prop. pp. 15, 77–80.

Note.—The following Special Committee for the Nomenclature of Economic Plants was appointed to deal with the list:—

Burtt Davy, J., Imperial Forestry Institute, Oxford.
Chittenden, F. J., Royal Horticultural Society, London.
Exell, A. W., British Museum (Natural History), London.
Eyma, P. J., University of Utrecht.
Harms, H., Botanisches Museum, Berlin-Dahlem.
Hochreutiner, B. P. G., Professeur au College Supérieur, Geneva.
Rehder, A., Arnold Arboretum, U.S.A.
Robyns, W., Jardin Botanique de l'Etat, Brussels.
Honorary Secretary: Miss M. L. Green, The Herbarium, Royal Botanic Gardens, Kew.

Dr. Burtt Davy will be glad to receive lists of tree-names that are doubtful or of questionable validity.

SHORT NOTES.

Ida M. Roper Herbarium.—In accordance with her bequest, the late Miss Roper's herbarium has been formally offered to, and accepted by, the University of Leeds.

As a Fellow of the Linnean Society, a contributing member of the British Botanical Exchange Club, a regular attendant at the Bryological Society's field meetings and Hon. Secretary of the Bristol Naturalists' Society, whose active interest in the local flora was well known, Miss Roper had acquired an extensive knowledge of British plants; Somerset and Gloucestershire were intensively worked for the local Society; further afield she knew the rarities of the Channel Islands, Scotland, Ireland,

Wales, Yorkshire, and the Broads, Fens and Brecklands of East Anglia. The collection is a valued addition to the University herbarium, reflecting, as it does, long and earnest pursuit of field botany; its ten thousand specimens include good series of such critical genera as *Viola*, *Fumaria*, *Alchemilla*, *Rosa*, &c., acquired partly by exchange. Correspondence with specialists and critical notes by referees, preserved with the material discussed, exemplify the opinions of leaders of the period and add to its value for purposes of study; there are photographs of local scenery showing details worthy of record, such as the changes induced by *Spartina Townsendii* in Poole Harbour. A few sheets perpetuate the memory of J. G. Baker, John Windsor, Boswell Syme and others of the past, and the initiated will appreciate *Holosteum umbellatum*, gathered by Mary Marsham in St. Faith's Lane, Norwich, in 1849.—W. H. Burrell, University of Leeds Herbarium.

Uromyces Fabae de Bary.—Occurrence of the æcidial stage on the leaves of Vicia Faba L. in Britain.—Between November 19 and 23, 1935, several collections of the æcidia of this Rust on the leaves of young self-sown bean plants were made in a field belonging to the Lacies farm, Grantchester, near Cambridge. The field is one of about thirty acres, on well-drained heavy clay land, and had carried a crop of beans during the summer. This crop had been incompletely harvested, and much shelling had occurred, so that at the time of observation the field carried a dense stand of young self-sown bean plants intermingled with small heaps of old straw. The total rainfall for the three days before the first discovery of æcidia of the rust was 1·3 inches, recorded at Grantchester, and the temperature for the month had been low. Not more than twenty leaves bearing æcidia were found during the five days, and these were confined to a small portion of the field.

This record is interesting in view of the rarity of the æcidia of this rust on *Vicia Faba* in England and the fact (see W. B. Grove, 'The British Rust Fungi,' p. 97) that they occur normally in the spring. It shows that the teleutospores will germinate in the autumn, given suitable conditions, and the rarity of the æcidia on the leaves, both then and in the spring, may therefore be ascribed (1) to the scarcity in most seasons of teleutospores, and (2) to the improbability that they will be in the vicinity of young bean plants, when the conditions favourable to germination and infection occur. The rarely happening combination of circumstances recorded above would appear to have overcome the usual obstacles to the production of æcidia on this host.—W. F. Steven.

BRITISH BRYOLOGICAL SOCIETY.

THE Annual Meeting and Foray of the above Society was held at Muckross, Killarney, August 10–17, 1935. The President, Mr. D. A. Jones, M.Sc., A.L.S., and twenty-four other members were present. At the General Meeting on August 13 thanks were tendered to Major Phelps for facilities for the exploration of the Muckross demesne (National Park), to Messrs. D. B. Bradshaw and D. I. Cronin for rendering such facilities possible, and to Dr. Lloyd Praeger for help in the arrangement of some of the excursions. Cheltenham was selected as the venue for the 1936 meeting. The President, who was familiar with the district, and had given an account of its bryophytic flora in this Journal (June, 1913), gave a general description of the habitats and localities where the characteristic or rare bryophytes occurred.

The Killarney district, owing to its humid and warm climate, is the home not only of some of our rarest vascular plants, but also of some of our rarest cryptogams. During the excursions some attention was naturally paid to the former, though the field-work was chiefly concerned with the latter, especially with the bryophytes. The carboniferous limestone on the margins of the Lower Lake yielded most of the characteristic plants of such a substratum, such as *Eurhynchium circinatum*, *Marchesinia Mackaii*, and *Placodium cirrochroum*, though the oak growing on it was *Quercus sessiliflora*. The steep siliceous rocks of Eagle's Nest, the trees (*Q. sessiliflora* dominant again) on its wooded slopes, and the ground and rocks between it and Old Weir Bridge provided many rare and interesting plants. *Plagiochila punctata*, *P. spinulosa*, and *P. tridenticulata* were so abundant on the oaks that mosses and lichens were often absent, and the usual habitat distinctions between saxicolous and corticicolous species were often broken down.

Torc Mt. was explored, but very little of the rare *Daltonia splachnoides* was seen. The banks and boulders by the side of the famous Torc Cascade gave a rich harvest of hepatics, a list of which would almost become a catalogue of our rarer species. The ascent of Mangerton proved a delightful excursion, especially from a scenic point of view. Horse's Glen, Loch Erhagh, and the Devil's Punchbowl were explored on the way. A number of interesting and rare mosses were observed; some were new vice-comital records. Other places investigated were Dinish, Cromaglown and O'Sullivan's Cascade. About Dinish the most common *Radula* was *R. Carringtonii*; at Cromaglown *Trichostomum hibernicum* was common, and near O'Sullivan's Cascade *Hookeria laetevirens* and *Grimmia retracta* were noted.

After the Killarney excursions fifteen members and friends travelled on to Dingle and explored the extreme west of Ireland.

Slea Head, Dunmore Head, Connor Hill and Brandon Mt. were visited.

The following is a list of new vice-county records (1, South Kerry; 2, North Kerry). Some of the Sphagna had been seen the previous year by Mr. A. Thompson, but have not been published till now:—

SPHAGNA.—*Sphagnum plumulosum*, Eagle's Nest (2). *S. recurvum* var. *robustum*, Mangerton (2). *S. fallax* var. *laxifolium* and var. *Schultzii*, Brandon Headland (1). *S. compactum* var. *subsquarrosum*, near Loch Cruttia (1), var. *imbricatum*, Garygarry (2). *S. obesum* var. *teretiramosum* and var. *hemi-isophyllum*, both new to Ireland, Connor Hill (1). *S. inundatum* var. *lancifolium*, Torc Mt. (2), new to Ireland. *S. aquatile* var. *intortum*, near Loch Cruttia (1), Mangerton (2), var. *sanguinale*, Loch Cruttia (1), var. *remotum*, Connor Hill (1), Mangerton and Old Weir Bridge (2), all three new to Ireland. *S. auriculatum* var. *ovatum*, Brandon Headland (1), var. *canovirescens*, Torc Mt. (2), new to Ireland. *S. crassifolium* var. *diversfolium*, Connor Hill (1), var. *magnifolium*, Old Weir Bridge (2). *S. Camussii*, Connor Hill (1), Eagle's Nest (2). *S. papillosum* var. *sublaeve*, Eagle's Nest (2).

TRUE MOSSES.—*Dichodontium pellucidum* var. *compactum*, Brandon Mt. (1). *Blindia acuta* var. *trichodes*, Brandon Mt. (1). *Campylopus atrovirens* var. *muticus*, Brandon Mt. and Connor Hill (1). *Dicranum uncinatum*, Eagle's Nest (2). *Fissidens pusillus*, Torc Mt., etc. (2). *F. Curnowii*, below O'Sullivan's Cascade (1). *Grimmia robusta*, near L. Cruttia (1), Brickeen Bridge (2). *G. retracta*, below O'Sullivan's Cascade (1). *G. Doniana*, near L. Cruttia (1). *Rhacomitrium ramulosum*, L. Naluchan (1). *Tortula atrovirens*, Slea Head (1). *Barbula ferruginascens*, L. Cruttia (1). *B. convoluta* var. *Sardoa*, Dingle (1). *Weisia microstoma*, Dingle (1). *Trichostomum tortuosum* var. *fragilifolium*, near Eagle's Nest (2). *Bryum caespiticium*, Dingle (1). *B. alpinum* var. *viride*, near L. Cruttia (1). *B. argenteum*, Dingle (1). *Thuidium delicatulum*, Torc Mt. (2). *Eurhynchium curvisetum*, Dingle (1). *E. myosuroides* var. *brachythecioides*, Mangerton (2). *Amblystegium tenax* (*A. irriguum*), Muckross (2). *Hypnum molluscum* var. *fastigiatum*, Torc Mt. and Muckross (2). *Drepanocladus falcatus*, Brandon (1).

HEPATICS.—*Aneura major*, Dunmore Head (1). *Lophozia Muelleri*, above L. Cruttia (1). *L. bicrenata*, Mangerton (2). *Plagiochila asplenioides* var. *major*, Muckross (2). *Odontoschisma denudatum*, Eagle's Nest (2).—W. WATSON.

REVIEWS.

Pollen Grains: their Structure, Identification and Significance in Science and Medicine. By R. P. WODEHOUSE, Ph.D., Scientific Director of the Hayfever Laboratory, the Arlington Chemical Company, Yonkers, New York. 8vo, pp. xv, 574, 14 pls. and 123 text-figs. McGraw-Hill Publishing Co.: London, 1935. Price 36*s*.

THE study of pollen began with the discovery of the compound microscope, and dates from two of the earliest workers, Nehemiah Grew in England and Marcello Malpighi in Italy. But the morphology of pollen-grains, the author points out in his preface, has lagged far behind other branches of botanical science, and at the present time the discovered is but a small part of the discoverable. The object of the present work, while stating so far as possible what is known about pollen-grains, is primarily to bring out the principles involved in their study, to show where new discoveries may be made, and to give a trustworthy method of approach.

The stimulus has perhaps been the importance of the identification of pollen as a source of hay-fever, but the work has developed to become a valuable botanical handbook helpful, for instance, to students of pollen preserved in peats and other sediments, and also to the taxonomist who, by his rejection of pollen-grain characters, " has thrown away, perhaps, the richest part of his heritage, for in no other part of the plant are to be found packed in so small a space so many readily available phylogenetic characters."

The book contains two parts. Part I. (General), of 200 pages, includes an interesting historical review from the date of Hooke's microscope in 1665 to the work of Hugo Fischer in 1890, whose Ph.D. thesis provided a definite classification based on the critical examination of the pollen of about 2200 species. Then follow chapters on methods of collecting and preparation, one by Prof. G. Erdtman on " Pollen Statistics "—the method of investigation in peats and other sediments,—study of atmospheric pollen, and hay-fever and its seasonal types and causes. The concluding chapter, "Pollen-grain Characters," is an introduction to pollen-morphology, founded on three classes of characters—hereditary, external, and internal environmental. The main characters, those of the furrows, are mainly hereditary and phyletic in their distribution and are of the greatest value in the identification and classification of plants. Their number and arrangement is described in relation to the polyhedral symmetry of the grain.

Part II. (Classification) opens with a " Master Key," a guide to the family, and is followed by a descriptive account of the pollen of the fossil Gymnosperms, the living Gymnosperms

(with a key to the genera), and the Angiosperms. Under the families are described the form of the grain that is basic and from which other forms might have been derived, and, so far as is known, the interrelationships of the various forms to each other and the evolutionary tendencies in the group. Where advisable keys to the genera and species are provided. The author has found that, as the results of his study, the different families follow for the most part, quite naturally, the sequence of the system of Engler and Prantl.

The book indicates the extensive gaps in our knowledge; many large and important families are not represented, and others by only one species. Under Palmaceae only one species is included, the Date Palm, in which the remarkable similarity of the unquestionably primitive pollen-grain to those of the Cycadales and Bennettitales " suggests that the palms may not be very far removed from their gymnospermous ancestors, bearing to them among the monocotyledons perhaps about the same relationship that the Magnolieae do among the dicotyledons ": a somewhat far-reaching deduction from a single example. Pollen of angiospermous anemophilous families suggests that anemophily is a secondary character; and the simplicity of the grains of the Naiadaceae is also one of reduction—not a primitive character.

The author has produced a book of special interest, the value of which is enhanced by the excellent plates and numerous text-figures, which, with few exceptions, are original and the work of the author.—A. B. R.

Moss Flora of North America (North of Mexico). By A. J. GROUT, Ph.D. Vol. ii. pt. iii. pp. 139–210, pls. lviii.–lxxxiii. Published by the Author, Newfane, Vermont, 1935. (Price not stated.)

THIS new part has appeared soon after the last, and will be welcomed by bryologists especially for the treatment of Bartramiaceae, including *Philonotis*, by Dr. Seville Flowers, and of Bryaceae, the first part, by Dr. Andrews. Miss Geneva Sayres has worked out the Timmiaceae and Aulacomniaceae. The present part, again, is richly and beautifully illustrated. the original drawings being done by Dr. Flowers.

The working out of different groups by separate authors is in many ways an advantage, but it has one great drawback in resulting in a lack of uniformity in nomenclature. Thus on p. 161 we have (correctly) *Bartramia viridissima* (Brid.) Kindb., but on p. 174 *Philonotis fontana* Brid., instead of *P. fontana* (Hedw.) Brid. This is, perhaps, a slip, but in the case of Dr. Andrews' treatment of *Pohlia* it is, unhappily, quite otherwise; the International Rules of Nomenclature are here

disregarded, most unfortunately in a work of this importance and value. One had hoped that *Webera* had been established for *Pohlia* for good and all! The starting point of bryological nomenclature from 1801, now universally adopted, is ignored, e. g. *Pohlia carnea* (L.) Lindb. appears, instead of *Webera delicatula* (Hedw.) Schimp.

In his general treatment of the genus Dr. Andrews has been rather startlingly independent, including in it *Mniobryum*, *Epipterygium* and *Anomobryum*. There will probably be little objection to the first named, but it is rather doubtful if authors will follow his lead in regard to *Anomobryum*, which has not before been placed here, and which seems a fairly well circumscribed genus. Dr. Andrews has united *Webera acuminata* and *W. polymorpha*, probably quite correctly, though one has a perhaps sentimental wish that *W. polymorpha* might have been retained as a variety. He has also found new names for *Pohlia erecta* Lindb. (*P. defecta* (Sanio) Andr. n. comb.), and for *P. commutata* Lindb. (*P. Drummondii* (C. Muell.) Andr. n. comb. Both seem inevitable, and the former at least will put an end to a good deal of confusion.—H. N. D.

ROYAL HORTICULTURAL SOCIETY'S RECENT PUBLICATIONS.

Lily Year-book, 1935. *The Royal Horticultural Society*. Edited by F. J. CHITTENDEN, F.L.S., V.M.H. 8vo, pp. 140, frontis., 30 pls. & text-figs. Royal Horticultural Society: London, 1935. Price 5*s*. paper, 6*s*. cloth.

THIS, the fourth annual issue, contains articles of general and special interest. The first, and most valuable from a botanical standpoint, is a list of Lily names and synonyms by Dr. F. Stoker, who gratefully acknowledges assistance from many helpers. It is a list, with full references, of species, varieties and forms, the valid names being indicated by thick type. The original habitat is indicated, and critical notes are included where called for. Mr. Hay has a chatty article on Lily literature ancient and modern, Carl Purdy contributes notes on Western American Lilies, and Dr. Tincker describes some experiments carried out at Wisley on the relation between drainage and growth. The experiments indicate the importance of effective drainage and aeration. Notes on vegetative propagation of hybrid clons are given by Dr. D. Griffiths of the U.S.A. Bulb Station, Washington, whose lamented death after receipt of his paper is recorded. The well known irregularity in germination of seed is emphasised by J. Ingram's records. Fumigation of bulbs with paradichlorbenzene is recommended by W. E. H. Hudson as fatal to millipedes, mites and other pests. E. K. Balls describes the habitat of some *Fritillaria* species in Asia Minor, and Col. C. H. Grey writes on *F. imperialis* and allied species. Other articles are of special garden interest. The numerous

plates illustrate mainly species as grown in cultivation, but include as frontispiece a portrait of Mr. Arthur Grove, and also one of the late Dr. Griffiths.

Cherries and Soft Fruits. Varieties and Cultivation in 1935. *Report of the Conference held by the Royal Horticultural Society*. Edited by F. J. CHITTENDEN, F.L.S., V.M.H. 8vo, pp. 164, 15 figs. Royal Horticultural Society: London, 1935. Price 6*s*.

THIS Conference, held at the Society's Hall, supplements that on Apples, Pears and Plums held at the Crystal Palace during the Great Autumn Show in 1934. It comprises a series of papers introduced by such well-known experts as Mr. E. A. Bunyard and members of the Staffs at the Research Stations at Long Ashton, East Malling, the Society's Garden at Wisley, and the John Innes Horticultural Institution. Varieties, cultivation, diseases and their control are dealt with, and the useful discussions following the papers are reported in full.

Welsh Timber Trees, Native and Introduced. By H. A. HYDE, M.A., F.L.S. Second edition, revised throughout. 8vo, pp. viii, 107, 25 plates and 24 text-figs. The National Museum of Wales and the Press Board of the University of Wales: Cardiff, 1935. Price 2*s*.

THE issue of a second and revised edition of this handbook, first published in 1931, is sufficient indication that its merits have been widely appreciated. Although the references to the tree-flora and woodland ecology of Wales and the records of specimen trees in the Principality are primarily of local interest, the greater part of the subject-matter applies generally to the British Isles. The botanical characters of the principal species, their habit and sylvicultural features and the properties of their wood are described and illustrated with some excellent photographs and clear text-figures. It is observed that the price has been advanced from one to two shillings, but there is probably no other book at anything like the same price which provides such a useful introduction to the study of British trees. It can be recommended to teachers and students of botany, natural history and forestry, and even to estate agents and timber merchants interested in the growing or utilisation of home-grown timbers.

That the author is in touch with current researches in British forestry and timber technology is shown by the large number of references to recent work both in the bibliography and in the text. He is no less zealous in his revision of botanical names to accord with the International Rules of Botanical Nomenclature; indeed, it is a shock to see the durmast or sessile-fruited oak referred to by the unfamiliar name of *Quercus petraea* Lieblein. Does this mean that *Quercus sessiliflora* is to be

rejected, along with the ill-fated but equally apposite *Q. pedunculata*? It is not to the credit of systematic botanists that the present confusion in nomenclature makes it more satisfactory to use English than Latin names for so many of our common trees. This, however, is no reflection on this second edition of Mr. Hyde's book, which is recommended alike to those who already possess the first edition and to those who do not.—B. J. R.

Annales Bryologici. A Year-book devoted to the Study of Mosses and Hepatics. Edited by Fr. Verdoorn. Roy. 8vo, pp. viii, 173, with text-figs. M. Nijhoff: The Hague, 1935. Price 6 guilders.

This volume contains articles of wide and varied interest, mainly, but not exclusively, taxonomic. Several are biographical. R. S. Chopra (Lahore) contributes an obituary of Shiv Ram Kashyap (1882–1934), Professor of Botany in the Punjab University, and described as the father of Hepaticology in India; a photo and list of publications are included. F. Elfving (Helsingfors) writes an appreciation of the life and work of the eminent Swedish bryologist, S. O. Lindberg, in honour of the centenary of his birth. He was born in 1835 and died in 1889. The writer emphasises his insistence as a teacher on practical knowledge; as an examiner a student who had some knowledge of the native flowering-plants had no fear of failing. Hans Buch contributes a review of Lindberg's work on the system of classification of Mosses and Liverworts. A portrait and brief notice of Leopold Loeske (1865–1935) prefaces his last contribution, "Bemerkungen zur Systematik der Laubmoose"; and there is also a reprint of an autobiography of Jules Cardot (1860–1934), the Belgian bryologist, with a portrait.

Systematy is represented by "Monographische Studien über die indomalayischen Arten von *Pycnolejeunea*," by G. Hoffmann, a detailed morphological and taxonomic study (pp. 80–129); "Additions to the Moss Flora of China," by E. B. Bartram, including species from the provinces of Kweichow, Kuangsi and Fukien; and by two papers by G. Chalaud, one on some new forms and varieties of Pyrenean Hepatics, the other on the systematic position of *Eucalyx Muellerianus*, which is regarded as merely a form of *Eucalyx hyalinus*. H. Chaudhuri (Lahore) has studied the morphology and physiology of the fungal endophytes of four species of Indian liverworts; and R. F. Griggs (Washington, D.C.) describes the pioneer growth of two species of *Lophozia* and *Cephaloziella* on nitrogen-free volcanic ash on the Kalmai volcano. J. Amann introduces a new mounting material for microscope preparations—viscol, a phenyl derivative of viscose dissolved in glycerin; and the editor contributes notes on Series vii. and viii. of his "Hepaticæ Selectæ et Criticæ" and Series i. and ii., "Musci Selecti et Critici."

BOOK-NOTES, NEWS, ETC.

Linnean Society of London.—At the General Meeting on January 30 (postponed from January 23 owing to the death of the King, the Patron of the Society) Dr. W. T. Calman, C.B., F.R.S., President, read from the Chair two loyal addresses to King Edward and Queen Mary which had been prepared by the Officers and approved by the Council. These were unanimously adopted, all present rising from their seats.

Sir Arthur W. Hill gave an account of some experiments carried out at Kew to counteract the effects of London fog on plants and flowers. The experiments, which were not yet decisive, indicated the importance of humidity and ventilation and also of neutralizing the acid reaction of the fog.

Dr. A. B. Rendle read a paper illustrating by three Linnean species of *Asclepias* the relation of the Linnean and other herbaria to the descriptions in the 'Species Plantarum.' It was shown that the diagnosis of *A. variegata* was based on a figure of Plukenet, the specimen of which is in the Sloane Herbarium, that of *A. nivea* on a figure in Dillenius' 'Hortus Elthamensis,' and that of *A. curassavica* on a specimen in the Linnean herbarium. The first two species had been confused by Linnaeus in his herbarium and by the citation of a reference to the Gronovian herbarium.

At the meeting on February 6 the President drew attention to the donation from the Treasurer, Mr. Francis Druce, of a copy of 'The Herbal of Pseudo-Apuleius from the ninth-century manuscript in the abbey of Monte Cassino [Codex Casinensis 97] together with the first printed edition of Joh. Phil. de Lignamine [Edito princeps Romæ 1481] both in facsimile, described and annotated by F. W. T. Hunger, Sc.D., Leyden, 1935.' A special vote of thanks was accorded to Mr. Druce for this donation.

Prof. T. A. Stephenson gave an account of the marine ecology of the South African coasts, showing the effect on distribution caused by the two opposing currents at the extreme south, the warm southward Mozambique current on the east and the northerly polar current on the west. Mr. Garside described a botanical trip through bush and mountainous country north and east from Cape Town. An excellent series of lantern-slides showed the nature of the country and its vegetation, and illustrated the main object of the trip, a visit to the home of a new and remarkable monophyllous species of *Haemanthus*.

At the General Meeting on February 20, the President in the Chair, Sir Edward Poulton, F.R.S., described an experiment indicating that the growth of the Dead-nettle was stimulated by a top-dressing of soil in which Stinging-nettles had grown.

Dr. J. C. Willis, F.R.S., gave an account of some further studies in endemism, based on deductions from the principles

laid down in his book 'Age and Area.' By an elaborate tabulation of the floras of outlying islands, Hawaii, Galapagos, New Zealand and others, he showed that the number and proportion of endemic species varied directly with the size of the genera, and a similar result was obtained with some continental floras. The proportion of endemism in Dicotyledons was greater than in Monocotyledons, and in the former that of the Sympetalae exceeded that of the Archichlamydeae. The results suggested that the Monocotyledons appeared and became dispersed later than the Dicotyledons, and had probably two distinct origins, a southern and an eastern or Lemurian.

'Bulletin du Jardin botanique de l'Etat Bruxelles.'—Vol. xiii. fasc. 4 (November 1935) contains descriptions of new Cyperaceae from the Belgian Congo by H. Chermezon, and of new species and varieties of *Bidens* and *Coreopsis* by E. E. Sherff of Chicago from Belgian Congo and Contral Africa, and revisions (illustrated) of the Congo species of *Erythrina* by Jean Louis, and of Thymelaeaceae, represented by six genera and twenty-seven species, by P. Stamer.

Belgian Flora.—The 'Bulletin de la Société Royale de Botanique de Belgique' (ser. 2, xviii. fasc. 1) contains papers of taxonomic and ecological interest on the native flora. R. Mosseray gives a descriptive account of the native species and hybrids of *Verbascum*, R. & M. Bouillenne discuss the phytogeography of the Hautes Fagnes, and H. J. Van Langendonck the vegetation of the environs of Ghent. A. Maréchal contributes notes on the *Cicendietum* in the valley of the Lesse and its affluents. P. van Oye gives an annotated list of the Desmids of the subalpine district of Belgium, and F. Demaret describes the respiratory exchanges accompanying the varying water-content of the tubers of *Bryonia dioica* during their vegetative cycle.

Flora of Surinam.—A. J. G. H. Kostermans ("Studies in South American Malpighiaceae, Lauraceae and Hernandiaceae," Meded. Bot. Mus. en Herb. Rijks-Univ. Utrecht, n. 25) discusses the nomenclature and taxonomy of various critical species in these families, especially those of Surinam.

Aslib Book-List.—The Association of Special Libraries and Information Bureaux have issued the first part of their 'Quarterly Recommendations of recently published Scientific and Technical Books' (subscription for Non-Members 10*s*. 6*d*. per annum). The books are classified as: A, Books of General Interest; B, Intermediate Books; C, Advanced or Specialist Books. Only books in the English language have been included. Botany is represented by six entries only, and there are notable omissions.

THE PHYLLOTAXY OF *DIOSCOREA GLAUCA* Muhl.

By I. H. Burkill, M.A., F.L.S.

Dioscorea glauca is a native of the eastern parts of North America from the State of New York in lat. 43° N. to the State of South Carolina in lat. 34° N. and from the Atlantic westwards to 95° E. of Greenwich. The older botanists regarded it as constituting part of *D. villosa* L.; and some recent authorities quite reasonably call it *D. villosa* subsp. *glauca*. The characters on which the latest writers rely for distinguishing it from the other segregates of *D. villosa* lie in the vigour of its growth and the disposal of its foliage, beyond which, however, there is, in the size and shape of its rhizome, another character apt to be neglected. The writer admits that it is as reasonable to count it a subspecies as to count it a species, but, because the following pages deal with aspects in which it most strikingly differs from the other subspecies, he wishes here to treat it as a species. Dr. J. K. Small ('Manual of the South-eastern Flora,' 324; 1933) calls attention concisely to its characters above ground, and Dr. H. H. Bartlett, in a paper entitled "The Source of the Drug *Dioscorea*, with a Consideration of the *Dioscoreae* found in the United States" (U.S. Dep. Agric. Bur. Plant-industry, Bullet. 189; 1910), gives an excellent description of those below ground. It has long been cultivated in the Royal Botanic Gardens, Kew, whence the material for this account was generously supplied.

Like all the Dioscoreas it is a tropophyte: the shoots come above ground in spring and die late in autumn. In the United States the capsules cling to the dead vines through the winter. Underground a thick rhizome persists from year to year, growing horizontally at a little distance below the surface of the soil. It is well stored with starch. Underground parts of plants stored with food do not lie, as this rhizome does, close under the surface unless protected from herbivorous animals in some way: and it is rich in a saponin, which makes it unpalatable and somewhat poisonous; abundant irritant raphides are also present and the parts soon grow hard. This hardness and its knobby appearance (fig. 1) get for it the name of Devil's Bones: and it has a rather widespread use in domestic medicine, from which it gets the name of Colic Root. The saponin makes it diuretic, expectorant, and diaphoretic; and its value is similar to that of several other Dioscoreas which serve as local remedies in widely separated parts of the world.

Fig. 1 was drawn from a finger of the rhizome dug in the first week of November 1935: the year's growth was just over and the above-ground parts were perishing. This finger had eight lobes (numbered on the drawing), four of them to the left,

alternating with four of them to the right, the latter a little larger than the former, evidently because their shoots had been on the outside of the clump and had so shaded those of the other side that the growth of the rhizome below had been better. Roots were present in all parts; but on the older parts they had ceased to function, except as anchors. Lobe 1, though alive, carried no longer any living buds: it would soon have followed the yet older parts in dying, for the rhizome dies behind as it grows

Fig. 1.

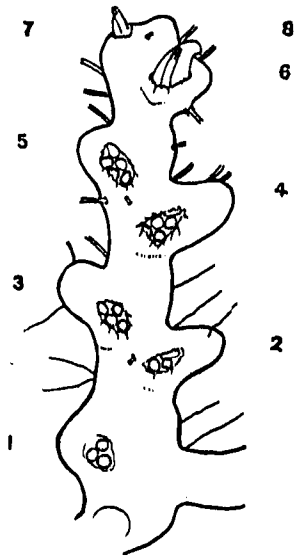


Fig. 2.

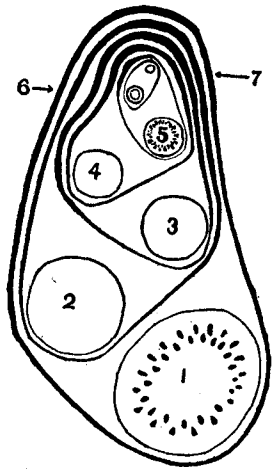


Fig. 1.—A finger removed from the rhizome of *Dioscorea glauca* in autumn, with eight lobes: the bases of leafy shoots and buds are seen on the upper surface: × ½.

Fig. 2.—A section through a bud, such as is seen on lobe 6 of fig. 1, in early autumn. The section cuts through seven developing axes. The position of the vascular bundles is indicated in nos. 1 and 5, and of the cylinder which will break up into the bundles in no. 6.

forward; and by the perishing of the central parts a single plant becomes many. It is convenient to give the conditions of each of the eight lobes *seriatim*:—

1, alive but inactive, its surface with the scars of past lost stems;

2, with two scars left by stems of the year 1934 and a group of buds with their activity in abeyance, protected by scales;

3, with a scar left by a stem of 1934 and the bases of two stems of 1935, together with a group of buds as on the last;

4, with two scars left by stems of 1934 and two bases of stems of 1935, together with a group of buds as on the last two lobes;

5, with a scar of a stem of 1934 and two bases of stems of 1935, together with a group of buds as on the last three lobes;

6, a group of buds, the calyptriform scale of the first tattered somewhat, so as to expose the stem and the calyptriform scale of its first branch; the stem exposed in the commencement of its growth for 1936, already more than 1 cm. long;

7, a group of buds as on lobe 6, but in a slightly less advanced condition;

8, a lobe with no organs exposed. When the brown cortex was removed—a very easy matter, as the activity of a phellogen left its union with the deeper tissues very tender—a minute papilla was exposed: and when cross-sections were taken through it, a channel was detected leading into a little pear-shaped cyst, wherein, very securely protected, was the apical bud, already with the rudiments of leaves and a calyptriform scale surrounding it and a bud in this scale's axil. The protection is perfect: moreover, both sides of the scale and all the other surfaces being covered by such slime-holding several-celled hairs as Dioscoreas often have, the little cyst seems to defy desiccation.

After the date of digging, growth in lobe 8, by being much more intense on the lower than on the upper surface, would have turned this apex towards the air, and the bud in the cyst, emerging, would have exposed its calyptriform scale in the way which is seen on lobe 7, in readiness for extruding the aerial stem.

Holm ('American Midland Naturalist,' ix. 458; 1925) has given a brief account of the seedling and first stages of the rhizome, and it is intended to deal in a later paper in more detail with them; but before passing on attention may be called to the great number of buds which are produced on a mature rhizome—put by, seemingly, as an insurance against winter damage. There were about 20 at rest on this finger of rhizome, half of them probably under normal circumstances altogether superfluous.

The reader will have understood that the rhizome is sympodial, with growth alternately to right or to left, and that secondary growth brings all the apices to an upward position. If such a calyptriform bud, as is seen on lobe 7 (fig. 1), be cut horizontally, the succession of scales and shoots represented in fig. 2 is exposed. Each stem begins in this species with a calyptriform scale and gives off into its axil a branch: the scale enwraps both stem and branch: the branch in its turn begins with another calyptriform scale covering a branch in its axil; and this second calyptriform scale enwraps stem and branch again: so the process is continued; the numerals on fig. 2 indicate the sequence. The

thicker parts of the scales pull more or less in the same direction, resisting the growth of the stem within; and the latter becomes arched forward, as is drawn in fig. 1 on lobe 6. This arching forward is a phenomenon entirely unlike the bending down of the apex in the stem of *Tamus* while yet underground.

A sympodial arrangement, as that in the rhizome to which attention has been called, is repeated in the buds on the lobes: they lie in series—to right and to left alternately.

Comment has been made above on the number of buds in reserve. Of stems such as are represented in fig. 2, it is probable that nos. 5, 6, and 7 would never be stimulated into growth. In the following paragraph it will be shown that such as they are begin life in a weaker condition than those which are called into activity.

In fig. 2, a ring within stem no. 6 indicates the tissue, at this stage relatively transparent and easily recognisable, which gives rise to the vascular bundles. It forms a continuous cylinder and develops corrugations longitudinally; and then, between the places where leaves are developing, it breaks up into the two rings of vascular bundles which are seen in stem no. 5, by means of parenchyma which separates the outer curve of each corrugation from the inner and finally causes the two rings of bundles to be as distinct as in stem 1 of that figure. The number of vascular bundles produced is not the same in all stems, nor in different parts of the same stem; but it is proportionate to the size of the stem. The inner ring consists of cauline bundles; the outer ring of common bundles—so called because they are common to the stem and leaf; upwards they pass outwards in the leaf-traces by threes. As a rule, the number of cauline bundles in a stem at any point is either as many as, or one fewer than, the number of common bundles. The greatest number seen by the writer in the stem of *D. glauca* is 38, nineteen being cauline and nineteen being common. In the stems which he examined, one first stem of a series (for instance, no. 1 of fig. 2) would have such a number as this in its first internode above the calyptriform scale, while the remoter stems would have smaller numbers, *i. e.*, they were weaker—but, however, not greatly so.

If an individual mature stem be taken and sections cut at various distances from the base, a parallel reduction is seen, but with greater extremes; and, *pari passu*, with the reduction in the number of bundles the stem becomes thinner. A stem with 38 vascular bundles in it through the lowest 30–40 cm. upwardly becomes less abundantly supplied until there may be 10 only. However, it does not always contain its maximum at the very base—for instance, a stem, which may be used as an illustration, had 31 bundles just above the calyptriform scale, 34 just above the first group of leaves, with a diameter of 4·5 mm., and towards its extreme tip 18, with a diameter of 2 mm.

It is convenient here to digress for a moment, in order to bring into line a remark in de Bary's 'Comparative Anatomy of the Phanerogams and Ferns' (English ed., 235; 1884). De Bary, referring to the tubers of *D. opposita* Thunb. (a species well known in the past as *D. Batatas*), says that the tubers "are traversed by numerous separate bundles which converge towards the apex and are finally united into a short terminal portion." The short terminal portion represents the initial cylinder of undeveloped vascular tissue seen in stem no. 6 (fig. 2), and the abundant storage tissue of the tuber represents the filling of parenchyma which divides the bundles in stem no. 1. De Bary, it may be explained, erroneously held that *Dioscorea* tubers are root structures.

Returning to the stem of *D. glauca* it is to be remarked that, as in other Dioscoreas, there are grooves outside the cauline bundles and ridges outside the common bundles. By counting

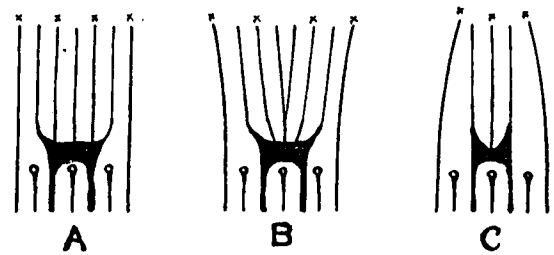


Fig. 3.—Diagrams of the course of vascular bundles at the nodes. A, the unions seen under the insertion of a leaf where there is neither increase nor decrease in the number in the stem; the three common bundles which make the leaf-trace pass out of the plane and are replaced by three above: the crosses indicate cauline bundles. B, a case of increase in the number of common bundles. C, a case of decrease of one cauline and one common bundle.

them it is possible to obtain a knowledge of how many bundles there are within; but sometimes the ridges are not distinct enough for certainty. The grooves retain the slime-secreting hairs after the ridges have lost them.

As the common bundles enter the petiole in leaf-traces of threes, a stem with 19 common bundles in it holds the supply for six leaves with one over: a stem with 9 holds no more than the supply for three leaves. In parts of the stem where the number of bundles is neither rising nor falling, diagram A of fig. 3 shows what happens. Three common bundles pass out—they are represented as ceasing: the cauline bundles behind them form something suggestive of a nerve ganglion; and three common bundles are anchored in this ganglion-like body replacing and occupying the positions in the outer ring of the three which pass out of the stem.

All the five—the three common and the two cauline—are thicker just below the insertion of the leaf: they maintain this greater thickness from their embryonic condition, and the cauline do not here become parted by parenchyma as represented on stems 1 and 5 of fig. 2. T. G. Mason (Sci. Proc. Roy. Dublin Soc. xviii. 195; 1926) has called attention to interesting anatomical structures in these ganglion-like unions of bundles in *Dioscorea*, but "not found in *D. villosa*." As his material for study came from Kew, he referred to *D. glauca* as exceptional.

In some Dioscoreas no more than two cauline bundles at a node show this disturbance: in others, including *D. glauca*, adjacent cauline bundles may show disturbance. It is always possible by the use of sections of the stem to trace bundles past the disturbance at the node and to measure in terms of bundles the distance round the axis of one leaf from another.

The middle diagram of fig. 3—B—shows the addition upwards of a common bundle, two being anchored into the ganglion-like junction in the centre. This way of increasing the number happens frequently: and at times an additional cauline bundle takes origin in the same manner. Diagram C of the same figure shows how a reduction in the number of bundles usually occurs—a common and a cauline bundle being lost together.

In the following statements divergences have been worked out by means of the vascular bundles; when, for instance, 28 vascular bundles were present, half of them would be common and half of them cauline, and two common and three cauline might be found to pass unbroken on the left of leaf A and on the right of leaf B, which meant that from one median leaf-trace to the next was the space of 10 bundles or 10/28 of the whole stem, presuming the spacing equal (which it is approximately), *i.e.*, the divergence was 5/14: again, if, for instance, 18 vascular bundles were present, half of them common and half of them cauline, should one common bundle and two cauline bundles pass unbroken on the left of leaf A and on the right of leaf B, then the number of bundles from one median leaf-trace bundle to the other would be 8 and the divergence 8/18 or 4/9, which is a condition very much nearer to that of opposite leaves than the first.

Nägeli (Beitr. wissensch. Bot. i. 124; 1858) pointed out that the divergence in *Tamus communis* is variable. Falkenberg ('Vergleichende Untersuchungen über den Bau der Vegetationsorgane der Monocotyledonen,' 65; 1876) stated that *D. villosa* has a variable divergence. Jungner (Bihang K. Svensk. Vetensk. Akad. Handl. xiii. pt. 3, no. 7, 61; 1888) made the same statement, with the fractions he had found. Neither Falkenberg nor Jungner indicated to which part of *D. villosa* he referred; but it is certain that the part which is *D. glauca* has a most variable phyllotaxy. The writer, using the method described above, found, by investigating about eighty cases, that its limits are

almost 1/7 and almost 1/2, or in terms of bundles 5/34 and 18/38—say, in degrees of the circle 53° and 171°.

The reader will understand that measurement in degrees of the circle cannot be accurate, but it brings to the mind the variability more clearly than high fractions. The stem is already cylindrical when the corrugated embryonic vascular tissue breaks up into bundles, and the earlier paraboloid condition of its apex, as having passed away, seems to need no consideration.

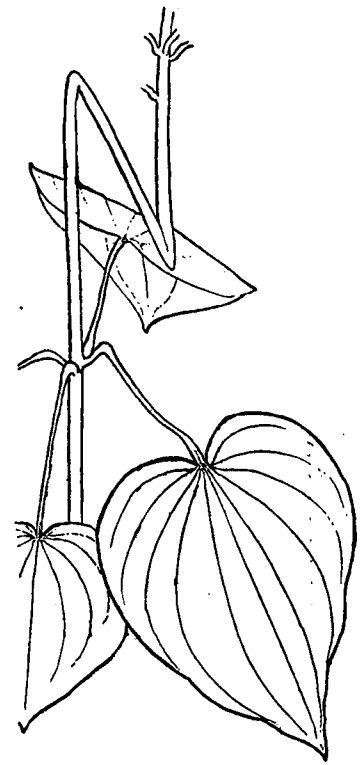


Fig. 4.—Part of a stem of *Dioscorea glauca*, to indicate how the leaves are in groups.

The following statements are from a particular stem worked out in detail. The divergences are indicated for its 35 leaves by means of nine diagrams, in which the common bundles are indicated, the median of a leaf-trace by black triangles, the laterals of a leaf-trace by arrow-heads, and bundles passing the leaves by white triangles. The numbers refer to the successive leaves and the arrows to their succession.

Fig. 4, which precedes the diagrams, is a piece of a stem with four leaves grouped together at the top of a long internode, followed by another long internode, and this by more leaves in association. The writer has had no living material with more than four leaves at any one point; but Small, *op. cit.*, says that there may be even as many as seven. Fig. 4 was not drawn from the stem which supplied the diagrams to follow, but was closely similar in general appearance.

The stem, now to be considered, was about 1·5 m. long and bore 35 foliage leaves. The first leaf was 294 mm. from the calyptriform scale, the second 0·5 mm. higher, the third 3 mm. above the second, and the fourth 0·5 mm. above the third. Then followed an internode of 140 mm. and a solitary leaf. It will

The Length, Diameter, and Number of Bundles in successive Internodes of a selected Stem of D. glauca.

Distance from the last leaf in mm.	Diameter of the first of the internodes in the group.	Number of vascular bundles.	
		Cauline.	Common.
294, 0·5, 3, 0·5	4·5	17	17
140	4·5	17	17
75, 0·5, nil	4·0	17	17
85, nil	3·75	16	17
76, nil	3·75	16	17
54, 12, nil	3·5	15	16
94, 28, nil, nil, nil	3·25	15	15
148, 1, 2, 0·5	3·0	14	14
130, 8, 2, 2	2·75	13	13
155, nil, 1, 3.....	2·5	12	13
145	2·5	12	12
28, 20	1·5	9	9

be best to give the whole of the stem in tabular form, and at the same time to add the diameter and the number of vascular bundles.

The first diagram (fig. 5) is of the position of the leaves at the head of the lowest long internode—the internode of 294 mm. The position of the branch in the axil of the calyptriform scale is indicated by the letter B: so one gets the position of the median nerve of the calyptriform scale. Leaves nos. 1 and 2 appeared on the opposite side of the axis at the end of the long arrow. Then followed leaves nos. 3 and 4, one on either side. After another long internode leaf 5 appeared over the space between nos. 3 and 4, and the production of lateral organs, with this, had swung back to the neighbourhood of the orthostichy of the calyptriform scale. As the middle diagram shows, the

stem under leaf no. 6 still had 17 common bundles, and leaf no. 6 was as nearly opposite to leaf no. 5 as the half of an odd number permits. Again, leaves follow leaf no. 6 round the sides of the stem, no. 7 having a pair in 7 *a* and no. 9 a pair in 9 *a*. They were exactly paired.

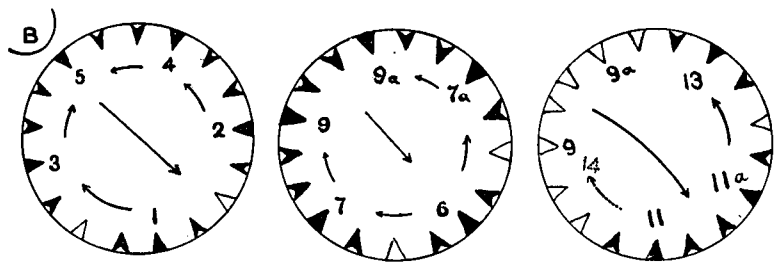


Fig. 5.—Diagrams to indicate the relationships of successive leaves: the leaves are indicated by numbers; each has three leaf-trace bundles, the central marked as a black triangle, the lateral as black arrow-heads, and the number of the leaf is against the central. Common bundles which serve none of the leaves in the group are indicated by white triangles. Arrows indicate the sequence of organs. B is the branch in the axil of the calyptriform scale. These three diagrams relate to leaves 1 to 13.

The right-hand diagram again shows 17 common bundles, but in the ganglion-like junction of cauline bundles at leaves 9 and 9 *a* one of the cauline bundles had been dispensed with and thereby two common bundles became neighbours. The production of lateral organs swings back again with leaves nos. 11 and 11 *a*, but obliquely, as the long arrow indicates. This obliquity is

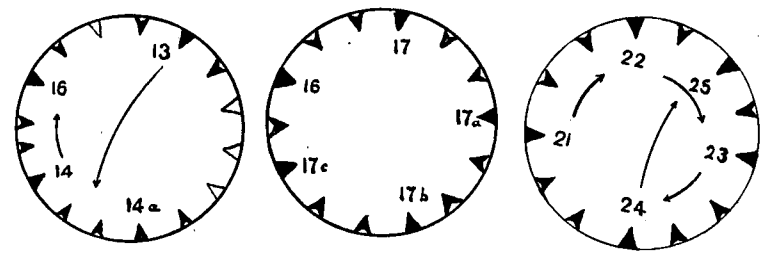


Fig. 6.—Diagrams similar to those in fig. 5, relating to leaves 13 to 25.

the beginning of a further obliquity, as becomes clear in the left-hand diagram of fig. 6, for leaf no. 14 would seem to be due facing leaf no. 13, were it not that the space for it is under size: it was separated from no. 13 by a long internode and, as the left-hand diagram (fig. 6) indicates, when it did appear was paired

with another—14 *a* in the diagram. The number of vascular bundles was now down to 30—fifteen common and fifteen cauline. Following leaves nos. 14 and 14 *a*, instead of no. 16 appearing on one side and no. 17 on the other, no. 16 appeared unpaired and the space for no. 17 was smaller than the space for no. 16. Then, as the middle diagram shows, no. 17 appeared, not alone nor even paired, but with three companions. No arrows have been put on that diagram; but it may be that nos. 17 *a* and 17 *b* are a pair corresponding to the pair 14 and 14 *a*; and that nos. 17 and 17 *c* follow as the leaf-formation passes back to the side of no. 16.

The number of common bundles was next reduced to 13, as the right-hand diagram indicates. Leaf no. 21 now appeared partly over leaf no. 16, and a distinct tendency to a spiral arrangement developed, but was checked by the position of leaf no. 25 obliquely opposite no. 24.

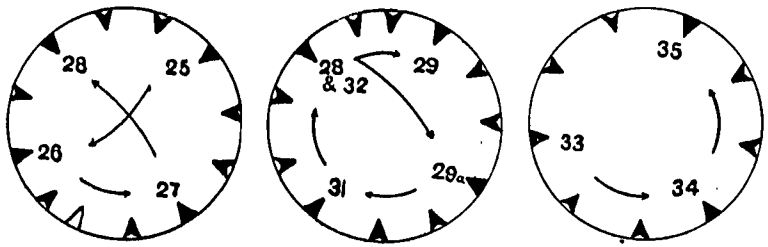


Fig. 7.—Diagrams similar to those in fig. 5, relating to leaves 25 to 35.

In the left-hand diagram of fig. 7 the common bundles are reduced to 12—that is, just enough for the leaf-traces of four leaves; but the next four leaves are not quite evenly spaced, so that no. 28 has anchored one of the lateral bundles of its leaf-trace no further away that the ganglion-like junction of the node of leaf no. 26—the distance on the stem being 4 mm. Twice in this diagram arrows indicate a long swing across the axis.

In the middle diagram the spiral tendency appears more distinctly; and it appears to be fully established in the right-hand diagram, but the direction is reversed.

One further figure is necessary. The reader may be reminded that *Dioscorea* is a genus of the Monocotyledons among which distichous arrangements of lateral organs are common. The distichy of the rhizome of *D. glauca* and the buds on its rhizome has been made evident. It is suggested that distichy extends to the leafy stem, but is obscured by the number of leaves accommodated round the axis; that it is possible to detect it in the order in which the leaves appear on the chief part of the stem,

and upwards until a genetic spiral obliterates it; and that it is possible to connect the elongation of the long internodes with it—for, as fig. 8 suggests, when the growth-rhythm swings right across the axis, a long internode is initiated. It is suggested that the swing crosses the axis between the calyptriform scale and leaves 1 and 2, the internode being 294 mm. long; checked at a place where the axis has room for more lateral members,

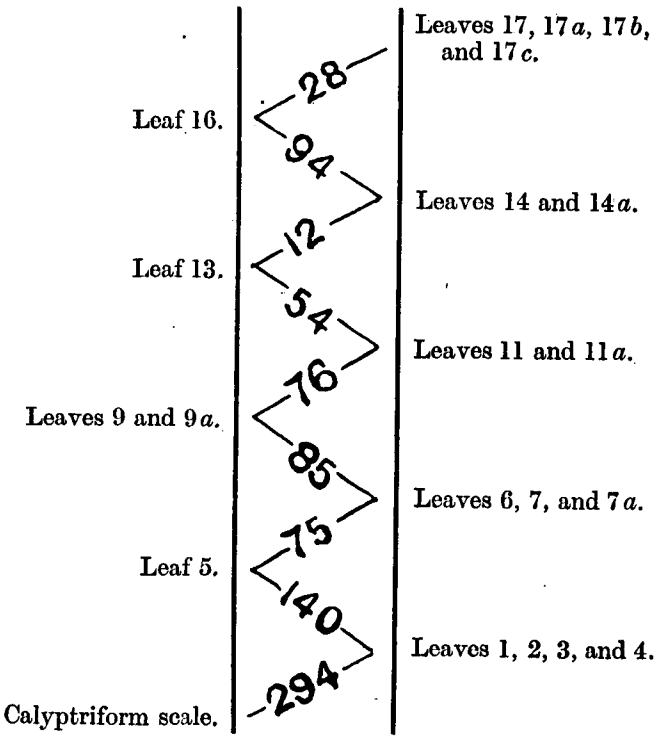


Fig. 8.—Diagram giving the position of the leaves with regard to the long internodes—the length of these is given.

leaves nos. 3 and 4 are left in close attachment to nos. 1 and 2. The swing reaching the other side gives rise to a long internode under leaf no. 5. Then it swings across again to leaf no. 6 to the side more connected with leaf-formation than the other and where leaves 7 and 7 *a* are left in close association with leaf no. 6. It swings across again this time to a pair of leaves (nos. 9 and 9 *a*), and back to another pair (11 and 11 *a*), and so on as the

figures suggest. The suggestion that distichy is connected is offered for criticism. In no case can one get away from the fact that leaves become spaced in different measures on different sides of the stem.

One remark must be made before closing: it is that leaves nos. 1 and 2 and leaves 3 and 4 were not absolutely pairs, as assumed in the left-hand diagram of fig. 5, and that some other stems showed the same phenomenon of leaves in the first group nearly but not quite in pairs. The explanation given assumes that they may be regarded as pairs.

Summary.

With the object of understanding the morphology of the stems of the Dioscoreaceae, *Dioscorea glauca* has ben studied in some detail. In it the position of the leaves round the axis is determined long before the internodes elongate. Elongation of these, when it follows, carries some of the leaves much further from their neighbours than others. The internal force leading to this seems to be rhythmic, and its effect to oscillate across the axis: when it is the turn of a leaf (sometimes a pair share the turn) at the end of the oscillation to be removed from the neighbourhood of those below it a long internode results, and when it is the turn of a leaf which is lateral to the line of oscillation to be removed from the neighbourhood of those below it only a short internode results. Thus is the elongation of the internodes bound up with the divergence—and this divergence varies greatly.

It is suggested that the distichy seen in the underground parts is another phase of the oscillation.

This paper will be followed by one on *Tamus communis*, wherein a slightly different arrangement of long and short internodes is described.

Research during the last twenty years has established the existence in plants of chemical substances known as auxins: for a full account of them, see F. A. F. C. Went's paper in the 'Biological Reviews' of the Cambridge Philosophical Society, x, 187; 1935. They are produced in various parts of plants, one being the young leaf, if not also the tissue immediately under it. It is thought that an auxin is produced in or under the young leaves of this *Dioscorea* and of *Tamus*. Like all known auxins in cauline tissue, the activity of this supposed auxin is seen in the stem below its place of origin. Rhythmic activity has been detected in connection with auxins; but not such as would make long and short internodes to follow each other. It is self-evident that a factor must exist checking the action of auxins; and it may be that this new rhythm is a rhythm of a checking factor bound up with the distichy of the stem. Whatever it is, an interesting field for further work lies open.

Miss Saunders's "Leaf-skin Theory," claiming that the internode belongs to the leaf above it, is so far good that the internode may be demonstrated as under the influence of the leaf above it.

In *D. glauca* there is an abundant provision of buds on the rhizome for growth if needed: this is described in the preceding pages as well as the secure way in which the very young bud is protected.

NOTES ON THE FLORA OF THE BERMUDAS.

By A. B. Rendle, F.R.S.

(Concluded from p. 71.)

I am indebted for the following notes on the Bryophyta and Thallophyta that I collected to the various specialists under whose names they appear. New records are indicated by an asterisk. The specimens and also those of the flowering plants and ferns are in the British Museum Herbarium :—

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

Leucobryum glaucum (Hedw.) Schimp. On wet ground among ferns, with *Odontoschisma prostratum*, Paget Marsh, March 27, no. 419; May 5, no. 711.

Fissidens Garberi Lesq. & James. On a much weathered honeycombed piece of rock near the quarry, Castle Harbour; growing with *Lejeunea minutiloba*. A narrow, rather acute-leaved form. April 6, no. 515 *a*.

Trichostomum bermudanum (Mitt.) Par. Endemic. Very common on walls and rocks.

Tortula agraria Sw. Shady bank, Hungry Bay, April 8, no. 523.

*Bryum erythrocarpum Schwaegr., forma. Rock near quarry, Castle Harbour, April 6, no. 514. I think there is little doubt of this, though it is quite "off-type" in the leaves, and the fruit is not quite so mature as one would have liked for a new record. The species has not been recorded for Bermuda, but it is quite what one might expect there.

Amblystegium varium Lindb. Face of damp rock, Orange Valley, Devonshire, March 30, no. 467. On stone, and creeping over roots in mud, Devonshire Marsh, April 4, no. 486.

ISOPTERYGIUM MICANS (Sw.) Mitt. With *Odontoschisma prostratum* on decaying fern-root and butt of Palmetto, Paget Marsh, Devonshire Marsh. March, April.

*TORTELLA FLAVOVIRENS (Bruch) Broth. On rock near Hungry Bay, south shore, no. 468. The genus has not hitherto been recorded for Bermuda. An interesting link of an "Atlantic" European species with the only known locality for it in the United States of America—namely, Florida.

*CLAOPODIUM (?). On damp rock face in cave near the hotel, Castle Harbour, with *Radula pallens*, April 6, no. 513. A very interesting little moss which I cannot place. It is almost certainly a *Claopodium* (a genus not hitherto recorded for Bermuda), but does not agree with any described species. Unfortunately the material is very scanty, and there is also the question whether it might be a shade-form of something.

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

The islands of the Bermuda group, owing to their extreme isolation, their very small total area, and the uniformly limestone character of the soil have but a very restricted hepatic flora, which is a collection of waifs and strays either of general European and North American distribution or derived from the West Indies and the southern parts of North America. There are no endemic elements, though a few of the species, such as *Lejeunea minutiloba* Evans and *Crossotolejeunea bermudiana* Evans would appear to be more frequent there than elsewhere.

The hepatic flora has been admirably dealt with by Dr. A. W. Evans in the 'Flora of Bermuda,' by Dr. N. L. Britton (New York, 1918), but in view of the rapidly changing flora of the islands owing to drainage and other "improvements" it may not be without interest to place on record a list of the species found by Dr. Rendle, which embraces nearly half of the total number recorded from the islands :—

REBOULIA HEMISPHAERICA (L.) Raddi. Wall by roadside, Prospect, April 20, no. 587; Doe Bay, south shore, rock-wall by path to the sea, c.fr., March 18, no. 350.

ANEURA LATIFRONS Lindb. On roots of fern in Paget and Devonshire Marshes. March 17, no. 333, with *Cephalozia connivens*; March 28, no. 470, and April 12, no. 717, with moss and *Calypogeia fissa*; April 4, no. 485.

PALLAVICINA LYELLII (Hook.) Gray. On wet ground, Paget Marsh, c.per., March 27, no. 432, May 8, no. 708; on damp fern-root, Devonshire Marsh, April 12, no. 541.

CEPHALOZIA CONNIVENS (Dicks.) Lindb. On roots of fern with *Aneura latifrons*, Paget Marsh, March 17, no. 333; and on root of Palmetto with *Parmelia* sp., *Odontoschisma prostratum*, and *Telaranea nematodes*, May 8, no. 709.

ODONTOSCHISMA PROSTRATUM (Sw.) Trevis. Wet ground, Paget Marsh, May 8, no. 707, and creeping among *Leucobryum glaucum* March 27, no. 429, and on roots of fern with *Isopterygium micans*, March 17, no. 332; on fern root Devonshire Marsh, April 12, no. 716.

CALYPOGEIA FISSA (L.) Raddi. On fern roots, Devonshire Marsh. March 28, no. 430; April 4, no. 484; April 12, no. 715.

TELARANEA NEMATODES (Gotts.) Howe. On fern root, Devonshire Marsh, c.per., April 4, no. 483; Paget Marsh, on bark of decaying Palmetto, March 27, no. 417; on Palmetto root, c.per., May 8, no. 709.

RADULA PALLENS (Sw.) Dum. Devonshire Marsh, on damp ground, March 28, no. 440, on stone with *Lejeunea minutiloba*, April 4, no. 518; coating damp rock face in cave near Castle Harbour Hotel, April 6, no. 512.

COLOLEJEUNEA MINUTISSIMA (Sm.) Schiffn. Devonshire Marsh, on bark of Juniper with *Parmelia* sp., March 28, no. 435, and on decaying branch of *Myrica cerifera*, c.per., no. 439.

LEJEUNEA MINUTILOBA Evans. On piece of wood, Devonshire Marsh, c.per., April 4, 518 *a*; on rock near quarry, Castle Harbour, April 6, no. 515.

RECTOLEJEUNEA PHYLLOBOLA (Nees & Mont.) Evans. On a stem of *Jasminum simplicifolium* in the jungle on ridge, Castle Harbour, c.per., April 6, no. 516.

FUNGI. By Miss F. L. STEPHENS, M.Sc., F.L.S.

Previous records of fungi from Bermuda were made by :—

"The 'Challenger' Expedition" (Report of the Scientific Results of the Voyage of H.M.S. 'Challenger,' 1873–6, i. 1885, 100–5; Journ. Linn. Soc. London, xiv. 351–2, xv. 48–9). 24 species are recorded.

George Massee, "Fungi Exotici" ('Kew Bulletin,' 1898, 133–4). 4 species are enumerated.

F. J. Seaver (Mem. New York Bot. Gard. vi. 501–13; 1916) describes 122 fungi.

N. L. Britton ('Flora of Bermuda,' New York, 1918). Includes a general survey of the fungi of Bermuda.

J. C. Arthur (Bull. Torrey Bot. Club, xlix. 194 ; 1922) describes as new a rust found on *Sisyrinchium Bermudiana*.

José Vizioli (' Mycologia,' xv. 107–20 ; 1923). An account of 21 Pyrenomycetes.

F. J. Seaver, H. A. Whetzel, and C. Westcott (' Mycologia,' xix. 43–51 ; 1927) give an account of *Poronia leporina* and mention some Geasters and a species of *Tylostoma*. This is the first paper of a series intended to form a complete report of collections made in the year 1921–22 and the the winter 1925–26.

The only fungi of the present collection worthy of special mention are some species of *Atichia* found on *Elaeodendron Laneanum*, *Jasminum simplicifolium*, *Eugenia axillaris*, and *E. uniflora*. As these do not appear to fit any known species of the genus, they will be described in a later paper together with two records from New Zealand.

Species which, as far as I know, have not hitherto been recorded are marked by an asterisk.

Ascomycetes.

Dimerosporium meliloides (B. & Rav.) Sacc. On *Baccharis glomeruliflora*, Paget Marsh, March 27, no. 402. Previously found by Seaver, 1916.

Meliola Cookeana Speg. On *Lippia nodiflora*, Devonshire Marsh, April 18, no. 561. Previously recorded by Seaver, 1916.

*Leptosphaeria culmorum Auersw. On *Scirpus Olneyi*, Warwick Marsh, April 19, no. 567.

Hypoxylon multiforme Fr. On *Myrica cerifera*, Devonshire Marsh, March 28, no. 433. Previously recorded by the ' Challenger ' Expedition and by Seaver, 1916.

Basidiomycetes.

*Anthracoidea Caricis (Pers.) Bref. On *Rhynchospora stipitata*, Devonshire Marsh, March 8, no. 220.

*Uromyces Bidentis Lagerh. On *Bidens pilosa*, Devonshire Marsh, April 18, no. 562.

U. striatus Schroet. On *Medicago hispida*, Khyber Pass, Warwick, April 22, no. 585. Previously found by Seaver 1916.

Uredo nominata Arth. On *Sisyrinchium Bermudiana*, Warwick Bay, May 8, no. 724, and Walsingham, March 28, no. 428. This species was first described from Bermuda material in 1922.

Puccinia Dichondrae Mont. On *Dichondra carolinensis*, Devonshire Marsh, March 20, no. 353. Previously recorded by Seaver, 1916.

*P. Hydrocotyles (Link) Cooke. On *Hydrocotyle verticillata*, Devonshire Marsh, March 8, no. 221 ; April 18, no. 560.

P. Lantanae Farl. On *Lantana involucrata*, Prospect, March 8, no. 227 ; Coral Beach, March 13, no. 271 ; Orange Valley, Devonshire, April 12, no. 534. Previously recorded by the ' Challenger ' Expedition and by Seaver, 1916.

*Polystictus pinsitus (Fr.) Cooke. On *Juniperus bermudiana*, Prospect, April 18, no. 563.

*Fomes fomentarius (Link) Gill. Devonshire Marsh, March 28, no. 434.

Stereum hirsutum (Willd.) Fr. On *Myrica cerifera*, Devonshire Marsh, March 28, no. 436. Previously recorded by Seaver, 1916.

*Cyathus vernicosus (Bull.) DC. On soil, Prospect, March 11, no. 254.

Fungi Imperfecti.

*Phoma herbarum West. On decaying *Pimento* leaves, Agricultural Park, March 4, no. 200.

*P. Oleandrina Delacr. On *Nerium Oleander*, Prospect, March 8, no. 233.

*Phyllosticta Coccolobae Ell. & Ev. On *Coccoloba uvifera*, Hungry Bay, April 8, no. 532 *a*.

*P. Neriii West. On *Nerium Oleander*, Prospect, March 7, no. 232.

*Macrophoma Oleandri Pass. On *Nerium Oleander*, Devonshire Marsh, March 8, no. 228 ; Warwick Marsh, April 22, no. 719.

*Gloeosporium Canavaliae Syd. On *Canavalia lineata*, Coral Beach, March 13, no. 272.

*Tubercularia vulgaris Tode. On *Myrica cerifera*, Devonshire Marsh, March 27, no. 437.

*Cercospora bicolor Wint. On *Coccoloba uvifera*, Coral Beach, March 13, no. 273.

*Cladosporium herbarum (Pers.) Link. On dead *Pimento* leaves, Agricultural Park, March 4, no. 200 ; *Rhizophora Mangle*, Hungry Bay, March 11, no. 259 ; *Coccoloba uvifera* Hungry Bay, March 11, no. 260.

LICHENS. By Miss A. LORRAIN SMITH, O.B.E., F.L.S., and I. M. LAMB, B.Sc., F.L.S.

THYREA CUBANA (Tuck.) Riddle (*Omphalaria cubana* Tuck.). On rock, Spanish Rock, south shore, April 1, no. 461.

*COLLEMA (SYNECHOBLASTUS) VESPERTILIO (Lightf.) Hoffm. On fence, Orange Valley, Devonshire, April 24, no. 781. *Distrib.* Europe and North America.

LEPTOGIUM TREMELLOIDES (Linn. f.) S. F. Gray. On stem of Juniper, Prospect, March 13, no. 264; on stem of Jasmine in "jungle," Castle Harbour, April 6, no. 516.

PYRENULA NITIDA (Weig.) Ach. var. NITIDELLA (Flk.) Schaer. On Fiddle-wood, Prospect, April 5, no. 697.

OPEGRAPHA BONPLANDI Fée. On Fiddle-wood, Prospect, April 1, no. 421.

GRAPHIS LINEOLA Ach. Hungry Bay, March 11, with *Ramalina complanata*, no. 783.

CHIODECTON sp. In jungle, Castle Harbour, March 16, no. 335.

CLADONIA FIMBRIATA (L.) Fr. var. BORBONICA (Del.) Wain. On bank, Orange Valley, Devonshire, April 12, no. 537.

C. FIMBRIATA (L.) Fr. var. Paget Marsh, March 27, no. 415.

*C. DELICATA (Ehrh.) Floerk. Paget Marsh, March 17, no. 331. *Distrib.* Cosmopolitan.

*PARMELIA CETRATA Ach. On decaying branch of *Myrica cerifera*, Devonshire Marsh, March 28, no. 438. Widely distributed in temperate and warm zones.

P. TINCTORUM Despr. On Juniper bark, Prospect, April 1, no. 422; on decaying branch of *Myrica cerifera*, Devonshire Marsh, March 28, no. 804.

RAMALINA COMPLANATA (Sw.) Ach. Common on branches of trees.

BUELLIA CANESCENS De Not. On Juniper stem, Prospect, March 13, no. 264 *a*.

PHYSCIA STELLARIS (L.) Nyl. On Buttonwood (*Conocarpus erecta*), Hungry Bay, April 8, no. 782.

P. CRISPA (Pers.) Nyl. On fence, Orange Valley, Devonshire, April 24, no. 718.

MARINE ALGAE. By GEOFFREY TANDY, B.A., F.L.S.

Note.—The Algae of Bermuda have been well worked by American botanists—F. S. Collins and A. B. Hervey ("Algae of Bermuda," Proc. Amer. Acad. Arts & Sci. liii. 1–195; 1917),—and Marshall A. Howe has given an account of the more common and conspicuous species in Britton's 'Flora of Bermuda.' It may seem presumptuous for a mere phanerogamist to attempt a contribution, but the following list may supply a few additional localities and indicate the relative frequency of some of the commoner species. The collection was made mainly during April and May on the rocks and in the tide-pools in the bays along the south shore—Doe Bay, Devonshire Bay, Hungry Bay, Grape Bay, Warwick Bay, Church Bay, and Wreck Bay; at Ruth's Bay and Cooper's Island in Castle Harbour; and with the kind assistance of Dr. and Mrs. L. R. Blinks at Agar's Island and Fairyland Creek in the Great Sound. The only new record is *Lophocladia trichoclados*, collected on the south shore and at the eastern end of the Islands. It has a wide Atlantic distribution, West Indies, Canary Is., and the West African coast.

The marine Monocotyledon, *Thalassia testudinum* Konig & Sims, was common in shallow water; near Agar's Island it formed a green meadow on the sea-bottom. Here also grew *Cymodocea manatorum* Aschers., recorded by Britton for Castle Harbour.—A. B. R.

CHLOROPHYCEAE.

ULVACEAE.

ENTEROMORPHA spp. Doe Bay, Hungry Bay, Grape Bay (384, 530, 546, 727).

ULVA spp. (? LACTUCA L.). Hungry Bay, Ruth's Bay (721, 753).

CLADOPHORACEAE.

CLADOPHORA FULIGINOSA Kuetz. Devonshire Bay, Grape Bay, St. David's and Cooper's Islands (724, 737, 738, 743, 764, 766).

RHIZOCLONIUM ? RIPARIUM (Roth) Harv. Wreck Bay (744).

ANADYOMENE STELLATA (Wulf.) Ag. Agar's Is., Devonshire Bay (624, 767).

VALONIACEAE.

VALONIA MACROPHYSA Kuetz. Fairyland Creek (621).

ENDODESMIS VERTICILLATA (Kuetz.) Boerg. Devonshire Bay, Warwick Bay, Ruth's Bay (625, 720, 725).

DASYCLADACEAE.

ACETABULARIA CRENULATA Lamour. Fairyland Creek (628).

DASYCLADUS CLAVAEFORMIS (Roth) Ag. Cooper's Is. (776).

CODIACEAE.

CODIUM INTERTEXTUM Collins. Agar's Is. (622).
C. ISTHMOCLADUM Vick. Agar's Is., Wreck Bay (630, 723).
AVRAINVILLEA NIGRICANS Decaisne. Agar's Is. (773).
PENICILLUS CAPITATUS Lam. Agar's Is. (752).
HALIMEDA TUNA (E. & S.) Lamour. Agar's Is. (623).
H. TRIDENS (E. & S.) Lamour. Agar's Is. (772).

BRYOPSIDACEAE.

BRYOPSIS PENNATA Lamour. Agar's Is. (640).

CAULERPACEAE.

CAULERPA CRASSIFOLIA (Ag.) J. Ag. Ruth's Bay (765).
C. RACEMOSA (Forsk.) J. Ag. Agar's Is., Wreck Bay, Devonshire Bay (631, 736, 746, 749).
C. CUPRESSOIDES (Vahl) Ag. Agar's Is., Ruth's Bay (617, 742).

PHAEOPHYCEAE.

ENCOELIACEAE.

COLPOMENIA SINUOSA (Roth) D. & S. Agar's Is., Hungry Bay (620, 755).
SCYTOSIPHON LOMENTARIA (Lyngb.) J. Ag. Wreck Bay (775).

MESOGLOIACEAE.

CASTAGNEA ZOSTERAE (Mohr) Thur. Ruth's Bay, Wreck Bay (756, 774).

FUCACEAE.

SARGASSUM NATANS (L.) Meyen. Warwick Bay (695).
S. ? LINIFOLIUM (Turn.) Ag. Agar's Is. (639).
S. LENDIGERUM (Turn.) Ag. Agar's Is. (616).
S. spp. Warwick Bay, Wreck Bay (696, 769).

DICTYOTACEAE.

ZONARIA ZONALIS (Lamour.) Howe. Doe Bay, Devonshire Bay, Hungry Bay, Cooper's Is. (383, 754, 761, 771).
PADINA spp. Agar's Is., Hungry Bay (643, 753).

RHODOPHYCEAE.

HELMINTHOCLADIACEAE.

LIAGORA ELONGATA Zanard. Ruth's Bay (732).
L. CERANOIDES Lamour. Grape Bay (762).

CHAETANGIACEAE.

GALAXAURA OBTUSATA (E. & S.) Lamour. Grape Bay (763).
G. sp. Devonshire Bay (751).

GELIDIACEAE.

WRANGELIA sp. Wreck Bay (746).

RHODOPHYLLIDACEAE.

EUCHEUMA DENTICULATUM (Burm. f.) Coll. & Herv. Ruth's Bay (778).

BONNEMAISONIACEAE.

ASPARAGOPSIS TAXIFORMIS (Del.) Coll. & Herv. Hungry Bay (544).

RHODOMELACEAE.

LAURENCIA PAPILLOSA (Forsk.) Grev. Doe Bay, Devonshire Bay, Hungry Bay, Grape Bay, Ruth's Bay (385, 529, 730, 739, 768).
L. OBTUSA (Huds.) Lamour. Agar's Is., Devonshire Bay, Ruth's Bay, north shore St. George's (729, 757, 758, 603, 636).
*LOPHOCLADIA TRICHOCLADOS (J. Ag.) Schmitz. Rock pool at tide-level, Grape Bay, Ruth's Bay (528, 740).
DIGENEA SIMPLEX (Wulf.) Ag. Devonshire Bay (760, 777).
BOSTRYCHIA nr. SERTULARIA Mont. Agar's Is. (619).
B. TENELLA (Vahl) J. Ag. Devonshire, Hungry, Church and Wreck Bays, north shore St. George's (545, 552, 605, 745, 748, 759).
DASYA ? OCELLATA (Grat.) Herv. Agar's Is. (635).
D. ARBUSCULA (Dillw.) Ag. Agar's Is. (637).
D. PEDICELLATA Ag. Agar's Is. (646).
D. RAMOSISSIMA Harv. Cooper's Is., Warwick Bay (733, 734).

CERAMIACEAE.

CERAMIUM CLAVULATUM Ag. Devonshire, Hungry and Grape Bays, north shore St. George's (604, 728, 731, 737, 750, 764).

GRATELOUPIACEAE.

HALYMENIA BERMUDENSIS Coll. & Herv. Agar's Is. (632).
H. PSEUDOFLORESIA Coll. & Howe. Agar's Is. (634).

* Not mentioned in Collins and Hervey, "Algae of Bermuda."

CORYNOMORPHA CLAVATA (Harv.) J. Ag. Whale Bay (coll. *Blinks*) (618).

DUMONTIACEAE.

DUDRESNAYA CRASSA Howe. Agar's Is. (648).

CORALLINACEAE.

CORALLINA RUBENS L. Hungry Bay (735).

NOTE.

Reference has been made above (p. 47) to a small collection received by Petiver from John Dickinson and preserved in the Sloane herbarium. Dr. Britton refers to Petiver's record* as "probably the earliest reference to Bermuda botany." Mr. Ardagh has drawn my attention to a list of Bermudan plants in Dr. Gunther's 'Early British Botanists and their Gardens' (1922). Among the lists of plants in John Goodyer's manuscripts at Magdalen College, Oxford, are certain lists in the handwriting of John Parkinson, one of which ("List of Plants growing in the Bermudas") is reprinted on pp. 368, 369, with indications of the more obvious botanical names. Dr. Gunther suggests the date of these lists as about 1636. As to the Bermuda list he remarks that it "so closely resembles Parkinson's list of Bermudan plants printed in 1640 at the end of his 'Theatrum Botanicum,' p. 1671, that it is probable that the printed version was taken from this copy in an abbreviated form."

These statements are only partly correct. The list in the 'Theatrum' is evidently condensed, with changed order, from that found among Goodyer's MSS., but it is described as a list of plants "knowne to us to grow in our severall plantations of *Virginia*, the *Bermudas*, *New England* or elsewhere among our own peoples habitations," and includes also items from a "List of Nuts, Fruits, and Seeds," desiderata, "To have from Virginia, New England, etc.," which follows the "Bermuda list" in Dr. Gunther's book, but is not stated to be in the handwriting of Parkinson.

The first published account of the vegetation of the Bermudas is that by Captain John Smith, the famous traveller and adventurer, and sometime Governor of Virginia. Smith wrote a 'General History of Virginia, New England, and the Summers Is.' (London, 1624), a rare book, an original copy of which I have consulted in the British Museum library. It is reprinted in Pinkerton's 'Voyages and Travels,' vol. xiii. (1821). Summers Islands was the early name for the Bermudas; the first English settlement was that of Admiral Somers (or Summers), who was wrecked on the islands in 1609.

* 'Musei Petiveriani' [Cent. viii.], p. 80: "To Mr. John Dickinson I am obliged for some plants he lately sent me from Bermudas (besides 2 collections some years agoe) with asseverances of larger performances. Dec. 31, 1700."

Smith gives some account of the vegetation (pp. 172, 173, Pinkerton's edition), from which Parkinson evidently copied (without acknowledgment)—his wording (in the Goodyer list) is almost identical. But Smith's account covers only about half the number of plants mentioned in the Goodyer Bermuda list. A later work by Smith, 'The True Travels, Adventures, and Observations of Captain John Smith in Europe, Asia, Africa, & America from A.D. 1593–1629' (London, 1630) (quoted by Sloane, in his 'Catalogue,' as "Smith's Obs."), also at the British Museum, contains "the continuation of the general history of Virginia, the Summer Isles, & New England, with the present estate, from 1624 to the present 1629" (pp. 45–48), but no more is said about the vegetation. But Chapter 26, "The first planting of the Barbadoes" (pp. 55 & 56) "from the relations of Captaine John White & Captaine Wolverstone," supplies the items needed to complete the "Bermuda list" of the Goodyer MSS. Parkinson evidently copied from both of Smith's books, but omitted to mention the Barbadoes.

It may be of interest to mention the plants noted by Smith in the Bermudas. "Tall and goodly cedars, infinite store of palmetoes, numbers of mulberries [presumably *Morus rubra*], wild olive-trees store [*Elaeodendron*], with divers others unknown both by name and nature," the prickle-pear (*Opuntia Dillenii*), the poisoned weed like our English ivy (*Rhus radicans*), the red-weed, a tall plant the stalk covered with a red rind, the root of which is strongly emetic (what is this?*—it is not in Parkinson's 'Theatrum' list, but is in Goodyer's MS. list), the purging bean, a kind of Woodbind, running on trees near the sea-side twining itself like a vine (*Canavalia lineata*), "a small tree which causeth costiveness"*, a bush like a bramble with long yellow fruit with a hard shell enclosing a grey berry that "taken inwardly purgeth gently" (probably *Guilandina Bonducella*); red pepper, a fruit like our Barberries whose taste is terrible hot (*Capsicum baccatum*); and in the bottom of the sea, growing on the rocks, a large pale red plant in the form of a vine-leaf, very strangely interlaced (the fan-coral). "Now besides these natural productions, providences and pains, since the plantation, have offerred divers other seeds & plants, which the soil hath greedily embraced & cherished, so that at the present 1623 there are great abundance of white, red and yellow coloured potatoes, tobacco, sugar-canes, indigos, parsnips, exceeding large radishes, the American bread, the Cassado root, the Indian pumpeon, the water melon, musk melon and the most delicate pine-apples, plantains & papaws, also the English artichoke, pease &c. briefly, whatsoever else may be expected for the satisfaction either of curiosity, necessity or delight."

* Mr. T. E. Wallis suggests doubtfully a *Phytolacca* and *Canella alba*, West Indian genera but not now native in Bermuda.

The " fruits and trees " mentioned by Smith as planted in the Barbadoes are Mancinele Apple (*Hippomane Mancinella*), great store of exceeding great Locus trees (*Hymenaea Courbaril*), a tree like a Pine beareth fruit so great as a Muske melon (probably *Citrus Decumana*), Plum trees many, the fruit great & yellow, Wild Fig trees, Guane trees (*Psidium Guajava*), Palmetoes of three several sortes, Papaws, Prickle-pears, Cedar trees very tall and great (probably the native *Juniperus barbadensis*), Fustic trees (*Maclura tinctoria*), Sope berries, the kernel as big as a sloe and good to eat (!) (*Sapindus Saponaria*), Pumpeons in abundance, " Goads [gourds] so great as will make good great bottles," Ginni wheat, Cassado (*Manihot*), Pines and Plantains. "All things we there plant do grow exceedingly so well as tobacco." These are nearly all included in Parkinson's lists.—A. B. R.

REVIEWS.

The Algae and their Life Relations. By JOSEPHINE E. TILDEN. 8vo, pp. x, 550, text-figs. 250. University of Minnesota Press : Oxford University Press, 1935. Price 22*s.* 6*d.*

THIS book aims at advancing a new view as to the evolution and interrelationships of the Algae—a view based essentially on the assumption that the various classes originated progressively under gradually changing conditions of illumination and in relation to a progressive invasion of the shallower waters and the littoral zone of a primæval ocean. The Cyanophyceae are regarded as the oldest, the Chlorophyceae as the youngest class, while Rhodophyceae, Phaeophyceae, and " Chrysophyceae " are intermediate—these various groups being assumed to have arisen in the sequence named. In each class the most highly specialised forms are considered to be the oldest, and the simplest to be those most recently evolved, although the latter are at the same time regarded as most nearly resembling the ancestral type. A further hypothesis that underlies the author's scheme is that in most of the groups that exhibit sexual reproduction an alternation between morphologically similar generations represents the primitive type of life-cycle. Therefore, the diplobiontic Florideae are placed at the beginning and the haplobiontic forms at the end of the series of the Red Algae, while the Phaeophyceae begin with Dictyotales and Sphacelariales and pass on, through the Ectocarpales to the Laminariales and Fucales, since under the conditions obtaining between tide-marks " the primitive type of alternation was gradually changed so that more and more, from the Ectocarpales in an ascending scale to the Fucales, the sporophyte has become the dominant plant in the life-cycle " (p. 209). Among Chlorophyceae the Siphonales and Siphonocladiales,

comprising the bulk of the marine forms, are placed at the head and the rest of the Green Algae (grouped as Uninucleatae) follow. Whether one is, therefore, to regard the siphoneous type as the original one among the Green Algae is not clear, but its importance is implied in the suggestion on p. 356 that *Caulerpa* and *Psilophyton* " may represent two mutational branches from the same ancestral line of development at different times " !

The considerations upon which the above general hypotheses are founded are contained in the first three chapters of the book, but it is difficult to find in the author's text any adequate grounds for the many unusual views that are advanced, many of which are totally at variance with the opinions expressed by those who have contributed in large measure to our present knowledge of the diverse algal classes. As evidence for the relation of Rhodophyceae and Cyanophyceae we are apparently to take the presence of protoplasmic connections in Stigonemataceae and the occurrence of similar pigments in certain members of the two classes. In interpreting the Dictyotales as the nearest relatives of the Rhodophyceae, the author relies on similarity in the type of life-cycle and the presence of tetraspores, although a comparative study of Dictyotales warrants the view that the tetrasporangium there is a specialised form of unilocular sporangium. Even where one is inclined to agree with the author's conclusions, one would hardly admit her line of argument.

Practically no consideration is given to the current views as to the evolution of the diverse classes from unicellular, and in most cases flagellate, ancestors. In fact, the Chrysophyceae, Heterokontae, Bacillariales, Cryptomonadineae, Peridinieae, and Euglenineae are included in one common class " Chrysophyceae " which is dismissed in seventeen pages. " Almost imperceptibly one passes from such algal forms as *Ectocarpus* and *Tribonema* to *Euglena* and then to the truly animal forms of the phylum Protozoa " (p. 348). It is very difficult to take this section of the book seriously and one can hardly believe that the author has ever carefully studied the modern literature dealing with the groups comprised in her " Chrysophyceae."

Apart from these major features, the book suffers from the drawback that it contains too many suggestions that are quite unsupported by fact, and against which strong arguments could often be brought, *e. g.*, that mentioned above regarding *Caulerpa* and *Psilophyton*, that on p. 8 to the effect that " the pyrenoid perhaps came into existence in response to the strong light conditions of shallow shore waters," or that on p. 101 that in the Rhodophyceae " sexual reproduction probably appeared in plants for the first time." It is for this reason that the book can hardly be recommended for an uncritical student, although when one can get away from the numerous unfounded hypotheses a good deal of useful information can be gleaned from the text. Stress

is, however, placed throughout on reproductive detail and vegetative structure usually receives but scant notice.

In details of classification the author generally follows the recognised authorities, although here too one finds occasional treatment that is hardly reconcilable with the present state of our knowledge. Instances are afforded by the inclusion of Hydrodictyaceae among Siphonales, the placing of *Botrydium* and *Protosiphon* in the same family (Protosiphonaceae), and the retention of *Splachnidium* in the Fucaceae, although Kuckuck's (1929) work (included in the second edition of Oltmanns) has made that position quite untenable. The bibliography at the end of the book is not well balanced and omits a considerable number of important papers, especially those published in the German language. Thus, no mention is made at all of the brilliant series of memoirs by Kuckuck in 'Wissentschaftliche Meeresuntersuchungen' published between 1894 and 1912, most of the important papers of Svedelius are omitted, and the same is true of many of those of Sauvageau. The imperfections of the bibliography are reflected also in the text by frequent citation of the wrong authority; thus, on p. 11 Sharp is given as the authority for the nature of the assimilation products in Phaeophyceae, while Kylin is cited as the authority for the occurrence of oogamy in *Desmarestia*. In dealing with *Hydrodictyon* no mention is made of Mainx's work, nor in relation to *Chara* of that of Oehlkers.

The book is plentifully supplied with illustrations and life-cycles are frequently represented by a series of linked diagrams. One may doubt whether so many of these need to have been included, since the general sequence of events is in many cases the same.—F. E. Fritsch.

A List of Marine Algae from Bombay. By F. Børgesen. (Kgl. Danske Vidensk. Selsk. Biol. Meddel. xii. 2 (1935).)

This paper may justly be called the natural sequel to Dr. Børgesen's other studies on Indian Algæ, particularly those from the northern part of the Arabian Sea, described in vol. xi. no. 6 of the same serial publication. The algal flora of Bombay is poor, largely owing to the high degree of pollution, and also to the loose or soft character of the substratum. No more than 86 species are in the list, and, though Dr. Børgesen suggests that more remain to be discovered, it seems unlikely that there will be any startling increase as a consequence of further investigation. Dr. Børgesen made a study of the Indian material in the British Museum Herbarium in the course of his studies for this paper, and saw the set of Karachi Algae collected by J. A. Murray, of which he had seen the corresponding specimens in the Kew

Herbarium. An important consequence is that Dr. Børgesen is now not inclined to believe in the presence of northern and arctic Algæ at Karachi. He says: "When I heard that the British Museum also possessed a large collection of J. A. Murray's Algae from Karachi I was, of course, especially interested in finding out whether the northern species were found there too. This not being the case greatly increases my doubts as to whether they really live there, and seems to me to render it probable that they have come into Murray's collection, found in the Kew Herbarium, by mistake." It is important to note that when Dr. Børgesen called attention to the phytogeographical considerations involved by the presence of North European Algae at Karachi, he was careful to add, "if really present there." This caution is only one of the things which makes the work of Dr. Børgesen outstandingly good among the phycologists of our (or any other) time.—G. Tandy.

Tropische und subtropische Weltwirtschaftspflanzen.—Teil III. *Genuszpflanzen.* Bd. 3. *Der Teestrauch und der Tee. Die Maté- oder Paraguay-teepflanze.* By Dr. Andreas Sprecher von Bernegg. 8vo, pp. xvi, 432, 88 text-figs. Ferdinand Enke: Stuttgart, 1936. Price 31 R.M.

Previous volumes of this series by the same author have already been reviewed in this Journal (1934 and 1935), vol. i. on Cocoa and Cola, vol. ii. on Coffee and Guarana; and vol. iv. on Tobacco is in preparation. The present volume is about half as large again as either of the two preceding, to be accounted for by the very considerable amount of literature on the major subject, which occupies the greater part of the volume. Its bibliography comprises 351 entries, and Dr. Bernegg's task has been to present a condensed general account of a very wide subject in its historical, botanical, cultural, technical, and commercial aspects. It will be useful to those who want a general view; and frequent references in the text to the work and writings of specialists will be a guide if more detailed information is desired. As the chief centres of tea-cultivation are in the British and Dutch Indies and of Maté in South America the literature is mainly in English, Dutch, and Spanish, and the author suggests that German readers may find use for a volume in their own language.

Dr. von Bernegg leaves questions of nomenclature and of the botany of the species and varieties of the tea-plant to be settled by the botanists, and adopts two geographical entities, *Thea sinensis* (L.) Sims (incl. *Th. bohea* L. and *Th. viridis* L.) and *Thea assamica* Masters, adopting the six geographical races of the latter recognised by Watt. A description of the plant is

followed by sections on growth-conditions—climate and soil—and cultivation, the latter including a list, occupying fifty-three pages, of parasitic or harmful plant and animal organisms, including the common and scientific name, distribution, effect on the plant, and methods for treatment. The remaining sections are technical.

Maté was used by the Indians of Parana before Europeans came to South America, and the history of its use and spread in the sixteenth and seventeenth centuries is associated with the early missionary work of the Jesuits. Originally it implied the dried, lightly roasted and crushed leaves, leaf-stalks, flower-stalks, and young shoots of several wild species of *Ilex*, but as a present-day recognised economic product it is restricted to the leaves of *Ilex paraguariensis* St. Hil., of which Loesener recognises two varieties, *genuina* and *parvifolia*, and a form *latifolia*. A point of interest in the cultivation is a difficulty in germinating the hard seeds, unless taken from the fresh scarcely ripe fruit; even with special treatment several months are required. The Maté habit is confined to South America, mainly to Brazil, Paraguay, and Argentina. -A. B. R.

The Beginnings of Plant Hybridization. By CONWAY ZIRKLE. Morris Arboretum Monographs.—I. Cr. 8vo, pp. xiii, 231, frontispiece & 7 pls. University of Pennsylvania Press, Philadelphia: Oxford University Press, London, 1936. Price 11*s.* 6*d.*

DR. ZIRKLE is Geneticist to the Morris Arboretum, and the present volume introduces a series of monographs. In his preface the author refers to the lack of some general account of the earlier plant breeders and their inadequate treatment in Sachs's 'History of Botany.' "It is not generally known that plant hybrids had been made and observed for forty-five years when Koelreuter undertook his classic experiments in 1760," and that "some few of these early investigators designed and executed their experiments as scientifically as did Koelreuter himself." Dr. Zirkle has included all of the discussions of plant hybrids that he has been able to find before 1761, regardless of their merits, and realising that some are intrinsically worthless, in order to depict the scientific standards of the early eighteenth century and that we may appreciate the background of those investigators who gave us our first real knowledge of plant hybrids.

The earliest references to crossing, apart from the prehistoric knowledge of pollination of the female by the male date palm, are almost entirely animal, and these are discussed in the first chapter dealing with the earliest descriptions of hybrids. The

derivation of the word from the Greek ὑβρις, an insult or outrage, suggests that it acquired the meaning of mongrel from the fact that such creatures were an outrage on nature. The true appreciation of hybridity was delayed by confusion as to the meaning and nature of male, female, or bastard; the terms were applied to inanimate objects, and in nature may have implied merely difference in size. Aberrant forms arising from hybridization were regarded by the herbalists as degenerate or sports, and Mendelian segregation was misinterpreted as degeneration. Camerarius, 'De Sexu plantarum Epistola, 1694,' suggested the possibility of the fertilization of a female plant by the male of a different kind, but it was the sexuality of plants, not hybridization, in which he was interested.

A chapter is given to Xenia in Maize, recognized by Cotton Mather in 1716 as due to cross-pollination, and his letter to Petiver is included as affording the earliest account of plant hybridization yet found. The first artificial hybrid was made by Thomas Fairchild (1667–1729), a Hoxton florist, who fertilized a Carnation (*Dianthus Caryophyllus*) with the pollen of a Sweet William (*D. barbatus*). The author discusses in full the interest aroused by Fairchild's work among his contemporaries, Patrick Blair, Richard Bradley, Philip Miller, and Peter Collinson. Bradley, whose writings are the main source of our knowledge of Fairchild, produced hybrid Auriculas, and his numerous writings contain many references to hybridization and sex in plants. In a letter to Bradley in 1721 Miller described the insect pollination of tulips; he also described hybrids in *Brassica*. Other early workers were Paul Dudley (1675–1751) of Massachusetts and John Bartram. There are also contributions by six of Linnæus's students, published in the 'Amœnitates,' and his own 'Disquisitio de sexu Plantarum' (1760), with references to hybridization.

The chronological list, which forms an Appendix, gives a useful summary of the various stages in progress.

Dr. Zirkle's book is full of interest and is a valuable contribution to the history of Botany.—A. B. R.

Flora of the Presidency of Madras. By J. S. GAMBLE. Part XI. Addenda, Corrigenda, Indexes, etc., by C. E. C. FISCHER. Sm. 8vo, pp. lxiv, 1865–2017, with map. Secretary of State for India in Council: London, 1936. Price 7*s.* 4*d.*

DR. FISCHER is to be congratulated on bringing to completion this useful 'Flora,' which was interrupted by the regrettable death of the original author. The Addenda contain a few genera omitted from the earlier parts and a replacement of the key of *Pavetta*, now arranged according to Dr. Bremekamp's recent monograph. There are separate Indexes to botanical and

vernacular names respectively, a list of works cited, with the abbreviations used in the text, a glossary of the terms used, and a general key to the families.

Previous parts have been noticed in this Journal on their appearance.

Tropical Planting and Gardening, with special reference to Ceylon. By H. F. Macmillan. 4th ed. 8vo, pp. x, 560 (illustrated). Macmillan : London, 1935. Price 25*s*.

A new edition of a standard work is always welcome, especially a work dealing with gardening in the tropics. It is to be regretted that the title of this book has been changed from 'A Handbook of Tropical Gardening and Planting' to 'Tropical Planting and Gardening,' which is most misleading, as there is very little about planting in the book. It is remarkable that this is still almost the only work on the subject, in spite of the many English people living in the tropics who are enthusiastic gardeners and the numerous botanic gardens which exist to introduce new plants and stimulate interest in their cultivation. It is surely this very lack of manuals that has made progress in tropical horticulture so slow and the variety of plants grown in tropical gardens so pitifully small in proportion to what might be grown.

This book, which is profusely illustrated with excellent photographs, is one that can confidently be recommended to all gardeners in the tropics. It will be useful to botanists also, though no attempt appears to have been made to follow the International Rules of Botanical Nomenclature.

The work is divided into five parts : I. deals with the general principles of gardening ; II. with flower-gardens, giving lists of plants suitable for different climates ; III. with fruits and vegetables ; IV. with various estate and commercial products ; and V. with pests and miscellaneous subjects.—A. H. G. A.

BOOK-NOTES, NEWS, etc.

Linnean Society of London.—At the General Meeting on March 5, the President, Dr. W. T. Calman, C.B., F.R.S., in the Chair, two new Fellows were admitted and eight were elected. The chief business of the meeting was a number of interesting exhibits that had been arranged in the Library, to which the members adjourned after some explanatory remarks by exhibitors. Those of botanical interest were as follows. Dr. F. G. Brieger showed a series of maize cobs illustrating the genetic control of aleurone and endosperm colour in the seeds, and indicating different degrees of dominance in the factors. Dr. J. M. Dalziel showed abnormal leaves of *Ginkgo* on which seeds had developed. Exhibits from the Royal Gardens, Kew, included living specimens

from two interesting "conifers," *Agathis vitiensis* and *Gnetum*, in flower, and a fine cone of the Cycad, *Encephalartos Hildebrandtii* (by the Director) ; living sporelings of a New Zealand fern, *Loxoma* (by Mr. F. Ballard) ; a selection of rare British Grasses (by Mr. C. E. Hubbard) ; and a series of species of the Ericaceous genus *Pieris* showing inflorescences varying from axillary flowers through the raceme stage to a panicle (by Dr. J. Hutchinson). Mr. L. C. Luckwill demonstrated development of seedlings from excised cotyledons of varieties of Tomato. A. L. de Jussieu's botanical press, shown by Mr. Ramsbottom, was a real "press," of the kind eschewed by modern collectors, who appreciate the importance of moderate pressure and plenty of warm air in drying plants. It has been presented to the Department of Botany, British Museum, by the widow of the late Dr. L.-L. B. de Beaumont. A series of photographs of South African succulent Asclepiads by Dr. Hubert Lang was shown by Dr. H. G. Schweickerdt. Two interesting bibliographical exhibits were a trial-proof page of the 'Species Plantarum,' ed. i., showing that Linnæus had contemplated a folio format for the work, comparable with that of the 'Hortus Cliffortianus' (shown by the Assistant Secretary) ; and a copy of John Sebastian Miller's 'Icones Novæ,' consisting of one leaf of text and seven coloured plates (shown by Dr. T. A. Sprague) with evidence of the publication of the work in 1740.

At the General Meeting on March 19, the President in the Chair, the Botanical Secretary, Mr. Ramsbottom, showed a number of lead models of Fungi prepared by M. Jules Lagrange, in which the external characters were faithfully reproduced ; Mr. F. T. Brooks, F.R.S., contributed two communications on Fungi ; a demonstration of *Allomyces javanicus* Kniep, and an account of a paper by Dr. F. K. Sparrow on British aquatic Phycomycetes based on material collected at Cambridge and Haslemere.

British Mycological Society.—Vol. xx. pt. 2 of the 'Transactions' contains notes on changes in nomenclature in the recently issued second edition of the 'List of Common Names of British Plant Diseases' (Camb. Univ. Press) by E. M. Wakefield and W. C. Moore. Some revision of the scientific names was necessary to come into line with recent research and to conform to the International Rules of Nomenclature (1930). E. W. Mason clears up the confusion between two species passing as *Cercospora Bloxami* Berk. & Br. W. A. R. Dillon Weston describes the stimulating effect of high light intensity on the sporulation of *Helminthosporium Avenae* and *Alternaria Solani*. Lillian M. Hunter records the occurrence of species of a Rust, *Milesia*, in Great Britain and Ireland, with notes on their life-history ; and Mary D. Glynne contributes notes on three fungi found on wheat at Rothamsted and new to Britain. J. R. Thomson

has studied the inadequately known *Cylindrosporium concentricum* Grev., and confirms its systematic position. W. H. Wilkins gives a detailed account of the effect of a " white rot " disease (*Ustilina*) on the common lime, by which the tree may be completely destroyed; and E. J. H. Corner describes an exhaustive study of two Malayan species of *Hygrophorus* (Basidiomycete) with dimorphous spores; of one, *H. firmus* he proposes sixteen varieties based on spore characters. There are also some short notes.

BOTANICAL SOCIETY OF EDINBURGH.—Trans. & Proc. xxxi. pt. 4 contains an account of the floral mechanism of *Saraujа subspinosa*, grown from seed collected by Forrest in Upper Burma. The development of the flower is described in detail, and the method of pollination is suggested. The corolla falls with the nectaries and stamens before the stigmas are ripe. In the staminate stage the flowers are reversed, but by movement of the pedicel become upright when the stigmas are receptive. These would therefore receive pollen shed from flowers higher up in the inflorescence. The flowers are diplostemonous, but the number of stamens is increased almost invariably to fifty by splitting of the five inner antepetalous. Dr. W. Watson contributes notes on lichens, mainly from Orkney, in the Edinburgh Herbarium: rare or critical species are described in detail. The President, Dr. Wilson, describes some observations on the decay of timber caused by *Merulius domesticus* and other fungi.

ANTIRRHINUM RUST.—In the 'Journal of the Royal Horticultural Society,' lxi. pt. 2, D. E. Green describes the results of his experiments in spraying and dusting with fungicides carried out at Wisley. Copper-containing sprays—Bordeaux and Burgundy mixtures—provided a fair degree of control, the plants so treated remaining vigorous and flowering well for the second time. But the control is not completely satisfactory, and at least six applications of the spray are required. Sulphur-fungicides are of little use in this country owing to inadequate temperature. Work on the selection of a resistant stock is in progress at Wisley, and results are so far promising.

ORCHIDS IN SARAWAK.—To the 'Orchid Review' for March A. F. Ricketts contributes notes on a number of Bornean species, many of a very striking growth and habit.

REPORT OF THE THIRD IMPERIAL BOTANICAL CONFERENCE, LONDON, 1935.—This is obtainable from the Royal Botanic Gardens, Kew. Price, One shilling. It contains a list of the delegates and members and a *précis* of the discussions and resolutions. A report of the Conference appeared in this Journal last September (p. 299).

THE GENUS *ENDOSTEMON* N. E. BROWN.

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

THE genus *Endostemon* of the Labiatae was described by N. E. Brown in 1910 (Fl. Capens. v. pt. 1, 295). It was based on a single species, *E. obtusifolius*, and separated from *Ocimum* because of its distinctive appearance and floral structure. N. E. Brown suggested that the new genus was allied to *Hyptis*, but from an examination of the type-material it appears that *Endostemon* belongs to the subtribe Moschosminae of the Ocimoideae, and is most nearly related to *Orthosiphon*. The fundamental differences which distinguish *Endostemon* from *Orthosiphon* and other nearly allied genera are in the corolla, which is subequally 4-lobed, with all the lobes flat, and in the stamens, which are included in the corolla-tube, having very short pilose filaments.

Since 1910 three further species of *Endostemon* have been described*, and now a number of other species have been found included in neighbouring genera. With the addition of these and one species previously undescribed, the present number of species of *Endostemon* is raised to seventeen.

The species have in common not only the features of floral structure mentioned above, but are usually somewhat distinctive in their facies. It is a characteristic to have the flowers straight in line with the pedicels, which are rigid and usually more or less ascending; the fruiting calyx is declinate, the flowers are often small, and the corolla is evidently soon deciduous, for there are rarely many complete flowers on a raceme. Some additional diagnostic characters in the flower are not shared by all the species, as, for example, the villous throat or broad lateral teeth of the calyx of some species and the pubescent ovary-lobes of others.

Of the species of *Endostemon* originally described in neighbouring genera the majority have been found in *Orthosiphon*. These include Briquet's section *Diffusi*† (comprising those in which the calyx is villous at the throat), which Bremekamp ‡ recently raised to generic rank, with the name *Pseudocimum*. I consider that the genus *Pseudocimum* is unnecessary, and that the section *Diffusi* should be included under *Endostemon*, as its members have the floral structure typical of that genus. In this section *O. tenuiflorus* is exceptional in its long corolla-tube, but it is obviously very closely allied to *O. diffusus*, in which the corolla-tube is short as is usual in *Endostemon*. The only character, then, whereby *Pseudocimum* differs from *Endostemon*

* Good in Journ. Bot. lxix., Suppl. 2, 147 & 148 (1931); Bremekamp in Ann. Transvaal Mus. xv. 2, 250 (1933).

† Briquet in Engl. & Prantl, Natürl. Pflanzenfam. iv. 3 *a*, 372 (1897).

‡ Bremekamp in Ann. Transvaal Mus. xv. 2, 251 (1933).

is the villous throat of the calyx. This character is indeed constant within the group, but it is not considered adequate alone to justify generic separation.

The genus is widely distributed in tropical Africa, usually occurring in dry savannah regions; it extends to South Africa, Arabia, and one species occurs in India. Of the sixteen African species eight are confined to an area including roughly Somaliland, Abyssinia, Kenya Colony, and Tanganyika Territory (one occurs also in Arabia and Transvaal), seven others are found in the region of Angola, southern Belgian Congo, Rhodesia, and Transvaal (one extending to the Cameroons and one to Natal), and the remaining species is common to both areas, occurring also in west tropical Africa.

A revised description of the genus is given, taking into account the species which have been added.

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

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

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

The work has been carried out in the British Museum Herbarium, and my thanks are due to Mr. Ramsbottom, Dr. Taylor, and other members of the staff for their assistance and for the facilities afforded me. I am indebted also for loans of material to the authorities of the other institutions named above.

ENDOSTEMON N. E. Brown in Dyer, Fl. Cap. v. pt. 1, 295 (1910).

Pseudocimum Bremekamp in Ann. Transvaal Mus. xv. 2, 251 (1933).

Herbs sometimes with tuberous roots, usually erect and branching. *Stem* 4-angled or sometimes terete. *Leaves* opposite and decussate, sessile or petiolate, the lamina usually serrate at the margin, sometimes gland-dotted. *Inflorescence* consisting of verticillasters (usually 2- to 6-, but sometimes up to 12-flowered) borne in terminal or axillary racemes; bracts usually persistent, small or sometimes large and leaf-like. *Calyx*, when flowering, usually straight on a straight pedicel, somewhat

ascending, in fruit more or less declinate and slightly accrescent; tube naked or villous at the throat, campanulate, unequally 5-toothed; posterior tooth broadly ovate to orbicular with the margin slightly decurrent; lateral and anterior teeth narrowly triangular to subulate, the anterior pair the longer. *Corolla* exserted beyond the teeth of the calyx or sometimes only equalling them; tube usually pilose within, straight or nearly so, cylindrical or rarely somewhat widened at the throat; mouth not 2-lipped, but subequally 4-lobed, the posterior and anterior lobes sometimes slightly larger than the lateral lobes and the posterior lobe rarely emarginate, all the lobes flat or nearly so. *Stamens* 4, included within the corolla-tube, the filaments all free, very short and usually pilose; pairs inserted in the upper half of the corolla-tube at nearly the same depth, the members of each pair well separated at their insertion; anthers reniform, 1-celled. *Disk* scarcely enlarged anteriorly. *Ovary* 4-lobed, the lobes glabrous or sometimes pubescent at the apex. *Style* included within the corolla-tube, sometimes swollen at the base between the ovary-lobes, usually considerably enlarged at the apex where it is unequally and obtusely 2-lobulate. *Nutlets* oblong to suborbicular, rounded or truncate and sometimes pubescent at the apex, sometimes mucilaginous on wetting.

Species 17, in tropical and south Africa, Arabia, and India. Type-species *E. obtusifolius* (Meyer) N. E. Brown.

Key to the Species.

a. Calyx villous at the throat. Section DIFFUSI.
  b. Flowers more than 3 mm. long; fruiting calyx usually more than 4 mm. long. Lamina of leaves less than 2·5 cm. long.
    c. Verticillasters 2-flowered. Leaves sessile, the lamina oblanceolate or linear ..... 1. *tenuiflorus.*
    cc. Verticillasters 4- or 6-flowered. Leaves petiolate, the lamina ovate, obovate, or suborbicular.
      d. Plant more or less prostrate; racemes usually less than 5 cm. long; stem herbaceous ..... 2. *Wakefieldii.*
      dd. Plant erect; racemes usually more than 5 cm. long; stem woody at the base.
        e. Rhachis thinly puberulous or glabrous; leaves greyish tomentose beneath. (African species.) ..... 3. *obbiadensis.*
        ee. Rhachis thickly and finely pubescent and glandular; leaves more or less pubescent beneath. (Indian species.) 4. *viscosus.*
  bb. Flowers less than 3 mm. long; fruiting calyx usually less than 4 mm. long. Lamina of leaves small or up to 6 cm. long ..... 5. *gracilis.*
aa. Calyx naked at the throat. Section EU-ENDOSTEMON.
  b. Ovary-lobes, and in the early stages the nutlets, puberulous at the apex.

c. Leaves of the main stem spreading, with the lamina less than 1·5 cm. long; pedicels not exceeding 3 mm. in length (even in fruit).. 6. *tubulascens.*
cc. Leaves of the main stem ascending or absent; when present with the lamina more than 1·5 cm. long when mature; pedicels usually exceeding 3 mm. in length (even in flower).
d. Leaves of the main stem present; racemes usually more than 7 cm. long ..... 7. *dissitifolius.*
dd. Leaves of the main stem absent; racemes usually less than 7 cm. long ..... 8. *malosanus.*
bb. Ovary-lobes and nutlets glabrous.
c. Lateral teeth of the fruiting calyx broad, enlarged posteriorly, obliquely obtuse or subacute at the apex. Calyx more or less closed at the mouth in fruit by the broad lateral and the upturned anterior teeth.
d. Leaves with a relatively long, sharply defined petiole more than half as long as the lamina; lamina less than twice as long as broad and less than 1·5 cm. long, minutely puberulous ..... 9. *Ellenbeckii.*
dd. Leaves sessile or tapering into a very short petiole less than half as long as the lamina; lamina more than twice as long as broad and more than 1·5 cm. long when mature, more or less pubescent or villous.
e. Floral bracts more than 5 mm. long, leaf-like; inflorescence not sharply defined ..... 10. *tereticaulis.*
ee. Floral bracts less than 5 mm. long, not leaf-like; inflorescence sharply defined ..... 11. *camporus.*
cc. Lateral teeth of the fruiting calyx generally narrow, not enlarged posteriorly, acute or subulate at the apex. Calyx open at the mouth in fruit.
d. Leaves all distinctly petiolate. Flowering calyx usually less than 4 mm. long (from the base of the tube to the apex of the posterior tooth), with the tube less than 3 mm. long and the corolla well exserted from it.
e. Flowers more than 8 mm. long and corolla-tube usually more than 2 mm. broad at the throat. Leaves obtuse at the apex ..... 12. *usambarensis.*
ee. Flowers less than 8 mm. long and corolla-tube usually less than 2 mm. broad at the throat. Leaves usually subacute... 13. *obtusifolius.*
dd. Leaves sessile, subsessile, or sometimes shortly petiolate. Flowering calyx usually more than 4 mm. long (from the base of the tube to the apex of the posterior tooth), with the tube more than 3 mm. long and the corolla shortly exserted from it.

e. Leaves entire or very shallowly serrate at the margin; oblong-ovate, rounded at the base. Stem villous ..... 14. *villosus.*
ee. Leaves serrate or crenate at the margin; broadly obovate to lanceolate, cuneate to cordate at the base. Stem more or less pubescent, but not villous.
f. Lamina of mature leaves less than 2 cm. broad and usually less than 3 cm. long ..... 15. *retinervis.*
ff. Lamina of mature leaves more than 2 cm. broad and usually more than 3 cm. long.
g. Leaves evenly and coarsely crenate at the margin, more or less spreading, very broadly ovate (usually more than 3 cm. broad when mature), cordate or rounded at the base ..... 16. *scabridus.*
gg. Leaves usually obtusely serrate at the margin, ascending, broadly ovate to lanceolate (rarely more than 3 cm. broad when mature), broadly cuneate at the base .... 17. *tuberifer.*

Section Diffusi (Briq.) Ashby.

Orthosiphon section *Diffusi* Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3 *a*, 372 (1897).

Calyx villous at the throat.

1. **E. tenuiflorus** (Benth.), comb. nov.

Orthosiphon tenuiflorus Benth. in DC. Prodr. xii. 50 (1848).

Ocimum depauperatum Vatke in Linnæa, xliii. 84 (1880–82).

Pseudocimum trichocalyx Bremekamp in Ann. Transvaal Mus. xv. pt. 2, 252 (1933).

Geographical Range.—Arabia, Abyssinia, British Somaliland, Socotra, and northern Transvaal.

Arabia. Dhofar Mts., Hafa, *Bent* 81 (K); Rizout, *Bent* 90 (K).

Abyssinia. Nr. Sheikh Husein, a little west of Riv. Shebeli, 2000 ft., Dec., *Donaldson Smith* 292 (BM).

British Somaliland. Wagga Mt., 1897, *Lort Phillips* s.n. (BM); Golis Range, *Drake Brockman* 118 (K); 30 miles south of Bulhar, Mar., *Drake Brockman* 1066 (K); Ahl Mts., nr. Meid, 2700–4200 ft., Apr., *Hildebrandt* 1561 (type of *Ocimum depauperatum*; BM, K); Suksodi and Shiekh, 5000 ft., light sandy soil, Mar., *Godman* s.n. (BM); without locality, June, *James & Thrupp* s.n. (K).

Socotra. West of Jamaria, Apr., *Schweinfurth* 392 (K); granite rocks above Wadi Kuschan, 2600 ft., May, *Schweinfurth* 624 (K); without locality, Feb.–Mar., *Balfour* 549, 578 (K).

Transvaal. Zoutpansberg: Lilliput, Nov., *Moss & Rogers*

785 (BM); Messina, 2000 ft., *Rogers* 19,393 (BM). Pietersburg, *Moss & Rogers* 772 (BM).

The distribution is remarkable in that no connecting link is known between Abyssinia and northern Transvaal. Bremekamp (*loc. cit.*) classifies the Transvaal specimens under a separate species, *Pseudocimum trichocalyx*, but I can find no difference between these and the plants from Abyssinia and Somaliland. It is possible that the species grows between these localities, but has escaped collection.

2. **E. Wakefieldii** (Baker), comb. nov.

Orthosiphon Wakefieldii Baker in Dyer, Fl. Trop. Afr. v. 371 (1900).

KENYA COLONY. SEYIDIE PROV.: Taro, 1500 ft., Mar., *Kassner* 512, 578 (BM). On journey from Ribe (Ribo ?) to the Galla Country, May, *Wakefield* s.n. (K, type); Mowesa, in *Brachystegia* forest, *Graham* 1739 (K).

3. **E. obbiadensis** (Chiov.), comb. nov.

Orthosiphon obbiadensis Chiov. Fl. Somal. 276 (1929).

Geographical Range.—Italian Somaliland and Tanganyika Territory.

ITALIAN SOMALILAND. Sultanty of Obbia, forest nr. Biomal, in a sand-bank, May, *Puccioni & Stefanini* 558 (612) (F, type).

TANGANYIKA TERRITORY. Rufiji, 50 ft., sunny position, common herb, Jan., *Musk* 147 (K).

4. **E. viscosus** (Roth), comb. nov.

Ocimum viscosum Roth, Novæ Plantarum Sp. 274, "*Ocymum*" (1821).

[*Ocimum menthoides* Heyne ex Roth, *loc. cit.*, *nomen synonymum.*]

Plectranthus viscosus (Roth) Spreng. Syst. Linn. Veg. ii. 691 (1825).

Ocimum ? diffusum Benth. in Wall. Pl. As. Rar. ii. 14 (1831).

O. hirsutum Benth. in Wall. Cat. 2717, *pro parte* (1831).

Orthosiphon diffusus Benth. in DC. Prodr. xii. 50 (1848).

O. hispidus Benth. *loc. cit.*

O. diffusus var. *hispidus* (Benth.) Hook. f. Fl. Brit. Ind. iv. 613, "*hispida*" (1885).

Geographical Range.—India, in Madras and Mysore.

MADRAS. CUDDAPA: Cuddupa Hills, *Beddome* s.n. (BM); Madhainbonda, 2500 ft., Aug., *Gamble* 20,862 (K); Mogipenta, 3000 ft., Aug., *Gamble* 20,965 (BM, K). Nilgiris, in *Herb. Wight* s.n. (K); Nilgiri Hills, *Gardner* s.n. (BM), and 2000 ft., dry places, Aug., *Gamble* 108,020 (BM); Nilgiri and Kurg Hills, *Herb. Hooker & Thomson* s.n. (BM, K); Hassanur, Aug., *Madras Herb.* 10,594 (K); without locality, *Beddome* s.n. (BM). Trichinopoly, Dec., *Wall.* 2717 p.p. (K). MADURA: Pulney Mts., Sept., *in Herb. Wight* 2494 (2082) (K); Lower Pulney Hills, 2000 ft., Sept., *Anglade* 1054 (K); Ammayanayakanur, July, *Bourne* 25 R (K). TINNEVELLY: Palamcottah, Oct., *Wall.* 2717 p.p. (K). Courtallum, 1824, *Wall.* 2717 p.p. (K).

MYSORE. BANGALORE: Habbat, common waste-land, Nov., *Bourne* 6376 (K). Without locality, June, *Heyne in Wall.* 2717 p.p. (K).

Peninsula India, without locality: *Heyne in Herb. Roth* s.n. (B, type), *in Herb. Wight* 2494 (K) and 2495 (2100) (K, type of *Orthosiphon hispidus*; BM), *in Herb. Wight* 2160 (K), *Wall.* 2718 (K, type of *Ocimum diffusum*; BM).

CEYLON ? *Walker* s.n. (K, this plant was probably collected in southern India).

This species is the only member of the genus known to occur in India.

5. **E. gracilis** (Benth.), comb. nov.

Ocimum gracile Benth. in DC. Prodr. xii. 39 (1848).

Orthosiphon glutinosus Chiov. Result. Sc. Miss. Stefan.-Paoli Somal. Ital. i. 145 (1916).

Geographical Range.—Sudan, Italian Somaliland, Kenya Colony, Zanzibar and Tanganyika Territory.

SUDAN. Lagori, Nov., *Andrews* 80 (K).

ITALIAN SOMALILAND. Uanle Uein, nr. Mogadishu, Nov., *Paoli* 1196 (F, type of *Orthosiphon glutinosus*).

KENYA COLONY. TANALAND PROV.: Witu, *Teede* 100, 101 (BM); Lamu and Witu, *Whyte* s.n. (BM). SEYIDIE PROV.: Freretown, Nov., *Taylor* s.n. (BM); Rabai Hills, July–Sept., *Taylor* s.n. (BM); Changamwe, 100 ft., common in grasslands and in coconut plantations, *in Herb. Coryndon Mus.* 6325 (K); nr. Changamwe, on Uganda Railway, 14 miles from Mombasa, 325 ft., Nov., *Mearns* 2182 (BM, K).

ZANZIBAR. Amboni, *Holst* 2714 (K); without locality, *Bojer* s.n. (K, type), dry sandy meadows, July–Nov., *Hildebrandt* 998 (K); *Kirk* s.n. (K), *Taylor* 26/3 (K). Pemba: *Vaughan* 557 (K).

Characterised by its numerous slender racemes and very small flowers.

Section EU-ENDOSTEMON*.

Calyx glabrous at the throat.

6. **E. tubulascens** (Briq.), comb. nov.

Orthosiphon tubulascens Briq. in Engl. Bot. Jahrb. xix. 174 (1894).

ANGOLA. HUILLA: Morro de Lopollo, sandy meadows, Jan.–Mar., *Welwitsch* 5492 (type; BM, K).

* Section *Eu-Endostemon*, sect. nov. Calyx fauce glaber.

7. **E. dissitifolius** (Baker), comb. nov.

Orthosiphon dissitifolius Baker in Dyer, Fl. Trop. Afr. v. 371 (1900).

O. Hocki De Wild. Contrib. Fl. Katanga, 181 (1921).

O. Homblei De Wild. *op. cit.* 182.

O. tomentosus De Wild. *loc. cit.*

Geographical Range.—Belgian Congo and Northern Rhodesia.

Belgian Congo. Katanga: Elisabethville, 4800 ft., Oct., *Rogers* 10,218 (K), *Quarré* 14 (K), and Oct., *Hock* s.n. (Br, type of *O. Hocki*); Lufaku Plateau, Dec., *de Witte* 72 (Br); Biano, Esschen Plateau, plain, Nov., *Homblé* 888 (Br, type of *O. tomentosus*); Biano, nr. Katentaria, Plateau de la Manika, plain, Nov., *Homblé* 776 (Br, type of *O. Homblei*) and 777 (Br).

Northern Rhodesia. Tanganyika Distr.: Urungu, Fwambo, Sept., *Carson* 69 (K, type). Luangwa Distr.: Malangushi Riv., under trees, Dec., *Kassner* 2077 (BM); Ndola, cultivated land, July, *Young* 108 (BM).

8. **E. malosanus** (Baker), comb. nov.

Orthosiphon malosanus Baker in Dyer, Fl. Trop. Afr. v. 371 (1900).

O. unyikensis Gürke in Engl. Bot. Jahrb. xxx. 400 (1901).

Geographical Range.—Tanganyika Territory and Nyasaland.

Tanganyika Territory. Rungwe: Unyika, Mbosi Hills, 5200 ft., light bush-forest, grey laterite soil, Oct., *Goetze* 1387 (B, type of *O. unyikensis*); without locality, Nov., *Davies* D 719 (K).

Nyasaland. Mt. Malosa, 4000–6000 ft., Nov.–Dec., *Whyte* s.n. (K, type).

The flowers so resemble those of *E. dissitifolius* that one might regard these two species as representing different stages in the life-history of the same plant. I would suggest that *E. malosanus* is based on an older plant of *E. dissitifolius* which has undergone a period of drought, losing all the leaves of the main stem, and then has produced new flowers and leaves on short branches near the apex of the stem. The fact that one of the specimens shows evidence of burning lends some support to this view, but no definite decision can be made from the material at present available.

9. **E. Ellenbeckii** (Gürke), comb. nov.

Orthosiphon Ellenbeckii Gürke in Engl. Bot. Jahrb. xxxviii. 174 (1906); figured *op. cit.* xli. 326 (1908).

British Somaliland. Between Rufa and Moja, on stony wooded mountain-slopes, June, *Ellenbeck* 1087 (B, type); between Gobelle and Maja, on stony ground, in thin bush on the plateau, May, *Ellenbeck* 1063 (B).

May be recognised by the reduced internode at the base of each raceme, giving the appearance that the flowers of the lowest verticillaster of the raceme and the leaves and branches of the next node of the stem are all in the same whorl.

10. **E. tereticaulis** (Poir.), comb. nov.

Ocimum tereticaule Poir. Encycl. Méthod. suppl. 592, "*Ocymum*" (1810).

O. Thonningii Schumach. in Schumach. & Thonning, Beskr. Guin. Pl. in K. Dansk Vidensk. Selsk. iv. 265, "*Ocymum*" (1829).

Orthosiphon cleistocalyx Vatke in Linnæa, xxxvii. 317 (1872).

[*Ocimum darfurense* Schweinf. ex Baker in Dyer, Fl. Trop. Afr. v. 347 (1900), *nomen synonymum.*]

[*O. corchorifolium* Hochst. ex Baker, *loc. cit.*, *nomen synonymum.*]

Orthosiphon gofensis S. Moore in Journ. Bot. xxxix. 263 (1901).

O. Kelleri Briq. in Bull. Herb. Boiss., sér. 2, iii. 988 (1903).

Endostemon ocimoides Bremekamp in Ann. Transvaal Mus. xv. 2, 250 (1933).

Geographical Range.—West tropical Africa, and from British Somaliland and Abyssinia through Uganda, Kenya Colony, and Tanganyika Territory to Rhodesia, Bechuanaland, and northern Transvaal.

Senegal. Without locality: *Perrottet* 670 (BM, G); *Leprieur, Guillemin* s.n. (K); *Heudelot* 168 (K).

Gold Coast. Accra, weed, odour of thyme, May, *Dalziel* 26 (K); Accra plains, *Irvine* 658 (K); nr. Accra, savannah, Mar., *Deighton* 598 (K).

West Tropical Africa. Without locality, *Don* s.n. (BM).

Sudan. Gebel Smin (?), on Kordofan frontier, Sept., *Pfund* 472 (K).

Abyssinia. Mawerr Mts., 3500 ft. (seen up to 5000 ft.), Aug., *Schimper* 45 (B), 2214 (BM, K); plains of Hamedo, 4500 ft., Sept., *Schimper* 385 (B, type of *Orthosiphon cleistocalyx*); Mt. Gof (Goro Escarpment), 3900 ft., *Delamere* s.n. (BM, type of *Orthosiphon gofensis*).

British Somaliland. Wagga Mt., *Bury* s.n. (BM); Golis Range, *Drake Brockman* 188 (K); Ahl Mts., nr. Meid, 3900 ft., Apr., *Hildebrandt* 1421 (BM); Roobi, *James & Thrupp* s.n. (K); Abdallah, *Keller* 232 (type of *Orthosiphon Kelleri*; K).

Uganda. Busoga, at Busaba, 3700–4000 ft., *Maitland* 1149 (K).

Kenya Colony. Ukamba Prov.: without locality, 1500 ft., *Scott Elliott* 6420 (BM). Seyidie Prov.: Rabai, Duruma, Oct., *Taylor* s.n. (BM); Voi, 1990 ft., May, *Napier* 1029 A (K); Mbuzuni, c. 1500 ft., Nov., *Scott Elliott* 6240 (K).

Tanganyika Territory. Arusha: Lower Nduruma, c. 3000 ft., Jun., *Haarer* 1433 (K). Usambara: Duga, bush-forest, Aug., *Holst* 3189 (K).

Southern Rhodesia. Wankie, May, *Rogers* 13,237 (BM).

BECHUANALAND PROTECTORATE. Francistown, Jan., *Rand* 65 (BM).

TRANSVAAL. Messina, 2000 ft., Jan. & Mar., *Rogers* 20,037 (BM, K), and Nov., *Moss & Rogers* 154 (BM); nr. Messina, May, *Young in Herb. Moss* 16,952 (BM); nr. Messina, flood-bed of Riv. Limpopo, May, *Young in Herb. Moss* 16,953 (BM). PIETERSBURG: farm Calais, Harmony Block, July, *Breyer* s.n. (TM).

Differs from *E. camporus* in the large leaf-like bracts of the inflorescence. There is considerable variation within the species in the indumentum of the stem and leaves.

11. **E. camporus** (Gürke), comb. nov.

Ocimum camporum Gürke in Engl., Pflanzenwelt Ost-Afr. C. 350 (1895).

Geographical Range.—East tropical Africa.

KENYA COLONY. KENYA PROV.: Embu District, Emberre, Tana plain, 3000–3500 ft., Nov., *Browne* s.n. (BM), and 4000 ft., June (native name "*Mwithandea*"), *Graham* 1741 (K); Donyo Sabuk District, open bush, 5400 ft., Dec., *Napier* 2371 (K). UKAMBA PROV.: Galunka, May, *Kassner* 825 (BM, K); without locality, 4000 ft., *Scott Elliott* 6347 (BM) and 5000–6000 ft., *Scott Elliott* 6709 (BM, K). SEYIDIE PROV.: Boura Mts., Teita, July, *Sacleux* 2527 (P).

TANGANYIKA TERRITORY. Riv. Himo, 1000 ft., Jan., *Volkens* 1739 (type; BM, K).

12. **E. usambarensis,** sp. nov. *Herba* ramosa ad c. 40 cm. alta. *Caulis* primum obtuse quadrangulus et pubescens, deinde teres; internodi c. 3–4·5 cm. longi. *Folia* patentia; petiolus 0·2–0·6 cm. longus pubescens; lamina ovata, basi cuneata ad rotundata, apice obtusa, margine crenata, usque ad 3·3 cm. longa et 2·4 cm. lata, utrinque plus minusve pubescens, subtus nervatione subprominente. *Racemi* simplices, c. 6–10 cm. longi; rhachis pubescens; verticillastri 6-flori, per anthesin c. 0·7–1·1 cm. inter se; bracteæ persistentes, 2–3 mm. longæ; pedicelli 3 mm. longi, minute glanduloso-puberuli. *Calyx* extus pubescens, intus subglaber, ore aperto, in fructu maturo ignotus; tubus campanulatus, 2–3 mm. longus, dente postico c. 2 mm. longo et lato, dentibus anticis 1·5 mm. longis laterales excedentibus. *Corolla* extra dentes calycis longe exserta, extus puberula, intus pilosa; tubus cylindricus apicem versus leviter ampliatus, 7–8 mm. longus et fauce 2–3 mm. latus; lobus posticus et anticus 2–3 mm. longi, quam lobi laterales longiores. *Stamina* in corollæ tubo inclusa, filamentis pilosis, 1–1·5 mm. longis. Stylus in corollæ tubo inclusus 5 mm. longus, apice incrassatus et inæqualiter 2-lobulatus. *Ovarii* lobi glabri.

TANGANYIKA TERRITORY. USAMBARA: Kwa Mshuza, mountain-forest, Aug., *Holst* 8985 (K, type).

Closely allied to *E. obtusifolius*, from which it is distinguished by its larger flowers.

13. E. OBTUSIFOLIUS (E. Meyer) N. E. Brown in Dyer, Fl. Cap. v. pt. 1, 296 (1910).

Ocimum obtusifolium E. Meyer, Comm. Pl. Afr. Austr. 227 (1837).

O. rariflorum Hochst. in Flora, xxviii. 67 (1845).

O. laxiflorum Baker in Dyer, Fl. Trop. Afr. v. 348 (1900).

Geographical Range.—From Angola and Nyasaland Protectorate through Rhodesia to Transvaal and Natal.

ANGOLA. Nr. Pungo Andongo, in thickets, not common, Jan., *Welwitsch* 5552 (type of *Ocimum laxiflorum*; BM), and moist thickets, Nov., *Welwitsch* 5553 (BM); Golungo Alto, thickets on banks of Riv. Cuango, not frequent, Mar., *Welwitsch* 5554 (BM) and 5584 (BM). Malange, moist situations in sugar-cane plantation and in the Pandanus, July, *Gossweiler* 1032 (BM).

NYASALAND. Without locality, *Buchanan* 110 (BM).

NORTHERN RHODESIA. LUANGWA: Malangushi Riv., *Kassner* 2077 ter. (BM); Chibanga Stream, open plain, Dec., *Kassner* 2090 (BM). Batoka Plateau, nr. Kalomo, *Allen* 217 (K).

SOUTHERN RHODESIA. Salisbury, 5200 ft., Nov., *Eyles* 3734 (K). Marandellas, woods, Dec., *Rand* 363 & 366 (BM). MAKONI: Rusapi, *Hislop* Z 254 B (K). Without locality, *Hislop* 127 (K).

TRANSVAAL. ZOUTPANSBERG: Louis Trichardt, Dec., *Breyer in Herb. Transvaal Mus.* 24,212 (TM); Wylie's Poort, Feb., *Breyer in Herb. Transvaal Mus.* 19,399 (TM). Barberton, Dec., *Pott* 5671 (TM). Banks of Riv. Limvovo, 1950 ft., Feb., *Schlechter* 4526 (BM).

NATAL. DURBAN: between Omtendo and Omsamculo, in fields nr. the sea, 1837, *Drège* s.n. (type; BM); Illovo, 200 ft., May, *Wood* 6418 (BM).

South Africa, without locality, *Gerrard* 78 (BM).

14. **E. villosus** (Briq.), comb. nov.

Orthosiphon villosus Briq. in Engl. Bot. Jahrb. xix. 177 (1894).

ANGOLA. HUILLA: in thickets around Lopollo, in sandy clay soils, Jan. & Mar., *Welwitsch* 5472 (type; BM, K); without locality, *Antunes* A 71 (B).

15. **E. retinervis** (Briq.), comb. nov.

Orthosiphon retinervis Briq. in Engl. Bot. Jahrb. xix. 175 (1894).

O. menthaefolius Briq. *tom. cit.* 176 (1894).

E. angolensis Good in Journ. Bot. lxix., Suppl. 2, 147 (1931).

Geographical Range.—Cameroons and Angola.

CAMEROONS. Buar, c. 3250 ft., May, *Mildbraed* 9335 (BM, K).

ANGOLA. LUNDA: Dalo, dry forest, Nov., *Young* 1278 (BM). BIÉ: north-east of Vila da Ponta (Fte. P. Amelia), Riv. Cubango, in herb-grown open shady woods, on red clay soils, Jan., *Gossweiler* 2521 (BM, type of *E. angolensis*); nr. Lopollo, frequent in rather humid thickets, Mar., *Welwitsch* 5475 (type of *Orthosiphon menthaefolius*; BM, K). Cuango region, Cissicala, Jan., *Mechow* 553 (B, type).

16. **E. scabridus** (Briq.), comb. nov.

Orthosiphon scabridus Briq. in Engl. Bot. Jahrb. xix. 175 (1894).

ANGOLA. Malange, Jan., *Mechow* 442 (B, type). CUANZA SUL: Libolo, on granito outcrop, Dec., *Dawe* 335 (K).

Characterised by its large cordate leaves with coarse crenation.

17. E. TUBERIFER Good in Journ. Bot. lxix., Suppl. 2, 148 (1931).

ANGOLA. BIÉ: Capombe, in humid situations along the reed-bed of the rivulet Kuansha, Oct., *Gossweiler* 2189 (BM, type).

Resembles very closely *E. dissitifolius*, but differs in having the lobes of the ovary glabrous.

NOTES ON THE FLORA OF ANGOLA.—III.

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

Cleome Gossweileri Exell, sp. nov. *Herba* annua erecta virgata, ramulis subsparse vel densiuscule glandulosis, glandulis brevibus sessilibus vel subsessilibus. *Folia* trifoliolata, inferiora petiolata, petiolo usque 12 mm. longo, superiora breviter petiolata vel sessilia, foliolis obovato-cuneatis, 3–8×2·5–6 mm., apice rotundatis nonnunquam apiculatis, margine sparse vel densiuscule glandulosis. *Flores* lutei (semper?) pedicellati, pedicellis patentibus ad 15 mm. longis glandulosis, in racemos terminales bracteatos dispositi. *Sepala* oblongo-elliptica, 6×3 mm., glandulosa. *Petala* ovata basi cuneata unguiculata, 15×8–9 mm., glabra. *Stamina* circa 30, filamentis inæquilongis, 12–30 mm. longis, antheris oblongis, 3–3·5×0·5–0·7 mm. *Capsula* 6–9 cm. ×1–1·5 mm., subsparse vel densiuscule glandulosa, gynophoro 12–13 mm. longo, seminibus valde curvatis ambitu suborbicularibus, 0·8 mm. in diam., minute insculptis.

Hab. ANGOLA: corolla yellow, in halophyte formation, at 10 m. alt., Lobito, Benguela, fl. & fr. Sept., *Gossweiler* 10,349. (Typus in Herb. Mus. Brit.; Herb. Conimbr.); near the town of Benguela, *Welwitsch* 965 pro parte (Herb. Mus. Brit.).

This species has been confused with *Cleome foliosa* Hook. f., from which it differs in the leaves being always trifoliolate, in having narrower capsules and an indumentum of small sessile glands, not glandular-pilose as in *C. foliosa*. *C. Gossweileri* seems to be confined to the littoral region of Benguela, a region rich in endemic species.

Polygala Gossweileri Exell & Mendonça, sp. nov. *Herba* perennis cæspitosa, c. 15 cm. alta, basi lignosa ramosa, caulibus gracilibus striatis glabris. *Folia* subsessilia lineares, 8–14×0·5–1 mm., apice apiculata glabra. *Flores* cærulei graciliter pedicellati, pedicello 5–7 mm. longo glabro, nunc in racemos usque 1·5 cm. longos ut videtur foliis oppositos dispositi nunc solitarii. *Alæ* oblique ellipticæ, 5×2·5 mm., apice acutæ margine minute ciliolatæ. *Sepala* 2·2 mm. longa margine ciliata 2 anterioria fere ad apicem connata. *Petala superiora* obovata, 4×3·3 mm., glabra. *Carina* 5×2 mm., glabra apice cristata, crista 1 mm. longa, fimbriata. *Stamina* 6 fertilia, 2 sterilia non antherifera, filamentis antheriferis et non antheriferis subæqualibus basi in tubum 3 mm. longum basin versus ciliolatum connatis, partibus liberis c. 2 mm. longis. *Ovarium* ambitu suborbiculare, 1×1 mm., glabrum, stylo 5 mm. longo apice incurvato. *Capsula* 2·5–3×2–2·5 mm., anguste alata glabra vel fere glabra, seminibus oblongis, 2·2 mm. longis sericeis apice arillatis.

Hab. ANGOLA: skirting the marshy meadows of the Colui Valley, Bié, fl. & fr. Oct., *Gossweiler* 2146. (Typus in Herb. Mus. Brit.; Herb. Conimbr.)

Many-headed perennial with woody rootstock; leafy shoots much branched from the base, ascending; total height 5 inches; flowers indigo-blue.

This species belongs to Sect. *Orthopolygala*, Ser. *Tetrasepalae* Chod., and is very closely related to *P. huillensis* Welw., from which it differs in having narrower leaves and shorter inflorescences and in the structure of the androecium. In *P. huillense* the six fertile stamens are arranged in two pairs, with filaments joined to within about 0·5 mm. of the anthers and two single stamens whose free filaments are 1 mm. long. The two sterile filaments are only free for a length of about 0·5 mm. In *P. Gossweileri* the six fertile stamens are not arranged in pairs, the filaments are free for a length of 2 mm., and the two sterile filaments are almost of equal length to the fertile ones. As is usual in Ser. *Tetrasepalae*, one or two stamens are to be found in close connection with the stigmatic surface when the flowers are dissected.—A. W. E. & F. A. M.

Psorospermum Hundtii Exell & Mendonça, sp. nov. *Suffrutex* rhizomatosus 15–20 cm. altus, caulibus erectis pubescentibus. *Folia* opposita brevissime petiolata, petiolo usque 1 mm. longo, lamina anguste elliptica apice plerumque acuta nonnunquam mucronulata basi cuneata, 3–6×1–1·8 cm., glabra opaca, supra nervis vix conspicuis subtus in sicco sparse nigro-punctata sed

glandulis haud pellucidis, nervis lateralibus 7–8-paris leviter conspicuis. *Flores* in cymas breves terminales rufo-tomentellas dispositi. *Sepala* elliptica nigro-lineata, 3·5×1·9 mm. *Petala* elliptica apice acutissima leviter acuminata basi breviter unguiculata, 6–7×2–8 mm., intus piloso-lanuginosa. *Disci squamulæ* trigono-subulatæ 1–1·5 mm. longæ. *Staminum phalanges* pubescentes 4 mm. longæ. *Ovarium* ellipsoideum 5-angulatum 5-loculare, loculis uniovulatis, stylis glabris cum ovario 4 mm. longis. [*Fructus* ignotus.]

Hab. ANGOLA: flowers greenish white, in *Acacia*-forest, Xongorola, between Ganda and Caconda, Benguela, fl. Nov., *Hundt* 253. (Typus in Herb. Berol.)

In habit and in the shape of the leaves this species closely resembles *P. Mechowii* Engl. from Malange, but differs in having opaque leaves with gland-dots which are few in number and are not visible when the dried leaves are held up to the light. *P. Hundtii* seems to differ both from *P. Mechowii* and the very variable *P. febrifugum* Spach in having petals which are shortly unguiculate. It also differs from *P. febrifugum* in habit. Although very variable in this respect, the latter never seems to occur as a rhizomatous undershrub of such small dimensions as *P. Hundtii*. Although occasional specimens of *P. febrifugum* with glabrous leaves are found, the leaves are nearly always distinctly albescent beneath.—A. W. E. & F. A. M.

Hibiscus benguellensis Exell & Mendonça, sp. nov. *Herba* erecta perennis (?), caule stellato-pubescenti scabriusculo. *Folia* petiolata, petiolo stellato-pubescenti 10 mm. long, lamina ovato-lanceolata apice acuta margine dentato-serrata basi breviter cordata 7-costata, 4–9×2–4·5 cm., supra subtusque stellato-pubescenti, scabriuscula, costa media supra subtusque prominula, costis lateralibus 4–6-paris. *Flores* pedunculati, pedunculis florum inferiorum apicem versus articulatis 2–2·5 cm. longis, pedunculis florum superiorum basin versus articulatis 6–7 mm. longis. *Involucri bracteæ* circa 8 subulatæ calycis tubum paullo excedentes 4 mm. longæ, stellato-pubescentes. *Sepala* triangularia acuta 4–5 mm. longa basi in calycem 2–3 mm. longam connata. *Petala* delapsa (verisimiliter rubra). *Capsula* 8–12 mm. longa penicillato-pilosula. *Semina* longe fusco-pilosa.

Hab. ANGOLA: Benguela, Bailundo District, 5000 ft., *Wellman* s.n. (Typus in Herb. Kew.)

This species belongs to Sect. *Bombycella*, and is allied to *H. rhodanthus* Gürke and *H. huillensis* Welw., from both of which it can be distinguished by having a relatively longer epicalyx (exceeding the tubular portion of the calyx) and by the characteristic ovate-lanceolate leaves which are definitely, though not deeply, cordate at the base. The specimen is in fruit and the petals are not known. The flowers are probably red, as is almost invariable in the section.—A. W. E. & F. A. M.

Hibiscus Castroi Bak. f. & Exell, sp. nov. *Suffrutex* divaricato-ramosus, ramulis annotinis viridibus hornotinis cortice griseo obtectis. *Stipulæ* mox deciduæ. *Folia* parva petiolata, lamina ovata vel ovali margine grosse crenato-serrata basi cuneata utrinque dense stellato-pubescenti, 8–12×5·8 mm., petiolis brevibus ±2 mm. longis. *Flores* solitarii breviter pedunculati, pedunculo 3–5 mm. longo. *Involucri bracteæ* anguste lineares 2–3 mm. longæ plerumque reflexæ quam calycem breviores. *Calyx* in toto 5–6 mm. longus, lobis ovato-lanceolatis acuminatis dense stellato-tomentellis 4–5 mm. longis. *Petala* 6–7 mm. longa flava. *Columna staminea* 2–2·5 mm. longa, filamentorum partibus liberis c. 0·3 mm. longis. *Styli* 3–3·5 mm. longi. *Capsula* suborbicularis, 5×6 mm., dense puberula, seminibus dense et longe albo-sericeis.

Hab. ANGOLA: Damba do Espinheiro, Mossamedes, *M. Castro* 92. (Typus in Herb. Conimbr.; Herb. Mus. Brit.)

"Flores amarelas. Terrenos arensoso e pedregosos."

This species belongs to Sect. *Bombycella* DC. and is remarkable for having small yellow flowers (nearly always red or pink in the section). In this respect it is similar to *H. sulfuranthus* Ulbr. from Hereroland, but differs in being a much-branched woody undershrub, not with virgate stems as in *H. sulfuranthus*, and with much shorter, relatively narrower leaves than in Ulbrich's species. —E. G. B. & A. W. E.

Hibiscus Fritzscheae Exell & Mendonça, sp. nov. *Arbuscula* 1·5–2 m. alta valde ramosa, ramulis primo velutinis demum glabrescentibus. *Folia* omnino velutina petiolata, petiolo 4–6 mm. longo, lamina suborbiculare ovata vel elliptica, 1·3–2·5×1–1·7 cm., apice rotundata margine breviter crenato-serrata plerumque rotundata. *Stipulæ* filiformes 2–4 mm. longæ. *Flores* rubri pedunculati, pedunculo usque 22 mm. longo, apicem versus articulato velutino. *Involucri bracteæ* 8 lineari-oblongæ nonnunquam reflexæ calyce subæquantes vel parum breviores. *Sepala* anguste triangulares acuta, 6–7×2–2·5 mm., velutina et pilosa basi breviter connata. *Petala* late obovato-elliptica, 10–13×7–9 mm., extus stellato-pilosa intus glabra. *Columna staminea* 4 mm. longa glabra, filamentorum partibus liberis circa 3 mm. longis. *Styli rami* liberi 6 mm. longi. *Capsula* globosa 8 mm. diam. minutissime stellato-pubescens. *Semina* glabra.

Hab. ANGOLA: Huila, Monino, *B. Fritzsche* 163. (Typus in Herb. Berol.); Mossamedes Railway at km. 109, *Pearson* 2813 (Herb. Kew.).

Although the seeds are glabrous, this species must undoubtedly be placed in Sect. *Bombycella*, since it has the characteristic red flowers and general appearance of the species of that section. *Hibiscus serratifolius* Ulbr. with glabrous seeds has also been placed in Sect. *Bombycella*, but is readily distinguished from our species by its deeply divided leaves.—A. W. E. & F. A. M.

Hibiscus cuanzensis Exell & Mendonça, sp. nov. (*H. Mastersianus* Hiern, Cat. Afr. Pl. Welw. i. 71 (1896), pro parte quoad spec. Welw. 5241). *Herba* perennis 1–1·5 mm. alta, caulibus patenti-ramosis primo stellato-tomentosis et stellato-aculeolatis demum verruculoso-aculeolatis ceteroque glabrescentibus. *Folia* petiolata, petiolo usque 7 cm. longo, laminis foliorum superiorum inflorescentiæ bractiformibus anguste ellipticis, 2–5×0·7–2·5 cm., inferiorum ambitu suborbicularibus usque 8·5×8·5 cm. circa ad medium trilobatis, lobis acutis, lobo medio longiore usque 4·5 cm. longo, margine irregulariter serratis basi obtusis vel subtruncatis vel rotundatis vel brevissime cordatis 5–7-nervis omnino stellato-pilosis. *Stipulæ* lineares 5–7 mm. longæ. *Flores* stramineo-flavi (fide cl. Welwitsch) breviter pedunculati, pedunculo 3–6 mm. longo, in racemos terminales elongatos foliatos basi ramosos dispositi vel nonnunquam in axillis foliorum pseudo-geminati. *Involucri bracteæ* circa 8 lineares apice furcatæ ad basin liberæ tomentosæ et margine setigeræ calycis tubum paullo excedentes 8–9 mm. longæ. *Sepala* ovato-lanceolata acuta 12–15 mm. longa stellato-tomentosa et ad nervos stellato-setigera basi per 5 mm. connata. *Petala* ±4 cm. longa. *Columna staminea* 2 cm. longa filamentorum partibus liberis 2 mm. longis. *Capsula* ovoidea acuta primo dense et longe setigera demum glabrescens, 8–13×7–9 mm., seminibus ±trigonis sub lente lepidotis.

Hab. ANGOLA: Cuanza Norte, Pungo Andongo, near Cazella, fl. & fr. April, *Welwitsch* 5241 (Typus in Herb. Mus. Brit.); Calunda Mangue, *Welwitsch* 5241 (Herb. Mus. Brit.).

This species was included by Hiern (*loc. cit.*) in his *H. Mastersianus*. As Milne-Redhead has pointed out (in Kew Bulletin, 1935, 272), the type of *H. Mastersianus* must be taken as "Zambesi, Tette, Kirk," one of the two specimens quoted by Masters under *H. furcatus* Roxb. (in Fl. Trop. Afr. i. 201; 1868). The Angolan material cited by Hiern seems to be separable into at least two species which we are here describing as new. The true *H. Mastersianus* Hiern (*i. e.*, the species typified by the Kirk specimen) differs from *H. cuanzensis* in having definitely aristate carpels and leaves much less densely hairy. It has been collected only in Portuguese East Africa and Rhodesia and has not yet been found in Angola. *Welwitsch* 5242, from Caghuy, Pungo Andongo, is very close to *H. cuanzensis*, and may well turn out to be a form of it. The leaves are only slightly lobed and the flowers, which are much smaller (about 2 cm. long) are described by the collector as "intense flavi," while those of *Welwitsch* 5241 are described as "stramineo-flavi." Further collecting is necessary to elucidate the relationship between the two specimens.—A. W. E. & F. A. M.

Hibiscus Hiernianus Exell & Mendonça, sp. nov. (*H. Mastersianus* Hiern, Cat. Afr. Pl. Welw. i. 71 (1896), pro parte quoad spec. Welw. 4927 et 4928; *H. surattensis* var. *Mastersianus* (Hiern) Hochr. in Ann. Conserv. Jard. Bot. Genève, iv. 112; 1900, pro parte quoad spec. Welw. 4927 et 4928; Exell in Journ. of Bot. lxv. Suppl. Polypet. 34; 1927, quoad spec. Gossw. cit.).

Herba perennis vel annua prostrato-adscendens vel erecta, caule dense stellato-pubescenti et sparse stellato-aculeato. *Folia* petiolata, petiolo 1–2·5 cm. longo stellato-pubescenti, lamina late ovata vel suborbiculari vel reniformi nonnunquam profunde 3–5-lobata, lobis apice plerumque rotundatis basin versus angustatis, apice plerumque obtusa vel rotundata, margine breviter serrata, basi obtusa vel truncata vel breviter cordata 5–7-nervia, 1–4×1–5 cm., omnino stellato-pilosula. *Stipulæ* lineares 2–3 mm. longæ. *Flores* flavi breviter pedunculati, pedunculo 2–5 mm. longo, in racemos terminales breves subscorpioides (ante anthesin) conferti. *Involucri bracteæ* lineares liberæ nunc sepalis subæquantes nunc breviores, apice furcatæ margine patente setigeræ. *Sepala* anguste lanceolata acuta 10–13 mm. longa dense minute stellato-pubescentia et ad nervos stellato-setigera per 4–5 mm. connata. *Petala* ±obovata 2·5 cm. longa stellato-pubescentia. *Columna staminea* 11–12 mm. longa dense antherifera, filamentorum partibus liberis 0·5 mm. longis. *Ovarium* dense setigerum, stylis immaturis.

Hab. ANGOLA: Huila, *Welwitsch* 4927 (Typus in Herb. Mus. Brit.), 4928 (Herb. Mus. Brit.); Huila, Humpata, *Pearson* 2102 (Herb. Kew.); Bié, River Tiengo, Cuito, *Gossweiler* 3665 (Herb. Mus. Brit.).

The two Welwitsch specimens were included by Hiern in his *H. Mastersianus* (see preceding species). *H. Hiernianus* differs from *H. cuanzensis* and from *H. Mastersianus* by its much smaller leaves with lobes (when present) rounded at the apex and narrowed towards the base, and by its much shorter, more condensed, subscorpioid racemes.—A. W. E. & F. A. M.

Hibiscus Ficalhoanus Exell & Mendonça, sp. nov. (*Hibiscus physaloides* (non Guill. & Perr.).—Hiern, Cat. Afr. Pl. Welw. i. 69 (1896), pro parte quoad spec. Welw. 4933). *Herba* annua erecta 30–60 cm. alta, caule basi ramoso stellato-tomentello. *Folia* petiolata, petiolo 1–2·5 cm. longo, inferiora ovata vel ovato-lanceolata, superiora subhastata vel profunde trilobata vel lineari-lanceolata vel linearia, margine crenata, 1·5–6×0·6–4·5 cm., sparse vel dense stellato-pubescentia vel stellato-strigulosa. *Flores* (flavidi, basin versus purpurei?) breviter pedunculati, pedunculo c. 1 cm. longo stellato-tomentoso, in racemos terminales et in axillis foliorum superiorum dispositi. *Involucri bracteæ* breves filiformes 2–3 mm. longæ ±reflexæ. *Sepala* triangulares acuta c. 14 mm. longa fere ad medium connata stellato-pubescentia. *Petala* obovata 4 cm. longa. *Capsula* subglobosa, 12×10 mm., extus stellato-tomentosa, seminibus lepidotis.

Hab. ANGOLA: Huila, near Lopolo, fl. & fr. Oct., *Welwitsch* 4933. (Typus in Herb. Univ. Olisip.; fragm. et tab. delin. in Herb. Mus. Brit.)

This species is related to *Hibiscus physaloides* Guill. & Perr., *H. mossamedensis* (Hiern) Exell & Mendonça*, *H. andongensis* Hiern, and *H. loandensis* Hiern, all of which seem to form a natural group with filiform involucral bracts. *H. Ficalhoanus* can be distinguished from all the others by the very short involucral bracts and by the invariably short peduncles. The species is named after Count Ficalho, who was the first to recognise it as a new species. He wrote on the Lisbon sheet "A comparar com *H. physaloides* ex Hiern . . . mas certamente distincto, e apparentemente uma especie nova."

Hibiscus Ottoi Exell, sp. nov. *Herba* annua erecta caule ramulisque stellato-setigeris et stellato-pubescentibus. *Folia* petiolata, petiolo usque 3·5 cm. longo stellato-tomentello, lamina ambitu plerumque ovata trilobata nonnunquam hastata, 2–6×0·7–5 cm., apice acuta, margine serrato-crenata, basi cordata, supra subsparse subtus dense stellato-pubescenti omnino sparse stellato-setigera. *Flores* flavidi breviter pedunculati, pedunculo ad 0·7 cm. longo stellato-tomentoso, in racemos terminales ±foliatos dispositi. *Involucri bracteæ* 7–8 filiformes 5–6 mm. longæ dense pilosulæ. *Calycis lobi* lineari-lanceolati acuti distincte trinervii 8–9 mm. longi basi in tubum 5–6 mm. longum connati. *Petala* 3·5–4 cm. longa obovata stellato-pubescentia. *Columna staminea* 15 mm. longa, partibus liberis filamentorum c. 1 mm. longis. *Capsula* ovoidea, 10–11×7–8 mm., acuta dense stellato-pilosa et stellato-pubescenti, seminibus lepidotis.

Hab. ANGOLA: Benguela, Xongorola, between Ganda and Caconda, 1700 m. alt., fl. & fr. April, *Otto Hundt* 913. (Typus in Herb. Mus. Brit.; Herb. Berol.; Herb. Conimbr.) "Auf alten Feldern im feuchten Land; bis 2 m.; gelb."

This species is near *H. loandensis* Hiern, from which it differs in having much shorter peduncles, shorter involucral bracts, and less sharply serrate leaves, and to *H. Ficalhoanus* Exell & Mendonça, from which it differs in having longer involucral bracts and much longer and narrower calyx-lobes. The relationship with the latter species is very close and further collecting may show intermediate forms. It appears more satisfactory to keep them specifically apart until more is known about them.

Hibiscus Hundtii Exell & Mendonça, sp. nov. *Herba* rhizomatosa prostrata 10–15 cm. alta, caulibus dense strigulosis basin versus ramosis. *Folia* petiolata, petiolo 7–18 mm. longo, basalia

* **Hibiscus mossamedensis** (Hiern) Exell & Mendonça, comb. nov. (*Hibiscus rhabdotospermus* var. *mossamedensis* Hiern, Cat. Afr. Pl. Welw. i. 70; 1896).

suborbicularia, caulina ovato-cordata acuta margine crenulato-serrata basi 3–5-nervia omnino strigulosa, 1–3×0·8–2·2 cm., stipulis anguste lanceolatis 3–4 mm. longis. *Flores* axillares longe pedunculati, pedunculo 2–5 cm. longo, striguloso. *Involucri bracteæ* 5–6 lineares quam calycis tubum paullo minores 3–3·5 mm. longæ basi brevissime connatæ stellato-pilosulæ et minute stellato-pubescentes. *Sepala* anguste lanceolata acuta, 17×3–3·5 mm., per partem tertiam connata. *Petala* roseo-violacea anguste obovata, 3×1·7 cm., stellato-pilosula. *Columna staminea* 6 mm. longa dense antherifera, filamentorum partibus liberis usque 1 mm. longis. *Styli* 12 mm. longi per 9 mm. connati. *Capsula* immatura ellipsoidea apiculata glabra.

Hab. ANGOLA: Benguela, Xongorola, between Ganda and Caconda, *Hundt* 705. (Typus in Herb. Berol.)

This species is nearest to *H. fugosioides* Hiern, but differs strikingly in habit. *H. fugosioides* is a tall virgate plant up to 70 cm. high, while *H. Hundtii* is prostrate and much branched at the base. It is also much more densely hairy.—A. W. E. & F. A. M.

Hibiscus pachycarpus Exell & Mendonça, sp. nov. (*Hibiscus calyphyllus* (non Cav.).—Hiern, Cat. Afr. Pl. Welw. i. 72 (1896), pro parte quoad spec. Welw. 4898).

Herba suffruticosa, caule sparse stellato-puberulo. *Folia* longe petiolata, petiolo 8 cm. longo stellato-puberulo, lamina ovata acuminata apice rotundata margine irregulariter crenato-dentata basi subtruncata vel brevissime cordata 7-nervia, 8–9×5–5·5 cm., subtus stellato-pubescenti, costis lateralibus prominulis circa 3-paris, stipulis lineari-subulatis 6–7 mm. longis. [*Flores* ignoti.] *Capsula* ovato-pyramidalis lignosa apice acuminata 3 cm. longa, 2 cm. in diam. et 2–3 mm. crassa, seminibus subreniformibus, 4·5×3·5 mm., dense sericeis.

Hab. ANGOLA: Quicanda, Zenza do Golungo, Cuanza Norte, fr. Sept., *Welwitsch* 4898. (Typus in Herb. Mus. Brit.)

Although the material is very inadequate, this species is so clearly distinguishable from *H. calyphyllus* Cav. (to which Hiern "very doubtfully" referred it) by its woody thick-walled capsule that we consider it advisable to describe it as new.—A. W. E. & F. A. M.

Hibiscus pruriosus Exell & Mendonça, sp. nov. (*H. lunariifolius* Hiern (non Willd.), Cat. Afr. Pl. Welw. i. 72 (1896), pro parte quoad spec. Welw. 5251).

Herba perennis 1·5–2 m. alta, caule erecto patente ramoso stellato-tomentoso et cum pilis prurientibus stellato-triramosis. *Folia* longe petiolata, petiolo 5–8 cm. longo stellato-tomentello, lamina late ovata vel suborbiculare trilobata, lobis triangularibus acutis, apice acuta margine serrata basi alte cordata, 5–7-nervia,

2·5–8×2–7 cm., costa media supra prominula subtus prominente, costis lateralibus 3–4-paris supra stellato-pubescentibus et stellato-strigulosis subtus stellato-tomentosis et cum pilis prurientibus stellato-triramosis munitis, stipulis lineari-lanceolatis 3–5 mm. longis. *Flores* sulphureo-vinosi breviter pedunculati, pedunculo densissime stellato-strigoso, 4–7 cm. longo, in axillis foliorum superiorum dispositi racemos foliosos terminales formantes. *Involucri bracteæ* lineari-oblongæ apice subulatæ, 20–25×4–5 mm., basi per 3–4 mm. connatæ stellato-tomentosæ. *Calyx* 15–20 mm. longus, segmentis ad basin ovatis subito anguste lineari-subulatis basi per 4–5 mm. connatis. *Petala* 6–7 cm. longa. *Columna staminea* 5 cm. longa, staminorum partibus liberis 3 mm. longis. *Rami styli* stellato-pubescentes. *Capsula* subglobosa apice acuta cum pilis prurientibus plerumque stellato-triramosis munita, seminibus sparse lepidotis.

Hab. ANGOLA: Cuanza Norte, Pungo Andongo, Mata de Pungo, *Welwitsch* 5251. (Typus in Herb. Mus. Brit.)

It seems doubtful whether true *H. lunariifolius* Willd. occurs in Africa. Dr. Mildbraed kindly informs us that the type has involucral bracts 15–20 mm. long, but only just over 1 mm. broad at the base (4–5 mm. broad in our species) and with indumentum only visible with a lens. We have divided the material which Hiern (*loc. cit.*) placed under *H. lunariifolius* into two species, the other specimens (from Cazengo and Huila) being referred to *H. Donianus* D. Dietr. which has shorter, much narrower involucral bracts and leaves which are subtruncate or only shallowly cordate at the base.—A. W. E. & F. A. M.

NOTE.—We regret that *Ritchiea Noldei* Exell & Mendonça (in Journ. Bot. lxxiv. 17; 1936) was misspelt owing to lack of information on the ticket. It should be *Ritchiea Noldeae*, named after Baronin Ilse Nolde.—A. W. E. & F. A. M.

THE ESSEX *DORONICUM PLANTAGINEUM*.

BY A. B. JACKSON, A.L.S.

IN Gibson's 'Flora of Essex,' 173 (1862), *Doronicum plantagineum* is stated to grow in a lane leading from Widdington to the Jock Wood, on the authority of Edward Forster, who found it there in 1800. Gibson adds a note in the 'Flora,' "Still found there plentifully and well naturalised." Forster's record is confirmed by a specimen in the British Museum Herbarium, labelled "*Doronicum pardalianches*," the name "*D. plantagineum*" being added in another hand. Mr. J. E. Lousley showed Mr. Pugsley and myself this locality on May 8th, 1935: the plant was growing in considerable quantity on a ditch-bank and seemingly well established. It is not, however, *D. plantagineum*, as generally understood in England, the leaves being noticeably broader and often slightly cordate or cordate truncate, resembling those of *D. pardalianches* in outline. The Doronicums of this group are critically dealt with by Rouy in Rev. Bot. Syst. 1903, 17, and the following description of his "Forme iii. *D. Willdenowii*," distinguished from his *D. plantagineum* "type" and "Forme i. *gallicum*" as follows, fits our Essex plant:—"Souche à stolons nuls ou très courts, feuilles radicales et celles des rosettes ovales, plus ou moins cordées, mais à lobes écartés ou ovales-suborbiculaires à base largement tronquée; feuilles caulinaires ovales, les inférieures ordinairement atténués ou contractées en un large pétiole auriculé-amplexicaule, rarement sessiles, mais alors auriculées; feuilles supérieures ovales ou elliptiques, embrassantes; réceptacle poilu; folioles du péricline courtes (presque une fois moins longues que les ligules)."

In Coste's Fl. France, ii. 297 (1903), this broad-leaved plant is treated as a distinct species under the name of *D. emarginatum* Le Grand with the following diagnosis:—"Feuilles radicales à limbe un peu échanchré ou faiblement cordé à la base; feuilles moyennes embrassantes, sessiles ou rétrécies en pétiole ailé." Its distribution is given as woods and shady rocks, Indre, Maine et Loire, Mayenne.—N. Africa. There are specimens in Herb. Mus. Brit. (Herb. Gadeceau) labelled "Doronicum scorpioides Willd. ?" from near Le Mans and other localities, where it is apparently of cultivated origin, but is occasionally naturalised. In Herb. Kew. there are two sheets from Scotland labelled "*D. plantagineum*, Freeland, Bridge of Earn, July 1870, J. R. Drummond," and "Blair Culross, Co. Perth, April 18, 1872, T. Drummond," and another, "Widdington, Essex, R. W. B., 10. 5. 1925." This last is presumably the locality where the writer gathered it last year.

The plant figured on plate 630 of 'English Botany,' representing *D. plantagineum*, was drawn from a specimen of the broad-leaved plant sent by Mr. T. Walford from another Essex locality: roadside near Saling Hall. A drawing of the radical leaf of the true *D. pardalianches* was subsequently added to the plate, and this confusion explains why the figure has been quoted for the two species. This broad-leaved plant is no doubt much more clearly allied to *D. plantagineum* than to *D. pardalianches*, which has smaller flowers and distinctly cordate leaves. Individual plants show considerable variation in leaf-form, and the herbarium material at my disposal appears to show intergrading between the narrow typical form and the extreme broad and subcordate leaf of *D. Willdenowii*. The character based on the presence or absence of stolons seems equally unreliable. Broad-leaved plants are sometimes without them, so that these characters do not appear to be correlated. This view is borne out by other observers, including Bonnet, whose critical study of the group (Bull. Assoc. Franc. Avant Sciences, 1894, ii. 636) should

be consulted. Under these circumstances it seems best to regard the broad-leaved plant as a variety of *D. plantagineum* to be cited as follows :—

Doronicum plantagineum var. **Willdenowii** (Rouy), comb. nov.
D. plantagineum forme *Willdenowii* Rouy, in Rev. Bot. Syst. 1903, 17.
D. scorpioides Willd. Sp. Pl. 2114 (1800) ; non Lam. (1786).
D. emarginatum Le Grand, ex Coste Fl. Fr. ii. 297 (1903).
D. pardalianches Eng. Bot. t. 630 (excl. radical leaf).
It is common in cultivation in this country.

NOTES ON PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA.

TARAXACUM SPECIES FROM IRELAND AND WALES FROM THE LUND BOTANIC GARDEN.—Gustaf E. Haglund (' Botaniska Notiser,' 1935, 429–438) states that during a journey in Ireland and Wales undertaken by Dr. Degelius in 1933 for the purposes of lichenological studies seeds of species of *Taraxacum* were also collected. These were grown in the Lund Botanic Garden. The eighteen species are distributed in the following way among the groups distinguished by Dahlstedt :—

ERYTHROSPERMA (*Dissimilia*).

T. Degelii G. Hagl., sp. nov. IRELAND : Aran Islands, Inishmore, Kilmurvy. The *Dissimilia* group constitutes a parallel to the *Erythrosperma* group, but differs chiefly through its fruits, which are usually grey or olive—not red. *T. Degelii* is said to be a very characteristic species, recognised by its small light brownish fruits and intensely yellow heads.
T. glauciniforme Dahlst. IRELAND : Aran Islands, Inishmore.

SPECTABILIA.

T. britannicum Dahlst. IRELAND : Lisdoonvarna.
T. hibernicum G. Hagl., sp. nov. IRELAND : Aran Islands, Inishmore, Kelronan. A comparatively low-growing species with firm long bow-curved dark-coloured slightly bluish green leaves, the lobes of which are short, acute, and claw-like.
T. Nordstedtii Dahlst. IRELAND : Oughterard.
T. serratilobum Dahlst. IRELAND : Oughterard ; Galway.
T. unguilobum Dahlst. IRELAND : Oughterard ; Galway.

VULGARIA.

T. connexum Dahlst. Wales : Harbour.
T. cordatum Palmgr. (*T. amblycentrum* Dahlst.). IRELAND : Aran Islands, Inishmore, Kelronan.

T. crispifolium Lindb. fil. IRELAND : Galway roadside, at the University. Killarney.
T. Dahlstedtii Lindb. fil. WALES : Fishguard.
T. expallidiforme Dahlst. ENGLAND : Kew Gardens. Leg. *Nannfeldt*.
T. hamatiforme Dahlst. WALES : Fishguard.
T. hamiferum Dahlst. IRELAND : Killarney.
T. insigne E. L. Ekm. WALES : Fishguard.
T. latisectum Lindb. fil. ENGLAND : Priory Road [? Kew]. Leg. *Nannfeldt*. IRELAND : Galway, interior little bay.
T. protractifrons Dahlst. IRELAND : Roundstone.
T. protractifrons Dahlst is said to differ from *T. expallidum* by its longer internodes and usually more prolonged leaf-lobes with less distinctly protracted points.
T. subcyanolepis M. P. Chr. IRELAND : Aran Islands, Inishmore, Kelronan ; Oughterard. Galway, roadside at the sanatorium.

The author states that up to the present about 150 species of *Taraxacum* are known to occur in England.—E. G. BAKER.

REVIEWS.

MORPHOLOGY OF THE GRASS-SPIKELET.

Beiträge zur Morphologie des Grasährchens. Inaugural Dissertation zur Erlangung der Doktorwürde genehmigt von der Philosophischen Fakultät der Friedrich-Wilhems-Universität zu Berlin. By GÜNTHER ROSSBERG. Pp. 42, text-figs. 7, tt. 3. Berlin, 1935.

THE grass-spikelet has for a long time been the subject of detailed investigation. Numerous attempts have been made to explain its structure and the origin of its subordinate parts, but the results obtained are often contradictory and not conclusive. Dr. Rossberg has tackled two problems about which there has been considerable diversity of opinion. First, he considers the arrangement and reduction in the number of stamens, and, secondly, the origin and structure of the palea (upper pale, valvule) and its position in relation to the remaining organs of the spikelet. His researches have been based on a comprehensive study of the most important genera of all the tribes recognised by Hackel, whilst he has especially considered those grasses which were supposed to have some peculiarity, *i. e.*, those which deviate from the normal in possessing more or less than three anthers or those in which the palea has an odd number of nerves.

The hexandrous flower, as it exists in the Liliaceae, is considered the basal type. In the Gramineae it is still seen in many members of the tribes *Oryzeae* and *Bambuseae*. Here the six

stamens are stated to be in two whorls, the members of the outer whorl alternating with the lodicules. The male flower of *Luziola peruviana* Gmel. was found to be entirely hexandrous in the material investigated, and not with six to many stamens as usually described. By means of serial sections it was found that the filaments of the second whorl originate at a higher level than those of the first. *Oxytenanthera Braunii* Pilger possesses three long anthers alternating with three shorter ones. Owing to the fusion of the filaments in this genus, it was not possible at first to state which formed the inner or the outer whorl, but by a comparison with species of *Dendrocalamus* which have similar anthers and free filaments, it is shown that the longer anthers belong to the outer and the shorter anthers to the inner whorl.

Probably the most interesting type of stamen arrangement is found in tetrandrous flowers. Few examples are known in the Gramineae and these occur in the genera *Microlaena* and *Tetrarrhena*. Here two stamens are laterally placed, one on each side in front of the ovary, and two medianly, one being opposite the palea and the other opposite the lemma. In *Microlaena stipoides* R. Br., by means of low-cut transverse sections, it was possible to observe three grooves in the ovary, produced by pressure of the staminal filaments and thus fixing their position. These grooves correspond to the lateral anterior pair and the posterior odd stamen, and, as they lie near the ovary, it is inferred that they belong to the inner whorl. On the other hand, the anterior odd (fourth) stamen, which was more strongly developed, occupied a somewhat isolated position and is all that remains of the outer whorl. Thus in tetramerous grasses both whorls are represented, the inner completely and the outer only by a single stamen.

In most species of grasses the spikelet is built on the well-known triandrous plan. The three stamens belong to the outer whorl, the inner whorl having aborted. Here the odd stamen is situated between the lemma and ovary, and the other two are on the side facing the palea. A transition from hexandrous to triandrous flowers is seen in *Ehrharta ramosa* Sm., in which spikelets are found containing six or three stamens.

The diandrous grasses belong to two types. In the " lateral " diandrous type, the two stamens are laterally placed, one on each side of the ovary and between it and the palea, whereas in the " median " diandrous type, the two stamens stand exactly medianly, one between the lemma and ovary and the other between the ovary and palea. The " lateral " diandrous type, which has been arrived at by the abortion of the odd anterior stamen in a triandrous flower, is found in most diandrous grasses, and examples mentioned include *Orthoclada laxa* Beauv., *Streptogyne crinita* Beauv., *Thysanolaena maxima* Kuntze. The " median " diandrous type, which is considered to have evolved from the tetrandrous type, is found in a comparatively small number of

genera, namely, *Dimeria*, *Anthoxanthum*, *Hierochloe*. The theory of the origin of the " median " diandrous type is based on an example of the usually tetrandrous *Microlaena*, in which only the anterior and posterior stamens developed, the lateral two having aborted. Thus the " median " diandrous type was produced and the two stamens belong to different whorls.

Monandrous grasses may be divided into two types. In one type the solitary stamen is abaxial and inserted between the lemma and ovary, as in *Vulpia ciliata* Link. This type is shown to have been derived from the triandrous type by the abortion of the two stamens on the side facing the palea, so that the stamen is here the odd one of the outer staminal whorl. In the other type, the stamen is adaxial and between the ovary and palea, as in *Elytrophorus spicatus* A. Camus. Monandry of this type is considered to have been derived from the tetramerous type *viâ* the " median " diandrous type, by the abortion of the odd remaining stamen of the outer whorl. Support for this view is given by the fact that the palea of the " median " diandrous flower possesses a mid-nerve, which is also the case in monandrous grasses where the stamen is adaxial. This is not so where the stamen is abaxial. The solitary stamen is thus the posterior odd one of the inner staminal whorl.

In the reduction in number of stamens the author traces two lines of descent, both from the primitive hexandrous type. One leads through the tetramerous type to the " median " diandrous type and thence to the monandrous type where the stamen is situated between palea and ovary. The other line of reduction results first in the production of triandrous flowers and from these either " lateral " diandrous or monandrous types of flower may be derived—in the former case by abortion of the odd anterior stamen and in the latter by the abortion of the posterior pair of stamens.

The second part of Rossberg's thesis deals with the morphology of the palea. This organ is typically two-nerved, but in a number of genera and species there is a so-called palea which deviates from this type and possesses a midrib, with or without a varying number of lateral nerves. Various examples are considered and discussed, whilst explanations are given in those cases in which errors have been made in interpreting the structure of the palea, or where the latter has been identified as some other part of the spikelet.

The main problem which the author attempts to solve is whether the so-called paleas with a midrib are really true paleas. He found that in the 1-nerved palea of *Microlaena stipoides* R. Br., *Cinna arundinacea* L., etc., the single nerve was not formed by the fusion of two nerves, as only one vascular bundle was present. One interesting theory, that this 1-nerved palea is really the lemma of a reduced second floret, at first sounds very feasible, but it is shown that the scale in question originates before the point of

insertion of the flower is reached, which would not be the case if it was a reduced second floret. As the palea is here opposite the lodicules, and, furthermore, as the hilum of the caryopsis points towards it, the author has no doubt that it is a true palea and that it corresponds to the 2-nerved palea of *Phalaris* and *Ehrharta*. A similar argument is used to show that the 3- or more-nerved paleas of *Oryza* and *Leersia* etc. are true paleas.

Rossberg points out that there are two fundamentally different views as to the morphology of the palea. One view is that it represents a uniform simple organ and the other that it has evolved by the intergrowth of two originally separate leaves or leaf-primordia. These theories are of importance in considering the origin of nervation in the palea. The question as to whether the latter is homologous to one or two leaves is connected with explanations given for the presence of one to two to many nerves. Where the palea is 2- to 6-nerved and no midrib is present, the following possible explanations are given for the presence of the nerves. In the first case, a nerve appears in each primordial outgrowth and thus a 2-nerved palea is eventually produced. In the second case, where the palea is 6-nerved, it is assumed that the two primordia are equivalent to two leaves, in each of which three nerves appear. The result is a palea with 6 nerves. If the two outer nerves of each primordium are not differentiated, then a 4-nerved palea is produced. With regard to those paleas with an odd number of nerves the following suggestions of origin are given. The 5-nerved palea could possibly be derived from the 6-nerved type by the disappearance of the two inner nerves and their replacement by a single nerve, and the 3-nerved palea in a similar manner from the 4-nerved type. In both of these cases it is assumed that the palea is homologous to two leaf-organs. Another interpretation is given in which it is suggested that nervation in the primordium of the palea is not the result of unequal meristematic activity, but rather the result of pressure during primordial growth of the floral organs. If the growth is unrestrained and without pressure, a midrib is formed. If, however, during development, pressure of one of the floral organs or of the rhachilla is exerted on the primordium of the palea, a midrib is not differentiated and nerves develop unhindered on each side of the primordium. In one-flowered spikelets where the rhachilla is not produced, it is considered that the 2-nerved character of the palea was produced before the spikelets were reduced to the one-flowered condition. The author considers the pressure theory to be the most plausible in explaining the nervation of the palea.

In conclusion, the relationships of the tribes to one another and their possible origin are considered, but the subject, which offers much room for speculation, is too large to be considered here.—C. E. HUBBARD.

Vergleichende Morphologie der höheren Pflanzen. By Dr. WILHELM TROLL, Professor of Botany in the Martin Luther University, Halle-Wittenberg. Vol. I. Part 1. Vegetationsorgane. 8vo, pp. vi, 107, text-figs. 104. Borntraeger: Berlin, 1935. Price, Subscription R.M. 9.60, single volume R.M. 11.50.

IN his introduction the author expresses his regret that the traditional conception of Morphology seems to have disappeared, and has given place to phylogenetic speculations having no sound morphological basis. The old morphology based upon the conception of an archetype he considers to have been destroyed by mechanistic views of nature, and needs to be brought back to the consideration of the "Urpflanze." His first chapter deals therefore with the "Rebirth of Morphology," which, he says, can only be brought about through the spirit of German science. The introduction of such a nationalistic attitude into botanical or indeed into any science seems regrettable. It is true that the author says that science as such knows no nationality, but he also states that whoever wishes to understand the nature of German science must be conscious of the unbridgeable gulf which separates the inner life of the German spirit from the positivistic scientific ideals of the western nations.

But the author's bark is really worse than his bite, for he criticises adversely the views put forward by eminent German botanists such as Hofmeister and Sachs, and particularly Goebel's experimental morphology with which he has no sympathy. On the other hand, he quotes with approval from the works of Darwin and Owen, and when dealing with phylogeny he concurs with Bower's statement that "Comparative morphology, checked by the positive facts of Palæontology, must be still the foundation on which to base phylogenetic considerations."

The author is controversial mainly in his introductory and earlier chapters. When he comes to deal with the actual morphological problems he is more didactic and shows his German thoroughness. His "Comparative Morphology" deals with Spermatophyta and Pteridophyta and when completed this work will consist of three volumes. The present part, amounting to 170 pages, is concerned with general morphology and begins with the consideration of the morphology of the shoot. He commences his general account with the structure of the seed and the germination of the seedling of dicotyledons. No mention is made of abnormal cases of pseudomonocotyledonous seedlings like those of *Ranunculus Ficaria*. Possibly a discussion of these may follow later. In describing the seedling of the Maize, the author homologises the scutellum with the cotyledon of other monocotyledonous embryos, considering its peculiar character to be due to the one-sided position of the food-material. There is no discussion of other views which have been put forward to explain the special structure of the grass-embryo.

The description of buds and their scales is followed by that of such specialised buds as bulbs, of which the author gives an excellent and clearly illustrated account, that of the snowdrop based on the work of A. Braun, Irmisch, and Buxbaum being particularly good.

At the end of Part I. there is a list of the publications bearing on the topics dealt with; but, though his account comprises a description of many Monocotyledons, no mention is made of Dr. Arber's comprehensive book.

The illustrations are well chosen and clearly reproduced.

The book when completed will be of considerable usefulness, but it would have been more helpful as a book of reference if the morphological views of other botanists had been fully discussed.—F. E. Weiss.

Flora of West Tropical Africa. By J. Hutchinson, LL.D., F.L.S., and J. M. Dalziel, M.D., B.Sc., F.L.S. Vol. II., pt. 2. 8vo, pp. 293–651, figs. 278–381, and map. Crown Agents for the Colonies: London, 1936. Price 8*s.* 6*d.*

We congratulate the authors on the completion of this 'Flora,' which will be of service to workers in West African botany and should stimulate further work, especially in the field. The 'Flora' is of the nature of a "Prodromus," indicating a stage in progress, and indicates where, especially, more information is needed. A case in point is the Palmaceae represented only by twenty-five species and eleven genera (including the cultivated Coco-nut). Nine species belong to *Raphia* and the well-known inadequacy of palm-material in herbaria suggests the remark that "to arrive at a proper understanding of the species a great amount of observation and collecting in the field" is necessary.

The present volume, for which Dr. Hutchinson is responsible, contains the account of the Monocotyledons, which are arranged according to the author's recently published system. The Orchidaceae have been elaborated by Mr. V. S. Summerhayes, and in the Gramineae the help is acknowledged of Mr. C. E. Hubbard, who has prepared the key to the tribes and genera and contributed the account of the genus *Eragrostis*; full use has also been made of the late Dr. Stapf's work for the 'Flora of Tropical Africa.' This assistance in the two largest families must have greatly accelerated the work.

As noted in the reviews of previous parts, a large number of new species are cited, as in 'Kew Bulletin ined.'; the descriptions in the keys will, under the new Rules, not validate publication, and adequate descriptions will doubtless follow in due course. And who is going to supply descriptions for the *nomina nuda* of Chevalier? These should either be neglected (following the Rules) or described. Presumably for the sake of uniformity with earlier parts, the new Rule for citation in parenthesis of an original author when a species is transferred is not observed. May we have rest for a season from alterations in Rules!

Generally speaking, Dr. Hutchinson adopts a somewhat broad view in species, as indicated by a fair sprinkling of names regarded as synonyms; for instance, in the genera *Anthericum* and *Chlorophytum*, which need a critical monographic revision. Mr. Summerhayes's account of the Orchidaceae is more critical, as becomes a specialist; he is evidently impressed with the late Dr. Schlechter's work on the family, which has led to a considerable reorganization and shuffling of names in the *Angraecum* group of genera.

The large clear drawings indicating the habit and floral features of many of the genera are a helpful feature. The useful coloured vegetation map was prepared in collaboration with the late Dr. T. F. Chipp, and has also been used in Mr. D. A. Bannerman's 'Birds of Tropical West Africa.'

We note in the text references to an Appendix, which, however, is not included in the present part, which concludes with a general index.—A. B. R.

Floral Illustrations.

(1) *A Book of New Zealand Flora for New Zealand Boys and Girls.* With Illustrations from original Water-colour Drawings. By Mabel C. Coleclough. 4to, 37 illustrations (part coloured), and text. Longmans, Green & Co.: London, 1936. Price 5*s.*

During five years spent in New Zealand the author painted a selection of the best-known flowers. These have been photographically reproduced, mainly in colour, and provided with a brief descriptive text to enable the young people better to know and appreciate the beauties of their native flora. The drawings, which with a few exceptions are life-size, are artistic and accurate representations indicating to some extent the habit and external leaf and flower characters. The plants are included under their botanical names, but English and Maori names are also quoted. There is no definite arrangement and neither plates nor pages are numbered—a regrettable omission, which makes precise reference impossible.

The author thanks Dr. J. Holloway, Lecturer in Botany at the University of Otago, for verification of her work, and he contributes an Introduction.

We note also that Miss Coleclough was awarded the Royal Horticultural Society's Grenfell Medal for paintings of New Zealand plants in 1932. A similar publication on New Zealand fruits is contemplated.

(2) *Garden Flowers.* By HILDA M. COLEY. 32 coloured plates, 14½ by 9½ ins., in two series. Lutterworth Press : London, 1936. Price 3*s.* 6*d.* each set.

MISS COLEY was awarded the Royal Horticultural Society's Grenfell Bronze Medal for botanical accuracy for these paintings of garden flowers. They are a beautiful set of drawings of thirty-two of the most popular flowers, showing something of the general habit and some details of structure and development. Details consist generally of separate drawings of the parts of flower and fruit, sometimes shown in successive stages : in the floral dissections the method employed supplies a general impression rather than minute detail. Miss Coley is not merely a draughtsman, the arrangement of main figure and details is generally effective and some of her drawings, such as of the Nasturtium, Honeysuckle, and Columbine, are graceful and attractive pictures. Those who know the limits of colour-process reproduction will appreciate the success achieved, especially with the greens—the yellows, however, as in Winter Aconite, the glorious Dutch Crocus, and Californian Poppy lack the natural brightness.

The series would form a decorative and instructive addition to the walls of the schoolroom. Descriptive lessons for the pictures are supplied, with the plates, in the author's 'Our Heritage of Garden Flowers.'

Symbolæ Sinicæ. Botanische Ergebnisse der Expedition der Akademie der Wissenschaften in Wien nach Südwest-China, 1914/1918. By H. HANDEL-MAZZETTI. VII. *Anthophyta.* Lief. 4. 8vo, pp. 731–1188, 9 text-figs. and 7 pls. Julius Springer : Vienna, 1936. Price R.M. 98.

THIS substantial instalment to Chinese floristic work continues the form of previous parts already noticed in this Journal. The present part contains the enumeration of the Sympetalae, and is mainly the work of Dr. Handel-Mazetti, but with assistance in some of the families—Heinrich Andres (Bonn) supplies the account of Pirolaceae ; Harald Smith (Upsala), Gentianaceae ; J. A. Nannfeldt (Upsala), Campanulaceae except *Lobelia* by E. Wimmer (Vienna). The best-represented family is, naturally, Compositae, occupying 100 pages in spite of a restrained treatment of *Taraxacum,* represented only by seven species, and *Hieracium* with two varieties of *H. umbellatum.* Rubiaceae, on the other hand, makes a poor show with 18 pages, less than Caprifoliaceae (20 pages). *Primula, Rhododendron, Pedicularis,* and *Gentiana* are well-represented genera and supply many novelties. Among

the novelties we note a new genus of Pirolaceae, *Monotropastrum,* and a new *Paulownia.* The sole representative of Convolvulus is *C. steppicola,* a remarkable isolated species, a typical steppe-plant from Yunnan most comparable with *C. galaticus* Rost.

It will be a help to those who use the volumes if the author will supply a bibliography when the work is completed, as, except in a few cases, references to the original description of species is not given. As in previous parts new species are indicated by a double asterisk and those new to China by a single one.

Dr. Handel-Mazetti has our best wishes for his continued progress with the work.

Les bases scientifiques de l'amélioration des plantes ('Encyclopédie Biologique,' vol. xiii.). By F. BOEUF. 8vo, pp. 543, figs. 50. P. Lechevalier : Paris, 1936. Price 140 francs.

THE author, who has had nearly thirty years' experience of plant breeding in Tunis, has produced a thoroughgoing practical work dealing with all aspects of the subject. He includes a survey of the genetical, ecological, biometrical, and statistical results which have a bearing on plant breeding. The subject is clearly set forth, and this book should stimulate wider interest and further research throughout France. The approach is a very general one, Part I. (132 pages) being devoted to a discussion of life and living organisms, including protoplasm, the cell, the chromosome theory, and the various methods of reproduction in higher plants.

Part II. (210 pages), on heredity, variation, evolution, and taxonomy, will place the reader in touch with the main results and conceptions of modern plant genetics. It explains Mendelian heredity, the various types of chromosomal mutations, and the biometric methods most frequently used. Evolutionary problems are discussed, and a final chapter is concerned mainly with conceptions connected with species and the homologues series of variations so widely occurring in cultivated plants. Part III. deals with the practical problems of plant selection, hybridization, and vegetative multiplication. A chapter is devoted to problems of adaptation and acclimatization from the ecological point of view, and the final chapter introduces various biometrical methods and formulæ.

This work is at the same time a comprehensive lucidly expressed introduction to the subject for the general reader and a guide for the practical worker in plant breeding. One might have expected a fuller treatment of the modern researches on wheat, but it would be unfair to cavil where so much has been given. The place of an index is taken by a rather full table of contents.—R. R. G.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on April 2, the President, Dr. W. T. Calman, C.B., F.R.S., in the Chair, the President read a letter from the Right Hon. Lord Wigram, Secretary to the King, announcing that His Majesty had been graciously pleased to grant his Patronage to the Society. The President also announced the award by the Council of the Linnean Gold Medal for 1936 to Prof. John Stanley Gardiner, M.A., F.R.S.

Mr. H. W. Pugsley showed lantern slides of *Orchis latifolia* L. and other species that in recent years have been passing under that name, and gave a short account of the discovery in Britain of the yellow-flowered *O. latifolia* var. *ochroleuca* (Boll.) and of a new subspecies of *O. majalis* Reichb. which has been found in county Wicklow, Ireland.

Mr. Wilmott gave an illustrated account of two new British marsh Orchids: the first found in 1934 near Dingle (Kerry) and the second last year above Loch Maree (Ross-shire). The first is one of the group to which belong *O. purpurella* and the plants which Mr. Pugsley refers to *O. majalis*, but the second may be allied to *O. Traunsteineri*, although presenting several differences. *O. Traunsteineri* has been recorded for the British Isles, but only erroneously.

At the General Meeting on April 23, the President in the Chair, Capt. F. Kingdon Ward, B.A., V.M.H., gave as the Hooker Lecture a sketch of the vegetation and geography of Tibet.

A SOCIETY FOR THE BIBLIOGRAPHY OF NATURAL HISTORY has been established for the study of the bibliography of all branches of zoology, botany, and geology. It is proposed to publish a journal containing lists of bibliographical papers already published; original contributions as to dates of publication of works; particulars as to the disposal of libraries and collections of deceased naturalists; and papers on bibliographical subjects. Also facsimile reproductions in whole or part of rare or unique works. A card-index catalogue of references to all published papers on bibliographical subjects will be compiled and maintained. All interested in the subject are eligible for membership (subscription, one guinea per annum). Dr. C. Davies Sherborn, Mr. Francis J. Griffin, and Mr. Francis Hemming are respectively Chairman, Hon. Secretary, and Hon. Treasurer, *pro tem.* The Society's address is at present 41 Queen's Gate, S.W. 7.

OTTO EUGEN SCHULZ.—We hear with regret of the death on February 17 of this German authority on the Cruciferae, who contributed the taxonomic description of the new *Brassicella* to Dr. Wright's account of the Lundy *Brassica* in the March number of this Journal. Herr Schulz contributed monographs of Erythroxylaceae (1907) and Cruciferae (1919–1927) to Engler's 'Pflanzenreich.'

THE PHYLLOTAXY OF *TAMUS COMMUNIS* L.

BY I. H. BURKILL, M.A., F.L.S.

THE internodes of *Tamus communis* vary in length in a conspicuous way: in illustration the measurements of all composing a typical stem are given in Table I. The first cipher is the length of the first internode of the stem, in millimetres, and the others follow in sequence across the page (in lines of ten for the convenience of counting): bold type is used for internodes which exceeded 75 mm., and italics for those which did not reach 26 mm. As far as the letter (*a*) the stem was underground: as far as (*b*) it carried leaf-scales in place of foliage leaves: after (*b*) small foliage were produced, and after (*c*) fully developed leaves.

TABLE I.—*The lengths of all the internodes of a typical stem in mm.*

0	*24*	66 (*a*)	**91**	**166**	**170**	**153**	**119**	44	**82**
150	**78**	59 (*b*)	65	72	35 (*c*)	**80**	**102**	54	37
11	52	**106**	*10*	58	62	*5*	**82**	29	29
63	*4*	**78**	48	*21*	*6*	50	39	*10*	35
21	40	52	*11*	36	39	43	26	50	27
32	57	29	41	26	*19*	53	*12*	*19*	57
17	42	38	30	62	*17*	31	54	*20*	32
48	*22*	44	*17*	37	39	26	*25*	51	29
50	53	51	36	*22*	52	36	31	34	43
42	40	*16*	37	40	31	45	*12*	52	44
26	48	35	55	*18*	48	44	31	33	38
45	66	45	*20*	72	92	55	50	49	45
72	68	39	50	49	46	46	34	42	*20*
30	35								

Some comments on the Table follow. The tuber of *Tamus* is a peculiar structure of cauline origin developed under the first bud of the stem of the plant. The bud persists sympodially until injury overtakes it, and then another bud is formed in its neighbourhood adventitiously, of the same construction and of the same importance to the plant. Each year adds a leaf-scale within the bud to shelter the initial stages of the stem for the next year: that its shelter may be effective there is no space between one scale and the next; indeed, the cortex of the tuber grows up, round and almost over them. It is the undeveloped internode between the scales, which, in the Table above, is recorded as *0*. Following it are two underground internodes, of 24 and 66 mm. respectively. Beyond them, at (*a*), the stem had emerged from the soil. The next ten internodes terminated at nodes with leaf-scales, for the stem of a mature plant of *Tamus* is never leafy at the base. After (*b*) leaves appeared, at first undersized, but at (*c*) of full size. There were 116; and the stem had been able to grow until its 132nd internode. The plant was female, but had set little fruit: the lowest

inflorescence had been at the 48th node, but the lowest berry was at the 106th, and there were few of them.

As graphs convey much more to the untrained eye than arrays of measurements, fig. 1 has been prepared from this particular stem. At the first glance a certain amount of regularity is seen in it; and in the following pages an analysis is attempted.

The stem which supplied the graph was one of thirty-six chosen to give data, of which eighteen were of male plants and eighteen of female: half the number were taken from hedgerows in the neighbourhood of Torbay, Devon, and half from scrub in the neighbourhood of the hedgerows. All the internodes were measured from ground-level to the very tip. Fasciation is very common in *Tamus*; but care was taken that no data should be

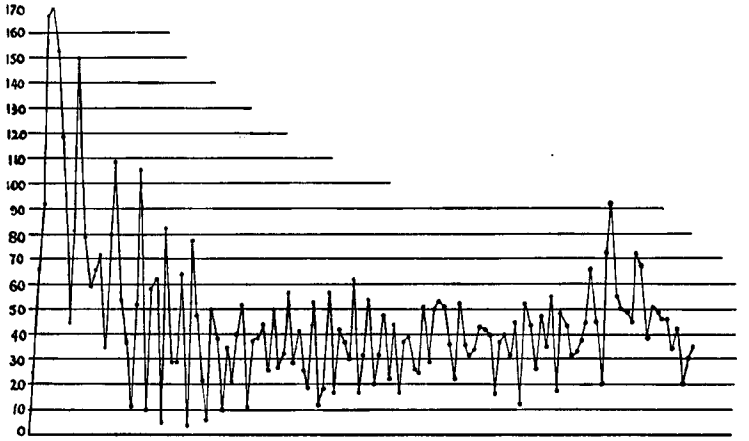


Fig. 1.—Graph of the lengths, in millimetres, of the internodes of a selected stem of *Tamus communis*.

derived from fasciated plants: immature plants were discarded; and all the measuring was done as late as possible in the season, so that elongation should have ceased.

The stem of *Tamus* is sharply divisible by its anatomical structure into two parts—that below ground and that above ground: that below ground has a thick cortex: abruptly at the surface of the soil the cortex becomes thin and its exterior grooved. The darkness and the moisture of the soil apparently determine this and also that at the same time the internodes shall be short and that there shall be fleshiness in the leaf-scales at the nodes just as the cortex is fleshy. The number of underground internodes varies from, say, 3 to 6: at least half of the buds under their scales are reserve buds which will not be

sent above ground if those more prepared for the coming season survive the winter, which is so often fatal to them that the risks of destruction are considerable even in the mild climate of Torbay. An examination of underground stems in summer shows that the leader is very often killed. It is advantageous, therefore, to the plant that the buds should not be without a layer of soil over them; and the need of such protection furnishes a sufficient teleological reason for the shortness of the underground internodes. These will not be discussed further; but attention will be directed to the aërial stem, wherein elongation of the internodes is all-important that the leaves may reach the light.

Brenner, writing from Switzerland, says (in Kirchner, Loew & Schroeter, 'Lebensgeschichte der Blutenpflanzen Mitteleuropas,' i. pt. 3, 704; 1914) that *Tamus* stems reach 7–8 m. in length. They seem not to do so in Britain: the longest which the writer has measured in south Devon, where the climate is undoubtedly favourable to the plant, was not much more than 4·5 m. Brenner, however, remarks that other writers have recorded dimensions similar to those found in Britain and also lesser dimensions.

Hedgerows in Devon are planted on high banks of loose stones and earth; and, especially on the light red soils, supply ideal conditions for *Tamus*, which gets abundant sunlight on the face of the hedge, the right amount of moisture in the shade of the wall and such openness in the soil as it prefers. The hedgerows favour it more than the nearby scrub; for the scrub casts too much shade, and its layer of leaves on the surface of the earth is prejudicial. But away from all shade in the open of the fields *Tamus* cannot grow, as adequate moisture fails it there. For these reasons equal numbers of plants for study were taken from hedgerows and from scrub.

The limits of the variation in the 36 chosen plants are shown by the following figures:—

Of internodes measuring

0 to 10	mm. there were	213
11 to 20	,, ...	276
21 to 30	,, ...	370
31 to 40	,, ...	397
41 to 50	,, ...	340
51 to 60	,, ...	281
61 to 70	,, ...	173
71 to 80	,, ...	141
81 to 90	,, ...	77
91 to 100	,, ...	52
101 to 110	,, ...	32
111 to 120	,, ...	25
121 to 130	,, ...	15
131 and upwards to 200 mm.		83
Between 200 and 401 mm.		26

The longest internode was 401 mm. long. The average of all is 48 mm. This average is well above the length—31–40 mm.—which the greatest number of internodes attain, and there are obvious disharmonious data in the totals. One cause of disharmony is easily recognised, for the longest internodes were unduly elongated.

Further analysis of the figures was undertaken : the internodes were associated in groups, the lengths of 2, 3, 4, 5, etc. being added together ; and it was found that the lowest number which gave a reasonably smooth curve was five. Curves for each of the 36 plants were then constructed by the sums of five internodes together : fig. 2 is a graph so obtained. The reader will observe that it consists of five superposed curves ; the data for one of them being the sums of internodes (counting from the ground-level

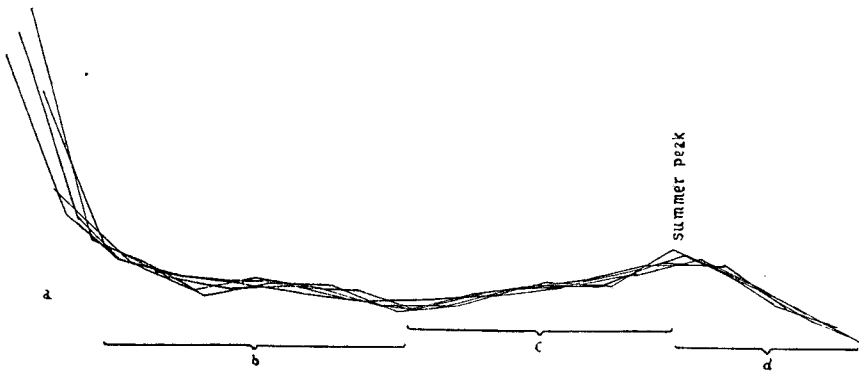


Fig. 2.—Graph illustrating the average lengths of the internode of a typical hedgerow plant of *Tamus* in different parts of the stem.

only) 1–5, 6–10, 11–15, etc. : the data for a second the sums of 2–6, 7–11, 12–16, etc., and so on.

The 36 graphs thus constructed, and of which fig. 2 is an example, proved most instructive. They made it clear how the waning of the spring-push leads to a decrease of elongation, ending as the grand period of growth brings in the rise to a summer maximum. The spring-push is fed from the tuber : the stem in summer becomes autotrophic ; and then later it is required to feed the tuber. In accordance with the curves, and using as well the point where foliage- displaced scale-leaves, the data from the 36 stems were divided into four parts (see fig. 2) :—*a* where scales were present ; *b* the leafy part of the waning spring-push ; *c* the rise of summer growth, and *d* its waning. It was interesting, then, to observe that part *d* showed a curtailment in scrub plants as contrasted with hedgerow plants. Such a difference can only be because the struggle for light in the scrub

prolongs the effort to grow upwards and curtails the time when the shoots can feed the tuber. It represents the handicap of growth in scrub ; for in scrub the plants are incontestably less successful than in the hedgerows.

The average lengths of internodes in the different parts—parts *b* and *c* having for the purpose been added together, as they were alike—were now found to be :—

Part *a*, with 265 internodes.....	117 mm.
Parts *b* and *c*, with 1318 internodes.	45 ,,
Part *d*, with 905 internodes.....	33 ,,

Out of the 265 internodes of part *a*, 42 per cent. were below the average and 58 per cent. above—a consequence of that

TABLE II.—*Showing how compensation for shortness is found in the nearest internodes : the data relating to parts* b *and* c *of the stems, and worked out in percentages of runs of five internodes.*

Length of the central internode of the five.	Percentages made by				
	the 2nd before.	that before.	the central internode.	that after.	the 2nd after.
0 to 5 mm.	21	29	2	31	17
6 to 10 ,, ...	18	31 ↑	4 ↓	28 ↑	19
11 to 15 ,, ...	20	27 ↑	7 ↓	26 ↑	20
16 to 20 ,, ...	20	26 ↑	8 ↓	25 ↑	21
21 to 25 ,, ...	22	23 ↑	12 ↓	24 ↑	19
26 to 30 ,, ...	21	23 ↑	15 ↓	22 ↑	19
31 to 35 ,, ...	21	23	17	22	19
36 to 40 ,, ...	20	21	18	21	20

disproportionate elongation of a few which has already been mentioned. More study of this unequal distribution about the mean is necessary than has been as yet possible. But there is another irregularity in part *a* connected with it : it lies in the relatively large number of very short internodes, four being less than 6 mm., another four less than 11 mm. and a ninth only 13 mm. ; after which none were found shorter than 33 mm. and only a few shorter than 40 mm. As will become evident later, the very short internodes are compensatory to very long internodes adjacent to them ; but this does not explain the discontinuity of the curve made when one for the lengths of the abbreviated internodes is plotted. The data relating to part *b* (with *c*) and part *d* make reasonably symmetrical curves about their average lengths.

All the data for these three parts were arranged in fives, and then sorted by the length of the middle internode of the five. The runs of five were given the value 100, and the percentages which each of the five made were worked out. The preceding and following Tables give the results for internodes shorter than the averages: Table II. contains the data for part *b* (with *c*); Table III. for part *d*. The data were divided so that the one Table might afford a check to the other.

It is obvious that Tables centred round the long internodes would give the same result, namely, that if one internode is unduly short or unduly long, compensation is likely to be found in the next internodes. Remoter internodes may be expected to be of average length. The ups and downs of the graph in fig. 1 are an indication of this. The circumstance that the

TABLE III.—*Showing how compensation for shortness is found in the nearest internodes: the data relating to part* d *of the stems, and worked out in percentages of runs of five internodes.*

Length of the central internode of the five.	Percentages made by				
	the 2nd before.	that before.	the central internode.	that after.	the 2nd after.
0 to 5 mm.	21	31	3	27	18
6 to 10 ,, ...	20	28 ↑	7	26 ↑	19
11 to 15 ,, ...	19	26	11	25	19
16 to 20 ,, ...	22	23	14	22	19
21 to 25 ,, ...	21	23	16	20	20
26 to 30 ,, ...	21	21	19 ↓	20	19
31 to 35 ,, ...	21	19	19	21	20

figures down the middle column of Table II. run 2, 4, 7, 8, 12, 15, 17, while those of Table III. run 3, 7, 11, 14, 16, 19, is of course due to the fact that the average length of the internodes in part *b* (with *c*) is 44, while the average length in part *d* is 33.

The annual stem of *Tamus* has not, like a tree-trunk, its greatest diameter at the ground, but at a considerable distance up the stem: this is connected with its climbing habit, as rigidity is not required after twining has been established and its weight has become the burden of another plant. The thickest stems, measured in Devon, had a diameter of 5 mm. at a metre above the ground. Brenner (*op. cit.*) gives the maximum diameter known to him as 6 mm. At its thickest part the stem holds the greatest number of vascular bundles. These bundles are of two kinds, common (*i. e.*, common to the stem and leaves) and

cauline. The cauline, which can be regarded as divisible into an outer and an inner part, do not make an inner ring in the distinct way shown on p. 90 to occur in *Dioscorea glauca*, but their inner edge lies distinctly nearer to the centre of the axis than that of the common bundles, and it is easy in sections to distinguish them from the common bundles. Sometimes the common and the cauline bundles are equal in number: sometimes the common exceed the cauline by 1, 2, or rarely 3. The maximum number of the two together which the writer has observed is 39. There is something strange in the way in which continental writers name a lower figure: Naegeli (Beitr. Wissenschaftl. Botan.' i. 124; 1858) does not give a higher figure than 28: Bucherer (Bibl. Botan. xvi. 22, pl. iv. fig. 3; 1889), after quoting Naegeli, puts forward a diagram with 24: Queva (Mém. Soc. Sci. Lille, sér. 4, xx. 109, pl. v. fig. 1; 1894) gives a diagram with 22 and names the average as 16; and lastly, Brenner (*op. cit.*) names 30. It may be that none of these have thought it interesting to ascertain the maximum number. Whatever the number is, at least one half are common bundles, and these pass into leaf-traces by threes: in the stem they alternate with the cauline bundles or here and there are two together between cauline bundles. They make a full ring and so provision for leaf-traces on every side of the stem; but, the total number of bundles in the stem being variable while the number of bundles in each leaf-trace is fixed, more orthostichies exist where the stem is thickest than towards the base and the apex. Thus is that variability in the spacing of the leaves round the axis on which Naegeli commented, demonstrable in the variability of the vascular bundles. The following account of a selected stem, every internode of which was sectioned, is given to illustrate it.

The stem did not arise direct from a tuber, but as a branch of a stem from the tuber, the end of the leader having perished. At its point of origin it had a diameter of 1·75 mm. and 14 bundles, 7 common and 7 cauline. During the course of the first internode one of the common bundles was doubled so that under the first node there were 8 common and 7 cauline bundles. From the common bundles the leaf-scale at this node drew three, the middle one of which came from a point at the origin of the stem 90° from the midrib of the subtending scale. The three lost common bundles were replaced in the normal manner (see fig. 3 A, *supra*, p. 93). The scale of the second node drew three common bundles from the opposite side of the axis: but 17, the number of bundles present, as an odd number, is not divisible by two, and, estimating the distance of this second scale round the axis from the first by using the bundles, its actual divergence was 7/15. At the node of this second scale an additional cauline bundle took its origin, so that there were 16 bundles, 8 common and 8 cauline. At the next node a further common bundle was added, making

17, being 9 common and 8 cauline: the diameter was 3 mm. Through the following seven internodes the increase was continued, the common bundles usually one more than the cauline until in the tenth internode there were 28 bundles, equally divided between the two kinds; and the diameter was 4·25 mm. From this point to the forty-ninth node the number of bundles was almost constant, usually 29, but here and there 28, and the diameter rose to 5 mm. After the forty-ninth node, along with a diminishing diameter to the stem, there was a steady reduction in the number of bundles until there were but 18, equally divided between the two kinds; and the stem had a diameter of 2·5 mm.

Such a stem with a run of, say, thirty-six consecutive internodes of maximum diameter and holding its maximum number of bundles, nevertheless showed the association of long and short internodes in this part as in the rest of the stem.

The examination of other stems showed a similar increase upwards in the diameter and the number of bundles to a maximum,

TABLE IV.—*The number and the percentage of short internodes of different lengths in different parts of the stem.*

Length of the internodes.	In part *a*.		In part *b*.		In part *c*.		In part *d*.	
	No.	Per cent.	No.	Per cent.	No.	Per cent.	No.	Per cent.
0 to 5 mm.	4	1·50	30	3·62	12	2·45	47	5·19
6 to 10 ,, ...	4	1·50	44	5·31	21	4·29	51	5·64
11 to 15 ,, ...	1	0·38	34	4·10	17	3·48	55	6·08
16 to 20 ,, ...	1	0·38	51	6·16	35	7·16	83	9·17

its maintenance, and a subsequent fall: and, equally, no obvious interference in the association of long and short internodes. The exact length, however, is subject to influences which create differences in different parts of the stem. Table IV. shows this.

It will be noted that internodes of 0 to 10 mm. make a higher proportion than the internodes of 11 to 20 mm. in part *a*: that internodes of 6 to 10 mm. a higher proportion than internodes of 11 to 15 mm. in parts *b* and *c*: and also that internodes from 0 to 15 mm. make a higher proportion in part *b* of the stem than in part *c*. This is due to the short internodes being under influences operating unequally in the different parts of the stem; one is diminishing vigour towards the limit of growth: another seems to be a peculiar force which acts on the growth strongly at the base, but loses some of its strength upwards.

Fig. 1 shows the number of internodes between two short ones; the first interval is 8 internodes: then follow 3 and 5, and soon 2 appears. Eight, which occurred in this stem, is the

greatest interval observed as yet on any stem: those usual are 3 and 2: as in the 36 plants taken for study, 3 occurred 376 times, 2 occurred 356 times, 4 occurred 78 times, and 5 occurred 20 times. The plant which supplied the data for fig. 1 happened to be rather more irregular than most, and was chosen for the graph as it was desired to represent as much variation as possible. In other plants a rhythmic periodicity was more distinctly set up. The commonest proved to be 3–2–3–2–3, *i. e.*, short–long–mid–short–long–short–long–mid–short etc., or short–mid–long–short–long–short–mid–long–short. In one plant this rhythm was repeated unbroken over 42 internodes and in another over 35 internodes. The rhythm 3–3–3–3, *i. e.*, short–mid–long–short, etc., occurred in another plant, unbroken over 15 internodes. The rhythm 2–2–2–2, *i. e.*, short–long–short–long, occurred on two plants unbroken over 14 internodes, in both cases towards the end of the stem.

The commonest rhythm, 3–2–3–2–3, leads to such arithmetical calculations as in Tables II. and III.: and it may be said that the regularity of those Tables bears witness to the measure in which this rhythm prevails. Whereas 2–2–2–2 seems to be a rhythm liable to be set up towards the end of growth on thin stems, the rhythm 3–2–3–2–3 seems liable to occur where the stems are thickest. In the rhythm 2–2–2–2 the tendency to produce short internodes must lie on one side of the stem, while the tendency to produce long internodes is on the other. The rhythm 3–2–3–2–3 certainly occurs in the stem over lengths where the leaves are arranged at divergences of about 5/13, and in such lengths of the stem the tendency to produce short internodes is likewise bound up with the leaves on one side of the stem and the tendency to produce long internodes with those on the other. Fig. 3 shows this: the circles in it give the position of 14 leaves on 13 orthostichies, and the size of the circles indicates the length of the associated internodes: the mid-length internodes lie in series and the last of them is on the orthostichy of leaf no. 1. In this way a spiral tendency would carry the rhythmic activity round the stem, as, indeed, it must certainly do when the rhythm is 2–2–2–2 and the divergence something near 3/8. A divergence of 2/5, which is the usual one in very young plants of *Tamus*, would lead to the same phenomenon of tendencies to elongate tied to the points of origin of lateral organs on one side of the stem. Such a tendency was found in *Dioscorea glauca*; but was in that species distinctly bound to the stem on sides opposing each other.

The rhythm 3–3–3–3 seems very rarely to persist over more than a few internodes: but it is common for the rhythm 3–2–3–2 to be checked with 3 and to recommence with 3, so that 3–2–3–3–2–3 results. Further enquiry will be directed in order to ascertain whether such a break is connected with a reversal in the

spiral of the phyllotaxy. There are, of course, more ways than one in which an interval of three internodes may be produced; thus the mid-length internode may follow a short internode or it may follow a long internode, and it may be relatively short or relatively long in varying degrees. Enough data for discussing questions, arising from this, are not available yet: but it has been noticed how often at one of the breaks in the rhythm, 3–2–3–2 which results in 3–2–3–3–2–3, the two runs of three which come together appear the one as the image of the other, *i. e.*, mid–long–short–long–mid. The condition long–mid–short–mid–long was scarcely found.

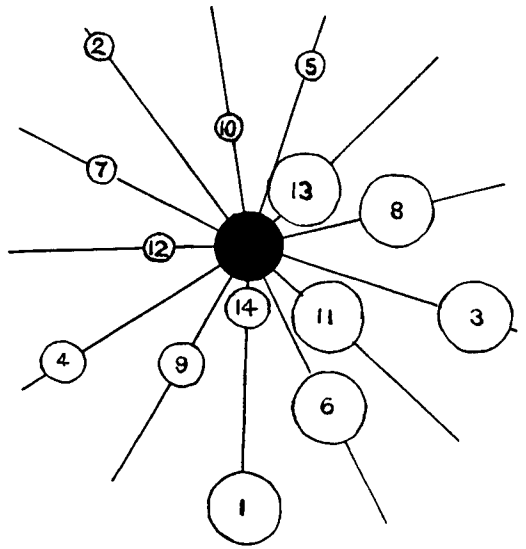


Fig. 3.—Diagram showing the relative positions round the axis of leaves at divergences of 5/13 and the size of the associated internodes (indicated by the diameter of the circles) when the growth rhythm is 2–3–2–3–2–3.

Summary.

The internodes of *Tamus communis* vary greatly in length: those underground are short, with the purpose of keeping their axillary buds protected through winter, to do which they must remain underground: the elongation of those above ground is for the purpose of placing the leaves in the light, but is influenced by three forces, the spring-push, the summer grand period of growth, and by an internal periodicity of a rhythmic nature. This internal rhythmic force should resemble that found in *Dioscorea glauca* (see above, p. 89), but has not been observed

in *Tamus* to have an oscillatory effect: instead, when the turn arrives to a leaf, on the side of the stem where this force is operative, to become separated from those nearest to it a relatively long internode is formed; and when it is the turn of a leaf on the opposite side of the stem a relatively short internode is formed. The long and the short internodes so follow each other as to be compensatory, the one to the other.

The variability of the divergence is considerable, and presumably the rhythm of the production of short and long internodes is disturbed thereby. But the labour of proving divergences is great, and enough data are not yet available. It is through divergence that the long and the short internodes become compensatory.

The stem is thickest well above the base, the divergence is here at its smallest fraction and the rhythm in which the short and long internodes form is likely to take a different period from the rhythm towards the termination of the stem.

The relation of the spring-push, when the tuber is the source of energy, to the summer grand period of growth, when the shoots become autotrophic, and to the period when they in turn feed the tuber, is made evident in a graph (fig. 2).

GENTIANA AMARELLA L. IN BRITAIN.

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

The *Endotricha* group of *Gentiana* was revised in 1892 by R. von Wettstein, who dealt especially with the forms akin to *G. germanica* Willd. and *G. obtusifolia* Willd. (*Gentiana* (*Endotricha*) in Oesterr. Bot. Zeitschr.), and by Herr Svante Murbeck, who wrote chiefly on the Linnean species, *G. Amarella* and *G. campestris* ("Studien über Gentianen, gruppe *Endotricha*," in Act. Hort. Berg. ii. no. 3, 10). In 1897 Wettstein embodied Murbeck's work with his own in his monograph "Gattung *Gentiana* sect. *Endotricha* Froel." in Denkschrift. Akad. Wiss. lxiv. 309. All of these plants had been hitherto regarded by botanists as annuals, but Murbeck demonstrated that in *G. Amarella* and *G. campestris* there exist both annual and biennial forms. In the case of *G. campestris* he divides the biennial plants into two subspecies, *suecica* (Froel.) and *germanica* (Froel.), and describes an annual form as a new species, *G. baltica* Murbeck. Similarly, under *G. Amarella*, he admits two biennial subspecies, *lingulata* (C. A. Agardh) and *axillaris* (F. W. Schmidt), and a separate annual species, *G. uliginosa* Willd. Murbeck gives a detailed account of the life-cycle of the *campestris*-like plants, which he says has been confirmed under cultivation; and he adds that the forms of *G. Amarella* are homologous in their

behaviour. The annual plants, *G. baltica* and *G. uliginosa*, are stated to germinate in the spring and to flower in the succeeding summer, retaining their cotyledons until the period of flowering. The biennial forms, *suecica*, *germanica*, *axillaris*, and *lingulata*, germinate likewise in the spring, but produce in the succeeding summer only a rosette of basal leaves. This rosette withers during the winter and only its leaf-bud remains, but in the second spring the growth is renewed, and from it the flowering stem develops in the second summer. The plant is thus a true biennial, requiring a period of two years for the development of a single generation. It will be noted that the production of a basal rosette of leaves in the first year, which disappears in the winter and is succeeded by a fresh growth from which the flowering stem develops, is an uncommon phenomenon. Rouy (Fl. France, x. 269 ; 1908) does not accept Murbeck's view, and treats all the French members of the group as annuals. It is evident that the life-history of these plants has not been generally studied ; and it must be remembered that climatic factors may affect their growth, and that the shorter summers of Scandinavia may produce results different from those obtaining in France. In Britain we have five plants allied to *G. Amarella* L., viz. :—*G. axillaris* (Schmidt) Rchb., *G. germanica* Willd. non Froel., *G. uliginosa* Willd., *G. lingulata* Agardh var. *praecox* (Murb.), and *G. septentrionalis* Druce ; and these will be noticed *seriatim*.

G. AXILLARIS (F. W. Schmidt) Rchb. This plant is recognised by common consent as the most widely distributed and best-known form of *G. Amarella* L., and is the usual autumnal Gentian of this country. According to Murbeck it is a biennial, with the stem composed of 6–12 internodes, including the peduncle of the terminal flower. When writing on *G. uliginosa* early in 1924 (Journ. Bot. lxii. 193) I remarked that I had failed to find any evidence of *G. axillaris* not being an annual in this country, as was generally supposed. Since that date I have continued my observations in the field, especially at Box Hill, in Surrey, where the plant is usually abundant. On August 3, 1924, I collected a set of fine plants in bud. These showed a few subspathulate leaves at the base of the stem but no definite rosettes ; and below these leaves were a few brown and withered foliar vestiges, which might or might not have persisted through the winter. There was no clear evidence of the existence of a rosette of the previous year. On September 13 I found, for the first time, among flowering individuals of the whitish-flowered form, a few well-developed rosettes that would certainly not flower till the following year. These rosettes consisted of spreading, oblong and not spathulate leaves, the largest having sixteen leaves, some up to 20 mm. long. On May 9, 1928, and again on May 29, 1932, I met with colonies of young plants showing

the decayed remains of the previous year's rosettes, and fresh growths of more or less rosette-like form with the lowest leaves varying in different individuals from oblong to subspathulate. Finally, on November 6, 1932, I found among dead flowering plants many seedling rosettes resembling those seen in September 1924, and some of these showed distinctly the ovate cotyledons. It seems then that in England *G. axillaris* is really a biennial as pointed out by Murbeck, although, not only in the herbarium but in the field, flowering specimens normally give the impression of an annual. It is noteworthy that the form of the first year's rosette-leaves differs from that of the basal leaves of the second year.

An important diagnostic character in this group is the number and relative length of the internodes. In *G. axillaris* the internodes above the rosettes are more numerous and less unequal than in the other British forms (except *G. germanica* Willd.), and the upper, which are generally the longest, do not as a rule greatly exceed the leaves. In condensed forms the internodes are usually contracted throughout. Two features of this plant given by Murbeck do not seem obvious from dried specimens. The sinuses of the calyx-lobes, which he terms obtuse or rotundate, appear to be more or less acute as in the other forms, and I can find no appreciable differences in the shape of the stigmas, which seem in every form to be obtusely ovate-lanceolate.

If *G. axillaris* and its allies be treated as distinct species, as seems to be justified, the application of the Linnean name, *G. Amarella*, comes into question. The diagnosis of Sp. Plant. 230, " G. corollis quinquefidis hypocrateriformibus fauce barbatis," is applicable to all the forms of the group, including *G. germanica* Willd. and *G. obtusifolia* Willd. ; and the synonyms obviously refer to more than one plant, for two names are cited from Caspar Bauhin's 'Pinax.' The habitat given, "In Europæ pratis," is also of general application. There are two sheets in the Linnean Herbarium labelled "Amarella " in Linnæus's hand, both there apparently in 1753. The first sheet has two specimens of *G. axillaris*, the second sheet one of *G. germanica* Willd. In these circumstances it seems impracticable to identify *G. Amarella* L. with any particular form, and the plant under discussion will therefore be treated as *G. axillaris* (F. W. Schmidt) Rchb.

A remarkable form of this plant, which sometimes grows in good quantity on chalk downs of the south of England along with the typical species, seems to merit distinction as a variety. It is always of low and slender growth, with fewer internodes than in the typical form, the upper often unusually long, and its flowers are of a greenish-white colour :—

Gentiana axillaris (F. W. Schmidt) Rchb. var. nov. **pallida.**
Exsicc. Pugsley, no. 538 (Box Hill).

Planta humilis, gracilis, foliis basalibus paucis, internodis (sub 8) superioribus relative longioribus, et corollis viridi-albidis nec purpureo-tinctis prædita.

G. GERMANICA Willd. This handsome species, readily distinguishable by its large, showy flowers and stipitate instead of subsessile capsules, has almost the same habit as *G. axillaris*, with broader foliage and a slightly greater number of internodes. It appears likewise to be of biennial duration, germinating in the spring.

G. ULIGINOSA Willd. This plant, which I discovered in 1923 in its only certainly known British locality, near Tenby, is fully dealt with in Journ. Bot. lxii. 193; 1924. It is an annual and probably does not germinate till early in the summer. Its total number of internodes, from the cotyledons upwards, is only 4–7, of which the uppermost two or three, or occasionally but one, are much elongated. It is noteworthy that this species, like *G. baltica* Murb., appears partial to the damp slacks of sand-dunes.

G. LINGULATA C. A. Agardh var. PRAECOX (Towns.) Murb. The life-cycle of this plant seems to be an over-wintering annual, as might be expected from its flowering in late spring and early summer. There is no obvious reason to doubt Arthur Bennett's statement (Journ. Bot. xxx. 153; 1892) that he had watched plants near Croydon from their germination in autumn up to the flowering stage in the following May or June. Murbeck gives the number of internodes as 2–4, and of these the uppermost is sometimes suppressed. The basal rosette is more marked at the time of flowering than in *G. axillaris*, and often shows several pairs of withered leaves that were presumably produced in the preceding autumn.

This plant, known only from the south of England, where it occurs in at least nine vice-counties, is placed by Murbeck under *G. lingulata* C. A. Agardh as a variety. But it presents several points of distinction. Morphologically it is essentially much dwarfer in habit (3–10 cm. high instead of 5–35 cm.), with fewer (2–4 instead of 3–6) and very much shorter internodes, and normally 4-merous flowers. Its life-cycle is different, for *G. lingulata* is a summer-flowering plant lasting till August, and is shown by Murbeck as a biennial. This duration seems to be confirmed by the fine series of *G. lingulata* from Herb. Granvik, now in the British Museum Herbarium, in which the withered rosettes, presumably of the previous year, are frequently more obvious than in dried specimens of *G. axillaris*. The geographical distribution of var. *praecox* also does not indicate a close connection with the Scandinavian and Russian *G. lingulata*, for it has not been observed except from the south of England. It therefore seems reasonable to detach var. *praecox* from *G. lingulata*, and

assuming the latter to deserve specific rank like *G. axillaris*, to regard the variety as a separate species endemic in Britain. As the varietal epithet "*praecox*" is already occupied in a specific sense (*G. praecox* A. & J. Kerner in Verh. Zool.-Bot. Gesellsch. xxxviii. Abh. 669; 1888), it is proposed to name the plant **Gentiana anglica**.

G. anglica, which grows on dry, calcareous ground like *G. axillaris*, appears to have been first observed on Afton Down, Isle of Wight, on May 25, 1864, by R. Tucker, who reported it in Journ. Bot. viii. 160; 1870. F. Stratton wrote about it in 1878, without giving it a name (*op. cit.* xvi. 263), and Trimen the same year (*tom. cit.* 265) referred it to *G. uliginosa* Willd. In 1883 it appeared in Townsend's 'Flora of Hants,' 216, as *G. Amarella* var. *praecox*, and nine years later it was placed under *G. lingulata* by Murbeck.

G. SEPTENTRIONALIS Druce. This plant was apparently first observed in Shetland by W. H. Beeby, who described it in a paper on Shetland plants in the 'Scottish Naturalist,' 1887. It seems to have been sent to Lange for his opinion, for it is inserted in Beeby's paper (p. 27) as "*G. Amarella* L. f. *multicaulis* Lge.—Flowers brownish-red externally, pale greenish-yellow or cream-coloured within; corolla-lobes apparently always erect; stem usually much branched below." I cannot trace that the form-name was published by Lange himself, and it is probable that "*multicaulis*" was only a MS. name suggested by Lange, and that Beeby's is the original description. In that case the name would stand as "f. *multicaulis* Lange ex Beeby." In the Rep. B. E. C. iii. 329 (1914), G. C. Druce published an account of a var. *calycina* of *G. Amarella*, based on a plant occurring in Ross and Sutherland, which is apparently identical with f. *multicaulis*, although the colour of the flower is said to be "white, tinged with lilac-purple." In 1922, in his 'Flora Zetlandica' (Rep. B. E. C. vi. 505) Druce bestowed a new name on a similar plant from Shetland. He writes here: "The Shetland *G. Amarella* is sufficiently distinct from the English form as to be worth designating *G. septentrionalis* nova subsp. or race" [*sic*], adding that it is usually more branched, with differently coloured flowers (pale, dull red and whitish within), but making no allusion to Beeby's earlier description. As a species the name first appears in the same Report (vii. 885; 1926), without diagnosis or reference, and the entry is cited in the 'Index Kewensis' as a "nomen." In Druce's 'Comital Flora' (p. 202), however, the plant is entered as a species, "*G. septentrionalis* Druce in Rep. B. E. C. 505; 1921," and as the plant's chief peculiarity, the colour of its flowers, is mentioned there, this may be held to comply with the Rules of Nomenclature and render the specific name valid. But the obligation to recognise such haphazard

creations is unfortunate. The "first record" in the 'Comital Flora' is erroneously credited to Druce, as var. *calycina*, instead of to Beeby.

G. septentrionalis grows not only in Shetland but in Orkney, whence it was distributed by Col. Johnston (no. 973, Sanday, 1920). It also occurs in Caithness, Sutherland and Ross-shire. Marshall obtained luxuriant specimens at Tongue Bay in 1901 (no. 2440), and in 1927 I collected fine series on the fixed sand-dunes at Golspie and Reay, where it grows in abundance, flowering in July and August. It seems to be an endemic Scottish plant, for, curiously enough, it is unknown from the Faeroes and from Scandinavia.

Although very near to *G. axillaris*, *G. septentrionalis* appears to have sufficient points of distinction to warrant specific rank. In the commoner form of the sand-dunes it is a dwarf plant only 5–10 cm. high. Its duration, whether an over-wintering annual or a biennial, can only be certainly determined by local observation, but it has the aspect of the former. At the time of flowering it generally shows the withered remains of a small basal rosette, above which spring a very few, nearly contiguous leaves before the stem rises with 5–7 short but gradually lengthening internodes. Only the uppermost internodes occasionally exceed the leaves. Solitary, rather long-stalked flowers spring from the upper nodes, and below these, often extending downwards to the basal foliage, are slender branches, each bearing one or two flowers. The plant thus often assumes a compact, pyramidal, floriferous aspect. In some localities the habit is laxer, Marshall's largest specimens from Tongue being 25 cm. high, with the upper internodes much exceeding the leaves, and the branches from the lower part of the stem producing two or even several flowers. The foliage of *G. septentrionalis* is somewhat intermediate between that of *G. axillaris* and *G. anglica*, but normally narrower than in either. The basal leaves are narrowly subspathulate, and the cauline less ovate-lanceolate and more obtuse than those of *G. axillaris*. The colour of the flowers is greyish- or yellowish-white within, but externally the corolla is of a pale, dull red tint, which quickly becomes ochreous-yellow or old-gold colour, imparting a distinctive aspect to the plant in cloudy weather, when the corollas remain closed.

The five British species, as seen at the flowering stage, may be thus contrasted :—

* *Germanicae*. Corolla large and showy, 20–30 mm. long. Capsule stipitate.

G. germanica Willd. Sp. Pl. ed. 4, i. 1346 (1797); *G. Amarella* L. Sp. Pl. 230 (1753), ex parte.

Biennial. Stem 5–(10–25)–35 cm. high, with a few basal leaves and 7–12 internodes above, the upper often slightly exceeding the leaves, and the upper axils (rarely more) bearing short, suberect, slender branches with 1–5 shortly peduncled flowers. Basal leaves spathulate, rounded-obtuse, the cauline ±spreading, sessile, ovate, subcordate-based, subacute or the uppermost acute. Flowers 5-merous; calyx with two teeth broader than the others; corolla lilac, much exceeding the calyx. Flowers in August and September.

** *Amarellae*. Corolla smaller, 12–20 mm. long. Capsule subsessile.

G. axillaris (F. W. Schmidt) Rchb. Icon. Botan. ii. 18, t. cxxx. (1824); *Hippion axillare* F. W. Schmidt, Flor. Böm. Inch. Cent. ii. 29 (1793); *G. Amarella* subsp. *axillaris* Murbeck, Gentianen (*Endotricha*) in Act. Hort. Berg. ii. no. 3, 20 (1892); *G. Amarella* L. Sp. Pl. 230 (1753), ex parte.

Biennial, producing in the first year a rosette of spreading oblong leaves. Stem 3–(10–25)–60 cm. high, with scattered basal leaves and 6–12 internodes above, generally ±equal or the uppermost rather longer and exceeding the leaves; the axils, at least the upper, bearing short, suberect branches with 1–several shortly peduncled flowers, or in some forms solitary flowers only; rarely the lower axils with longer branches. Basal leaves subspathulate, rounded-obtuse, the cauline spreading, sessile, lanceolate, subacute, or the upper ovate-lanceolate, acute. Flowers 5-merous; calyx with subequal lobes shorter than the corolla-tube; corolla dull purple. Flowers from August till October.

Var. *pallida* Pugsl. Stem 3–12 cm. high, slender, with very few basal leaves and 4–7 internodes above, the upper relatively long; branches from the median axils often longer than the upper. Flowers partly 4-merous; corolla greenish-white.

G. septentrionalis Druce, Comital Flora, 202 (1932); *G. Amarella* f. *multicaulis* Lange ex Beeby in Scot. Natur. 27 (1887); *G. Amarella* var. *calycina* Druce in Rep. B. E. C. iii. 329 (1914); *G. Amarella* subsp. or race *septentrionalis* Druce, *op. cit.* vi. 505 (1922).

Overwintering annual? Stem 3–(7–10)–25 cm. high, with few basal leaves and 4–7 internodes above, the upper longest, generally all shorter than the leaves but in some forms with the upper exceeding them; the upper axils bearing solitary, erect, ±long-peduncled flowers, the lower (often to the base of the stem) with longer, slender, ascending 1–2(–5)-flowered branches. Basal leaves subspathulate or oval, rounded-obtuse, the lower and median cauline spreading, sessile, oblong-lanceolate and obtuse, the upper suberect, sessile, lanceolate or ovate-attenuate, subacute. Flowers 5-merous; calyx with unequal lobes, the larger

nearly as long as the corolla-tube ; corolla greyish- or yellowish-white within, externally pale, dull or brownish red, soon becoming ochreous or old-gold colour. Flowers in July and August.

G. anglica Pugsl. sp. nov. ; *G. Amarella* var. *praecox* Towns. Fl. Hants, 216 (1883) ; *G. Amarella* subsp. *lingulata* (C. A. Agardh) var. *praecox* (Towns.) Murbeck, *tom. cit.* 19 (1892).

Icon. Butcher & Strudwick, Further Illustr. no. 254 (as *G. lingulata* var. *praecox*).

A dwarf, overwintering annual, producing a rosette of leaves in autumn. Stem 2–(4–7)–10 cm. high, with ±developed basal rosette and 2–4 internodes above (the uppermost sometimes suppressed) subequalling or exceeding the cauline leaves ; the axils of the cauline leaves bearing solitary erect ±long-peduncled flowers, those of the basal rosette often with slender suberect 1–2-flowered branches. Basal leaves subspathulate, rounded-obtuse, the cauline sessile, suberect, oblong or lingulate, obtuse, the uppermost pair more ovate-oblong and subacute. Flowers 4-merous or 5-merous ; calyx with unequal lobes, the longest subequalling the corolla-tube ; corolla dull or greenish purple. Flowers in May and June.

G. uliginosa Willd. Sp. Pl. ed. 4, i. 1347 (1797) ; Murbeck, *tom. cit.* 14 (1892) ; Pugsley in Journ. Bot. lxii. 193 (1924).

A dwarf short-lived annual. Stem 2–10(–20) cm. high, with very few basal leaves and the cotyledons usually still green at the time of flowering ; internodes 1–3, the uppermost (or occasionally 2) much elongate and exceeding the cauline leaves ; the axils of the cauline leaves with solitary or few long-peduncled flowers, those of the uppermost basal generally with slender 1–few-flowered suberect branches. Basal leaves oblong or lanceolate, obtuse, the cauline sessile, lanceolate or ovate-lanceolate, attenuate, subacute. Flowers 5-merous or partly 4-merous ; calyx-segments long and very unequal, the largest often subfoliaceous and exceeding the corolla-tube ; corolla dull or dark purple. Flowers in August and September.

TROPICAL AFRICAN UMBELLIFERAE.

By C. Norman, F.L.S.

Heracleum Taylori, sp. nov. *Herba* ±50 cm. alta, stricta pubescens. *Folia* homomorpha anguste oblonga ±6-jugata pinnata, petiolo 10–15 cm. longo, *foliolis* sessilibus imis exceptis, congestis, ambitu suborbicularibus vel ovatis, leviter vel vix trilobatis, lobis rotundatis vel denticulatis, 10–12×10 mm.

Umbellæ parvæ, radiis 4–8 subæquilongis densiuscule glanduloso-pubescentibus ±1–2 cm. longis, pedicellis crassis congestis ±3 mm. longis. *Involucri phylla* minuta mox decidua, involucellorum anguste linearia acuta. *Petala* alba parva ovata integra vel apice minute retusa. *Fructus* immaturus oblongus pubescens. *Stylopodium* inconspicuum ; *styli* longissimi.

Hab. Kenya : Aberdare Mountains, Kinangop, 11,500 ft., *G. Taylor* 1454 (Herb. Mus. Brit.).

Allied to *Heracleum elgonense* (Wolff) Bullock, from which it differs principally in size, the form of the leaflets and in, apparently (the main umbels have only fruit), lacking the raying petals ; also allied to **Heracleum abyssinicum**, comb. nov. (*Malabaila abyssinica* Boiss.), differing primarily in the few *short* umbel rays and congested leaflets.

I have long thought that the familiar and widely spread *Malabaila abyssinica* Boiss. would be better placed in *Heracleum*. It seems to have none of the characters of the true *Malabailae*, amongst which it has always seemed to spoil a homogeneous series, whereas it fits well into *Heracleum* a world-wide and much more heterogeneous group. It is hoped to deal with the question of all the tropical African plants which have been assigned to *Malabaila* in a subsequent paper.

Peucedanum Lynesii, sp. nov. *Herba* gracilis glaberrima, caule terete striato ramoso. *Folia* homomorpha, lamina ±15 cm. longa tri-ternatim decomposita, segmentis acicularibus vel angustissime linearibus usque 9 cm. longis et vix 1 mm. latis, integris vel remote denticulatis. *Umbellæ* ±6-radiatæ, radiis tenuibus rigidis 3·5–5 cm. longis, pedicellis paucis tenuissimis, fructiferis ±1 cm. longis. *Involucri* et involucellorum phylla 0. *Flores* polygami, petala delapsa. *Fructus* maturus ovalis, basi cordatus, ±9×7 mm., juga primaria approximata, prominula ; alæ tenues subnitidæ ±3 mm. latæ. *Stylopodium* inconspicuum, styli delapsi.

Hab. Tanganyika Terr. : Iringa, side of Mt. Lukota, 5600–6600 ft., *Lynes* (Herb. Kew.).

This species is unlike any other tropical African one known to me. In leaf-characters it is like *Bubon capense* Sond., but the wide-winged fruit is totally different, nor is Admiral Lynes's plant woody, but seems to be truly a herb.

Schimperella aberdarense, sp. nov. *Herba* (perennis ?) glabra alta ±5 pedalis (ex coll.) valde ramosa. *Folia basalia* invisa, *caulina* inferiora magna cum petiolo usque 24 cm. longa ambitu oblongo-lanceolata ±6 jugata bipinnatisecta, pinnis inter se sat remotis, ambitu anguste lanceolatis acutis, inferioribus ±6 superioribus ±2 cm. longis, *segmentis* ultimis lanceolatis acutis basi cuneatis margine inciso-dentatis, terminalibus quam lateralia

multo majoribus plerumque lobatis. *Folia caulina suprema* in segmentis filiformibus dissecta. *Umbellæ* magnæ, radiis 6–10 tenuibus, 2–4 cm. longis, pedicellis tenuissimis inæquilongis. *Involucri phylla* longissima filiformia usque 5 cm. longa, involucellorum brevissima ±5 mm. *Petala* alba ovata parva. *Fructus* omnino generis, orbicularis muriculatus.

Hab. KENYA: Aberdare Mountains, Kinangop Forest station, *G. Taylor* 1225 (type) (Herb. Mus. Brit.); *Miss E. R. Napier* 605 (Herb. Kew.). Differs from *Sch. verrucosa* (Gay ex A. Rich.) Wolff in its much larger size, its heteromorphous leaves and very long involucres. It is unfortunate that no basal leaves were collected (probably they had withered away), but it is unlikely that they would differ from those described except in size.

The genus *Schimperella* (now consisting of two species) was segregated by Wolff (Pflanzenreich, iv. 228, p. 325; 1927) and was based on Schimper's plants described by A. Richard (Flor. Abyssinica, i. 324) as *Sium sinense* and *S. verrucosum*. These two species were united by Bentham and Hooker ('Genera Plantarum,' i. 895) and transferred to *Pimpinella*. Wolff's view, however, is undoubtedly justified.

FERN NOTES.—I.

By A. H. G. ALSTON, M.A., F.L.S.

AMONG the numerous collections of ferns received at the Department of Botany, British Museum, there have been several discoveries of interest either of new species or of specimens that extend the known geographical range or throw new light on well-known species. Moreover, while naming these collections various other facts about ferns have been noticed, and it is thought advisable to start a series of miscellaneous notes to publish these.

PLATYCERIUM VEITCHII (Underw.) C. Chr. as a wild plant.

This species was described by Underwood in 1905 from a living plant at Kew. There is no type-specimen at Kew, but the species is still in cultivation. It was imported from Adelaide by Messrs. Veitch about 1896. Recently, dried specimens of a wild plant, which agrees with *P. Veitchii* in essential characters, have been received at the Museum from Mr. C. T. White, who states that the species is very common on rocks and cliff-faces in the Carnarvon Range, Queensland. Mr. White's discovery establishes the native home of the species.

New POLYPODIUM from the Tibetan frontier.

Among the plants brought back by Kingdon Ward from the frontier of Burma and Tibet was a *Polypodium*, which could not be named at the Museum and which was sent to Dr. C. Christensen, who reported that it was either a variety of *P. Rosthornii* Diels (*P. ovatum* Wall. non Burm.) or a new species allied to it. Later a similar specimen (Clarke, 19,843E) from India was discovered which has a rhizome and seems to me to be distinct from *P. Rosthornii* Diels. The new species differs from *P. Rosthornii* mainly by its larger fronds with indistinct lateral veins, shorter stipes, and brown, not greyish, scales.

Polypodium lancifolium, sp. nov.—Rhizoma late repens, c. 3 mm. diametro, seminuda; stipes 1·5–17 cm. longus, basi paleis brunneis lanceolatis concoloribus, cellulis elongatis, indutus; frondes c. 1 cm. inter se distantes, laminis simplicibus ambitu lanceolatis membranaceis apice acuminatis, costa prominente subnuda, nervis lateralibus inconspicuis; sori in laminæ parte costam versus irregulariter dispositi rotundi castanei.

Hab. BURMA: Nam Tamai, 4000 ft., common under bamboos in jungle, sometimes epiphytic, *Kingdon Ward* 9172 (type). INDIA: Burkal, Chittagong, *Clarke* 19,843.

Identity of MENISCIUM CRISTATUM Desrouss.

The comparison of the type of this species in Herb. Lamarck with that of *Asplenium denticulosum* Desv. in Herb. Jussieu proves them to be conspecific; they are small forms of the common West Indian *Diplazium arboreum* (Willd.) Presl, represented at Paris by Husnot 343 and Hahn 11.

The synonymy is as follows:—

Diplazium cristatum (Desrouss.) Alston, comb. nov.

Meniscium cristatum Desrouss. in Lamk. Encycl. iv. 94 (1797).

Asplenium denticulosum Desv. in Berl. Mag. v. 323, no. 82 (1811).

Diplazium denticulosum (Desv.) C. Chr. Ind. 231 (1905), non Gaudich.

Asplenium arboreum Willd. Sp. Pl. v. 320 (1810).

Diplazium arboreum (Willd.) Presl, Tent. 114 (1836).

Asplenium Shepherdii Spreng. in Nova Acta, x. 231, t. 17, f. 5–6 (1821).

Diplazium Shepherdii (Spreng.) Link, Hort. Berol. ii. 70 (1833).

Desrousseaux states that the type was collected in Martinique by Joseph Martin.

The name *Diplazium lonchophyllum* should be adopted for the Mexican plant called *D. denticulosum* in Christensen's 'Index.'

PTERIS ELEGANS Poir. Encycl. v. 718 (1804).

This has always been considered a doubtful species, but an examination of the type-specimen shows it to be the same as *Cheilanthes mysurensis* Wall.; the specific epithet *elegans* cannot be taken up for *C. mysurensis* because of the earlier *Cheilanthes elegans* Desv.

DIPLAZIUM KLOTZSCHII (Mett.) Moore in Trinidad.

The Trinidad fern, which has been distributed as *D. hians* Kunze, turns out to be *D. Klotzschii* (Mett.) Moore. It differs from *D. hians* by its more deltoid pinnules and simple, never forked veinlets. As this species was originally described as *Lotzea diplazioides* Kl. & Karst., in Linnaea, xx. 358 (1847), that specific epithet should be taken up, as **Diplazium diplazioides** (Kl. & Karst.), comb. nov. There are the following specimens in Herb. Mus. Brit.:—Trinidad: *Broadway* 5471, 5988, 6904; *Fendler* 47. Venezuela: *Moritz* 431: and cultivated specimens.

FURTHER NOTE ON SIR J. SMITH'S FERNS.

Marattia laevis Sm. Pl. Ic. ined. ii. t. 47 (1790).—The type-specimen of this species, labelled "St. Domingue, Thierry-Th. no. 90," is *M. Kaulfussii* J. Sm. and not *M. alata* Sw. as commonly stated. *M. laevis* Sm. has recently been rediscovered in Hispaniola by Türckheim and Fuertes.

Marattia salicina Sm. in Rees Cycl. xxii. no. 6 (1812).—The type-specimen is labelled "N.S. Wales—*R. Molesworth*," but, like Molesworth's specimen of *Darea heterophylla*, it was, no doubt, from Norfolk Island. No species of *Marattia* is recorded in Moore's 'Handbook of the Flora of N.S. Wales.'

Darea pectinata Sm.; Alston in Phil. Journ. Sc. l. 177 (1933); is the fern described later as *Asplenium Macraei* Hk. & Gr.

LICHENOLOGICAL NOTES FROM THE BRITISH MUSEUM HERBARIUM.—I.

BY I. MACKENZIE LAMB, B.Sc., F.L.S.

IN spite of the great attention which has been paid to the study of Lichens in the British Isles, and which has been fostered by a succession of excellent Lichen-floras by Mudd, Crombie, Leighton and Lorrain Smith, the British Lichen-population is still comparatively imperfectly recorded. Much work remains to be done, not only in extending our knowledge of the systematic interrelationships of the species known to occur, but also in delimiting their distributional range, a process

which will in due course throw considerable light on the mode of origin of the component elements of the present day flora. A further point which calls for co-operative study is the co-ordination and accurate definition in many cases of the species-concept by comparison of as large a number of individuals as possible from widely separated and ecologically distinct areas; in each case it is of the utmost importance that the possible range of morphological variation inside the species should be known with a tolerable degree of accuracy. Excellent work in this sense has been done on the continent by O. Galløe in his studies on the natural history of the Danish Lichens.

It is felt, therefore, that the publication of a series of critical notes on the British Lichen-flora will not only tend to fill in certain gaps in our knowledge, but will also be of service to students of the systematic and distributional relationships of Lichens in this country.

I should like to acknowledge my indebtedness to Dr. W. Watson, who has contributed so much to British Lichenology by his systematic and ecological work, for his kindness in examining a number of species and for the benefit of his advice.

Unless otherwise stated, the chemical reactions mentioned in the notes have been produced by the use of reagents (KOH, I) made up according to the directions given by Lorrain Smith in the 'Handbook of the British Lichens' (1921). The solutions should be renewed at fairly frequent intervals; in the case of the $CaCl_2O_2$, a saturated aqueous solution is employed.

An asterisk (*) after the number of the vice-county denotes a new v.c. record. The collection number is that of the plant in the British Museum Herbarium.

1. PARMELIELLA ATLANTICA Degelius, in Acta Phytogeogr. Suecica, vii. 131 (1935). Examination of British Museum Herbarium material has shown that a number of specimens belonging to this species were included under the name of *P. plumbea*; they were without exception devoid of apothecia and more or less thickly covered on the upper surface of the thallus with coralloid isidial outgrowths. *P. atlantica* has already been recorded from v.c. 3 and Ireland, v.c. 2, 16 and 27, and revision of the "*P. plumbea*" material has added the following localities:—

Lamorna, near Penzance, Cornwall (v.c. 1*), ex. herb. *W. Curnow*. Ennerdale, Cumberland (v.c. 70*), *W. Johnson*, North of England Lichen-Herbarium, 1894, no. 96 pr. p. Airds, Appin, Argyll (v.c. 98*), ex herb. *J. M. Crombie*. A specimen from South Brent, Devon (v.c. 3), ex herb. *H. B. Holl*, is labelled, in J. M. Crombie's handwriting, "*Coccocarpia plumbea* f. *myriocarpa* (Del.) *granulosa*"; it is, however, typical *P. atlantica* without apothecia.

2. CALOPLACA AURANTIA (Pers.) Hellb. var. **thallincola** (Wedd.) Lamb, comb. nov. (*Lecanora Heppiana* var. *thallincola* Harm.; *Caloplaca aurantia* f. *thallincola* Zahlbr.). The Lizard (v.c. 1*). On schistose rock, growing over the thallus of *Verrucaria maura* (coll. no. 107.) Spores 12·0–15·0 × 6·0–8·4 μ. The characteristic to which this plant owes its varietal name is of minor importance, since the thallus may occasionally be found to grow over the bare rock surface. The relation of breadth to length in the spores, however, appears to differ fairly constantly from that found in the type (see Harmand, Lich. de France, fasc. v. 810 & 811; 1913). In Cornish material of the type, for instance, the length/breadth spore coefficient is approximately 1·61; while in the var. *thallincola* it is constantly higher, averaging 1·82 in the present specimen. On account of this character it is thought advisable to restore the varietal status, while not going the length of segregating it as a distinct species, as has been done by Olivier and Du Rietz. This character of the spores may possibly be due to arrested development in the ascus, since a few of the pip-shaped broader form characteristic of the type may very occasionally be found.

3. RINODINA CONIOPTA (Nyl.) A. L. Smith, Monogr. Brit. Lich. ed. 2, pt. i. 257 (1918). The Lizard (v.c. 1). On schistose rock, with *Lecanora sulphurea* (coll. no. 114). The thallus remains unchanged with KOH, $CaCl_2O_2$ and (KOH)$CaCl_2O_2$. The thalline margins of the apothecia in this specimen are excluded at a very early stage, giving them a lecideine appearance; but a zone of gonidia persists below the hymenium. Spores 15·0–16·5 × 6·9–8·1 μ. Hymenium blue with I.

4. LECANORA ATRA (Huds.) Ach. Lichenogr. Univers. 344 (1810). The Lizard (v.c. 1). On walls and schistose rock (coll. nos. 81, 100). In these collections, although apothecia are abundantly developed, spores and asci appeared to be absent, the violet hymenial layer being composed entirely of paraphyses. This peculiarity has been noted also by Galløe, 'Natural History of the Danish Lichens,' pt. iv. 76 (1932).

5. SOLENOPSORA HOLOPHAEA (Mont.) Samp. in Broteria, Ser. Bot. xix. 26 (1921). Malpas, near Truro (v.c. 1). On schistose rock, showing a preference for the crevices (coll. no. 39). Spores 15·0–18·0 × 4·5–5·1 μ. Hymenium blue, becoming darker, with I.

6. LECIDEA MUTABILIS Fée, Suppl. Essai Cryptog. Écorc. Officin. 105 (1837). Budock, near Falmouth (v.c. 1). On oak bark (coll. no. 73 *a*). Thallus KOH+y, $CaCl_2O_2$—. Apothecia

brown, becoming convexo-immarginate. The spore wall is somewhat thickened (up to 1 μ). A yellow reaction with potash is not mentioned in Lorrain Smith's Monograph, but Dr. W. Watson has been good enough to inform me that it is a feature of his specimens of this species.

7. L. TENEBRICA Nyl. in Flora, lxv. 454 (1882). Isle of Barra (v.c. 110). Leg. University of Edinburgh Biological Society, 1935. Apothecia blackish, 0·6–0·8 mm. in diam. The medullary hyphæ have somewhat thick and irregular walls, their outlines being indistinct. Herr A. H. Magnusson, during a visit to the British Museum in 1925, kindly revised the herbarium collections of the *Lecidea rivulosa* group, and since these determinations throw considerable light on the distribution of *L. tenebrica* in the British Isles, it may be of interest to enumerate them, as follows:—

Isle of Sark (C*). Leg. & det. *J. M. Crombie*, sub *L. Kochiana* var. *lygaea*. (This is f. *fuscescens* Magn.)

Barmouth (v.c. 48*). Leg. *H. B. Holl.* Det. J. M. Crombie sub *L. Kochiana* var. *lygaea*.

Ystrad-ffin, Carmarthenshire (v.c. 44*). Leg. *H. H. Knight* sub *L. Kochiana*. (This is f. *fuscescens* Magn.)

Llyn Dinas, near Beddgelert (v.c. 49*). Det. J. M. Crombie sub *L. rivulosa* f. *obscurior*.

Crianlarich, Perthshire (v.c. 87*). Leg. *H. B. Holl.* Det. J. M. Crombie sub *L. Kochiana* var. *lygaea*.

To these localities must be added the following records, thus bringing the total number of known occurrences of *L. tenebrica* in the British Isles up to nine, of which one is slightly doubtful:—

Red Screes, Westmorland (v.c. 69). Type-specimen.

Malham and Clapdale (v.c. 64). See Watson in Journ. Bot. lxx. 71 (1932), and lxxiii. 153 (1935).

Garrynahine, Lewis (v.c. 110). Somewhat doubtful. See Watson, *loc. cit.*

8. L. PERCONTIGUA Nyl. in Flora, lxv. 457 (1882). Budock, near Falmouth (v.c. 1*). On granite wall (coll. no. 64). Thallus KOH+y then red. Although apothecia were present, their internal structure was more or less destroyed, a feature which is not uncommon in members of the *Lecidea contigua* group; spores were extremely difficult to find, and appeared to be poorly developed.

9. L. ERRATICA Körb. Parerg. Lich. 223 (1861) (*L. expansa* Nyl.). Near Brockenhurst, New Forest (v.c. 11*). On a flint pebble (coll. no. 11). The hypothallus predominates as a blackish stain. The spores are larger than is usual in this species, being 11·4–12·0 × 5·4–6·0 μ, with an average measurement of

11·9×5·9 μ. Hymenium blue, becoming sordid greenish, with I.

10. L. MEIOSPORA (Nyl.) Nyl. in Bull. Soc. Linn. Normand. ser. 2, iv. 291 (1872). Coverack (v.c. 1*). On pebble embedded in ground (coll. no. 143). Thallus KOH−, $CaCl_2O_2$−, medulla I−. Apothecia plane, black, marginate, rather pruinose, not noticeably arranged in lines, as is often the case in this species. Paraphyses brown, but not swollen, at the apices. Spores 12·6–15·5×6·7–7·9 μ. With I the hymenial gelatine becomes blue, then sordid greenish; the asci take on a reddish tint. In general appearance this specimen shows a strong similarity to *L. albocoerulescens*, but differs in the smaller spores.

11. CATILLARIA LENTICULARIS (Ach.) Th. Fr. f. *nigricans* Lettau in Hedwigia, lii. 135 (1912). Malpas, near Truro (v.c. 1*). On schistose rock (coll. no. 36 *a*). The majority of the spores are simple, but the presence of a certain number showing a well-developed septum indicates that the plant should be placed here rather than with *Lecidea nigroclavata* Nyl., if the latter species be recognized. The excipulum is somewhat thicker and more carbonaceous than in the type.

12. TONINIA MESOIDEA (Nyl.) Zahlbr. Cat. Lich. Univ. iv. 289 (1926–7). Malpas, near Truro (v.c. 1). On schistose rock (coll. nos. 32, 35, 41, 44). This plant varies considerably in internal structure even in collections from the same locality. The inner core of the hypothecium often consists entirely of dense white hyphal tissue, or may be reddish-brown, with the white hyphal complex restricted to a small area in the centre.

13. ARTHONIA CINNABARINA (DC.) Wallr. f. *cuspidans* Nyl. in Flora, lix. 310 (1876). Idless, near Truro (v.c. 1*). On oak bark (coll. no. 229). The apothecial walls are dark violet in section. Spores 15·0–18·0×5·4–6·0 μ, mostly 3-septate, some becoming brownish-yellow by degeneration. The thallus has a greenish subfurfuraceous appearance owing to the presence of superficial protococcoid algæ.

14. GRAPHIS RAMIFICANS Nyl. in Flora, lix. 575 (1876). Coverack (v.c. 1). On crab-apple bark (coll. no. 154). Thallus KOH+y, then red. Apothecia scarcely dendroid, some very slightly furrowed. Paraphyses brown at their swollen apices. Spores 9–11-septate, 51·0–66·6×9·6–12·0 μ, colourless. This species is included in the genus *Phaeographis* by Lettau, in Hedwigia, lii. 122 (1912), and lv. 26 (1914), on account of the preponderance of brownish spores in his material.

REVIEWS.

Das ozeanische Element der Strauch- und Laubflechtenflora von Skandinavien. By G. DEGELIUS. Acta Phytogeographica Suecica, 7, 1935, pp. 411, 4 plates, 90 figs. in text.

THIS comprehensive work represents a thorough and detailed attempt to explain the occurrence and distribution in Scandinavia of certain species of fruticose and foliose lichens to which the author applies the term "oceanic," in preference to the older but somewhat misleading definition "atlantic." This "oceanic element" represents solely a group of species whose predominantly western coastal distribution in Scandinavia is attributable to the peculiarities of the oceanic climate; purely littoral species are not included in the category. From the detailed review of the literature in Chapter III. it is seen that the peculiarity of the western coastal flora in Europe attracted recognition from a comparatively early period. The delimitation of the region of the oceanic flora as a whole ("subatlanticum") from that of the eastern continental flora ("mittelbalticum") has been attempted by various workers on the basis of a study of the boundaries of typically oceanic and typically continental plants respectively.

Twenty-two species of fruticose and foliose lichens with a markedly oceanic type of distribution are considered individually; charts of the Scandinavian and European localities demonstrate clearly their more or less western and coastal distribution. In Europe as a whole the oceanic species are found to show two main types of distribution, the eu-oceanic or extreme coastal element, and the suboceanic, which, although not confined to the strictly oceanic regions, attains there its highest degree of frequency and development. Scandinavian species belonging to the eu-oceanic type are:—*Parmeliella atlantica*, *Pseudocyphellaria crocata* and *P. Thouarsii*; while *Alectoria bicolor*, *Cetraria norvegica*, *Leptogium cyanescens*, *L. palmatum*, *Lobaria amplissima*, *L. laete-virens*, *Nephroma lusitanicum*, *Normandina pulchella*, *Pannaria pityrea*, *P. rubiginosa*, *Parmelia Arnoldii*, *P. crinita*, *P. laevigata*, *P. revoluta*, *Parmeliella plumbea*, *Sphaerophorus melanocarpus*, *Sticta fuliginosa*, and *S. sylvatica* represent the less extreme sub-oceanic element.

Each of these two main distributional types is further divisible into roughly northern and southern groups, complicated in the case of the suboceanic type by the presence or absence in mid-Europe of the species concerned. It is shown that 95 per cent. of the oceanic species of fruticose and foliose lichens in Scandinavia have a wide extra-European distribution, in contradistinction to the Scandinavian oceanic species of bryophytes and vascular plants, of which only about 44 per cent. and 17 per cent.

respectively are represented outside Europe. The author attempts to explain this peculiarity by suggesting that owing to the probably greater genotypic stability of the lichen-species new biotypes are less readily developed under the influence of widely different environmental factors than is the case in the bryophytes and vascular plants.

The probable causal influences responsible for the oceanic distribution of the species mentioned are considered under five headings :—Reproductive factors; macroclimatic factors, *i. e.*, the influence of temperature, humidity, etc. ; microclimatic factors, with the edaphic and biotic factors ; anthropogenic factors, *i. e.*, the influences directly or indirectly attributable to human activities ; and historic factors, the operation of which has taken place in past time. It is clear that, although many of the oceanic species considered very rarely produce fructifications, their localized distribution cannot be explained by inability to disseminate, as reproduction by diaspores (soredia, isidia, and detached thallus-fragments) is obviously extremely efficient. The macroclimatic influences, on the other hand, play a large part in determining the distribution, the hygric factors (rainfall, humidity, and mist) being of greater significance than the temperature factors, which, however, exercise an indirect influence on the degree of humidity. Microclimatic factors are very largely dependent on local topography. Here again, as in the case of the macroclimatic factor-complex, the hygric factors are allotted the most important rôle in determining distribution, but stress is laid upon the importance also of the biotic influences, such as the presence of suitable trees as substrata, exposure, etc. The purely edaphic factors are largely indirect in their operation. As regards the anthropogenic factors, it is pointed out that although the oceanic species considered can in general be defined by Linkola's term " hemerophobe," *i. e.*, adversely affected by the proximity of human activities, such influences possess comparatively little significance in determining their areal delimitation. The historic factors, although difficult to elucidate, are of very real importance to an understanding of the present-day distribution of the oceanic species, and the author considers that the oceanic lichen-element in Europe may be regarded as a Tertiary relict which survived the last glacial period in ice-free coastal regions of N.W. Europe, and probably acquired a wider distribution during the subsequent warm and wet atlantic and subatlantic periods, retreating into its present localized distributional centres under the adverse influence of the subboreal period which followed. These observations particularly are of great interest to those engaged in the study of the origin of the British flora, since the well-defined oceanic element found in S.W. Ireland and other parts of the British Isles is also subjected to careful examination and detailed discussion.

A new species, *Parmeliella atlantica*, and a new form, *Cetraria norvetica* f. *sorediata*, are described. The new combination *Pseudocyphellaria Thouarsii* (Del.) is made, a description of Delise's type-specimen being appended. The originals of *Sticta intricata* Del. and *Pannaria rubiginosa* (Thunb.) Del. are also redescribed.—I. M. LAMB.

Soils ; their Origin, Constitution, and Classification. By G. W. ROBINSON, M.A. 2nd Edition. 8vo, pp. xvii, 442, 17 text-figs. Thos. Murby & Co. : London, 1936. Price 20*s*.

PEDOLOGY is not yet so well-defined a science that it is possible to write a stereotyped text-book about it. The views of the world's leading pedologists are still much at variance on many fundamental points, and when they write books they tend to introduce a personal note which gives a refreshing originality not always found in scientific text-books. Professor Robinson says frankly that ' Soils ' is a summary of his own views on pedology, and his book is worth reading if only for that reason. But there are many other reasons, not least of which is the author's lucidity throughout an extremely complicated subject.

The book is primarily for the student, and contains one of the best elementary accounts of soil chemistry and physics yet written, but the field surveyor and ecologist may wish that more space had been devoted to those aspects of soil lore which can only be studied away from the impediment of a laboratory. The descriptions of the chief morphological soil types are excellent, and illustrate, among other things, how closely analogous are the taxonomic difficulties of pedology and ecology. To have discussed in more detail the inter-relationships of the two sciences would, perhaps, have been beyond the scope of an " Introduction to Pedology," but this book supplies much of the information which an ecologist needs, and which he might not ordinarily acquire, to enable him to discover those relationships for himself. Professor Robinson is a leading authority on the " British " pedological school of thought, which is at least open to no greater criticisms than others. His admirable exposition of its tenets should strengthen its position both at home and abroad.—G. V. JACKS.

Le Milieu et la Vie en commun des Plantes. Notions pratiques de Phytosociologie. By M.-A. REYNAUD-BEAUVERIE. 'Encyclopédie Biologique,' xiv. 8vo, pp. 237, 50 figs. Lechevalier : Paris, 1936. 60 francs.

THE purpose of this volume is to offer a survey of Plant Sociology, in the French language, on the lines of Braun-Blanquet's

work, which exists only in German and English. In arrangement the book closely parallels Braun-Blanquet's 'Plant Sociology': methods of analysis of vegetation, the influence of physical and biotic factors, and succession, are dealt with in turn. The book is interesting in that it draws attention to some unfamiliar French work (*e. g.*, Matonne's "indice d'aridité") but it cannot be recommended as a balanced account of Plant Sociology. The work of Scandinavian, Danish, American, and English ecologists is scarcely noticed, and important literature, even in French, is not included in the survey. Jaccard's work, for instance, is not mentioned, nor any of the Russian literature available in French summaries. On this account some sections of the book are quite misleading, notably the discussions on pH, light, and statistical ecology. There is an index, and a bibliography after each chapter.—E. ASHBY.

Invisible Radiations of Organisms. By OTTO RAHN. 8vo, pp. x, 215, 52 text-figs. Borntraeger: Berlin, 1936. Price R.M.13.20.

THE claim that living organisms give off invisible radiations capable of marked physiological action was first made by a Russian biologist, Gurwitsch, in 1923. He found that when the tip of an onion root was placed close to, but not in contact with, another root-tip, the side of that root nearer to the tip of the other root showed an increased proportion of nuclear divisions in the meristematic cells. The action was assumed to be due to a special radiation, that of mitogenetic rays.

Since this early experimental work of Gurwitsch there have been numerous publications in this field, and, as the author says, "It does not speak well for the present status of science that it has not been possible to settle definitely, in the course of twelve years, the question of the existence of this radiation. The fault lies equally with the two groups of contestants, those for and those against radiation." Biologists will welcome the book by one "who is convinced, from his own experience as well as from the study of literature, that mitogenetic radiation exists. He has realized that it is difficult to prove it because we are dealing with an extremely weak effect, and with very sensitive detectors. Above all, we are dealing with an entirely new phenomenon, and consequently cannot predict which changes of technique might increase or decrease the effect."

The book brings together all the relevant data and enables the reader to come to his own conclusion or to suspend his judgment. There is an introductory chapter by S. W. Barnes entitled "The Physics of Radiation," and the book concludes with a useful summary of each chapter and a bibliography of about two hundred entries.—V. H. B.

Almira Hart Lincoln Phelps, her Life and Work. By EMMA LYDIA BOLZAU. Cr. 8vo, pp. xi, 534. Frontis. and 11 illustr. Philadelphia, 1936. (Science Press Printing Co., Lancaster, Pa.)

IN an exhaustive study of the life and work of Mrs. Phelps the author has given an informative picture of the development of female education in the United States in the first half of the nineteenth century and, incidentally, glimpses of the life of cultured families in the Eastern States.

Almira Hart was born in 1793 and died in 1884. The names Lincoln and Phelps record her two marriages, in 1817 and 1831 respectively. Her elder sister, Emma Willard, a pioneer in the cause of female education, provided the stimulus to her own efforts; she worked first under her sister at the Troy Female Seminary and later in the founding and development of the Patapasco Female Institute. The régime and course of study in these two Institutes are described in detail.

But Mrs. Phelps's chief claim to our consideration lies in her series of elementary science text-books. Though not an original investigator, she was able to mould facts and principles gleaned from standard works into books suitable for beginners. An important feature was insistence upon a practical acquaintance with the subject. Her best known work, 'Familiar Lectures on Botany,' known popularly as 'Lincoln's Botany,' published in 1829, was an effort to combine analytical botany, starting with an examination of the parts of a simple flower, and a knowledge of the systems of Linnæus and Jussieu, with a study of the anatomy of the parts and their physiological functions. An outstanding feature were the numerous woodcuts. The interspersing of the text with anecdotes, verses, and moral reflections was the expression of her view that science should uplift as well as inform the mind. The book had a large sale and passed through many editions over a period of forty-three years. The text-books on Elementary Chemistry and Natural Philosophy, though widely used, did not achieve the same distinction. In Chapter VII. the author discusses the need for such elementary text-books in the early nineteenth century and the motif of the presentation of the subject-matter by Mrs. Phelps.

NORDHAGEN, R. *Om* Arenaria humifusa *Wg. og dens betydning for utforskningen av Skandinavias eldste flora-element.* Bergens Museum Arbok 1935, Naturvidenskapelig rekke Nr. 1. Pp. 183, pl. x.

THERE are eight plants of the *Arenaria ciliata* series, six of them here treated as subspecies of *A. ciliata*, *A. humifusa* Wg. (here shown to be the same as the arctic American *A. cylindro-*

carpa Fernald), and the annual *A. gothica* Fr. The two British plants are treated as *A. ciliata* subsp. *hibernica* Ostenf. & Dahl (not known outside the Ben Bulben range) and *A. ciliata* subsp. *norvegica* (Gunn.) Fries (Sutherland, Shetland; Iceland, Norway, Sweden, Finland). A long discussion of the occurrences and distribution of *A. humifusa* (with detailed maps) in relation to theories of earth-movements and glaciations ends in the conclusion that the species is a survivor of at least the last glaciation. (The endemicity of the Ben Bulben plant confirms this point of view, this flat-topped mountain agreeing with the type which Fernald in America considers to have remained unglaciated.)—A. J. W.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—At the General Meeting on May 7, the President, Dr. W. T. Calman, C.B., F.R.S., in the Chair, the following botanists were elected to Foreign Membership: Prof. Boris Aleksyevich Fedchenko, Leningrad, Prof. Merritt Lyndon Fernald, the Gray Herbarium, Cambridge, Mass. U.S.A., and Prof. Karl Freiherr von Tubeuf, Munich.

Dr. R. Melville showed a series of lantern slides illustrating natural hybrids of the Oxlip, *Primula elatior*, within their restricted area in Essex. He found that hybrids between the cowslip and oxlip were as frequent as those between the primrose and oxlip.

Miss M. T. Martin gave an account of the structure and development, especially of the male reproductive organs, of the South African Red Alga, *Chaetangium saccatum* (Lam.) J. Ag.

Miss C. K. Ricardo gave an account of the vertical distribution and movements of the plankton in Lakes Rudolf, Naivasha, Edward, and Bunyoni, results of the Cambridge Expedition to the East African Lakes, 1930–1, led by Dr. E. B. Worthington.

Two papers were read in title—"South African species of *Riella*," by G. Wigglesworth, and "*Epimedium* and *Vancouveria*, a monograph," by W. T. Stearn.

ROYAL SOCIETY.—Among the Fellows elected on May 7 botany is represented by Prof. Birbal Sahni, M.A., D.Sc., of Lucknow University, India. Prof. Sahni is well known for his palæobotanical work.

SOCIÉTÉ ROYALE LINNÉENNE DE BRUXELLES.—Belgian horticulturists celebrated, May 16–18, the Centenary of the foundation of this Society, and at the same time its fusion with the older Société Royale de Flore, the first Register of which dates from 1660. The President, M. Firmin Lambeau, has held office since 1909.

NOTES ON BRITISH HYPOCREACEAE.—II.

BY T. PETCH, B.A., B.Sc.

(Continued from Journ. Bot. lxxiii. 224; 1935.)

11. BROOMELLA.

In 'Notices of British Fungi,' no. 829 (1859), Berkeley and Broome described *Hypocrea Vitalbae*, a fungus which had been collected by Broome on *Clematis Vitalba* at Batheaston. It was said to have fusiform triseptate hyaline ascospores, produced at each end into a slender setiform appendage. Saccardo (Syll. Fung. ii. 557; 1883) instituted the genus *Broomella* for this species. Von Höhnel (in Ann. Myc. xviii. 73; 1920) pointed out that the fungus had been described from immature specimens, that it did not belong to the Hypocreaceae, but to the Melogrammae, and that it was the same as *Ceriospora xanthi* Sacc., found on the same host in Italy. When mature, it has brown spores. Von Höhnel had previously (1918) instituted the genus *Keissleria* for *Ceriospora xanthi*, but, as the name *Broomella* is the earlier, *Broomella Vitalbae* will stand, with an altered significance. *Broomella* is not a hypocreaceous genus.

Cooke and Massee ('Grevillea,' xix. 86) described *Broomella leptogicola*, found on the thallus of *Leptogium* sp., on *Robinia* at Kew. Its stromata were 0·5–1 mm. diameter, orbicular, convex, pruinose, fleshy, hard when dry, with obsolete ostiola. The asci were cylindrico-clavate, and the spores hyaline, fusoid, acute, five-septate, 37–40×6 μ. Von Höhnel (*loc. cit.*) regarded this as insufficiently described, and suggested that it might be a *Yatesula*. In the type of *Broomella leptogicola* in Herb. Kew. the alleged stromata answer to Cooke and Massee's description, as regards general appearance, asci, and spores. They are now flesh-coloured, with a white pruina. The stromata do not contain perithecia, but are covered by a continuous palisade layer of asci and paraphyses, and when moistened they show a green thalline margin. In short, they are apothecia and the fructifications of the lichen. The name *Broomella leptogicola* must be discarded.

12. CALONECTRIA LEIGHTONII (Berk.) Sacc.

Berkeley, in "Fungi Cubenses" (Journ. Linn. Soc. x. 379; 1868), described *Nectria Leightoni* Berk. as scattered, minute, perithecia ovate, yellow or pale red, sporidia subcymbiform, triseptate, hyaline, 25 μ long. In that list he added to his descriptions extra-Cuban localities from which he thought he had the same species, and in this instance he added "Hab. Europe.

Leighton's specimens are from Yorkshire, on Larch." Cooke ('Grevillea,' i. 155) reversed the localities, writing: "on Larch, Yorkshire . . . also found in Cuba." The Cuban fungus, however, is the type, and the description was drawn up entirely from it. The epithet *Leightonii* belongs to that fungus. Saccardo ('Michelia,' i. 309; 1878) transferred Berkeley's species to *Calonectria*.

As pointed out by Seaver ('North American Fungi,' i. 12; 1910), the Cuban fungus is a discomycete; it has narrow oval or subcymbiform 3–5-septate spores, 20–27×6–7 μ. The Yorkshire specimen is quite different, and is a lichen, apparently a species of *Porina*. It has minute hemispherical dimidiate rarely subglobose perithecia, 0·12–0·15 mm. diameter, dark red, blackening, in a very thin lichen thallus. By transmitted light the wall is brownish red. The spores are fusoid or subcymbiform, 3-septate, 18–25×3–4 μ, arranged more or less in a vertical bundle in the ascus. Berkeley left figures of the asci and spores of both specimens, and consequently there is no doubt what he examined.

13. Calonectria platasca (Berk.) Sacc.

Sphaeria platasca Berkeley ('English Flora,' v. 263; 1836) was found in Rockingham Forest on the soft wet decayed stump of a Maple which had been broken off, and was said to have orange perithecia, immersed in the wood almost to the base of the ostiolum. The asci were described as broad above, like those of *Sphaeria affinis* Grev. Greville's figure of the latter species shows a clavate ascus, not particularly broad. In 'Outlines of British Fungology,' 393 (1860), Berkeley listed his species as *Nectria platasca*, but as he had originally described the spores as "divided into four articulations, each containing a nucleus," Saccardo placed it in *Calonectria* ('Michelia,' i. 308; 1878).

In the cover of *Calonectria platasca* in Herb. Kew. there are three specimens *ex* Herb. Berkeley. One, the type, is labelled Morehay Lawn, which is in Rockingham Forest. Another is from Hungary, and the third from Mauritius. The first two do not appear to bear any perithecia. In the type there are minute orange-coloured masses embedded in the wood, but they do not show any definite structure, and I was unable to detect asci, spores, or perithecial wall in them. The Mauritius specimen bears a minute superficial fungus, which at first sight resembles *Nectria Peziza*, but it is apparently a discomycete, with one-septate oval spores, 14–18×5–6 μ, and does not fulfil Berkeley's description. The identity of *Calonectria platasca* must remain uncertain until further specimens are available. Berkeley's description suggests a *Cesatiella*. But it is remarkable that Berkeley labelled his herbarium specimens *Nectria Peziza* var. *platasca*.

14. Nectria Ribis (Tode).

Sphaeria Ribis Tode ('Fungi Mecklenburgenses,' ii. 31; 1791) was transferred to the genus *Nectria* in Rabenhorst, 'Fungi Europæi,' no. 247. The precise identity of Tode's fungus is a matter of conjecture, but the specimen issued by Rabenhorst has been accepted as his species. Rabenhorst's fungus is a *Pleonectria*, which was described as *Pleonectria berolinensis* by Saccardo ('Michelia,' i. 123).

Nectria Ribis was recorded from Scarborough by Massee in 'Fungus Flora Yorks.,' and his specimen is now in the British Museum Herbarium. Specimens collected at Lynn were issued under that name by Plowright in 'Sphaeriacei Britannici,' iii. no. 11, and others, collected at Forden, by Vize in 'Microfungi Britannici,' no. 153. In all these cases, however, the fungus is *Nectria cinnabarina* (Tode) Fr. Thus there did not appear to be any evidence of the occurrence of *Pleonectria berolinensis* in this country, but Dr. Ehrlich recently found a specimen in Herb. Kew. which is reputed to be British. The latter is *ex* Herb. Cooke, and was labelled by him *Nectria cinnabarina*. The sheet is stamped "British Fungi. M. C. Cooke," but it does not bear any date, name of host, or locality. Considering all the circumstances, its British origin must be regarded as doubtful, and confirmation of the occurrence of this species in Britain is desirable. It grows on various species of *Ribes*.

15. Nectria Keithii B. & Br.

Berkeley and Broome (Ann. & Mag. Nat. Hist. ser. 4, xvii. 144; 1876) described *Nectria Keithii* B. & Br., which had been found on cabbage stalks at Forres by the Rev. J. Keith. The perithecia were minute, pallid, crowded, furfuraceous, with a distinct ostiolum, and the ascospores fusiform, continuous, 5–6 μ long. Five years previously, in the same Journal, ser. 4, vii. 435 (1871), Berkeley and Broome had described *Nectria furfurella* B. & Br., found on cabbage stalks at Batheaston, as arising from an effused fleshy stroma, with flesh-coloured perithecia, at first subglobose, then collapsing, beset with shining scaly particles, with a distinct punctiform ostiolum, ascospores ovate, 3·75–5 μ, and branched paraphyses. Saccardo transferred both these to *Nectriella* Sacc. *non* Karst. ('Michelia,' i. 278; 1878), and suggested that they were the same species. There is no reason to suppose that he had seen specimens of either, and no doubt he judged merely from the similarities in the descriptions. Cooke ('Grevillea,' xii. 10; 1884) adopted Saccardo's suggestion, and placed *Nectria Keithii* as a synonym of *N. furfurella*, but here again it is improbable that he had examined specimens of both species, for the only specimen of *N. furfurella* was then in Herb. Broome, which was not acquired by the British Museum until 1887. Consequently,

it is not possible to accept the suggested synonymy, unless it is supported by the type-specimens.

The type of *Nectria Keithii* in Herb. Kew. *ex* Herb. Berkeley contains numerous perithecia, but they are apparently all immature. Fortunately it has been possible to match these by specimens collected recently on decaying stalks of *Brassica*, though it has been difficult to obtain mature specimens. There is also a mature specimen of this species, unnamed, in Herb. Mus. Brit. *ex* Herb. Broome, collected on cabbage stalks at Batheaston, March 5, 1877. The recent examples have perithecia identical with those in the type of *N. Keithii*, but their spores are one-septate, 9–16×3–5 μ. On the other hand, the perithecia in the type are immature, and the spores measured by Berkeley and Broome may have been those of one of the numerous hyphomycetes etc. which occur on decaying cabbage stalks.

The perithecia are scattered, or clustered on a thin fleshy yellow to yellow-brown stroma, which is subtranslucent when moist. They are up to 0·25 mm. diameter, globose, pale yellow-brown to dark brown, subtranslucent when moist. At first they have a conspicuous ring of white warts round the ostiolum, the warts being partly parenchymatous and partly of loose irregular tabular cells, but as the perithecium grows the warts separate and are, in part, weathered off, becoming at the same time the same colour as the perithecial wall. The wall of the perithecium is comparatively thick, composed of small cells, and yellow-brown by transmitted light. The asci are subcylindric or clavate, almost sessile, apex truncate, 48–60×7–10 μ, accompanied by slender branched paraphyses. The spores are narrow oval or subcylindric, sometimes inequilateral, ends rounded, one-septate, 9–16×3–5 μ. Except in colour, *Nectria Keithii* agrees with *N. subquaternata* B. & Br. The latter, in the specimens hitherto available, is pale flesh-coloured when fresh, becoming yellow or pallid when dry. This difference, however, appears insufficient to maintain *N. Keithii* as a distinct species, and I would place it as a synonym of *N. subquaternata*.

Whether *Nectria furfurella* is the same species is very doubtful. I have not been able to detect any perithecia on the type-specimen in Herb. Mus. Brit. The drawing of the perithecium published by Berkeley and Broome does not show any warts, but apparently a uniform covering of adpressed scales, while the apical view shows a uniformly rounded upper half, without the ring of warts which is so conspicuous in *N. Keithii*, at least in its younger stage. It is not possible to combine these species on the present evidence.

16. MELANOSPORA DISCOSPORA Massee & Salmon.

This species was described by Massee and Salmon (Ann. Bot. xv. 352, figs. 36–38; 1901) from specimens on the dung of Ibex and Wild Sheep. It was said to have discoid spores,

orbicular, 7–9 μ diameter when seen from above, but elliptic, 4 μ diameter, when viewed laterally. The figures show a typical *Melanospora*, with a subglobose perithecium furnished with a short stout beak. Many of the ascospores are figured as oval, presumably as seen laterally.

There is only one pellet in the type-specimen, which is marked "on dung of Sinaitic Ibex from Zoo, 3. 1901." I was unable to find any *Melanospora* on it, the only fungus present being *Chaetomium murorum*. The spores of the latter were ellipsoid, scarcely apiculate, 12–15×7–9 μ, and, when viewed laterally, narrow oval, 4 μ thick. A few spores were orbicular, 9 μ diameter.

Though the perithecium figured by the authors represents a *Melanospora* perithecium, it would seem probable that the description of the spores was based on those of the *Chaetomium*. *Melanospora discospora* must be regarded as a doubtful species.

17. MELANOSPORA VITREA (Corda) Sacc.

Berkeley (Mag. Zool. & Bot. i. 512; 1837) described and figured, as *Sphaeronaema blepharistoma*, a fungus found on the blackened gills of *Russula adusta* in very wet weather. Later (Ann. & Mag. Nat. Hist. ser. 1, vi. 363; 1841) he stated that his fungus was the same as *Sphaeronaema vitreum* Corda, described by Corda, also in 1837, from specimens on decaying Dahlia tubers. Berkeley added that he had also found it on nettle roots, but it is probable that the latter was another species. In Syll. Fung. ii. (1883), Saccardo transferred Corda's fungus to *Melanospora*, and in vol. xx., Supplement, 1270, the information that *Sphaeronaema blepharistoma* Berk. was a synonym was added. Consequently the British fungus now stands as *Melanospora vitrea* (Corda) Sacc.

I was unable to find the fungus on Berkeley's type, but, as, owing to its small size and hyaline texture, it is difficult to detect on a dried specimen, I may have overlooked it. I have, however, fresh specimens, found on *Russula adusta* at North Wootton, May 1935. The *Russula* was an old example which had grown during the autumn of 1934, and had been collected in April 1935 and kept moist under a bell glass.

The basal part of the fungus is globose, up to 0·3 mm. diameter, crowned with a cylindrical neck, up to 0·8 mm. high, 0·12 mm. diameter. In the larger specimens the neck is sharply defined from the bulb, but in the smaller the transition is more gradual. The neck may be uniformly cylindrical or may taper slightly upwards. Both the bulb and the neck are composed of vertically parallel hyphæ, fused laterally. Near the apex of the neck, the hyphæ of the wall separate and diverge, so that the apex is fimbriate, the separate hyphæ either tapering uniformly to the tip or contracting suddenly into a thin mucronate tip about 10 μ long. When fresh the whole fungus is hyaline. The spores

are extruded in a comparatively large globule, which is spherical and hyaline when fresh, but becomes irregular and pale yellow on drying. The spores are hyaline, cylindrical with rounded ends, or oblong oval, or oval, 8–13×3–5 μ, sometimes broadly apiculate. A few double spores, cylindrical, one-septate, sometimes constricted at the septum, 18–22×4 μ, occur. The bulbous base is lined with long sporophores, which bear the spores apically. There is no doubt that Berkeley's fungus is not a *Melanospora*, but a *Sphaeronaemella*.

Whether Berkeley's fungus is the same as Corda's seems doubtful. Corda described the pycnidium of his species as subpedunculate, and his figure shows it contracted below the bulb into a short stem-like base. On the other hand, Berkeley's figure shows the base of the pycnidium uniformly rounded, and it is so in the recent specimens. Corda described the spores of his species as oval, subquadrangular, 12·5 μ long, and added that the mature spore was oval when seen laterally, but nevertheless quadrangular. It would seen that the British fungus should remain under Berkeley's name as *Sphaeronaemella blepharistoma*.

Winter, in Rabh. Krypt. Flora, included *Melanospora vitrea* (Corda) Sacc. as an imperfectly known species. There does not appear to be any reason why it should have been transferred to *Melanospora*.

18. Melanospora cirrhata Berk.

Berkeley issued specimens in 'British Fungi,' no. 325 (1843), as *Melanospora cirrhata*, but he did not publish a description. Subsequently, he decided that his species was the same as *Melanospora Zamiae* Corda, and placed that name on some of the specimens in his herbarium. It was collected on straw at King's Cliffe, April 1841, and is now represented in Herb. Kew. and Herb. Mus. Brit. The perithecia are small, scattered, globose, 0·2 mm. diameter, with a cylindrical, straight or curved beak, 0·25 mm. high, 0·08 mm. diameter, sharply defined from the body of the perithecium, and terminating in a pencil of hyaline setæ. The walls of the perithecium and the beak are now yellow-brown, parenchymatous, membranous, the beak composed of irregularly longitudinal cells. The perithecium is sparsely clothed with pale yellowish, spreading hyphæ, thick-walled or almost solid, 2·5 μ diameter, which also extend in a circular patch from the base of the perithecium over the substratum. The spores are dark brown, broadly oval, not or slightly apiculate, 13–18×10–13 μ, or circular, 15 μ diameter.

Corda's species is unknown, but, as he described its perithecia as lageniform and its spores as lemon-shaped, it can scarcely be the same as Berkeley's. The dimensions of its spores were not given. In Saccardo, Syll. Fung. xi. 356, it is incorrectly stated that *M. cirrhata* Berk. is *M. vervecina* (Desm.) Fuckel. I first thought that it might be placed under *M. chionea*, but, as it is not densely woolly like that species and its spores are rather larger, it would appear preferable to leave it under Berkeley's name. Cooke ('Grevillea,' xvi. 102) considered *M. cirrhata* distinct from *M. Zamiae*.

19. Melanospora caprina (Fries) Sacc.

Fries ('Flora Danica,' pl. 1859, fig. 2, vol. xi. p. 14; 1825) figured and described *Sphaeria caprina* as "peritheciis globosis villosis albis, ostiolo longissimo subulato nigro." In Summa Veg. Scand. 396 (1849) he transferred it to *Ceratostoma*, and it was recorded for Britain under that name by Berkeley ('Outlines of British Fungology,' 402; 1860). Saccardo (Syll. Fung. ii. 462; 1883) transferred it to *Melanospora*. Meanwhile, Desmazieres (Ann. Sci. Nat. sér. 2, xvii. 103; 1842) had described and figured *Sphaeria vervecina*, which was transferred to *Melanospora* by Fuckel (Symbol. Mycol. 126; 1869).

The description of *Melanospora caprina* was meagre and insufficient for determination, but Fries sent a specimen, now in Herb. Kew., to Berkeley, and this is exactly the same as *Melanospora vervecina* (Desm.) Fuckel, in Fuckel, 'Fungi Rhenani,' no. 806. The latter name is a synonym of *Melanospora caprina*. A feature which distinguishes this species from other British species of *Melanospora* is that the perithecia are seated on a rather compact stout tomentose persistent dark brown or purple-brown subiculum. The ascospores are dark brown, broadly oval or somewhat lemon-shaped, 16–23×9–16 μ. The perithecium wall is yellow, not black, but the perithecium appears black, because, as in other species of *Melanospora*, the colour of the spores is seen through the subtransparent wall. Most of the available British specimens are from Scotland, but it has been collected at Carlisle and Rudloe, and recorded from Leigh Woods, Bristol.

20. Sphaeroderma.

Fuckel established the genus *Sphaeroderma* ('Symbolæ Mycologicæ,' App. 3, 22; 1875) with the type-species, *Sphaeroderma theleboloides*. The generic characters, as far as they are relevant to the present discussion, are "Subiculum effused, white, arachnoid, composed of much-branched septate hyphæ, the primary branches of which are constricted at the septa. Perithecia when young, hyaline, seated on the subiculum, but when mature quite free, membranous, with an obsolete, slightly elevated ostiolum." Saccardo, on entering the genus in Syll. Fung. ii. 459 (1883), divided it into two subgenera, viz., *Eu-sphaeroderma*, with an evident papyraceous subiculum, type-species, *Sph. theleboloides*, and *Vittadinula*, with subiculum absent or obsolete, type-species, *Sph. episphaerium* (Phil. & Plowr.)

Sacc. The latter species is *Melanospora episphaeria* Phil. & Plowr., which grows on the subiculum of *Hypomyces terrestris*. It is to be noted that Phillips and Plowright stated that their species had no "neck," but they figured the perithecium with a distinct ostiolum.

Clements ('Genera of Fungi,' 44 & 173; 1909) instituted the genus *Sphaerodes* for species of *Sphaeroderma* which lacked a subiculum, taking as the type-species, *Sphaerodes episphaerium* (Phil. & Plowr.) F. E. Clements; but in the second edition by Shear and Clements (1931), these authors included the genera *Vittadinula* Sacc. with the type-species *V. episphaeria* (Phil. & Plowr.) Sacc., and *Sphaerodes* Clem. with the same type-species *S. episphaerium* (Phil. & Plowr.) Clements.

Fuckel stated that *Sphaeroderma theleboloides* had a more or less dense subiculum, one to two inches wide, which was subpapyraceous or arachnoid when dry. It grew beneath dense masses of decaying leaves, and had the appearance of *Ozonium candidum*, but was not so compact or thick. When the perithecia were mature, the subiculum disappeared almost completely, leaving the perithecia loosely attached to the leaf by a few hyphæ only. The inconspicuous pointed apex of the perithecium indicated the presence of an ostiolum, but he had not been able to observe it open. With regard to this last detail, it is probable that Fuckel encountered the phenomenon which occurs in *Melanospora* and *Sphaeroderma*, viz., that the ascospores mature before the perithecium, so that apparently ripe perithecia are still unopened.

Fuckel issued specimens of *Sphaeroderma theleboloides* in 'Fungi Rhenani,' no. 2656. One of these was examined by von Höhnel, who stated ('Fragmente zur Mykologie,' no. 841) that it was quite unserviceable, as it contained only a few unripe perithecia. There are examples of 'Fungi Rhenani,' no. 2656, in Herb. Mus. Brit. and Herb. Kew., but they are in no better condition. From Fuckel's account, the present state of the specimens is only what might be expected. The leaves bear slight traces of mycelium here and there, with quite immature perithecia in a slight weft of mycelium. There is no evident papyraceous subiculum.

It is not possible to obtain further information regarding the perithecia of *Sphaeroderma* from the exsiccati, and one must await the discovery of fresh specimens. At present, *Sphaeroderma* is best taken as a *Melanospora* without a beak or setæ round the ostiolum. Whether it clashes with *Microthecium* or not, depends on whether the latter opens, as Tulasne claimed, and whether it develops setæ round the opening, as maintained by Fuckel. Here, again, additional specimens are required.

It is clear that the division of the genus *Sphaeroderma* according to the presence or absence of a subiculum is not tenable,

at least with *S. theleboloides* as the type of the first group, for, as stated by Fuckel, that species has no subiculum when the perithecia are mature. Moreover, the type-species of the other section, *S. episphaerium*, is parasitic on the subiculum of *Hypomyces terrestris*, and it is scarcely possible to say how much of the joint subiculum belongs to the *Hypomyces* and how much to the *Sphaeroderma*.

There remains the question whether the mycelium described by Fuckel was that of the *Sphaeroderma*. Fuckel stated that the main hyphæ were constricted at the septa, and "Mit *Hypocrea stipata* hat sie die septirten Hyphen gemein." *Hypocrea stipata* is another fungus which forms a white byssoid mycelium overrunning decaying leaves. In the exsiccati, the mycelium contains stout thin-walled septate hyphæ, up to 10 μ diameter, sometimes, but not always, constricted at the septa, with other hyphæ of varying dimensions, down to 1·5 μ diameter. But the hyphæ which run from the base of the perithecium are rather thick-walled, regular, 2·5–3 μ diameter. There would appear to be a possiblity that the general mycelium is that of another fungus, on which the *Sphaeroderma* is parasitic.

NEW SPECIES OF *ABUTILON* FROM TROPICAL AFRICA.

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

Abutilon Braunii, sp. nov. *Caulis* erectus teres pilis brevissimis et pilis longioribus tectus. *Stipulæ* lanceolatæ 2–3 mm. longæ. *Folia* ovato-lanceolata apice acuminata basi cordata, margine grosse dentata, 4–15 cm. longa, 3–9 lata; petiolis 1–6 cm. longis; indumento brevi velutino. *Flores* aureo-flavi axillares, solitarii vel aggregati, pedunculati; pedunculis 1–3 cm. longis. *Calyx* 1–1·1 cm. longus cano-tomentosus; sepalis acuminatis. *Petala* ±2 cm. longa, 1·7–1·8 cm. lata. *Carpella* immatura circa 19–20, 3-sperma, in globum disposita, apice mutica, reniformia 6 mm. alta.

Hab. Tanganyika Territory: Usambara, Mombo steppe, Aug. 6, 1908, *Braun* 1927 (type); 1928; (Herb. Amani).

This species is allied to *A. Figarianum* Webb, from which it differs in the shape of its leaves and sepals and size of flowers. The leaves of *A. Figarianum* are ovate-acuminate, the flowers about one-third the size, and the sepals more obtuse.

I have to thank Mr. P. J. Greenway for kindly allowing me to study the Abutilons from the Amani Herbarium.

Abutilon wituense, sp. nov. *Caulis* herbaceus pilis patentibus vestitus. *Stipulæ* lineares. *Folia* ovata vel orbiculari-ovata sæpissime lobata margine grosse crenato-serrata apice acuminata,

lamina in specimine nostro 6–10 cm. longa, 6–9 cm. lata, petiolis 6–11 cm. longis, pilis patentibus vestitis. *Flores* axillares solitarii, pedunculis 4–7 cm. longis, apicem versus articulatis. *Calyx* 1–1·5 cm. longus, tubo 4–5 mm. longo, laciniis ovato-lanceolatis 6–7 mm. longis. *Petala* in sicco flava, apice rotundata, 1–1·3 cm. longa. *Carpella* 9–11, cum aristis (2–3 mm.) 1·2–1·4 cm. longa.

Hab. TROP. EAST AFRICA: Witu, *Thomas* (*Gebr. Denhardt*) 10 (Herb. Mus. Brit.).

This species differs from the true *Abutilon indicum* Don, to which it has been referred; the carpels narrow gradually to the awn; and the stem is clothed with patent pilose hairs. It differs from *A. tortuosum* Guill. & Perr. in the calyx and carpels.

The true *Abutilon indicum* Don is figured in Wight's 'Icones,' t. 12. The carpels are 15–20 in number, narrowed abruptly on the back to a small point, not narrowing gradually upwards to the awn. The stem is not clothed with rather long, patently pilose hairs. *A. wituense* is allied to *A. bidentatum* Hochst., but the carpels are fewer in number and the awns longer.

Abutilon umtaliense, sp. nov. *Suffrutex* gracilis ramosus. *Stipulæ* parvæ lineares. *Folia* parviuscula ovato-lanceolata, basi cordata, petiolata, 1–2·2 cm. longa, 1–1·5 cm. lata, tomento brevi griseo vel brunneo induta, petiolis 1–1·5 cm. longis. *Flores* parvi in sicco flavi, axillares solitarii pedunculati. *Calyx* 1 cm. longus, lobi lanceolati uninervi. *Petala* ±1 cm. longa. *Pedunculi* sæpissime 1·5–3 cm. longi, rarissime 4·5 cm. longi. *Carpella* 8–10, oblonga, 7–8 mm. alta haud aristata.

Hab. RHODESIA: Odzani River Valley, Umtali, *A. J. Teague* 385 (Herb. Kew.).

A very distinct species. The flowers are small, only 2 cm. in diameter. The calyx-lobes are lanceolate and uninerved. The leaves are small, ovate-lanceolate, tapering to the obtuse apex. Another very small-flowered species is *A. messinicum* Burtt Davy, from tropical Transvaal, from which *A. umtaliense* differs in the inflorescence, which is solitary, and the carpels are longer and not aristate.

NOTES ON SOME INTERESTING BRITISH PLANTS.—II.

BY J. EDWARD LOUSLEY.

(Continued from Journ. Bot. lxxiii. 260; 1935.)

AQUILEGIA VULGARIS L. The forms of the Wild Columbine have attracted far more attention on the continent than in Britain, and the fact that only one important note (that by Druce on his var. *Milleriana*—see below) has ever appeared in our periodical literature is difficult to explain. During 1935 the writer paid some attention to the forms of this variable plant which may be grouped under four classes as follows:—

(*a*) Flowers of medium size, sepals about 18 mm. long, usually rich blue in colour, occasionally white, red, or purple, or very rarely maroon. The usual plant of calcareous soils in S.E. England and on other formations elsewhere; as illustrated in Engl. Bot. ed. 3, pl. xlvi. The blue-flowered forms are undoubtedly native in many counties, the white, red, and purple in several East Anglian Fens and perhaps elsewhere.

(*b*) Flowers larger, sepals about 22 mm. long, a brighter blue than those of (*a*); plant shorter and stouter. Locally frequent on the limestone around Ingleborough and Grassington, Mid-West Yorks, often in fissures of the limestone pavement, but occasionally in scar-woodland, as in Grass-Woods. It is this form which has been mistaken for *A. alpina* in the past, and thus F. A. Lees wrote: "'*Aquilegia alpina*. Ingleborough,' Martyn (1763); rep. Gough's Cam. (1789). A dwarfed but large-flowered form of *A. vulgaris*, such as grows in the fissures of the elevated limestone pavements, was intended by this, not the Linnean continental *alpina*" (Fl. West Yorks. 126, 1888). The earliest record of this plant is by Philip Miller, 'Gardener's Dictionary,' ed. 6, 1752; "Aquilegia montana, magno flore, C.B. Mountain columbine with large Flowers . . . I have found growing wild in the Park of Robert Fenwick, Esq.; near Ingleborough-hill, in Yorkshire." In the next edition of his work he amplified this note as follows:—"Aquilegia nectariis rectis, petalis ovatis longioribus. Columbine with erect Nectariums, and larger oval Flower Leaves. This is the Aquilegia montana magno flore C.B.P. Mountain Columbine with a large Flower . . . whose Petals are longer, and the Nectariums do not rise so high. This I found growing naturally near Ingleborough Hill, in Yorkshire. The flowers of this are much larger than those of the Garden Columbine and the Seeds which I sowed of this in the Garden at Chelsea produced the same Species without the least Variation" (*op. cit.* ed. 7, 1759). Since Bauhin's plant was a distinct species later known as *A. alpina* L. (of which it was given as a synonym by Linnæus himself—Sp. Pl. ed. 2, 533; 1762), which other botanists have failed to find in the north of England, it would appear that Miller had the present plant in mind and added the erroneous character of straight nectaries from garden plants of *alpina*. Such confusion of roots might well occur even in his well-kept garden during the five years between the 6th and 7th editions of his Dictionary. Hudson probably fell into a similar error when he copied out the Linnean description of *alpina* and much of the synonymy verbatim, adding "Habitat in sylvis montosis in comitatu Westmorelandico" (Fl. Anglica, 208, 1762). But there seems no reason to assume that Hudson based his plant on Miller's, as was done by Druce in Rep. B. E. C.

398, 1916, since Hudson clearly states that his plant came from Westmorland, in which county no Kendal-born botanist would be likely to include Ingleborough. Druce's "*A. alpina* Hudson . . . not of L." is quite unjustified, for the descriptions of the two authors differ only in a single comma, and Druce's utilisation of the references to Hudson and Miller as the basis of his new variety *Milleriana* (Rep. B. E. C., *l c. cit.*) provides, therefore, a strange mixture of (1) Linnæus's well-defined *alpina*, (2) Hudson's plant from Westmorland, and (3) Miller's Ingleborough plant which it seems reasonable to suppose was the form of *vulgaris* now known from that district. Druce's varietal name is thus a *nomen confusum* and best deleted from our British lists.

(*c*) Flowers smaller than in (*a*), sepals about 15 mm. long, dark maroon-purple ; plant shorter and smaller in all its parts ; stamens projecting slightly ; terminal lobes of the leaflets with rather more numerous serrations. Only observed from a limited area on the Millstone Grit near Austwick, Mid-West Yorks. The colour of the flowers matches that shown for *A. atrata* Koch in Hegi (Ill. Fl. Mittel-Europa, t. 112), and other characters suggest that species, which is not easy to distinguish from book descriptions alone. We are, therefore, greatly indebted to Mr. H. W. Pugsley, who knows *atrata* well as a plant of mountain woods in Central Europe, for examining the Austwick plant and confirming that it is not that species. Another *Aquilegia* sent by Dr. R. C. L. Burges from Temple Guiting, Gloucestershire, is not identical with the Yorkshire plant, although it has similar maroon-coloured flowers, but is merely a colour-variation of form (*a*).

(*d*) Here and there plants of varying form occur which appear to have originated from garden rubbish, or more probably as the offspring of natural hydridisation with garden plants. As this species is pollinated through the agency of Humble Bees, pollen might well be carried from garden plants to the stigmas of wild plants a considerable distance from cultivation. Such a colony was observed on the Great Doward, Herefordshire, June 9, 1935, where plants with pretty variegated pink flowers were noticed remote from dwellings. These proved puzzling until similar flowers were found in the gardens of cottages and hotels in the nearest village. Whereas cottagers might well have transplanted such forms into their gardens if they were found in the woods, it is unlikely that large hotels would find it worth while to do so on any considerable scale, and hence the suggested explanation seems a reasonable one. Probably the offspring of such natural hybridisation are responsible for the idea which some botanists hold that the Columbine is not native in many of its habitats.

FUMARIA MURALIS Sonder. Specimens from a hedgebank near Old Castle Farm, Cardigan, v.c. 46, Aug. 27, 1935, were

determined by Mr. H. W. Pugsley as " near var. *decipiens* Pugsl., but with subrotund fruits."

IBERIS AMARA L. A colony of this species was found in flower and fruit on Oct. 27, 1935, on a chalky bank in a clearing of a wood between Mickleham and Headley, Surrey, a station which is probably identical with " By a wood between Mickleham and Headley, H. Goss," where Salmon believed that the plant had existed for 87 years (Fl. Surrey, 149, 1931). The specimens, however, had large and broadly winged silicules as in Salmon's Colley Hill plant, and it is just possible that both stations are the result of former introductions. That the Candytuft is indigenous in a few stations in England seems certain (*e. g.*, round rabbit holes on Therfield Heath, near Royston, Herts), but in a great many of the counties to which it is credited in Druce's ' Comital Flora ' its status stands no higher than that of a " casual " and in others confusion with *I. umbellata* may be suspected. The difficulty of distinguishing cultivated from wild plants of *I. amara* by taxonomic methods alone is increased by very considerable variation in the wild form. Thus at the Royston station the rigid small-leaved plant of early summer offers a striking contrast to the bushy flexuous large-leaved plant of October. In this country *I. amara* probably has two generations in the course of a year, the first flowering in summer at a time when the soil is generally dry, the second growing from the seed of the first and flowering under the moister conditions prevailing in the autumn.

DROSERA ROTUNDIFOLIA L. var. DISTACHYA DC. Differing from the typical species in the scape, which is divided below the inflorescence into 2 to 5 very floriferous branches, each 2·5–4 cm. in length. Good specimens of this plant were sent by Mr. R. M. Mackechnie from near Clarkston, Renfrew, v.c. 76, gathered Aug. 25, 1934. Probably only a form, but a very well-marked strange-looking plant.

ECHINOPS SPHAEROCEPHALUS L. This alien species was the subject of a note in the 1932 volume of this Journal (p. 52), where it is recorded as found at Winspit, Dorset, by Mr. H. W. Pugsley in 1912. At this station it has also been known to Mr. A. H. Carter for many years, and he brought the writer fresh specimens gathered Aug. 25, 1935. This interesting plant has therefore persisted in a wild habitat at Winspit for at least twenty-three years.

OXYCOCCUS Hill. The British plants of this genus may be arranged as follows :—

O. MACROCARPUS Pursh (*Vaccinium macrocarpon* Ait. ; *V. Oxycoccus* L. var. *oblongifolius* Michx.). Icones : Hegi,

Ill. Fl. Mittel-Eur. v./3, fig. 2689; Britton & Brown, Ill. Fl. N. United States, ii. fig. 3276 (1913), "The American Cranberry." Stem comparatively stout, prostrate, with ascending flowering branches. Leaves oblong-elliptic, 6–17 mm. long, apex obtuse, margins less revolute than in the following species. Pedicels arising in groups on an elongated rachis which is usually terminated by a leafy shoot. Berry 1–2 cm. in diameter, ovoid or oblong (variable in shape and size, but always much larger than in the following species). This American plant is recorded as naturalised from two stations in Britain:—(1) Soughton Bog, near Mold, Flintshire, v.c. 51. Specimens in Herb. Kew. collected by Dr. Bidwell, Sept. 4, 1845 and July 1847. Circumstances of introduction discussed by H. C. Watson ('The Phytologist,' ii. 441; 1846; and Cybele Britannica, ii. 158; 1849). Said to be extinct by 1866 (Syme, Engl. Bot. ed. 3, vi. 54), where the locality is mis-spelt "Loughton"). (2) Bogs near Lyndhurst, S. Hants, v.c. 11, June 1927. R. Findlay in Herb. Kew. This species is naturalised in Holland and in many places in Germany.

O. QUADRIPETALUS Gilibert (*O. palustris* Pers.; *O. vulgaris* Pursh; *Vaccinium Oxycoccus* L.; *Schollera Oxycoccus* Roth). Stem very slender, creeping. Leaves ovate, acute, 3–8 mm. long, margins strongly revolute, thus often making the leaves appear triangular in outline in dried specimens. Pedicels 1–4, borne on a terminal short axis. Berry 5–10 mm. in diameter, globular or ovoid, suffused with a rich red (similar to that of the Red Currant) when ripe. Icones: Engl. Bot. t. 319; Hegi, fig. 2690.

Var. PYRIFORMIS Druce. Berries pyriform. Described by Druce from Methuen (Methven), Mid-Perth, Aug. 1918 (Rep. B. E. C. 1918, 289), but it had been noticed earlier by James Britten at Oakmere, Cheshire (Journ. Bot. 1870, 291), where the variety grew with plants bearing the globose fruits of the typical species.

Var. nov. **maculatus**, baccis omnino maculis alte brunneo-rubris notatis valde acerbis a typo differt. Berries uniformly covered with dark brownish-red speckles, very astringent in taste. Type, Oakhanger Bog, N. Hants, v.c. 11, Sept. 1, 1933, in Herb. Lousley. This variety was first noticed in Britain by John Sim, at Methven Bog, Perthshire, and he wrote:—"Two varieties of berries seem to grow here, the common egg-shaped and mottled form, and the other rather larger, between apple- and pear-shaped and destitute of spots, the upper surface red, the lower yellowish-green" ('Phytologist,' ii. (n.s.), 580; 1858), though in the present writer's experience the variety "destitute of spots" has usually rather smaller berries, and it is certainly the commoner and the one known to previous authors. Probably too it was this plant which J. Adair had in mind when he wrote

"In Ennerdale there seem to be two varieties, one producing red berries, the other a greyish-purple fruit" ('Naturalist,' 1899, 4), since the berries of *maculatus* do appear greyish-purple from a little distance which contrasts with the bright red of the usual plant. It is possible that it was this variety which was first selected for illustration in English Botany from specimens from Wm. Travis from Scarborough, for there is a note on the original drawing in the Botanical Department of the British Museum by Sir J. E. Smith that "The ripe fruit should be shown if it can, it is spotted very prettily," but the published plates show no evidence of such "spotting." Lady Davy had known an *Oxycoccus* with spotted fruits at Oakhanger for several years when she conducted the writer to the station in Sept. 1933, and specimens gathered on that occasion were distributed through the B. E. C. the same year (Rep. B. E. C. 1933, 765). Fresh specimens of berries of this and of the typical species were forwarded to Dr. W. B. Turrill of Kew, who replied "The *Oxycoccus* specimens are very interesting. They certainly appear to constitute two distinct varieties worthy of varietal names." Search through American and Continental literature has failed to reveal any mention of similar plants elsewhere, though one berry on Hegi, t. 207, is suggestive of the present variety. Notes on fruit colour are rare in foreign works, but a white-fruited form (f. *leucocarpus* Ascherson) is known in Germany. Britton and Brown say: "Berries often spotted when young" (Ill. Fl. N. U.S. ii. 704; 1913), and Smith "Berries spotted in an early state" ('English Flora,' ii. 221—but see also his contradictory remark on Engl. Bot. plate drawing, above), but these remarks do not apply to the present plant since (1) Many British stations entirely fail to produce plants with spotted berries. (2) At Oakhanger both *maculatus* and the typical form occur, and occupy distinct areas of the bog, keeping the same areas from year to year. (3) Large and small berries of both have been noticed, but no intermediates. (4) A careful search failed to reveal both types of berry on the same plant. Since *maculatus* is not known in the absence of the typical plant it may well originate as a mutant. Finally, in 1935, Mr. C. A. Cheetham showed the writer plants of *O. quadripetala* in the Austwick district, Mid-West Yorks, where he described two forms of berry similar to those under discussion. No correlated differences in leaves or flowers have been observed.

Var. MICROCARPUS Turczan. Very much smaller in all parts than the typical plant. Leaves 5–6 mm. long, broadest near the base; peduncles usually glabrous. Berries 5–7 mm. in diameter. Flowers commonly 4-partite and solitary. This plant is very well marked throughout northernmost Europe; thus in Russia (Suircishchikov, Illus. Fl. Moscow Govern. iii. 17; 1910), Sweden (Lindman, Svensk Fanerogamfl. ed. 2, 430; 1926),

etc. *O. Oxycoccus* and *O. microcarpus* are treated as separate species and figured as such. In Central Europe and the British Isles they become less clearly differentiated, and farther south (with the exception of Switzerland) *microcarpus* is either absent or unrecognised. The variety was first noticed from Britain by Prof. Lindman (Moss, New Phytol. 1912, 406), and this note was reprinted with additions by Druce (Rep. B. E. C. 327/8, 1913). It appears that *microcarpus* is almost restricted in this country to high altitudes in Scotland—the most extreme examples seen by the writer being from "Bog beside Loch Phradraig, alt. c. 2200′, S. Aberdeen, v.c. 92, July 11, 1934," gathered by E. C. Wallace.

GAULTHERIA SHALLON Pursh. Naturalised about 1 mile north of Toy's Hill, Brasted, West Kent, v.c. 16, Nov. 24, 1935, under very similar ecological conditions to those of the Leith Hill, Surrey, station. This plant is evidently very easily established in this country, and likely to spread rapidly. For references to other British localities, see Rep. B. E. C. 1934, 973.

VERBASCUM PULVERULENTUM (Vill.) Smith. In Journ. Bot. 1934, 173, this is recorded by the writer from near Colchester, N. Essex, v.c. 19, an interesting extension of its range. It was, however, recorded from this station by W. R. Horwood in 'Essex Naturalist,' xv. 101 (1907)—a record which has been overlooked by the compilers of both the 'Comital Flora' and the supplements to 'Topographical Botany.'

MELISSA OFFICINALIS L. Near the Palace, St. David's, Pembroke, v.c. 45, Aug. 27, 1935 (N. C. R.).

SCIRPUS NANUS Sprengel. As this species is reputed a shy flowerer in England it may be well to place on record that fine plants in flower were seen in great abundance near Minfford, Merioneth, v.c. 48, on Aug. 28, 1935. It still occurs at Littlesea, Dorset (P. M. Hall, Aug. 21, 1935), but only barren plants were seen.

SCIRPUS FILIFORMIS Savi. Wimbledon Common, Surrey, v.c. 17, Sept. 9, 1922. Specimens gathered on a ramble of the South London Botanical Institute, and originally labelled *S. setaceus* in error are in the writer's herbarium. They were collected from the side of a small ditch or trench between Cæsar's Camp and Putney Vale. As this is a new record for Surrey, from rather an unusual habitat on well-worked ground, confirmation is desirable, but the writer has a clear recollection of gathering the plants, and the débris still attached to the lower stems seems in accordance with the habitat.

PTERIDIUM AQUILINUM Kuhn. On Oct. 14, 1934, when botanising in the company of Mr. R. Melville on some rubbish-

tips near West Drayton, Middlesex, an elegant fern of unusual appearance attracted attention. This was later distributed by Melville as "*Pteridium aquilinum* (L.) Kuhn var." (Rep. B. E. C. 1934, 997). The specimens strongly recalled seedling ferns which the writer had been shown in greenhouses from time to time, where such plants had proved puzzling to the owners. In Herb. Kew. there are several sheets of similar plants, notably from Liss, Hants, July 1911 (Ref. 29,969), J. S. Gamble, and from the site of excavations of a Roman Bath, Bath, Somerset, C. E. Davis. They evidently represent the juvenile form of the common Bracken, and occur only in situations where an adequate supply of moisture and humus allows that species to reproduce from spores in addition to the customary manner by rhizomes. Since this plant has proved puzzling to amateur botanists, and in view of the recent distribution of specimens it seems advisable to quote the remark in 'English Botany,' xii. 146 :—"Seedling plants have the frond much thinner in texture, and the ultimate pinnules roundish-ovate and crenate, and the same form of the plant has been found on the walls."

PERTH—ANGUS BOUNDARY ON THE MAP IN 'COMITAL FLORA.' On the map issued with Druce's 'Comital Flora of the British Isles' (1932), there is a serious error in the colouring of v.c.'s 89 and 90. The western boundary of Angus is shown coincident with the River Tay, whereas it should extend south-east from Coupar Angus. The area thus erroneously shown as Angus (approximately covered by the word "Sidlaw" of Sidlaw Hills on this map) is part of East Perth (v.c. 89). The error is important, as a considerable number of very interesting and rare plants are to be found along the east bank of the Tay within this area. As already pointed out on page xxx of the 'Comital Flora,' Kinross is also wrongly coloured on this map—it should be pink, as in the case of Fife (v.c. 85), with which it is included for topographical purposes. Field-botanists will find it useful to make the corrections on their own copies.

The writer is greatly indebted to Mr. H. W. Pugsley for very considerable help in the compilation of these notes, and to the authorities at Kew and South Kensington for the facilities which they have placed at his disposal.

NEW BRITISH MINTS.

BY A. L. STILL.

WHILE searching the banks of the Dart, near Buckfastleigh, Devon, in August 1935, Mr. N. D. Simpson and the writer found a form of *M. arvensis* L. which is so distinct from any form hitherto seen that it seems worth a varietal name. The

most striking feature is the resemblance to some forms of *M. gentilis* L., particularly to the secondary growths.

Mentha arvensis L. var. nov. **decipiens**. Differt a typo foliis ovalibus acuminatis, marginibus convexis, utrinque serraturis æqualibus acuminatis præditis.

Stem slender, erect, with few branches, 3–3·5 dm. high, softly hairy, internodes 1–3·5 cm. long. *Leaves* oval 4×2·5 cm., with convex margins, tapering equally to both ends, base entire, shortly decurrent on the petiole, softly hairy on both faces, with acuminate apex, very little smaller towards the apex of the stem; serrations 8 on each margin of the stem-leaves, but usually 6 on the floral leaves, regular, acuminate, and prominent, 1·5 mm. deep; petioles 7 mm. long. *Whorls* moderately compact. *Pedicels* glabrous. *Calyx* campanulate, with acute triangular teeth, densely hairy with spreading hairs. *Corolla* bright reddish purple, hairy externally. *Stamens* exserted.

Specimen at the British Museum.

The features of the variety are the acuminate leaves, especially the floral leaves, with regular acuminate prominent serratures. The regular oval shape of these, widest at the middle and with convex margins, is also an unusual one in *M. arvensis*. The nearest of the many forms described by Topitz (Menthenflora v. Mittel-Europa, Bot. Centralb., 1913) is var. *Duftschmidii* Top., under which he includes var. *Allionii* Briq. and var. *densifoliata* Briq.; but the leaf-apex and serratures of this are not acuminate. The calyx-teeth are too long and the calyx too densely hairy for var. *Allionii* Briq., and the leaf-shape quite different from the plant in the Druce Herbarium which Briquet identified as var. *densifoliata*.

Mentha verticillata L. forma nova **calva**. Differt a typo pedicello glabro, calyce glabro eglanduloso.

Stem slender, 1–5 dm., softly hairy with few branches, internodes 1–6 cm. long. *Leaves* 4×2 cm., softly hairy on both faces, broadly lanceolate, cuneate at the base with petioles 1 cm. long, acute; serratures acute, pointing forward, 1–1·5 mm. deep; floral leaves gradually diminishing in size upwards. *Whorls* pedunculate. *Flowers* small. *Pedicels* usually glabrous, but exceptionally with a few long spreading hairs. *Calyx* small, narrowly tubular, with narrow acute teeth, usually entirely glabrous, eglandular, exceptionally having a ring of short hairs at the base, with a few hairs on the teeth. *Corolla* pale purple, glabrous externally.

I have been unable to trace a similar form among the sheets in Herb. Kew. and Herb. Mus. Brit., or among descriptions in British and Continental literature.

Specimen at the British Museum.

An interesting Mint, determined by J. Fraser as ×*M. gentilis* L., was collected by J. E. Lousley at Stanmore Common, Middlesex, Sept. 10, 1928, and distributed by him under the reference number Z 107 through the Watson Botanical Exchange Club. The determination was challenged by J. E. Little (Rep. Watson B. E. C. 1928/9, 486), and Mr. Lousley's sheet was re-examined by Fraser, who confirmed his previous identification (*op. cit.* 1929/30, 12). Assisted by directions from the original collection I gathered a similar Mint from this locality during the past summer, and have come to the conclusion that Fraser allowed too much weight to a single character, which was, moreover, not constant on the individual plant, namely, the glabrous pedicel and calyx-tube.

The plant differs from *M. gentilis* L. in being softly hairy on stem and leaves, and in the shape of the calyx which is not campanulate, but narrowly tubular and devoid of the glands which are so conspicuous a feature on all parts of *M. gentilis* L.; nor are the calyx-teeth characteristic of that hybrid.

The general facies of the plant points to either *M. verticillata* L. or *M. arvensis* L.

Against *M. arvensis* we have again the fact that the calyces are not campanulate, but tubular, while the whorls are distinctly pedunculate, with the possible exception of the youngest at the apex. In my opinion we should regard this Mint as one of the small-leaved section of *M. verticillata* L., which includes f. *acutifolia* Sm. and f. *dubia* Fraser. The leaf-dimension, twice as long as broad, supports this. In the present plant, the floral parts are not sufficiently hairy for its inclusion in f. *acutifolia*, which also has the whorls normally sessile. In f. *dubia* the leaves are not twice as long as broad and they are obtuse; the calyces are also shortly hairy, but a point of resemblance appears in the variable amount of hairs on the pedicels.

Referring to this Stanmore Mint, Mr. Fraser says (Rep. B. E. C. 1933, 590), "the calyx is almost nude, even on the teeth." This is true, the majority of the pedicels and calyces being naked; but in a few instances there are sparse long spreading hairs on the pedicels, and a ring of short hairs round the base of the calyces, with a few hairs on the teeth. Unless a large number of flowers are examined, these exceptions would easily escape notice. The fact is that the young buds are hairy, but the hairs fall at a very early stage in opening. I think the proposed name is appropriate. I should have preferred "calvescens," but this has already been used by H. Braun for a form of *M. gentilis*, though Briquet rejected the name in favour of "comatula."

A NEW *RUBUS* FROM SUSSEX.

By W. C. Barton and H. J. Riddelsdell.

Rubus newbridgensis, sp. nov. *Turiones* arcuati, faciebus planis, hirsuti, aculeis multis sat validis inæqualibus, quorum robustiores e basi longa compressa in angulis dispositi, reclinatis, aculeolis et aciculis et glandulis stipitatis multis inæqualibus instructi; turionum arma omnia præter aculeos robustiores nunc glanduligera nunc eglandulosa. *Folia* sat parva, quinata, in apricis subcoriacea, subtus sparsim hirsuta, dentibus inæqualibus subsimplicibus nec profundis serrata; foliolum terminale ellipticum vel ±obovatum, breviter acuminatum, ad basin subcordatum vel emarginatum, sat longe petiolulatum. *Inflorescentiæ* ±foliosæ, apicem versus vix decrescentis, infra laxæ supra densæ, ramuli inferiores vulgo breves 3–7-flori adscendentes, superiores 1–3-flori erecto-patentes. *Rachis* angulata hirsuta, aculeis multis sat tenuibus reclinatis vel robustioribus falcatis, aciculis glanduligeris eglandulosisque et glandulis stipitatis multis valde inæqualibus munita. *Flores* sat parvi, albidi; stamina stylos superantia; sepala viridia pallido-marginata, sub fructu laxe reflexa vel subpatentia.

Stem stout, yellowish green in shade, brownish to dark red in exposure, sometimes glaucous, arcuate or climbing, rooting at tips, *with faces flat* (or slightly concave), striate, considerably *hairy, with numerous stalked glands of very various length, numerous acicles and stout-based pricklets* of various sizes. *Stem-prickles numerous, unequal, the largest rather stout and chiefly on angles from long compressed base,* mostly *strongly declining,* occasionally falcate. *Many arms of all grades, except the large prickles gland-tipped.* Petioles armed like the stem, but with prickles curved. *Leaves rather small,* neat, mostly 5-*nate,* ±pedate, firm and *subcoriaceous in the open,* opaque, strigose above, paler and *thinly hairy beneath.* Leaves and leaflets concave and plicate till late in the season. *Terminal leaflet elliptic or slightly obovate* or rhomboidal, *with base emarginate to subcordate* or even cordate, *and* gradually narrowed to the usually rather *short acuminate point,* with stalk moderate or rather long (1/3 to 1/2 its length). *Toothing rather broad and shallow, unequal,* mucronate, *nearly simple. Panicle cylindrical, lax below, with lower branches rather short, ascending,* 3–5–7-flowered, *dense above, with upper branches erect-patent* or almost patent, 1–3-flowered; the *considerable ultra-axillary part* is *compact,* but foliaceous bracts are often conspicuous. *Rachis angular,* scarcely flexuose, *hairy* and towards the top also felted, armed *with crowded very unequal stalked glands,* of which a good proportion exceed the hair, *many acicles frequently gland-tipped and numerous prickles* usually *rather slender declining,* sometimes stronger and more curved; pedicels with numerous straight slender pricklets. *Flowers* rather *small, white* or very pale; petals roundish-oblong, clawed; *stamens exceeding styles; sepals green with paler margins,* aciculate and glandular, *loosely reflexed to subpatent or even patent under the ripening fruit.* Young carpels hairy; fruit abundant, not acid, often oblong, of many drupelets.

R. newbridgensis Bart. & Ridd. is uniform and constant in characters and without intermediate forms wherever we have seen it, and is easily distinguished from any other British bramble by the combination of a very fully and variously armed stem, neat concave leaves and leaflets, and a sturdy cylindrical panicle with hairy rachis densely armed and glandular. The plant is of a rather greyish-green colour in the open; the intermediate and basal leaflets are large in proportion to the terminal leaflet and the whole leaf, and consequently the leaves are often imbricate in spite of the longish stalk of the terminal leaflet; the armature is remarkably uniform on stem, rachis, and petioles; the stem-prickles are themselves often armed with hair, glands, and pricklets.

Distribution.—East Sussex, v.c. 14, in many places near Worth and eastwards to the Hartfield–Maresfield road. Plentiful and well developed by the stream near Rowfant railway station.

Exsiccata in Herb. Bart. & Ridd., Ref. nos. 4519 *typus* (holotype) (*Newbridge,* 1934), 3119, 3958, 3960, 4280–4282, 4516–4518, 4571, 4827, 4828, and a small dry-ground form 4283–4285.

ACAULESCENT SPECIES OF *VERNONIA* FROM SOUTH AFRICA.

By E. Percy Phillips, M.A., D.Sc.

In the *Journal of Botany,* xxxvi. 374 (1898) Schlechter described a species of *Vernonia* from Natal which he named *V. collina.* The specific epithet *collina* is invalidated, as Klatt (Bull. Herb. Boiss. iv. 824) had used the name for a South African species which I consider to be *V. monocephala* Harv. The name has also been used by G. Gardner (Hook. Lond. Journ. Bot. v. 213) for a species from Brazil. As the species must be re-named, I propose the name *V. Thodei* (Schltr.) Phillips, in honour of the late Mr. J. Thode, who has contributed so extensively to our knowledge of the high mountain flora of Natal.

Vernonia Thodei (Schltr.), nom. nov. *V. collina* Schltr., non Klatt nec Gardn. A small herbaceous plant 6–17 cm. high, with a short woody underground stem. *Leaves* radical, 2·5–4·5 cm. long, 0·6–2·6 cm. broad, elliptic, obovate or oblanceolate, obtuse, narrowed at the base, entire, rarely four-toothed, glabrous.

Peduncles bearing 1–2 terminal heads, pubescent or gradually becoming glabrous towards the base. *Heads* 1 cm. long, 1·5 cm. in diam. *Involucral bracts* 8–9 mm. long, ovate-linear, acuminate, obtuse, pubescent, glandular-pilose, or glabrous. *Corolla-tube* 4–5 mm. long, terete, gradually widening above, sparsely glandular; lobes 2·25–3·5 mm. long, linear, obtuse. *Anthers* 2 mm. long, linear, sagittate at the base. *Pappus* 5–7 mm. long, of long and short bristles. *Ovary* 1·25–1·75 mm. long, obovate in outline, pilose; style 0·6–1 cm. long, filiform, shortly pilose above; lobes 1–2·5 mm. long, linear.

NATAL :—Umvoti distr.: rocky places on summit of Little Noorsberg, near Dalton, c. 3450 ft., Oct., heads purple, *Thode* 64 ! Greytown, *Wylie in Natal Herb.* 21,609 ! P'Maritzburg distr.; Benvie, Karkloof, 4000–5000 ft., Sept., fls. purple, *Wylie in Herb. Wood* 10,053 ! ZULULAND :—Entonjaneni distr.: Melmoth, Dec., *Haygath in Natal Herb.* 8620 ! TRANSVAAL :—Pilgrim's Rest distr.: Mount Anderson, c. 7000 ft., Dec., common, flrs. blue-purple, *Smuts and Gillet* 2386 ! west of Anderson Pass, c. 6000 ft., Dec., *Smuts and Gillet* 2416 !

In 1932 this species was collected by Gen. J. C. Smuts and Mrs. A. B. Gillett, near Pilgrim's Rest in the N.E. Transvaal, and will probably also be found on the higher points of the Drakensbergen southwards. I have not seen Schlechter's type (*Thode* 150) of *V. collina*.

NEW VICE-COUNTY RECORDS FOR SPHAGNA FROM ENGLAND AND S.W. IRELAND.

BY A. THOMPSON.

Sphagnum acutifolium Ehrh.; summit of Cobduff, Glengariff; v.c. I. 3.

S. plumulosum Röll; Mangerton Mt., Killarney; v.c. I. 2.

S. compactum DC. var. *subsquarrosum* Warnst.; marsh near Lough Crutta; v.c. I. 1; Mangerton Mt., Killarney; v.c. I. 2. Var. *imbricatum* Warnst.; Plaitford Common, S. Wilts; v.c. 8; Skipwith Common; v.c. 61; near Lough Guitane; v.c. I. 2; Sugar Loaf Mt., Glengariff; v.c. I. 3.

S. strictum Sull.; S. side of Sugar Loaf Mt.; v.c. I. 3. This moss has not been recorded for Ireland before. It has been found in a few places in Scotland and once in Wales, but not in England.

S. amblyphyllum Russ. var. *mesophyllum* Warnst.; near Sugar Loaf Mt.; v.c. I. 3.

S. pulchrum Warnst.; Mangerton Mt.; v.c. I. 2.

S. recurvum P. de Beauv. var. *robustum* Breid.; Cadman Common, S. Hants: v.c. 11; moor near Hathersage, Derbysh.; v.c. 57; near Mangerton Mt.; v.c. I. 2. Var. *majus* Ångstr.; Plaitford Common; v.c. 8; Cadnam Common; v.c. 11; Howden Moors, S.W. Yorks; v.c. 63; Gap of Dunloe; v.c. I. 1.

S. fallax von Klinggr. var. *laxifolium* Warnst.; Austwick Moss, N.W. Yorks; v.c. 64; Brandon Headland; v.c. I. 1. Var. *robustum* Warnst.; Scandale, Ambleside; v.c. 69; Helvellyn Range; v.c. 70. Var. *Schultzii* Warnst.; marsh, Brandon Headland; v.c. I. 1.

S. cuspidatum Ehrh. var. *falcatum* Russ.; marsh near Glengariff; v.c. I. 3. Var. *plumosum* Schimp.; Mangerton Mt.; v.c. I. 2.

S. molluscum Bruch; summit of Cobduff, Glengariff; v.c. I. 3.

S. obesum Warnst.; several forms, Skipworth Common; v.c. 61. Var. *plumosum* Warnst.; ditch, Plaitford Common; v.c. 8; pool near Conway Mt.; v.c. 49. Var. *teretiramosum* Warnst.; Offerton Moor, Derbyshire; v.c. 57; Connor Hill, co. Kerry; v.c. I. 1. Var. *canovirens* Warnst.; near Glengariff; v.c. I. 3. Var. *hemi-isophyllum* Warnst.; Slippery Stones, S.W. Yorks; v.c. 63; Connor Hill, Dingle; v.c. I. 1.

S. inundatum Warnst. var. *eurycladum* Sherrin; Sugar Loaf Mt., Glengariff; v.c. I. 3; Dingle; v.c. I. 1; Mangerton Mt.; v.c. I. 2. Var. *densum* Sherrin; marsh near Mangerton Mt.; v.c. I. 2; summit of Cobduff; v.c. I. 3. Var. *lancifolium* Warnst.; summit of Torc Mt., Killarney; v.c. I. 2.

S. auriculatum Schimp. var. *tenellum* Warnst.; New Forest near Cadnam; v.c. 11. Var. *ovatum* Warnst.; among rocks, Brandon Headland; v.c. I. 1; on wet rock, near Glengariff; v.c. I. 3. Var. *laxifolium* Warnst.; ditch side near Cadman, v.c. 11. Var. *canovirescens* Warnst.; summit of Torc Mt.; v.c. I. 2.

S. aquatile Warnst. var. *turgidum* (C. Müll.); pool, Skipwith Common; v.c. 61; ditch, Plaitford Common; v.c. 8. Var. *intortum* Warnst.; Gap of Dunloe; v.c. I. 1; Mangerton Mt.; v.c. I. 2; near Glengariff; v.c. I. 3. Var. *sanguinale* Warnst.; ditch, Plaitford Common; v.c. 8; marsh near L. Crutta; v.c. I. 1. Var. *remotum* Warnst.; pool, Slippery Stones; v.c. 63; Gap of Dunloe; v.c. I. 1; Mangerton Mt.; v.c. I. 2.

S. crassicladum Warnst. var. *magnifolium* Warnst.; ditch, near Old Weir Bridge, Killarney; v.c. I. 2. Var. *diversifolium* Warnst.; submerged in slow stream, near Cadnam; v.c. 11; pool, Skipwith Common; v.c. 61; Connor Hill; v.c. I. 1; ditch near Glengariff; v.c. I. 3.

S. Camusii Warnst. ; pool, Skipwith Common ; v.c. 61 ; Connor Hill ; v.c. I. 1 ; near Eagle's Nest, Killarney ; v.c. I. 2.

S. contortum Schultz ; near Muckross Lake ; v.c. I. 2.

S. papillosum Lindb. var. *normale* Warnst. ; near Glengariff ; v.c. I. 3. Var. *sublaeve* Warnst. ; near Eagle's Nest ; v.c. I. 2. Var. *laeve* Warnst. ; Tal-y-Fan, near Carnarvon ; v.c. 49.

The Irish specimens were collected during two visits, one in August and September 1934 and the other with the B.B.S. in August 1935.

v.c. 8 is South Wilts ; 11, South Hants ; 49, Carnarvon ; 57, Derby ; 61, South-east Yorks ; 63, South-west Yorks ; 64, Mid-west Yorks ; 69, Westmorland and North Lancs ; 70, Cumberland ; I. 1, South Kerry ; I. 2, North Kerry ; I. 3, West Cork.

I have again to thank Mr. Sherrin for kindly checking the naming of my specimens.

BIBLIOGRAPHICAL NOTES.

CI. John Sebastian Miller's 'Icones Novæ.'

The late Mr. James Britten drew attention to this rare work (Journ. Bot. 1913, 255). He originally attributed it erroneously to John Frederick Miller, but afterwards (*l. c.* 1919, 353) pointed out that it was the work of John Miller (Johann Sebastian Müller). The entry in Dryander, Cat. Bibl. Banks, v. 63, cited by Britten, is as follows :—

"John Miller (Icones plantarum) (Londini, 1780.) fol. Textus fol. 1. tab. aen. color. 1–7. Plures non prodierunt."

A copy in the Library of the Royal Botanic Gardens, Kew, includes, in addition to the single leaf of text and the seven engraved plates, what appear to be first proofs, without lettering, of plates 1 and 2 (*Sophora tetraptera* and *Phormium tenax*).

According to the 'Dictionary of National Biography,' xxxvii. 413 (1894), "seven folio plates, dated 1780, were published, with a half-sheet of letterpress, but no title." Six plants were figured under the following names :—1, *Sophora tetraptera* ; 2, *Phormium tenax* ; 3, *Stewartia Malacodendron* ; 4, *Fothergillia* [sic] *latifolia* ; 5, 6, *Heliconia Bihai* ; 7, *Lagerstroemia indica*.

At the bottom of each plate is printed "Painted Engraved & Published by John Miller according to the Act. 1780."

As all the above information appears to be based only on the copies at the British Museum and Kew, which might be specimen

proof sheets of an unpublished work, it seems desirable to supply further evidence of publication.

According to Murr, Adnot. Bibl. Hall. 20 (1805), J. S. Miller announced in 1779 the forthcoming appearance of a new work for which he had prepared nearly 400 plates of plants : "A. 1779 promisit novum Opus insigne in fol. ad quod pæne 400 delineatas plantas paratas habuit. Primo Fasciculo destinavit Millerus sequentes plantas : (1) Heliconiam Caffram ; (2) Stewartiam Malacodendron ; (3) Lagerströmiam indicam ; nec pericarpium, nec semina Linnæo nota fuere ; (4) Fothergillia, novum genus Americanum, Sophora tetraptera. (5) Phormium tenax ; iungit coronarias cum ensatis et spathaceis." Actually the "*Heliconia*" appeared under the name "*Heliconia Bihai*" ; and the genus *Fothergilla* had been published already in 1774 by Murray (Linn. Syst. ed. 13, 418).

Under *Sophora tetraptera*, Aiton (Hort. Kew. ii. 43 ; 1789) cites "Joh. Miller. ic. tab. 1." Under *Phormium tenax* Linn. f. (Suppl. 204 ; 1781) cites "Mill. fasc. 1, figura optima," Murray (Linn. Syst. Veg. ed. 14, 336 ; 1784) cites "Mill. Ic. nov. tab. 2," and Aiton (Hort. Kew. ed. 2, ii, 284 ; 1811) has "J. Mill. ic. 2." Aiton cites "Heliconia Bihai. J. Mill. ic. tab. 5, 6." under *Strelitzia Reginæ* (Ait. Hort. Kew. i. 285 ; 1789). Thus it appears that, in addition to Dryander and Aiton, the younger Linnæus working at Uppsala, and J. A. Murray at Göttingen, also saw copies of Miller's Icones. Pritzel, 'Thesaurus,' ed. 2, 227, n. 6525, saw a copy at Vienna. These facts suggest that the work was actually published. Whether the cover of the first and only fascicle bore any title is doubtful. The title 'Icones novæ' cited by Murray may be accepted provisionally until further evidence is forthcoming. The words "Icones plantarum" used by Dryander and in Pritzel's Thesaurus, being in brackets, evidently represent a description of the work rather than a title.

Fothergillia [sic] *latifolia* J. S. Mill. Ic. nov. t. 4 is evidently a form of *Fothergilla Gardeni* Murr. The name *F. latifolia* was cited in the 'Index Kewensis' from "Pritz. Ic. Ind. Bot. Suppl. 125 (ic. ined.)" and not from the original place of publication. The reference in Pritz. Ic. Bot. Ind., pars altera, 126, reads : "Fothergilla latifolia ? Bibl. Goett. tab. ined."—T. A. Sprague.

SHORT NOTES.

Nomenclature of Marginaria A. Rich.—The work of Dr. E. M. Delf on the reproductive mechanisms of the Phaeophyceae has drawn my attention to the fact that the generic name *Marginaria* A. Richard is a later homonym, and must be rejected unless a proposal for its conservation can be justified.

As *Marginaria* Bory, Dict. Class. Hist. Nat. vi. 587 (1824) is earlier, has more combinations, and is in use for a genus of ferns, I do not know how to justify such a proposal. A new name is, therefore, necessary and to reduce dislocation to a minimum I propose

MARGINARIELLA Tandy, nom. nov. *Marginaria* A. Rich. Voy. Astrolabe, Bot. [i.] 9 (1832), non *Marginaria* Bory, Dict. Class. Hist. Nat. vi. 587 (1824).

In making the following combinations I do not express any opinion about the number of species in the genus nor about their limits. It is commonly accepted that there are but two species in the genus. I have provided new combinations for the nomenclatural types hitherto referred to *Marginaria* A. Rich., and leave it to some future worker, with more ample material than is available to me, to settle the synonymy.

M. Urvilliana (A. Rich.) Tandy, comb. nov. *Marginaria Urvilliana* A. Rich. Voy. Astrolabe, Bot. [i.] 10 (1832).

M. gigas (A. Rich.) Tandy, comb. nov. *Marginaria gigas* A. Rich. Voy. Astrolabe, Bot. [i.] 10 (1832).

M. Boryana (A. Rich.) Tandy, comb. nov. *Sargassum Boryanum* A. Rich. Voy. Astrolabe, Bot. [ii.] 138 (1834).—GEOFFREY TANDY.

REVIEWS.

Zesde Internationaal Botanisch Congres, Amsterdam, 2–7 September, 1935. Proceedings. Vol. I. *Report of the Activities.* Edited for the Organizing Committee by M. J. SIRKS, Hon. First Secretary. 8vo, pp. xvi, 450. E. J. Brill: Leiden, 1936.

THIS volume completes the account of the work of the Amsterdam Congress, as Vol. II., 'Abstracts of Sectional Papers,' was issued before the meeting for the convenience of members. The energetic Secretary, Dr. Sirks, is to be congratulated on this prompt completion of the history of the Congress.

The frontispiece is a portrait of the President, Prof. Dr. J. C. Schoute, who at short notice took over the presidency on the death of Prof. Went, of whom a portrait is also included. Dr. Schoute contributes a short preface. Then follow lists of the Officers and Committees, some account of their work, and the Programme. There were 963 members, a larger attendance than at any previous Congress, except the Cambridge, 1930 (1175), which, however, included 688 foreigners as against 711 at Amsterdam.

A full account is given of the General Meetings. These included the Opening and Final Plenary Meeting addressed by the President and an evening meeting at which lectures were given by Prof. A. Ernst and Prof. F. E. Lloyd, and also a joint meeting of the Congress with the Botanical Section of the International Union of Biological Sciences, at which Prof. A. C. Seward presided. It was proposed that the Botanical Section should act as an administrative connecting link between successive International Congresses, which, however, maintain their full independence from an international point of view to such an extent that any country which has not jointed the Union will have the same rights as those which have joined. Also that this Botanical Section be authorized to carry through any resolutions adopted by the International Botanical Congress. This resolution was carried at the final plenary meeting. It was emphasised that there would be no interference with the working of committees set up for definite objects by individual sections of the Congress.

An account of the various receptions and entertainments is also included.

The greater part of the volume is occupied by a précis of the proceedings of the various sections, with abstracts of papers which had not already been included in Vol. II. The report of the subsection for nomenclature, pp. 333–383, prepared by Dr. T. A. Sprague with the help of Miss M. L. Green, summarises the discussions of the 'Rules' and records the results. Lists of the delegates attending and of committees appointed are also given.

After a brief account of the excursions made during the meeting the volume concludes with three Appendixes: The resolutions, general and sectional, adopted at the final plenary meeting; a list of delegates arranged geographically; and notes of the meetings of various special committees.

An index of names refers to the parts taken by individual members in the work of the Congress; and an envelope attached to the cover contains reproductions of the various group photographs.—A. B. R.

The Life-form Spectrum of some Atlantic Islands. By C. RAUNKIÆR. Botaniske Studier, 4 Hefte. Pp. 249–328. J. H. Schultz Forlag: Copenhagen, 1936. Price Kr. 2.50.

IN this part of his 'Studier' the author describes the life-form spectra of a number of Atlantic Islands from the Bermudas and Azores in the north to Tristan da Cunha, the Falklands, and South Georgia in the south. Spectra for the northern Atlantic Islands have already been given by himself and other investigators. The West Indies are not included. The tables have been compiled from published floras and papers. As the

author points out, the problem of islands, especially oceanic islands, is complicated, as compared with that of continents, by the fortuitous character of immigration which also may favour the later introduction of alien species better suited to the contions of life in a given island. In the Bermudas especially the facies of the present flora differs considerably from the original; in comparison with its favourable hydrotherm figure a flora with a higher phanerophytic percentage would be assumed. The Bahamas are introduced for comparison with the Bermudas. In both cases the excellent floras by Britton and Millspaugh afford material for comparison. An interesting difference is found between the Cryptogam quotients in the two groups, that for the Bahamas being much the lower.

The spectrum for St. Helena, based on the 37 endemic species quoted by Hemsley in the 'Challenger' Report, a number of which are now extinct, must be mainly academic and scarcely representative of the original or present-day flora.

In conclusion, a comparison is made between the life-form spectrum for the flora of the Atlantic Islands and corresponding areas elsewhere.

Practical Problems in Botany. By WILFRED W. ROBINS, University of California, and JEROME ISENBARGER, Wright City Junior College, Chicago. Cr. 8vo, pp. vii, 402, 230 text-figs. J. Wiley & Sons: New York. Chapman & Hall: London. 1936. Price 10*s.*

THE subject is presented to the student in the form of a number of problems classified under the following heads—organization and composition of plants, nutrition of green plants, nutrition of non-green plants, growth, reproduction, dependence on surrounding conditions, how plants are fitted to such conditions, development and improvement, classification, and economic importance. Each section opens with a short introduction followed by a statement of the problem, such as "What are the different forms of the plant-body?" which is elucidated by a brief description of forms in an ascending scale with examples suggested for observation. Throughout the volume suggestions for practical work accompany the descriptive text. The method of presentation adopted should help to impress facts and principles on the student's mind, but the use of the book demands the help and guidance of a capable teacher.

Many of the numerous illustrations are adopted from previous works by the same author; some are clear outline figures, others are reproductions of photographs, some of which are small and obscure, conveying but little information.

Die Hieracien Norwegens. Piloselloidea. By S. O. F. OMANG. Pp. 179, with 4 plates. Norske Vidensk.-Akad. Oslo, 1935.

THE present tendency to specialisation, in which individually we grow to know more and more of less and less, is well illustrated in this volume, which deals with the Section *Piloselloidea* of *Hieracium* (excluding the main species *H. Pilosella* L.) as known in Norway, and enumerates in its index some five hundred specific and subspecific names. In Britain we have only one certainly native hawkweed, *H. Peleterianum* Mérat, that belongs to this group, such widely spread plants as *H. Auricula* Lam. and *H. praealtum* Vill. being absent, and no attempt has been made here to deal with our hawkweeds, or indeed any other genus of native flowering plants, on such a highly critical standard. Although Mr. Omang's work is written for his fellow hieraciarchs, a perusal of its pages suggests that it might really enable any careful botanist to name Norwegian plants of the group. Three subsections, *Acaulia*, *Subacaulia*, and *Cauligera*, are adopted, the last with eight subdivisions, and these subsections include forty-two collective species, many of which have numerous subspecies and varieties. As keys are provided for the generic subdivisions, the collective species, and the subspecies (if more than two) under each collective species, and as no intermediate or hybrid species are shown outside the generic subdivisions, it should not be impossible as a rule to identify specimens, at least as collective species, and the book should thus be of practical use to systematists in general as well as to specialists. Full descriptions (in German) are given throughout, with synonyms, exsiccatæ, and geographical distribution, and Latin diagnoses of thirty-nine new species are printed after the body of the work. It is noticed that these new groups are not uniformly shown as of the same rank. Literature has generally been fully consulted, but a paper in this Journal (lix. 60; 1921) on the type of *H. aurantiacum* L. appears to have been overlooked.

It is to be hoped that the author will be enabled to complete his Monograph with a similar volume on the Section *Eu-Hieracium*.—H. W. PUGSLEY.

Flora Arabica. By Rev. E. BLATTER, S.J., Ph.D., F.L.S. Part V. *Gnetaceae–Gramineae.* Records of the Botanical Survey of India, viii. no. 6. 8vo, pp. 451–519, xlix. 1936. Price 3*s.* 6*d.*

THIS part completes the late Dr. Blatter's 'Flora of Arabia.' It contains the Gnetaceae represented by four species of *Ephedra*, *Coniferae* (a Cypress and three Junipers), and the Monocotyledons (chiefly Grasses). Nearly half of the issue is devoted to a General Index to the whole work.

Floræ Siamensis Enumeratio. A List of the Plants known from Siam, with Records of their Occurrence. By the late Prof. W. G. CRAIB. Edited by A. F. G. KERR. Vol. II. pt. 3. *Compositae–Campanulaceae.* 8vo, pp. 235–310. Published under the Auspices of the Siam Society, Bangkok, 1936. Price to non-members, 12*s.* 10*d.*

NEARLY the whole of this number is taken up by the Compositae, which include a few endemic species recently described by the editor in the 'Kew Bulletin,' and also some introduced species. Stylidiaceae is represented by three species of *Stylidium*, Goodeniaceae by single species of *Goodenia* and *Scaevola*. *Lobelia* is well represented; several new species await description in the 'Kew Bulletin.' Critical notes on nomenclature are occasionally given.

Fieldbook of Illinois Wild Flowers. Illinois Natural History Survey Manual, i. Sm. 8vo, pp. x, 406, illustrated. Dept. of Registration and Education, Urbana, Illinois, 1936.

THIS handy little volume contains a selection of six hundred and fifty of the more common wild flowers of the State of Illinois with adequate descriptions in language as non-technical as possible and small but clear and helpful line-drawings. It should fulfil the object indicated in the Foreword, as "a guide to the enjoyment of those flowers most frequently met with in walks through our woods and fields." It is issued by the Natural History Survey Division of the State Board of Natural Resources and Conservation under the auspices of the Governor.

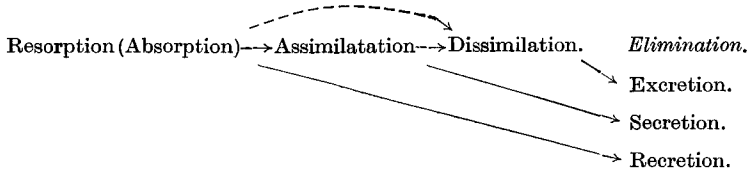
The book originated in a manuscript prepared by Dr. W. B. MacDougall, which has been enlarged by Dr. Herman Pepoon, with the assistance of several Illinois botanists. A short general account descriptive of the terms used in the text and of plant structure precedes the main text. A key working with obvious characters of habit, leaf, and flower indicates the family. Under each family striking characters are indicated, and in the larger a key to the included genera is given. For the species, distribution and habit are described as well as characters of stem, leaf, flower, and fruit. Less common species of the genus are described in smaller type, and without illustration. Popular names are used throughout, but the botanical name is also indicated.

Need for plant-conservation is evident: forty kinds of orchids are recorded for the State, several of which were at one time abundant. Now not a single species is common.

LETTER TO THE EDITOR.

ELIMINATION PROCESSES IN PLANTS.

IN his review of my book ('Die Stoffausscheidung der höheren Pflanzen,' Berlin, 1935), Dr. Skene says that it is difficult to find a suitable English equivalent for the German word "Stoffausscheidung" as used by me (this Journal, June 1935, 171). I should suggest translating this term by "*Elimination.*" The scheme of the different stages of metabolism that I have proposed would then be in English, as well as in French:—



In plant physiology the intake of nutritive matter is called Absorption, whereas in animal physiology and for insectivorous plants the term Resorption is used: it would be preferable to have but one term for the same physiological process. Resorption is followed by Assimilation, which in turn is succeeded by Dissimilation; if organic substances are resorbed, part of them may be at once dissimilated. The final step is *Elimination.* It is usually admitted that it follows Dissimilation; but this is only true in the special case of *Excretion.* Elimination may, however, also succeed Assimilation and is then called *Secretion*; or even follow Resorption, for which case the term *Recretion* has been created. According to my definitions, Elimination concerns all the products which have been excluded from metabolism, viz., Excreta products of Dissimilation (*e. g.*, terpenes), Secreta products of Assimilation (*e. g.*, sugars of the nectar), and Recreta that have never been assimilated (*e. g.*, silica).—A. FREY-WYSSLING, Zürich, May 9, 1936.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—The Society's year closed with the Anniversary Meeting on May 28. The Assistant Secretary's report indicated a stable condition of membership, the number of new Fellows elected during the year balancing that of losses by death and withdrawal. The Treasurer's account emphasised the needs of the library; the expense of maintaining periodical literature absorbs the greater part of the allocation.

In presenting the Linnean Gold Medal to Prof. Stanley Gardiner, the President commented on the valuable work in marine biology carried out by the various expeditions that the recipient had organised. After Professor Gardiner's reply the President delivered his address on "The Origin of Insects."

As a result of the ballot the Officers were re-elected—Dr. W. T. Calman, C.B., F.R.S., President; Mr. Francis Druce, Treasurer; and Mr. John Ramsbottom, O.B.E., and Dr. Stanley W. Kemp, F.R.S., Secretaries for Botany and Zoology respectively. New

members of the Council elected were Capt. Cyril Diver, Mr. M. A. C. Hinton, F.R.S., Prof. R. C. McClean, Mr. Charles Oldham, and Dr. Fred Stoker.

'LONDON NATURALIST.'—The Journal of the London Natural History Society for 1935 reports an increase in the number of its members and the formation of a new section to study Ecology. The first study to be attempted is that of Bracken and its associated flora and fauna. Areas in Richmond Park and on Epsom Common have been selected. A Memorial Bacot lecture entitled, "The Naturalist in the Laboratory," by the Honorary President of the Society, Prof. Sir F. Gowland Hopkins, O.M., P.R.S., is reported in full; it emphasises the importance especially of the work of the biochemist. The Botanical Section reports as new records for the Society's district *Astragalus glycyphyllos* L., *Rapistrum rugosum* L., *Linaria italica* Trev., and *Arctium nemorosum* Lej.

The number concludes with the eighth and last part of the "Botanical Records of the London Area." Further additions to this list will be published at some future date. The price of the volume is five shillings, and the home of the Society is The London School of Hygiene and Tropical Medicine, Keppel Street, Gower Street, London, W.C. 1.

CAMBRIDGE PROFESSORSHIP.—Mr. F. T. Brooks, F.R.S., University Reader in Mycology, has been appointed to the Professorship of Botany in succession to Prof. A. C. Seward, F.R.S., who retires after nearly thirty years' service.

LORD WAKEHURST.—The June number of the Royal Horticultural Society's Journal contains a portrait of the late Lord Wakehurst, better known as Mr. Gerald Loder, and a short appreciation, by F. R. S. Balfour, of his work for horticulture. His garden in Sussex was especially rich in New Zealand plants. He was also much interested in Conifers, and took a keen part in the work of the Conifer Conference in 1931, during his Presidency of the Society. Botanical literature also claimed his interest, and his knowledge was of service to the Library Committee of the Linnean Society, on the Council of which he served for three periods between 1915 and 1933 (Vice-President, 1930–31). Botanists throughout the world owe him a debt of gratitude for his furtherance of the 'Index Londinensis,' the responsibility for the compilation of which was undertaken by the Royal Horticultural Society.

He was born October 25, 1861, and died at his Sussex home, Wakehurst, April 30, 1935.

WATSON BOTANICAL EXCHANGE CLUB REPORTS.—Mr. George Goode, 63 De Freville Avenue, Cambridge, will gladly send (subject to refund of postage) almost any of the Annual Reports still in stock since the 22nd (1906).

SOME MORPHOLOGICAL PROBLEMS PRESENTED BY THE FLOWER IN NYMPHAEACEAE.

BY EDITH R. SAUNDERS, F.L.S.,
Sometime Fellow of Newnham College, Cambridge.

THE Nymphaeaceae have been divided into three subfamilies, and in all three certain features in the floral morphology call for further elucidation.

i. CABOMBOIDEAE.

This subfamily includes the two genera *Cabomba* and *Brasenia*, which differ in regard to the number of stamens and carpels present, but exhibit the same exceptional features in the gynœcium, which is apocarpous—*Cabomba* K3, C3, A generally 6 sometimes 3, G3; *Brasenia* K3, C3, A12–∞, G6–18.

Cabomba.—The flower is cyclic throughout. The calyx and corolla, which are sharply differentiated, alternate in the normal manner. When only three stamens are present they also, according to Eichler (4), p. 177, follow the general rule and alternate with the petals. But when six stamens develop, their position has been variously described by different observers. Caspary (3) and Gray (5) consider that the six constitute two whorls and that they stand opposite the six perianth members. Baillon (1), p. 80, on the other hand, holds that only a single trimerous alternipetalous staminal whorl is present in all flowers and that when the number exceeds three the increase is the result of deduplication. Consequently, if all three stamens undergo deduplication three pairs result, one pair being superposed on each petal.

A study of the vascular scheme makes it clear that neither of the above interpretations of the hexamerous androecium is in accord with the facts. Transverse sections of the flower show that the midrib bundles for the two perianth whorls turn out from the central vascular cylinder on alternate radii in rapid succession. When exserted the six members are united at their edges for a short distance so that they form a shallow basin before they become disjoined. After complete reconstruction of the residual vascular cylinder the six bundles for the androecium turn outwards simultaneously on the intermediate radii and the six stamens are seen to stand in line with the junctions of the six perianth members. It is evident that the almost simultaneous emergence of the sepal and petal midribs and the union at first of these six members into a short tube have had the effect that the two whorls are treated as one in the rhythm of alternation, so that a hexamerous whorl follows on the intermediate set of radii. The apparent grouping into pairs merely follows from the fact that the petals at their base are narrower than the sepals, hence the gap between the stamens on either side of a petal is

slightly less than that between those on either side of a sepal. A further process of reconstruction in the residual cylinder is followed by the aggregation of the vascular elements into three bundles in line with the petals: these bundles become the midribs of the three carpels, which form separate ovaries. The development of the carpel members in line with as many perianth members follows naturally after a hexamerous androecium situated on the intermediate set of radii. The fact that exceptionally four ovaries are formed may be taken to indicate that the full ground-plan would consist of six ovaries in one whorl alternating with the six stamens, but that of these generally three, sometimes only two, are suppressed. Were the full number composed of two trimerous whorls, of which one was ordinarily entirely lacking, the surviving whorl would presumably be developed in line with the sepals, not with the petals as is the case.

Though originally orientated radially, the ovaries shortly become turned slightly sideways. This twisting is probably caused by the particular space relations, for the axis tissue has now come to an end; consequently, as the ovaries enlarge, there is no additional room to be gained through disappearance of central parenchyma, while there will at the same time naturally be less congestion on the sepal radii—hence the mutual pressure results in a lateral twist.

It remains to consider the unusual position of the ovules; these are generally three, but sometimes four, in number, two occurring at a lower level and one, or occasionally two, at a higher level. They spring from the ovary wall at points lying about midway between the ventral and the dorsal mid-line. The clue to this apparently anomalous disposition is to be found in the vascular scheme. The midrib bundle on entering a carpel immediately gives off a pair of laterals. These laterals diverge until they come to be separated from each other by almost as large an arc of the circumference as that which lies between each of them and the midrib. There is thus no single bundle or pair of bundles in the ventral mid-line such as characterizes the typical monocarpellary ovary. At the level of origin of the lower pair of ovules a strand is ordinarily given off from each of the lateral bundles on the side towards the midrib and runs in the ovary wall in a horizontal direction. These strands are met by two corresponding horizontal strands from the midrib. It is from these two junction points which lie between each lateral and the midrib that the two funicle bundles take their rise and that the ovules are suspended. At the higher level where, as a rule, only one ovule develops, the two laterals converge and meeting in the ventral mid-line give off the bundle for the third ovule and so come to an end. The dorsal bundle (midrib), on the other hand, continues up the length of the style to the terminal very slightly enlarged stigma. The above scheme may

be regarded as typical for *C. caroliniana* A. Gray. Strasburger observed the same arrangement in *C. aquatica* Aubl., (7) pp. 57, 58, and t. viii. fig. 90. The full scheme is not, however, invariably developed. In one of the flowers I examined anastomosis between midrib and lateral took place only on the one side, the fellow ovule on the other side being suspended from the horizontal branch of the lateral bundle alone, while Raciborski states that he found no anastomosis on either side in the material which he examined (6), p. 250.

Brasenia.—The flower differs from that of *Cabomba* in being hemicyclic, as well as in the larger number of the stamens and carpels, and also in the form of the stigma, which extends down the inner face of the style. At the level at which the ovaries begin to take shape the central parenchyma of the axis still persists and their radial orientation is not therefore disturbed by mutual pressure. Two or rarely three ovules are developed in each ovary, standing one above the other. The main vascular scheme of midrib and laterals is similar to that of *Cabomba*. Here, too, the ventral face is without vascular bundles. In the typical case both laterals give off a horizontal strand on the side towards the midrib at the level of each ovule. These strands anastomose directly with the mid-rib. The funicle bundles spring from these junction points and the ovules are thus suspended in the dorsal mid-line as noted originally by Robert Brown (2). As in *Cabomba*, however, the full vascular scheme is not always realised. Occasionally only one lateral vein gives off an anastomosing branch at either ovule level. When this is the case one lateral may connect with the lower, and the other with the upper ovule, or the same lateral may connect with both ovules.

The characteristic "sling" mode of suspension of the ovules in the Cabomboideae suggests that the conditions obtaining in this subfamily necessitate an extra strong suspensory mechanism. However this may be, the several downgrade variations in vascular development are of particular interest, since they constitute an almost complete series bridging the gap between the normal marginal placentation of the typical valve carpel and the midrib-borne solitary ovule of a pseudo-valve or semi-solid carpel. It needs but the one further step in *Brasenia*, that of failure to develop in the lowest grade the one remaining horizontal suspensory branch from one lateral bundle, to have precisely the mode of placentation characterising the Resedaceous genus *Astrocarpus*. This might well happen, for as the ovule became shifted to the line of the midrib the necessity for any secondary vascular connection would presumably no longer exist. From this point of view, the lateral bundles would indeed appear to be now superfluous. Even in the normal *Brasenia* ovary the connecting strands are not differentiated until after the ovules are already well developed.

ii. Nelumbonoideae.

Nelumbium.—The flower is acyclic with numerous tepals, indefinite stamens, and 9–17 ovaries arranged in concentric rings and sunk in the enlarged flattened termination of the floral axis. A single vascular unit which may be described as a six-strand stele enters the short stipe of each ovary. As the stipe passes into the expanded region of the ovary this stele breaks up into about six branches, which radiate in every direction and in turn branch again. Here we have the very exceptional arrangement that the palmate venation of the peltate foliage leaf is continued in the carpel, for the ovaries here as in *Cabomba* and *Brasenia* are monocarpellary. One of the bundles is situated in the dorsal mid-line and becomes the midrib. This bundle ends below the summit of the ovary in a gland on the dorsal face. No obvious gap results, however, in the ring of bundles, as small laterals take its place. The solitary ovule is "slung" by horizontal branches from two postero-lateral bundles, which, as in the Cabomboideae, are situated at some distance from the ventral mid-line, but here the intervening arc is occupied by several small veins.

The short thick style ends in a large rotate stigma, recalling that of *Berberis*, where, however, the ovary is bicarpellary. This perfectly symmetrical form, though not uncommon in the syncarpous gynœcium, is never, so far as appears, found in a monocarpellary ovary formed of a typical valve carpel. Its occurrence in *Nelumbium* is probably to be accounted for by the entirely exceptional pattern of the vascular system of the carpel, which might be described as "radiate."

iii. Nymphaeoideae.

In the gynœcium of the Nymphaeoideae, which differs from that of the two preceding subfamilies in being syncarpous and multilocular, the numerous ovules are scattered along the side walls of the loculi, the only point from which they are lacking being the ventral mid-line. This apparently anomalous distribution is related here, as in other types in which it occurs, to the unusual and characteristic venation system. Two whorls of carpels are present; both of the consolidated type, the outer sterile, the inner fertile. *Nuphar*, which has a hypogynous flower, may be taken as an illustrative type. After the organisation of the perianth and stamen bundles the residual vascular system consists of an outer ring of main bundles in the ovary wall in line with the loculi representing the sterile carpel midribs, and an inner ring of similar bundles, similarly regularly disposed at the central end of the partitions (*i. e.*, on the alternate set of radii), which give rise to a double network of veins extending throughout the partitions to supply the ovules. The whole

system in each partition represents that of a fertile carpel. As the loculi close each sterile carpel midrib divides in two. These pairs of strands turn inwards, each half of a sterile midrib picking up in its course half the remaining system of the adjacent fertile carpel. As a result, each of the stigmatic rays, which stand over the loculi, is supplied with two bundles which may be represented thus—$\frac{1}{2}\frac{1}{2}\frown\frac{1}{2}\frac{1}{2}$, the bracketed half bundles representing the two halves of one sterile carpel midrib, the unbracketed half-bundles representing one-half of the system of two different fertile carpels.

In *Nymphaea*, in which the flower is partially syngonous, the vascular ground-plan is similar to that of *Nuphar*. It may be noted that the stigmatic plate is divided above into separate arms by median splitting of the fertile carpels, such as occurs in consolidated fertile carpels in many families.

I am much indebted for the material used in these investigations to the Director of the Cambridge Botanic Garden, Professor R. B. Thomson, and Dr. L. Huskins.

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NOTES ON MALAY FLACOURTIACEAE.

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

The Malayan species of *Flacourtia* have been well monographed by Dr. van Slooten in Bull. Jard. Bot. Buit. 1905, sér. 3, vii. 291, but I have some notes and descriptions of two new species to add.

The best way of separating and of identifying the oriental species is by the form and arrangement of the styles. In *F. Rukam* Zoll. & Mort., and *F. megaphylla* Ridl., the apex of the round fruit is flat and the styles stand erect and remote like pins in a pin-cushion. In *F. inermis* Roxb. and *F. tomentella* Miq., the top of the fruit is rounded and the styles, usually 5, are stouter, rising together and recurved on the berry. (*F. inermis* Roxb. has bisexual flowers and is apparently only known in cultivation.) In *F. montana* Grah. of India the styles are similarly thick and recurved with large stigmas, but they are branched at the top, each branch bearing a single stigma. In

F. Ramontchi L'Hérit. the styles are recurved, but connate at the base, the apex of the fruit tapering into the connate portion. In *F. Helferi* Gamble, the fruit, which is very small and oblong, tapers into a connate portion with 3 or 4 free styles, recurved with apparently very minute stigmas. *F. jangomas* Gmel., better known as *F. cataphracta* Roxb., has practically no styles, but 5 stigmas radiating like a star lying flat on the rounded top of the fruit. The number of styles or stigmas varies in the same species often from three to six, but most commonly there are five.

FL. TOMENTELLA Miq. Fl. Ind. Bat., Suppl. 387 (1860). *Fl. isumatrana* Planch MS., Hook. fil. Fl. Brit. Ind. i. 192 (1875), in part.

Of this tree the only published descriptions are the short one in Miquel's work, and one in Dutch in van Slooten's Bijdr. Fl. Ned. Ind. 125. It was first collected by Marsden in Sumatra about 1783, and his specimens in Hooker's Herbarium are labelled by Planchon *F. sumatrana*. Hooker described it in the 'Flora of British India,' but unfortunately confused it with an entirely different plant from Tenasserim, meanwhile Miquel had described it under the name *F. tomentella*. As there is really no adequate description of it, I give as complete a one as I can get.

Arbor, ramis albescentibus furfuraceis superne pubescentibus. *Folia* elliptica vel oblonga obtuse acuminata, basi cordata lobis rotundatis, marginibus obtuse serratis 9–31 cm. longa, 4–10 cm. lata, superne glabra lucida, costa depressa, nervis 13-paribus superne puberulis subtus elevatis cum costa pubescentibus, nervis transversis pluribus, in utra pagina elevatis; petioli crassi dense pubescentes 5–7 mm. longi. *Flores masculi*:—*Paniculæ* axillares hirtæ, ramis 2 vel 3 brevibus, 1–1·5 cm. longæ. *Bracteæ* 1 mm. longæ ovato-rotundatæ hirtæ. *Pedicelli* graciles hirti 4 mm. longi. *Sepala* 4, ovata extus hirta 1 mm. longa. *Stamina* 14–15, filamentis gracilibus 2 mm. longis. *Flores feminei*:—*Racemi* 5 vel 6 in axilla hirti, 4 mm. longi. *Pedicelli* hirti. *Sepala* 5, rotundata extus et intus albo-hirta. *Ovarium* oblongo-ellipticum. *Styli* 5, breves crassi decurvi, stigmatibus latiusculis bilobis. Discus pulviniformis margine undulato.

Hab. SUMATRA: West Coast (*Marsden*), ♂, Hort. Bot. Calcutta (*Wallich*); 6678 *a* in herbario proprio ♀.

This species is at once distinguished by its large cordate leaves, hairy beneath. In the styles rising from the same point on the ovary and deflexed, it resembles *Fl. inermis* Roxb., which, however, has bisexual flowers and smaller leaves not cordate. The plant has been more recently collected on the west coast of Sumatra by Diepenhorst and some other Dutch botanists, but I have seen no specimens. The female tree cultivated in the Calcutta Gardens was probably sent by Marsden.

Flacourtia Helferi Gamble MS., sp. nov. *F. sumatrana* Hook. fil. *loc. cit.*; Kurz, 'Forest Flora of Burmah,' i. 74 (1877). A *Fl. tomentella* Miq. cui similis, foliis basi angustatis nec cordatis, baccis perparvis, stylis 4, stigmatibus minutis, differt.

Arbor parva glabra, ramis patentibus. *Folia* oblonga vel elliptica obtusa, basi paullo angustata vel obtusa, marginibus obtuse serratis glabra, 20–23 cm. longa, 11–11·5 cm. lata, costa superne canaliculata, nervis depressis subtus elevatis 12-paribus, nervulis transversis copiosis parallelis subtus elevatis; petioli validi rugosi 1 cm. longi. *Flores masculi* ignoti. *Flores feminei*:—*Racemi* 2–4 in axilla, hirti 4 cm. longi, ramis paucis 3 mm. longis. *Bracteæ* lanceolatæ acutæ hirtæ 1 mm. longæ. *Pedicelli* 2 mm. longi hirti. *Sepala* 5, late ovata vel orbicularia imbricata hirta. *Ovarium* conicum. *Styli* 4 lineares recurvi stigmatibus minutis. *Discus* pulviniformis integer. *Bacca* oblonga conica parva in sicca 4 mm. longa. *Semina* 6, albumine oleoso, embryone minuto.

Hab. ASSAM: Sibsagur, Naga Duli, alt. 325 ft., Sept. 5, 1912, *Upendrath Kanjilal* 1781. TENASSERIM: *Helfer* 203/1 (typus in Herb. Kew.).

Helfer's Tenasserim plant was the one referred by Hooker to his *F. sumatrana*. His description in the 'Flora of British India' is a mixture of the characters of both species, and Kurz followed him. Gamble noted the difference between the two species and made dissections and drawings of the parts of the flower, but never published them, and of these and Kanjilal's notes I have made full use. Only specimens from female trees have been obtained, and both gatherings have exactly similar fruit, which are by far the smallest fruit of a *Flacourtia* that I have ever seen. They appear to have been quite ripe, though only 5 mm. long when dry, and to have only 4 styles, but one specimen is three-angled and has only 3 styles.

Flacourtia megaphylla Ridl., sp. nov. A *F. Rukam* Zoll. & Mor. cui affinis foliis multo majoribus oblanceolatis cuspidatis, floribus dense congestis fructu multo majore, differt.

Arbor parva spinosa. *Folia* oblanceolata cuspidata, cuspide 2 cm. longo, basi angustata obtusa, marginibus obtuse serratis, glabra 20 cm. longa, 8 cm. lata, nervis 11-paribus superne conspicuis depressis, subtus validis elevatis intra marginibus inarcuantibus, petioli crassi 3 mm. longi. *Flores masculi* ignoti. *Flores feminei* in axillis racemosi, racemis brevibus 8 mm. longis congestis pubescentibus. *Pedicelli* sericeo-pubescentes 2 mm. longi. *Sepala* 4, ovata acuminata 2 mm. longa extus subglabra intus dense albo-pilosa. *Ovarium* globosum. *Styli* 5, liberi remoti erecti, stigmatibus discoideis. *Bacca* subglobosa 2 cm. crassa.

Hab. BORNEO: Sarawak, Kuching. Small tree, armed, monœcious. *Haviland* 978. (Typus in Herb. Kew.)

Fl. JANGOMAS (Lour.) Gmel. (*F. cataphracta* Roxb.) is common in the Malay Peninsula in and around villages, but I do not think I ever saw it really wild, though it can hardly be said to be cultivated. It is remarkable that, though it is actually a better eating fruit than *F. Rukam* Zoll. & Mor., it is rarely to be met with in Borneo, Java, or Sumatra, or any of the islands further east. The fruit is as large as a cherry, green, flushed more or less with dull red. However, when ripe it is extremely astringent unless it is rolled about between the palms of the hands, when it quite suddenly becomes soft, loses all astringency, and tastes like a gooseberry. The fruit of *F. Rukam* Zoll. is very similar, but when "ripened," as the village children say, is less juicy and hence less popular. Garcia da Orta, 'Historia Aromatum,' 185, mentions it as growing in fields and gardens in Bacaim (Bassim), Chaul, and Batequala (Batticolo) in Bombay and calls it Jamgomas, in a later volume, p. 300, Jangomas, a modification of the Bombay native name Jangama. He mentions rubbing it in the hands as necessary before eating, and says the seeds grow more quickly to a tree after passing through a bird. Loureiro (Fl. Cochinch. 779) adopted the native name for the plant, *Stigmarota Jangomas*, from Garcia. His specimen in the British Museum is of leaves only, but is quite characteristic, and his description of the flowers and fruit is adequate. He found it cultivated in Cochinchina ("Habitat culta in Cochinchina, puto, quodetiam agrestis"). Where this plant is wild is doubtful. It is not considered by any botanist a native of India, Cochinchina, or Malaya, but is possibly wild in Assam.

Xylosma borneense Ridl., sp. nov. A *X. fragrante* Decne, foliis lanceolatis acuminatis, bracteis et sepalis extus glabris, marginibus albo pilosis, stylo multo longiore, differt.

Arbor vel *frutex* glaber, ramis gracilibus cortice albo-griseo. *Folia* lanceolata acuminata obtusa, basi rotundata vel breviter attenuata, marginibus serratis, chartacea 6–7 cm. longa 2·3–3 cm. lata, nervis 6-paribus gracilibus basi decurrentibus, nervulis transversis irregularibus sæpe ramosis pluribus, petioli canaliculati, transversim rugosi, 5 mm. longi. *Flores* masculi 6–8 in racemo axillari 5 mm.–1 cm. longo. *Pedicelli* 2 mm. longi. *Bracteæ* ovatæ acutæ glabræ, marginibus albo-pilosis. *Sepala* 5, ovata rotundata, marginibus albo-pilosis, 1 mm. lata, basi connata. *Stamina* plurima antheris oblongis. *Flores feminei* 4–5 in racemo 4 mm. longo. *Pedicelli* graciles 5 mm. longi. *Bracteæ* ut in masculis. *Sepala* 5, ovata rotundata basi connata, marginibus albo-pilosis. *Ovarium* subglobosum. *Stylus* 1·5 mm. longus, stigmate stellato-lobato. *Bacca* globosa 4 mm. longa, stylo 1 mm. longo.

Hab. BORNEO: Sarawak, *Beccari* 1169. (Typus in Herb. Kew.)

Though the male flowers appear to be open, the stamens

form a compact head with very short filaments. They probably elongate later. It is certainly allied to *X. fragans* Decne of Timor, but is distinct in its ovate bracts, which like the sepals are glabrous, but edged with white hairs, and the comparatively long style.

Ryparosa glauca Ridl., sp. nov. A *R. Scortechinii* King cui affinis foliis rigidis subtus glaucis, racemis longioribus laxioribus, differt.

Arbor glabra. *Folia* lanceolata-oblonga acuminata acuta, basi obtusa vel rotundata, coriacea subtus glauca 33–35 cm. longa 8–13 cm. lata, nervis superne inconspicuis subtus elevatis 7–9-paribus, costa superne depressa subtus elevata nervulis transversis et reticulationibus subtus elevatis conspicuis. *Petioli* 5 cm. longi ad apices incrassati. *Racemi* e nodis in trunco orti graciles 18–30 cm. longi puberuli. *Pedicelli* 2 mm. longi puberuli. *Flores masculi*:—*Sepala* 3 ovata puberula. *Petala* 5, oblongo-lanceolata obtusa, squama dense sericeo-barbata, 2 mm. longa. *Andrœcium* 3 mm. longum, stipite costato, antheris 5. *Flores feminei* non visi. *Bacca* globosa rufo-furfuracea 2 cm. longa, pericarpio crustaceo.

Hab. BORNEO: Sarawak, *Beccari* 242, 1878; Kuching, *Haviland* 982 (typus in Herb. Kew), 2010; *Hose* 3677.

This resembles also *R. acuminata* Merrill, also of Borneo, but the branches and leaves are not hairy, though the former are somewhat furfuraceous, the nerves are more numerous, and the inflorescence is not axillary but borne on the trunk.

Ryparosa minor Ridl., sp. nov. A *R. micromera* van Slooten cui affinis planta omnino glabra, foliis ellipticis majoribus, nervis paucis, differt.

Arbor parva glabra. *Folia* elliptica acuminata acuta, basi cuneata, rigide coriacea subtus glaucescentia 8–11 cm. longa 4–5 cm. lata, costa superne depressa subtus elevata, nervis 4–5-paribus gracilibus subtus elevatis, nervulis paucis anastomosantibus, reticulationibus elevatis. *Petioli* apicibus incrassatis 1 cm. longi. *Racemi* axillares glabri 6 cm. longi. *Bracteæ* minutæ ovatæ acutæ. *Pedicelli* 1 mm. longi. *Flores* masculi. *Sepala* 4, ovata acuta. *Petala* oblonga, squama hirta, 2 mm. longa. *Andrœcium* stipite 2 mm. longo, antheris 5, in capitulo parvo.

Hab. BORNEO: Sarawak. Small tree in swampy jungle near Kuching, *Haviland* 777. (Typus in Herb. Kew.)

NEW SPECIES OF *MONOTES* FROM ANGOLA.

By Helen Bancroft, M.A., D.Sc.

THE following new species of *Monotes* (Dipterocarpaceae-Monotoideae) has recently been distinguished amongst material sent from Angola to the Berlin Botanical Museum by the Baroness Nolde.

Monotes Noldeae Bancroft, sp. nov. *Arbor* magna, capite laxo rotundato, cortice griseo fissuris anguste sulcato; rami nodosi; ramuli brunnei tenuiter striati, ad basin interdum tumescentes. *Folia* griseo-viridia; lamina elliptica ad obovata, 5–8·8 cm. longa, 1·9–4·9 cm. lata, apice rotundata truncata vel leviter emarginata, basi plerumque rotundata nonnumquam leviter cuneata vel cordata glandulam planam nigram anguste ellipticam ferens, in pagina superiore areolata nitente pilis resiniferis et reliquiis sparsis pilorum simplicum instructa, subtus in venis et in maculis retis venarum pilis tenuibus breviter et sat dense pubescens, hic tamen in costa atque in nervis lateralibus fere glabra; costa cum nervis lateralibus supra impressa, subtus prominens; nervi laterales utrinque 10–13, marginem fere attingentes, juxta marginem interdum furcati; nervi laterales minus validi nonnumquam inter nervos principes adsunt; petiolus plerumque 1·4–1·7 cm. longus, breviter et sat dense pubescens, teres vel leviter canaliculatus. *Inflorescentia* parva axillaris paniculata, 2–4 cm. longa. *Sepala* circiter 0·2 cm. longa, dense pubescentia, sub fructu accrescentia et coccinea. *Petala* flavido-viridia vel rubescentia, circiter 0·8 cm. longa, intus infra in medio linea verticali pilosa munita. *Discus* aurantiacus.

Hab. ANGOLA: Huila, from dry savannah woodland, *I. Nolde* 202 (Herb. Berlin, type), flowering in February 1934, young fruits in April 1933; not common; native name *m'Būlı*.

A specimen from Malange (Kela: near the R. Lui), *Gossweiler* 9520 (Hb. Mus. Brit.), flowering on Jan. 28th, 1931, has smaller leaves than *I. Nolde* 202, but the lamina has the same shape and proportions, and the petiole-length and lateral vein-number are the same as in that type; there is less indumentum on the under surface of the leaf, but it is of the same kind as in *Nolde* 202, and there seems to be no reason why the two specimens should not be referred to the same species.

At first sight these specimens suggest similarity to *Monotes africanus* (Welw.) A. DC., and the characters are to some extent intermediate between those of *M. africanus* and *M. angolensis* De Wild. In having a glabrous upper surface in the mature leaf, and a practically glabrous midrib and lateral veins, with indumentum elsewhere, on the lower surface, *Monotes Noldeae* is near to *M. loandensis* Exell, from which it differs in proportions and shape of the leaf-lamina, and in the relation between petiole-length and lateral vein-number. *M. Noldeae* is also very similar in general characters to *M. Engleri* Gilg (*Engler* 3859, from Umtali, Mashonaland: Rhodesia); this species, however, is distinct in having a considerable amount of indumentum over the midrib and lateral veins on the lower leaf-surface.

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NEW SPECIES OF *ZOSTERA* FROM BRITAIN.

BY T. G. TUTIN, M.A.

THE new species of *Zostera* described here was noticed in the course of an investigation of the disease which during the last few years has been causing great destruction to *Zostera marina* L. on the Atlantic coasts of Europe and America. The investigation has been carried on during the last two years at the Marine Biological Laboratory, Plymouth, and this has given abundant opportunity for examining the plant in several localities at all times of the year. This examination in the field has made it quite clear that the plant always maintains its distinctive characters and is not merely a habitat form of *Z. marina*. This has also been confirmed by cultivation of the species in the laboratory.

My thanks are due to the Marine Biological Association for providing facilities for the work, and to Mr. E. T. Browne, The Royal Society, and the Development Commission for grants which have made it possible. I should also like to thank the Keeper of Botany at the British Museum and Messrs. E. F. Warburg and A. J. Wilmott for help.

An account of the work on the disease and autecology of *Z. marina* will appear shortly.

Zostera (*Alega*) **Hornemanniana** Tutin, sp. nov.—A *Z. marina* L. foliis angustioribus apice obtuso rotundato vel emarginato, nervis primariis tribus et marginalibus duobus, inflorescentiis et floribus multo minoribus, marginibus scariosis spathæ latioribus, stylo stigmate bis longiore, non stigmati æquante, seminibus minoribus differt.

Herba perennis. *Rhizoma* tenue, repens plus minusve reliquiis fibrosis vaginarum folium vestitum, ad nodos nigros paulum inflatos radicans, fasciculi vasculares duo, fasciculi fibrarum in stratis extremis corticis positi. *Folia* caulium sterilium fasciculata statu æstivo 15–30 cm. longa, 2 mm. lata, statu hiemale 5–12 cm. longa, linearia apice obtusa et rotundata statu juvenile, demum emarginata, in sectione transverso oblongo fasciculis vascularibus primariis tribus et marginalibus duobus prædita; vaginæ clausæ satis crassæ membranaceæ 4–7 cm. longæ; ligula c. 1·5 cm. longa, 1·5 mm. lata, apice acuta vel lacerata, margine basin versus cum vagina plus minusve conjuncta. Folia caulium fertilium 4–15 cm. longa, 2–3 mm. lata, vaginis 2–4 cm. longis, ceterum foliis caulium sterilium similia. *Caules floriferi* 10–30 cm. alti, compressi c. 1 mm. lati, pallide virides vel albi, ramosissimi; inflorescentia ex axilla folii, lamina caduca et vagina persistente prædita eveniens, pedunculo c. 0·5–2·5 cm. longo plano marginibus membranaceis, basi 1 mm. lato sub spatha 2 mm. lato. *Spatha* 8–11 cm. longa, viridis 2–3 mm. lata,

marginibus membranaceis 1·5–2 mm. latis, sub anthesi e spadice exstans, in lamina 5–8 cm. longa post anthesin sæpe caduca terminans. *Spadix* 2·5–3·5 cm. longa, c. 2 mm. lata, c. 12-flora; retinaculæ desunt; ovarium 2 mm. longum, stylo et stigmate 3 mm. longo, antheris 4 mm. longis, 1 mm. diametro, sessilibus. *Semina* 2·5 mm. longa ellipsoidea pallide brunnea, testa longitudinaliter costata.

Typus in Herb. Kew.: Trevol Rifle-range, estuary of the river Tamar, East Cornwall. On rather soft mud about half-tide mark, growing with *Z. nana* Roth, *T. G. Tutin*, July 1934. Same locality, April 1934, summer leaves, not flowering; and March 1934, winter condition.

Distribution.—Apparently fairly common round the British Isles and the coasts of Western Europe. The following list of British localities is obtained from the specimens in the Cambridge University Herbarium, for the loan of which I should like to thank Prof. A. C. Seward.

Scotland: *Sutherland*, Loch Fleet, near Golspie, *W. A. Shoolbred*, August 1897. Kyle of Tongue, *E. S. Marshall*, July 1900. *Orkney*, Finistown, *R. J. Burdon*, August 1920. Oyce, Firth, *H. H. Johnston*, September 1880. *Forfar*, Montrose Basin, *W. Gardiner*, 1841. *Ross and Cromarty*, Dingwall (no collector), August 1871. Tain Beach, ex Herb. *Syme*, August 1842. *Ayrshire*, Largs, September 1860. *Haddingtonshire*, Aberlady Bay, *McTaggart Cowan, Junr.*, August 1910. *Inverness*, Beauly Firth, *E. S. Marshall*, September 1910.

England: *Northumberland*, Berwick, 1850. *Suffolk*, no other locality, *J. S. Henslow*, no date. *Hampshire*, north side of Hayling Island; "in plenty with *Z. marina* and *Z. nana*," *E. S. Marshall*, September 1900. Lymington; "*Z. nana* large form," *W. R. Linton*, July 1893. *Devon*, Dawlish Warren, *S. H. Bickham*, September 1902 (in part). *Cornwall*, St. John's Lake, River Tamar, *C. J. Waterfall*, September 1878. I have also seen it at Salcombe and in the River Yealm in Devon, and in Dorset in the Fleet from Portland to Seventeen Acres Pier.

The present species may be distinguished in the field without much difficulty, except in the winter condition, when it closely resembles *Z. nana*. With herbarium material, even when flowering, difficulty is sometimes found in separating it from some forms of *Z. marina*. It is usually very difficult, or impossible, to see the styles and stigmas or to measure the length of the seed in dried material, and *Z. marina* sometimes has very narrow and occasionally slightly notched leaves on the flowering shoots, so, when the basal leaves are missing, as is often the case, it is difficult to be certain about the identification. These forms of *Z. marina*, however, usually have more woody and much longer peduncles, and the leaves and leafy terminations of the spathes are shorter in proportion to their length than in *Z. Hornemanniana*. In

Z. marina the ovary is 3·5–4 mm. long, the style and stigmas 5–6 mm. long, and the anthers 5 mm. long and 1·5 mm. in diameter, while in *Z. Hornemanniana* the ovary is 2 mm. long, the style and stigmas 3 mm. long, and the anthers 4 mm. long and 1 mm. in diameter. The seed is about 1 mm. shorter than in *Z. marina* and has fewer ribs.

Z. Hornemanniana occurs in a wider range of habitats than either of the other two British species. It does not tolerate quite as much exposure to wave action as *Z. marina* does, but it grows from half-tide mark down to 1–2 fathoms (about 2–4 m.), while *Z. nana* never grows permanently submerged, and *Z. marina* does not occur much above low-tide mark. It occurs in water of salinity varying between 25 and 42 gms. of dissolved salts per litre, while the other two British species have been found only in salinities between 20 and 35 gms. per litre.

In cultivation it keeps its distinctive leaf-characters, while the narrow-leaved forms of *Z. marina* in cultivation produce leaves similar to those of normal *Z. marina* under similar conditions. Attempts have been made to transplant *Z. marina* to beds of *Z. Hornemanniana*, but in each case the transplants have died, presumably owing to the conditions not being suitable for the growth of the former.

The British species of *Zostera* are protogynous, the female flowers maturing from one to three days before the male; in *Z. marina* the anthers fall as soon as the pollen is shed, while in *Z. Hornemanniana* and *Z. nana* they usually persist for some days after dehiscence. They dehisce longitudinally down the middle of their outer surface by disintegration of the cells in this neighbourhood, and are reflexed on the spadix so that they appear to be attached to it by their apex. The flowers mature in regular succession from the bottom of the spadix upwards, but the seeds ripen in a very irregular manner and there is often an interval of a week or two between the ripening of the first and the last seed on the same spadix.

Z. Hornemanniana is probably the same as the plant described by Hornemann as *Z. marina* var. *angustifolia*, but the type of this variety does not seem to exist and it is not possible to identify Hornemann's figure (1) with certainty. A specimen collected by Hornemann which was obtained on loan from Copenhagen can be regarded as an authentic specimen of this variety, but it is not in sufficiently good condition to be determined with absolute certainty.

Z. marina var. *stenophylla* Asch. & Graebn. (2 & 3) is definitely not the same as *Z. marina* var *angustifolia* Hornem., and is apparently a habitat form of *Z. marina* (4).

The chromosome number of *Z. Hornemanniana* is 12, which is the same as *Z. marina* and *Z. nana* (5). The chromosomes are small and very similar to those of *Z. marina*. The chromosomes

of *Z. nana* are considerably larger, so there can be no question of the present species having a hybrid origin.

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NEW LIGHT ON A *PENTANDRA* HYBRID WILLOW.

BY W. A. P. SPROTT.

×*Salix Meyeriana* Rostkov. in Willd. Berl. Baumz. ed. 2, 427 (1811). *S. cuspidata* Schultz, Prodr. Fl. Starg., Suppl. 47 (1819); Buchanan White, "Revision," Journ. Linn. Soc., Bot. xxvii. (1890). *Salix fragilis*×*pentandra* E. F. Linton, "The British Willows" in Journ. Bot. li., Suppl. p. 15 (1913).

This hybrid has been known by several different names when described by Buchanan White and British salicologists of recent years, but in conformity with the general practice of giving a plant its oldest valid name I revert in this paper to the original title—×*S. Meyeriana* Rostk. (*S. fragilis*×*pentandra*).

Without doubt, this is one of the most magnificent willows found in the British Isles, and it is surprising that such a large handsome tree should have escaped notice for so long. Dr. Buchanan White wrote (1889): "In Britain this hybrid has been either overlooked or is very rare, being confined to Shropshire." This opinion seems to have been shared by other botanists both before and after this date. Boswell-Syme (1873) mentions a Shropshire station, and Linton at a later date (1913) says: "Peaty districts, Salop, Cheshire."

Thus, right up to the present time, this showy hybrid has been thought of as the peculiar property of these western counties. Odd trees were seen in other counties, it is true, but these were usually found in private plantations or gardens and were obviously planted for their ornamental value. The late Mr. John Fraser told me that he himself grew a small tree of *S. Meyeriana* in his own garden from a "slip" taken from a tree similarly planted in Surrey. Like former salicologists he had no knowledge of the hybrid, ×*S. Meyeriana*, growing in the wild state other than in Shropshire and nearby districts.

A number of botanists were doubtful of this hybrid being truly native in its English localities, but Buchanan White pointed out that since *S. pentandra* L. is admitted to be native as far south

as Worcestershire, and since both it and *S. fragilis* L., the parents, occurred in Shropshire, there could be no valid reason for doubting the possibility (indeed, probability) of it being wild in that district. I think there is little doubt that this theory was generally accepted by contemporary salicologists as the most probable one. The only point which might introduce an element of doubt is the fact that all the Shropshire hybrids seen by Dr. Buchanan White or his local helper, Mr. W. Phillips, were female. But this phenomenon is not necessarily without solution, and in no way proves that the willow has been propagated asexually.

In 1934 I established proof of the presence of ×*S. Meyeriana* in the Eden valley, North Westmorland. My own identification was confirmed by Mr. Fraser. The hybrid can be seen at numerous points along the main road between Brough and Penrith, and is widespread throughout the Westmorland portion of the upper Eden basin. It may be found at intervals along the Eden from its junction with the River Eamont in the north to Kirkby Stephen and Brough in the south. It extends for several miles up most of the tributary streams and is seldon found far from water. At a rough estimate I should say it occurs most abundantly over an area of not less than 60 square miles. How C. E. Salmon and A. Ley, both keen salicologists, can have failed to see this willow when they worked this part of the country is most surprising. They must have passed through the ×*S. Meyeriana* belt on several occasions. Linton records their discovery of the rare hybrid *S. alba*×*pentandra* in this district, but I have been unable to find it.

The most remarkable and interesting feature of the Westmorland ×*S. Meyeriana* is that, apparently, male trees only occur. I have travelled all over the area, examining many hundreds of trees, without finding a single female tree. Mr. Phillips found that the female Shropshire tree was readily confused with *S. pentandra*. In the Eden valley there can be no confusion, for the tree is absolutely distinctive; usually 25 ft. in height with great breadth of crown—a pleasant contrast to the pollarded willows of southern counties.

In Westmorland, as in Shropshire, the parent trees (viz., *S. pentandra* and *S. fragilis*) are both quite common. Surely, I may claim, as did Dr. Buchanan White, *re* the Shropshire tree, that there is no valid reason for assuming that the Westmorland hybrid is other than native.

It is a natural habit of many salicologists to dismiss the claim of any little-known hybrid as "not native," its distribution being attributed to the old-fashioned methods of propagation employed when a willow holt was found in or near every village or hamlet, in the days when the willow was an important factor in our domestic life. In the upper Eden valley, which is as sparsely populated to-day as it was three hundred years ago, the people

have always been engaged in agriculture, but lesser subsidiary industries undoubtedly employed a considerable part of the population in charcoal-burning, in the manufacture of bricks, pottery, and lime, for both building and agricultural use. There were flour-mills, "bobbin" mills, and a host of other local industries, including, last but not least, basket-making. For this latter trade suitable willows were grown, and I believe the two most commonly cultivated for this purpose were *S. viminalis* and *S. purpurea*—the former being the osier *par excellence* of the basket trade, chosen for the pliability and toughness of its branches. I speak from my personal observation of an old basket-maker who still practised this craft when I was a youngster. These old village craftsmen were not likely to cultivate ×*S. Meyeriana*, for the branches snap too readily and, like *S. fragilis*, would be worthless for this purpose. Since ×*S. Meyeriana* was, apparently, of little commercial value, it seems unlikely that it would be artificially propagated over such an extensive area. For this reason, also, we may, perhaps claim it as a native.

Wimmer expressed the view that the leaves of ×*S. Meyeriana* can scarcely be distinguished from those of *S. pentandra* and Buchanan White seems to accept this view without question. No doubt, this is true of continental hybrids and likewise of the female Shropshire tree, but such a description in no way fits the male Westmorland willow. I must, therefore, deal with the sexes as if they belonged to different species in order to escape confusion.

♂×*S. Meyeriana* Rostkov. (North Westmorland).—A large shrub or tree, up to 25 feet high, with roughish bark on trunk; branches spreading-ascending forming broad distinctive crown, lower limbs fragile and forming a wide angle with main trunk. Branches, if cut back, very long and slightly brittle, with shining brown bark; twigs quite glabrous. Buds oval, glabrous. Stipules half round or half cordate-acuminate, obliquely pointed. Petioles short. Leaf-blades from 2–4 inches long, oblong-lanceolate, finely attenuate to a point, cuneate at base, finely serrate, glabrous, but not glutinous as in *S. pentandra* and only slightly fragrant. Leaves shining green above, pale green with darker reticulations underneath. Catkins shortly stalked, intermediate in size, coeval with leaves or later. Flowers May, intermediate between flowering periods of *S. fragilis* and *S. pentandra*. Bracts obovate-oblong, rounded above, soon deciduous, with few hairs and yellowish colour; stamens 4–5, dense; anthers deep yellow and stouter than in *S. pentandra*; filaments of varying length (usually 3 equal, and 2 shorter); hairy at base. I have never found a specimen with less than 4 stamens.

The above features are remarkably constant, and I have not noticed any variation in the leaf-breadth, which is so inconstant in *S. pentandra*—particularly where there is a varying depth of peaty soil. The leaf of the Westmorland ♂ *S. Meyeriana* is much narrower than in *S. pentandra* and finer in texture. The long attenuate leaf-point is a great help in identification. Flower not so compact as in the former, yet not so lax as in *S. fragilis*. Bracts less hairy than in latter.

Since the ♂ *S. pentandra* predominates in North Westmorland in the ratio of about 10:1 it seems likely that our northern hybrid is the product of a cross between ♂ *S. pentandra* and ♀ *S. fragilis*. The resultant ♂ *S. Meyeriana* appears to possess a dominant strain of the seed-bearing parent. That the seed-bearer should transmit to the offspring a preponderance of its own characters is suggestive in the Shropshire hybrid also, although the seed-bearing parent in this case seems to be ♀ *S. pentandra*. But this point may be of no great importance.

However, we are faced with the uncommon situation of two willows which bear little resemblance to each other, yet are, in effect, one and the same in name. I understand that, although both parents of a hybrid may have been the seed-bearer, the resultant hybrid must bear the same name. Generally speaking, this method seems satisfactory, but, as I have attempted to demonstrate, it cannot be considered altogether fitting in the case of ×*S. Meyeriana*.

♀ *S. Meyeriana* Rostkov. (Shropshire).—As I have not yet received specimens from the western counties, I must describe this hybrid (*i. e.*, the ♀ form) from data collected by a number of salicologists.

Just as Wimmer showed that the leaves of the continental hybrid and *S. pentandra* were almost indistinguishable, so the same thing was observed in Shropshire by Phillips and Buchanan White. In fact, in many places, including the Rea Brook, the trees were very similar in appearance. It appears that some distinction is afforded by comparison of the ♀ catkins, though Wimmer proved that this was inconstant and seemingly valueless. However, in other parts of the district, the hybrid was found to attain a height of 25 feet and was more easily distinguished. The intermediate flowering period was also a guide. I have yet to learn if the female tree reaches the same height as the male (under favourable circumstances). As regards the female characters, Linton says:—"Ovaries conic glabrous, stigmas rather large, style stout, not long; pedicels 2–4 times as long as the short nectaries."

Unfortunately, the famous salicologists paid little attention to the hybrids of *S. pentandra*, but it is to be hoped that further information will soon be forthcoming to complete this chapter of the British Salices.

NOTE.—There is in the British Museum Herbarium (in Herb. Linton) a male specimen of the hybrid collected in 1896 by Praeger at Kilcullen, Kildare.—ED., Journ. Bot.

CORNISH BRYOPHYTA.

By F. Rilstone.

In the following notes, concerning moss and hepatic records since the publication of a previous list in this Journal for 1926, the numbers (1) and (2) refer to the vice-counties (West Cornwall 1 and East Cornwall 2) into which Cornwall is divided for botanical purposes. New v.c. records are indicated by an asterisk. Unless otherwise indicated, the specimens were collected by the writer.

Mosses.

**Cynodontium Bruntoni* B. & S. Rock crevices, summit of a tor near Morvah (1), J. B. Duncan.

Dichodontium pellucidum Schimp. Near Brown Willy (2).

Dicranum scoparium Hedw. var. *spadiceum* Boul. Brown Willy (2).

Fissidens serrulatus Brid. Gatherings from near Penzance (1) in 1928 by Messrs. H. H. Knight, J. B. Duncan, and D. A. Jones were recorded in the Report of the British Bryological Society for that year.

F. polyphyllus Wils. Specimens were distributed through the British Bryological Society from Trevaylor near Penzance (1) in 1924 by Mr. P. W. M. Richards and from Dozmary Pool (2) in 1921 by Mr. D. Billing.

**Grimmia Stirtoni* Schimp. The Island, St. Ives, July 1926, Rev. C. H. Binstead. New to Cornwall.

Rhacomitrium canescens Brid. Polgoda Down, Perranzabuloe (1).

Pottia caespitosa C. Müll. Perranporth sand dunes. In plenty in May 1931 over a rather stony piece of ground (swept almost clear of sand by the wind) not far from St. Piran's Oratory. I have not been able to find it there since, and I understand that Mr. W. E. Nicholson finds the species similarly fugitive in Sussex. New to Cornwall.

Barbula vinealis Brid. Perranporth sand dunes (1), May 1935, D. A. Jones.

**B. gracilis* Schwaeg. Perranporth sand dunes (1), May 1935, H. H. Knight. New to Cornwall.

B. Hornschuchiana Schultz. Waste ground, Perranporth (1).

Leptodontium flexifolium Hampe. St. Cleer (2), R. W. Smitham.

**Weisia viridula* Hedw. var. *densifolia* B. & S. Tufts of this plant are conspicuous on the low walls along the "New Road" across the marsh from Perranporth to Bolingey (1). Mr. D. A. Jones agrees to the naming.

**Encalypta streptocarpa* Hedw. By path to disused mine from the old Toll Gate, Rose, Perranporth (1).

Bryum pendulum Schimp. A small form in Perran sand dunes near St. Piran's Oratory (1), J. B. Duncan, H. H. Knight, and D. A. Jones.

Eurhynchium circinatum B. & S. Marazion (1), 1921, L. H. Pegler.

Brachythecium salebrosum B. & S. var. *palustre* Schimp. Wet places in Perranporth sand dunes (1), D. A. Jones.

Hypnum cupressiforme L.

Var. *resupinatum* Schimp. Very common on tree-trunks and branches and on stones. Fruit is often freely produced, especially on low horizontally spreading branches of oak, willow, and hazel.

Var. *filiforme* Brid. Rather common on trees.

Var. *ericetorum* B. & S. Usually abundant on heathy ground; the fruit with the characteristic long slender setæ is fairly common.

Var. *tectorum* Brid. Very common on walls and rocks and on sand dunes.

Var. *elatum* B. & S. Occurs plentifully in closely packed, more or less level sheets among the sand dunes near Perranporth, especially in the neighbourhood of the ancient oratory of St. Piran and eastward to Mount.

Hepatics.

Aneura sinuata (Dicks.) Dum. var. *major* (Lindb.). Polgoda Downs, Perranzabuloe (1).

**Fossombronia angulosa* (Dicks.) Raddi. Wet rocks, Boscastle Harbour (2), H. H. Knight and J. B. Duncan.

**Alicularia compressa* (Hook.) Nees. Wet rocks by Boscastle Harbour (2), H. H. Knight and J. B. Duncan.

**Lophozia porphyroleuca* (Nees) Schiffn. A plant which Mr. D. A. Jones and Mr. W. E. Nicholson agree is very probably this species occurs on Brown Willy (2). New to Cornwall: there are no records for the south-western peninsula, but it occurs in Wales.

**L. alpestris* (Schleich.) Evans. On rocky slopes by the railway station, Liskeard (2). Mr. Jones agrees and Mr. Nicholson's comment is, "Probably right, but it is not a very marked form." New to Cornwall; the nearest recorded station is in Brecon.

**Sphenolobus minutus* (Crantz) Steph. Kilmar Tor (2). New to Cornwall.

**Leptoscyphus anomalus* (Hook.) Mitt. Brown Willy (2). New to Cornwall.

**Chiloscyphus pallescens* (Ehrh.) Dum. Wet rocks by Boscastle Harbour (2), May 1930, H. H. Knight and J. B. Duncan. New to Cornwall.

Calypogeia fissa (L.) Raddi. Besides growing in tufts on wet peaty banks and ditch sides this species is of widespread occurrence as scattered stems among Sphagna. Under such circumstances the stems are drawn out and the leaves more distant and more longly decurrent.

C. arguta Nees & Mont. A common plant of shaded loamy banks, where the leafy stems, closely pressed to the soil, are usually inconspicuous, but the eye is readily caught by the numerous erect gemmiferous branches with clusters of yellowish gemmæ at the top.

Lejeunea planiuscula Buch, emend. On rocks and stones at Lambriggan, Perranzabuloe (1), and on stones in hedge-banks of shady lanes, and on rocks and stone walls near the sea, Polperro (2). The stems are usually yellowish green and adhere closely to the rock. Mr. W. E. Nicholson kindly determined the Polperro plants.

Frullania germana Tayl. In a list of Cornish Mosses and Hepatics printed in this Journal for 1926 (p. 183) I included *F. germana* on the strength of a specimen in my herbarium gathered at Zennor (1) by the late Ll. J. Cocks. In view of the fact that Mr. W. E. Nicholson had found William Curnow's Penzance gatherings so named to be *Frullania Tamarisci* (L.) Dum. var. *Schiffneri* W. E. N., I re-examined the specimen. As I still considered it to be *F. germana* I submitted it to Mr. Nicholson, who agreed to the name. Zennor is at present therefore the only certain Cornish locality for this species.

**F. Tamarisci* (L.) Dum. var. *Schiffneri* W. E. Nicholson. On rocks in hillside in the valley and on rocks by the sea, Polperro (2). Det. W. E. Nicholson.

SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

Forty-first Annual Congress.

The Annual Congress of the Union was held at Oxford from June 30 to July 4th, under the presidency of Prof. G. D. Hale Carpenter, Hope Professor of Zoology in the University. About 200 members attended, most of whom were accommodated at St Peter's Hall, a recent addition to the Colleges of the University. Rhodes House afforded commodious and attractive headquarters,

The members were welcomed on the first evening by the pro-Vice Chancellor, the Warden of Wadham, after which the President gave his address entitled " Charles Darwin and Entomology." His thesis was that the coloration of insects and the various manifestations of mimicry find a rational explanation only in the theory of natural selection.

Mr. A. J. Wilmott presided over the botanical section, and his address was an interesting exposition of endemism in the British flora. He combatted the former idea of complete extinction of the original flora by glaciation, and associated various types of endemics with successive glacial periods in which specially favoured localities remained as homes of refuge for some species. Mr. A. R. Clapham described the ecology of the three districts which had been selected by Prof. A. G. Tansley for the afternoon botanical excursions, which were carried out under the guidance of himself and Mr. H. Baker. In the excursion to Aston Hill we ascended from poor chalk grassland to a shallow dry soil with dense thickets of juniper protecting seedlings of white-beam, yew, and beech; in open ground patches of *Iberis amara* were conspicuous; further up the pioneer trees were seen overgrowing and killing out the juniper, and still higher giving place to beech-wood of longer standing with a characteristic ground flora of sanicle, dwarf rosette herbs, *Asperula*, and Orchids—*Neottia*, *Cephalanthera*, and *Epipactis*. On the plateau at the top was luxuriant beech-wood with a ground-flora dominated by *Rubus*, with *Stachys sylvatica*, *Veronica montana*, and the male and lady ferns.

The excursion to the Ruskin Reserve at Cothill provided an interesting study of calcareous marsh, fen, and aquatics, and the gradual colonisation of the ponds from the surrounding scrub.

An excursion by motor-launch on the Thames to Hagley Pool gave opportunity for a study of the flora of the riverside meadows.

At the business meeting of the section Dr. Rendle reported the completion of the 'Flora of Sussex' by Lt.-Col. Wolley-Dod, and expressed the hope that funds would be available for its publication in time for the Hastings Congress next year.

Evenings were occupied by a pleasant informal reception by the President and Mrs. Hale Carpenter at Rhodes House, a reception by the Mayor of Abingdon at the ancient Guildhall, and a public lecture at Rhodes House by Dr. F. W. Edwards on his visit to Mt. Ruwenzori, illustrated by excellent lantern-slides.

The addition of an extra day allowed of visits under expert guidance to Colleges, the Bodleian Library, Museum of the History of Science, and other places of interest. A pleasant hour was spent at Wadham, at the invitation of the Warden; the gardens contain some very fine trees, including a glorious copper beech and a great tulip-tree—a beautiful sight in full flower.

The Congress closed with the Representatives' Meeting, at which Prof. F. E. Weiss, F.R.S., ex-President of the Linnean Society, was elected President for the Hastings Congress in 1937. The resignation of the Hon. General Secretary, Mr. Edward A. Martin, F.G.S., after twelve years of service, was accepted with much regret. Mr. W. C. Fishlock, of Reading, was elected in his place.

The local arrangements for the meeting were admirably carried out by the Oxford Executive Committee, with Prof. Hale Carpenter as Chairman and Mr. P. S. Spokes as a most efficient Hon. Secretary.—A. B. RENDLE.

BOTANICAL SOCIETY OF EDINBURGH.

CENTENARY MEETING.

DELEGATES from a number of universities, scientific societies, and institutions of this country and abroad attended the Centenary Meeting of the Botanical Society of Edinburgh held on July 1st. Messages of congratulation were received from many kindred societies, and about thirty delegates attended to present their addresses to the President of the Society, Sir William Wright Smith.

In his oration Emeritus Professor F. O. Bower outlined the progress of the Science of Botany during the past century. The period when the Society was founded was pre-protoplasmic, and it was not until 1846 that the word "protoplasm" was introduced by Von Mohl to connote "that viscid fluid of white colour .... which occupies the cell-cavity." The protoplast with its nucleus had not been recognised as the physical basis of life and heredity. Purely descriptive Botany, enriched by the large collections of the golden age of travel, was passing from artificial methods of classification into a gradually moulded Natural System. The year 1836 was also pre-evolutionary. The prescience of Darwin and Hooker, combined with the vision of Wallace, was opening the question of the mutability of species as against their fixed origin of special creation. Anatomy, Physiology and Classification all gained new aspects under the theory of Evolution. Morphology became the most arresting topic, and as the century progressed its scope widened from a mere study of external form and constitution of the adult shoot and the construction of the mature flower. During the middle of the nineteenth century a period of tracing "life-histories" set in, with Hofmeister as its greatest exponent, leading to the discovery of alternating sexual and neutral phases. The second half of the century in the history of the Society had witnessed the advance of Botany along many divergent branches of specialisation, which, though cognate, were often pursued with a dangerous exclusiveness. The individual specialist was apt to miss the wider aspects of the science, specific details of which he pursued. It was there that a Society like theirs might take an increasingly valuable part in these modern days of high specialisation, and of interests localised, but divergent. It would naturally welcome into its Proceedings all branches of the science upon an equal footing.

The afternoon was devoted to a visit to the Royal Botanic Garden, where the splendid collection of plants was greatly admired. An exhibit of botanical specimens, photographs, and historical objects, including the minute book containing the names of the original twenty-one members of the Botanical Society, was arranged in the laboratory.

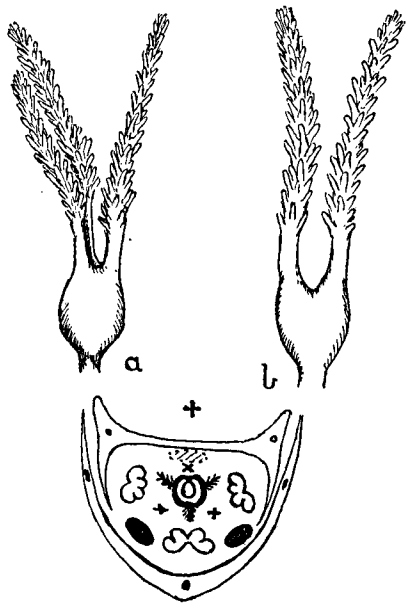
In the evening the delegates, members of the Society, and their friends were entertained at a civic reception in the City Chambers.—G. TAYLOR.

SHORT NOTES.

A GRASS FLOWER WITH THREE STYLES.—It is generally conceded that the most probable interpretation of the grass flower is to regard it as derived by suppression from the normal monocotyledonous type of trimerous organisation. On this view those species of the *Bambuseae* which have three lodicules, six stamens, and three stigmas, are to be regarded as florally primitive, however specialized they may be in other respects. The ovary with three stigmas is characteristic of some genera (e. g. *Phyllostachys*), but in other genera the number of stigmas varies between two and three. Furthermore, outside the *Bambuseae* three stigmas are met with, as in *Pharus* and *Streptochaete*, belonging to the *Oryzeae*. Though the vast majority of grasses have two styles or stigmas and occasionally, as in *Nardus*, only one, it is not unreasonable to suppose this to be due to reduction or, as in the single style of *Zea*, to fusion. It is, however, rather remarkable that the two styles of the majority of the groups should be so constant a feature and that anything in the nature of reversions should be so rare.

When dissecting some flowers of *Briza media* the lowest flower on one side of a spikelet was found to have an ovary bearing three styles in place of the usual two. As will be seen from the figure (*a*), one of these three, which is anterior in position, is smaller than the other two. The remaining flowers in the same spikelet as also a number of other flowers from the same inflorescence, which were also dissected, showed a perfectly normal structure (*b*). An interesting fact about this occurrence is that Penzig ('Teratologie,' ii. 470) records the phenomenon, also in *Briza media*, which suggests it is a variation to which this species

is more especially prone. The same author also (p. 464) records the occurrence of three stigmas in *Hierochloe*. Despite these



Briza media L. *a*, ovary with three stigmas ; *b*, normal ovary. Below, diagram of flower with three stigmas.

previous records the phenomenon would seem to be of sufficient rarity and interest to warrant the present note.—E. J. SALISBURY.

BROMUS MADRITENSIS L.—During the last two years this interesting and sometimes beautiful grass has increased enormously on Clifton and Durdham Downs, Bristol. Its normal habitat is " on banks and rocky slopes near the Avon below Bristol. Only upon Carboniferous Limestone ; very local but quite abundant " (White, ' Flora of Bristol,' 1912).

In June 1935, a new and large colony appeared at the edge of the Avon Gorge. This year, 1936, the colony covers at least a quarter acre, and as densely as in 1935. Recently I observed other considerable patches away from rock, and in bushy places near the top of the Gorge. Many small bushy places were palpably surrounded with it. Formerly I had only on rare occasions seen this species except on the actual limestone rock or on steep broken ground. At the junction of three roads by " the Fountain," Clifton, it grows in profusion with *B. sterilis*, *B. commutatus*, and some *B. erectus*, but no hybrid seemed present.

It is just possible the dry spring and summer of recent years have caused the plant to seek cooler and more sheltered ground. On these bushier and flatter places it is natural that the plants remain green, and very few get tinged with purple-red as they often do on rocky open declivities. On the Somerset side of the Avon this grass is, and probably always was, far less common. Once, in June 1929, I saw it in quantity on the border of allotment ground at Ashton Gate on the Somerset side of the Avon. It still grows " at the foot of riverside quarries as far as [and in 1936 further than] Cooks Folly," on the Gloucestershire side of the river.

Though this species is recorded from some fifteen southern and western counties of England and Wales, I do not remember ever seeing it outside the Bristol area ; nor, I think, in southern France or Italy. In Ireland " there is reason to suspect that it has been introduced " (Cyb. Hibern. ed. 2, 1898).

Perhaps the easiest place to see *B. madritensis* in the Bristol district is the rocky north bank of the main road from Clifton Down Hotel to the Suspension Bridge, where it persists—green and delicate in the shade of bushes and small trees, purple and erect in the sunlit areas.—H. S. THOMPSON.

REVIEWS.

Engler's Syllabus der Pflanzenfamilien. Edition 11. Edited by Dr. LUDWIG DIELS. 8vo, pp. 419, text-figs. 476. Borntraeger : Berlin, 1936. Price 16 R.M.

THIS is the first edition of the late Dr. Engler's monumental work to be issued since the death of the author. The previous edition (9–10), in which Dr. Ernst Gilg collaborated, appeared in 1924 and was reviewed in this Journal in 1925 (p. 58). Comparatively few alterations have been made in the new edition ; the number of pages is the same, but fourteen illustrations have been added. In a short preface Dr. Diels states that the arrangement of the Flowering Plants has been retained in essentials, since additions to our knowledge have not seriously affected the " Leitmotiv " of Engler's system. There are a few alterations in rank and position. The families Hydrostachyaceae and Podostemonaceae are removed from Rosales to an earlier position in the system, each with the rank of a Series. Balanophoraceae is removed from Santalales and given serial rank. Gyrostemonaceae and Achatocarpaceae, following the view adopted in the recent monograph of the Centrospermae in the ' Pflanzenfamilien,' are raised to family rank, while Thelygonaceae (Cynocrambaceae) is transferred to Myrtiflorae where it forms a subseries with Hippuridaceae. Humiriaceae and Lacistemaceae become subfamilies of Linaceae and Flacourtiaceae respectively. There are also some slight alterations in the arrangement of families in a Series.

Alterations in the arrangement of the Cryptogams include the rearrangement of the Myxomycetes in nine series and the inclusion of an illustration; the arrangement of the Dinoflagellatae included in the Nachtrage of Edition 10/11 is transferred to the main text; in the Algae a new series, Heterocontae, is inserted before the Diatoms (Bacillariophyta) and in the latter subfamilies are raised to family rank. In the Pteridophyta the fossil forms are given definite position as Classes, Subclasses, and Series.

Engler's chapter on the Principles of the Systematic Arrangement and his appendix on geographical plant-regions are reprinted in their original form.

The format of the book remains the same—a few families omitted from the general review in the previous edition have been added, one of these—Akaniaceae—is mis-spelt Akariaceae, but this is the only misprint that has been noticed.

The Syllabus should continue to hold its useful place as a general systematic review of the families of plants.—A. B. R.

The Cultivated Races of Sorghum. By J. D. Snowden, F.L.S., late Economic Botanist, Uganda Protectorate. 8vo, pp. vii, 274, 40 pls., 30 text-figs. Trustees of the Bentham-Moxon Fund, 1936. Price 10*s.* 6*d.*

In his Preface the Director of the Royal Botanic Gardens, Kew, Secretary to the Bentham-Moxon Trustees, explains the origin and motive of the work. In revising the cultivated Sorghums in the 'Flora of Tropical Africa' the late Dr. Stapf was much hampered by inadequacy of material. But his classification, though necessarily incomplete, stimulated interest in the group. A questionnaire from Kew to the Directors of Agriculture in those parts of the British Empire where grain Sorghums were a staple crop brought forth a very large number of specimens and much information, and Mr. J. D. Snowden, who had recently retired from his post in Uganda, was commissioned by the Bentham-Moxon Trustees to undertake the revision of the group; this has involved three years of work. The work has been done at Kew with the assistance of material borrowed from a number of other herbaria. For notes on the living plant the author is indebted to numerous overseas correspondents.

In a preliminary chapter the author gives a detailed account of the botanical history of the cultivated Sorghums from an early description by Pliny through the herbalists to the time of Linnæus. Linnæus described three species under his genus *Holcus*, and Mr. Snowden has been at some pains to unravel

their botany and synonymy by means of the few existing specimens and references. Moench in 1794 separated these species under his new genus *Sorghum*, leaving *Holcus* as now generally understood. Brotero (in 1804) placed the Sorghums under *Andropogon*, and this view was followed by Koernicke and Hackel in their respective classical works on the genus. Koernicke, however, suggested that all the cultivated Sorghums had been derived from a single wild species, *Andropogon halepensis*; and Hackel, in his monograph of the Andropogoneae, included under one species, *A. Sorghum*, two subspecies, *halepensis* and *sativus*, containing respectively the wild and cultivated forms. Stapf, in revising the genus for the 'Flora of Tropical Africa,' recognized fourteen cultivated species, and from a practical and also a scientific standpoint Mr. Snowden justifies this departure from the monospecific usage. It is also suggested that the cultivated Sorghums have arisen from more than one wild species, and at the end of the volume a diagram is given illustrating the probable relationships of the wild and cultivated races.

The classification adopted is based on Stapf's system, extended to include all the material at present known. Of the new species recognized some had already been indicated in the Kew herbarium by Stapf. The genus is limited to Stapf's section *Eu-Sorghum*—his section *Sorghastrum* being regarded as a distinct genus. Two sections are recognized, *Eu-Sorghum* and *Para-Sorghum* Snowden. The latter contains 8–10 wild species which have played no part in the evolution of the cultivated Sorghums. The latter are included under the Series *Sativa* of the Subsection *Arundinacea* of *Eu-Sorghum*.

Following Stapf, the shape of the flowering spikelets has been used for primary characters in grouping the species. Size of spikelet is also of importance, but colour is variable and of relatively little value as a specific character. Thirty-one species are recognised, grouped in six Subseries. Under each species the history and a full botanical description (in English) are given, with notes on affinities and distribution, and, where available, on cultivation and economic use. Descriptions follow of varieties and forms. Characters of spikelet and grain are illustrated by text-figures.

At the end of the volume are a chronological and classified list of the bibliography, and indexes respectively of botanical names, vernacular names, and countries and regions.

The work conveys an impression of thoroughness and is of special value as combining a taxonomic study with a cultural and economic outlook. The printers, Messrs. Adlard, have done their work well, but one could wish they had used larger type. The book is not one to read on a dull day.—A. B. R.

Prodrome de la Flore Corse. By JOHN BRIQUET, continued by RENÉ DE LITARDIÈRE. II. pt. 2. Avant-propos. Bibliographie (supplément). Catalogue critique: Oxalidaceae–Cactaceae. 8vo, pp. xxviii, 216. P. Lechevalier: Paris, 1936. Price 65 fr.

THE late Dr. Briquet was much interested in the flora of Corsica, and had spent some time in the island on his three botanical excursions, 1906 to 1908. The first volume and part one of the second volume of the 'Prodrome' appeared in 1910 and 1913 respectively. Briquet seems to have done no work on the flora since that date—in fact, the manuscript that he left bears date no later than 1909. But he looked forward to finishing the work when he had got rid of the "Rules of Nomenclature," to the elaboration of which he devoted so much of his leisure. Unfortunately, death intervened.

René de Litardière, Professor of Botany at the Faculté des Sciences of Grenoble, has been entrusted with the completion. This has involved considerable work, since beyond the family Hederaceae the manuscript is very incomplete, certain genera or species only being treated in full. The same *format* has, however, been followed, and critical notes left by Briquet have been indicated by brackets. Dr. de Litardière has also included a bibliography containing additions to and corrections of the list published in volume I.

The present part continues the account of the Archichlamydeous Dicotyledons from Oxalidaceae to Cactaceae—that is, including the families of the orders Geraniales, Sapindales, Rhamnales, Malvales, Parietales, and Opuntiales of the Englerian system. There still remain therefore the completion of the polypetalous and the sympetalous Dicotyledons. It is to be hoped that Dr. de Litardière will be able to complete the work, which, had it been planned on a less thorough and exhaustive scale, the author might have been able to finish in his own lifetime.—A. B. R.

Protoplasm. By WILLIAM SEIFRIZ, Ph.D. 8vo, pp. x, 584, 179 text-figs. McGraw-Hill Publishing Co: London, 1936. Price 36*s*.

THE author of this book, who is professor of botany at the University of Pennsylvania, is well known as an investigator of protoplasm, and all cytologists and plant physiologists will welcome his book. Life phenomena, at all events in the higher organisms, seem only to manifest themselves in protoplasm, and if we had a full understanding of its nature and working we should have made a big step towards the understanding of "vital" processes. Unfortunately, we have moved only a little

way towards this knowledge, so that the size of the volume excites surprise. What we know about protoplasm should surely be capable of statement in a smaller compass than 600 pages. The contents of the book soon show, however, that the title is, perhaps, a little misleading. It is not merely a statement of what is known of the structure and behaviour of protoplasm, but is very largely a textbook of those fields of physics, chemistry (especially colloid chemistry), and physiology which are of importance in the study of protoplasm and of the cell. The twenty-seven chapters include not only "The Living Substance," "The Structure of Protoplasm and Organic Colloidal Matter," but also deal with The Colloidal State, Emulsions, Surface Tension, Adsorption, Osmosis, Inhibition, Viscosity, Elasticity, Permeability, Acidity, Salts, Carbohydrates, Fats, and Proteins.

The preface states that the book has been written for students of biology and medicine and of the related subjects of biophysics and biochemistry, but is not intended for the author's colleagues. It necessarily covers an enormous field, and shows (what is, of course, well known) that the interpretation of protoplasm and the cell leads the investigator into some of the more difficult branches of physics and chemistry. To cover adequately such widely different branches of science is no mean achievement. In the more purely biological chapters, such as those on micrurgy and on tissue-culture, the author has given most interesting accounts of the present position of such subjects. The time for a full understanding of protoplasmic mechanisms is not yet in sight, but the book is a most attractive introduction to the study of the physical substratum in which life exhibits itself.—V. H. B.

Nature in Britain. Introduced by HENRY WILLIAMSON, with Contributions by R. ST. BARBE BAKER, E. G. BOULENGER, L. C. BUSHBY, R. & E. GATHORNE-HARDY, SETON GORDON, and FRANCES PITT. Sm. 8vo, pp. 250, Frontispiece and 142 illustrations. B. T. Batsford, Ltd.: London, 1936. Price 5*s*.

THIS symposium, a volume of the Pilgrims' Library, is somewhat ambitiously described as "a full introduction to the varied fauna and flora of Britain." It is a book by students of nature for nature-lovers. About two-fifths of the volume are of botanical interest. Earlier chapters deal with "Animal Life" by Frances Pitt, "Bird Life" by Seton Gordon, and "Reptile and Amphibian Life," and "Pond and Stream Life" by E. G. Boulenger. R. St. Barbe Baker of "The Men of the Trees" writes on "Tree and Shrub Life," Robert Gathorne-Hardy on "Flower and Plant Life," and Edward Gathorne-Hardy on Fungi. Mr. Baker

writes in an interesting way on the history of our forests generally and the habits and uses of our native and introduced trees. He has a tilt at the regrettable practice of afforestation in flooding the south with conifers where the milder climate allows broad-leaved trees to thrive to their best advantage, "a wise planter is aware that the greater value of the hardwoods will compensate him for their slower growth." His account of the origin of the London plane is rather vague; and is there a famous lime avenue at Trinity College, Oxford? The one at Trinity, Cambridge, was, in its prime, the glory of the College. The chapter on "Flower and Plant Life" is a rambling commentary on the plants as found in their characteristic habitats. Three pages only are given to Fungi—a brief account of a few of the commoner species.

The plates, good reproductions of photographs, form an attractive and useful part of the volume, showing animals and plants in natural surroundings.

Scientific names are always a stumbling-block; the following misprints might be noted in view of later editions, "beach fern" (p. 208), *Menziesia caerulia* (232), *Poa pratense* (236) (*pretense* in Index), *Gymnadenia connopsea* (240), *Olerulus lacrymans* (242).

BOOK-NOTES, NEWS, ETC.

ONTOGENY OF THE CARPEL.—As a result of a study of the meristematic activity of the floral apex of *Acacia longifolia* and *A. suaveolens* (Proc. Linn. Soc. N. S. W. lxi. 56–88), Dr. I. V. Newman concludes that the legume arises laterally on the apex and is a single laminar structure, bearing the ovules on its margin and growing in a manner similar to some vegetative leaves. The study of the histogenesis of these floral apices, in comparison with accounts by other workers on vegetative apices, favours the interpretation of the flowers of these two species as modified leaf-shoots. These results conflict with recent theories, which are discussed. The text is illustrated by four photogravure plates and text-figures.

In a previous number of the same Journal (lx. 428–446) this author reviews favourably the evidence for the validity of *Acacia Baileyana* as a natural species and not a hybrid originating in cultivation.

NOLANACEAE.—A monographic study of this family by Ivan M. Johnston appears as 'Contributions from the Gray Herbarium,' no. cxii. (Proc. Amer. Acad. Arts & Sci. lxxi. no. 1). The suggested relationship of the family with Boraginaceae and Convolvulaceae, on the one hand, and Solanaceae, on the other, is examined in detail, with the conclusion that the Nolanaceae have no direct relation with the former, but "are an extreme

product of that evolutionary activity in the Solanaceae which has produced the multiplicity of genera and species of that family in western and southern South America." They are practically confined to the coastal regions of northern Chile and southern Peru, and, generally speaking, the species are of restricted distribution, many being local. They are plants of well-drained sands and gravels. The species offer a perplexing problem in generic classification—the species can be readily defined and recognised, but natural groups are very ill-defined. A number of genera have been described, but there is justification for including all the species in one genus *Nolana* with *Alona* as a section or subgenus; however, the schizocarpic fruit of the latter seems to warrant a separation from the nutlet fruit of *Nolana*. Full descriptions, with synonymy, distribution, and citation of specimens, are given of the 6 species of *Alona* and 57 of *Nolana*.

MESEMBRYANTHEMA.—Mrs. H. M. Bolus ('Notes on *Mesembryanthemum* and Allied Genera.—Part III.' University of Cape Town. Price 3*s*.) continues her work on these genera. New species are described of *Aridaria*, *Carpobrotus*, *Carruanthus*, *Chasmatophyllum*, *Cheiridopsis*, *Drosanthemum*, *Khadia*, *Mesembryanthemum*, *Psilocaulon*, *Rhinephyllum*, *Ruschia*, *Stomatium*, and *Trichodiadema*.

LOUDON'S ARBORETUM.—In the 'Journal of the Royal Horticultural Society' for July, W. Roberts refers to the centenary of the publication of this monumental work in sixty-eight parts from January 1835 to July 1838, forming eight thick volumes. His appreciation consists mainly of extracts from answers received to printed lists—or Questionnaires—of trees and shrubs, some three thousand of which were sent out. A large selection of these were presented by Loudon in 1837 to a Miss Jane Jukes, who mounted them in a quarto album which recently came into Mr. Roberts's hands. The production of the work cost Loudon £10,000, and at his death in 1843 his widow was left in poverty. By Prof. Lindley's efforts, the sale of his works was promoted and Sir Robert Peel granted an annuity of £100.

'AMERICAN JOURNAL OF BOTANY.'—In the April number F. M. Turrell describes methods of measuring the internal exposed surface of leaves of Dicotyledons. Results indicate that this surface may vary widely in different species and in different leaves on the same plant. The ratio of the internal to the external exposed surface is low for shade leaves, intermediate for leaves of mesomorphic type, and high for xeromorphic sun leaves. The correlation between xeromorphic structure and high transpiration rate seems to be explained by the high ratio of internal

to external surface in xeromorphic leaves, due primarily to the extensive palisade type of mesophyll which exposes 1·6 to 3·5 times as much surface, per unit volume, as the sponge type. J. A. Moore has investigated the vascular anatomy of the flower in 42 genera, including 60 species of Papilionaceae; and R. G. Reeves describes the anatomy of seeds in five genera of Malvaceae.

Washington Academy of Sciences.—In the Journal, vol. xxvi. nos. 5 & 6, F. V. Coville renames as *Gilmania* the genus *Phyllogonum* (Polygonaceae) described by him from the Death Valley, California, in 1893, as *Phyllogonum* is a homonym of a genus of Mosses. The plant is very rare, and has been found only at intervals since its discovery by Mr. Coville. It is apparently in process of extinction, its persistence depending on the capacity of the seeds to lie dormant in the soil through years of drought. A. Ducke gives notes on Myristicaceae of Amazonian Brazil, and describes several new species of *Tryanthera* and *Virola*, with a synopsis of the species of the latter genus.

Flora of South Australia.—'Additions,' no. 33, by J. M. Black (Trans. R.S. S. Australia, lix. 252–62), includes a number of new records of Flowering Plants and the description of a new species of *Euphorbia*.

Leverhulme Research Fellowships.—Fellowships have been awarded to Mrs. A. Arber, D.Sc., for studies in angiospermous morphology and the history of botany, to S. D. Garrett, B.A., University of Adelaide, for study of the antagonism of soil microflora toward root-disease fungi (renewal of Fellowship), and to E. P. Mumford, M.Sc., for study of the terrestrial and freshwater biota of the Marquesas Is. (renewal). Research grants have been made to Prof. J. W. Heslop Harrison, F.R.S., for researches on evolution and heredity (renewal), and to W. H. Pearsall, D.Sc., for studies on the growth of Algae.

Sir Albert Seward.—We tender our congratulations to Prof. A. C. Seward, F.R.S., on the Knighthood recently conferred on him by His Majesty.

The British Association.—At the meeting at Blackpool, September 9–16, Mr. J. Ramsbottom, O.B.E., Sec.L.S., will preside over the Botany Section. At the Conference of Delegates of Corresponding Societies Dr. A. B. Rendle, F.R.S., will preside, and will speak on 'The Preservation of Native Floras.'

Correction.—In the July number on p. 202 in the description of *Mentha verticillata* f. nov. *calva for* Stem slender 1–5 dm., *read* Stem slender 4–5 dm.; on p. 203, line 8 from top, *for* collection *read* collector.

THE OOGONIA OF *MARGINARIELLA BORYANA* Tandy (*Marginaria Boryana* A. Rich.).

By E. Marion Delf, D.Sc., F.L.S., and M. B. Hyde, B.Sc.

It has recently been found that in certain Fucaceae with unisexual conceptacles the oogonial contents remain attached to the receptacle by means of an elastic stalk for two or three days after their extrusion. Each oogonium in these types produces only one oosphere surrounded by a more or less swollen oogonial wall. In the genus *Marginariella* some form of attachment was inferred from the features seen in the small amount of herbarium material available (Delf, 1935). Further investigation of these receptacles confirms the presence of mucilaginous stalks which pass through the ostiole, and suggests a mechanism of extrusion unlike that of any other known type. These results seem worthy of record, although critical observation of the living plant is essential for the elucidation of their full significance.

There are two species of *Marginariella*, both known to occur only in New Zealand and in one or two localities in the Dutch East Indies. In both the thallus is pinnate, reaching a length of 20–25 dm. from tip of longest pinna to base of plant (Montagne, 1845). The laterals dichotomise two or three times, and bear an occasional swim bladder; when fertile they also bear near the main axis a marginal fringe of small receptacles, each hanging from a short slender stalk. Receptacles belonging to the same fringe seem to be of the same sex*. In *M. Boryana* both kinds of receptacles are cylindrical, as may be seen on soaking out the dried material, but when dried the male and the old empty female receptacles are narrower and flatter than those with undischarged oogonia, and cannot always be distinguished externally from each other.

Little is known of the structure and reproduction of the genus. The most informative descriptions are those of Montagne (1842, 1845), who collected and examined a number of specimens, of which he wrote:—"Conceptacula globosa ellipticave, plus minus exstantia, spiraliter sinistrorsum. . . . Sporæ magnæ, obovato-pyriformes, perisporio initio inclusæ, mox nudæ, e cellulis parietalibus oriundæ paraphysibus immixtæ; . . . vero e morphosi ultimi articuli filorum, ut videtur, ortæ, forsan hinc minutæ et tantum ut gemmæ habendæ" (1842, p. 10). Subsequently the same author gave a description of what were, presumably, male receptacles (1845).

By examining a female receptacle of *M. Boryana* from base to apex, it can be seen that the uppermost conceptacles may

* I am informed by Mr. W. H. Gourlay of Christchurch, N.Z., who has observed living material, that both species are definitely dioœcious.

contain oogonia with oospheres when in the lower region they are all empty; thus the dehiscence is from below upwards as is frequent in the Fucaceae. The conceptacles are either full of oogonia at the same stage of development or they appear to be empty; thus it seems that all the oogonia of one conceptacle are shed at one time or in comparatively rapid succession, but the material is too scanty for any more definite conclusion.

Transverse sections show that the conceptacles are narrow tangentially, but reach radially to the central supporting strand of tissue (fig. 1). They extend vertically to about twice their

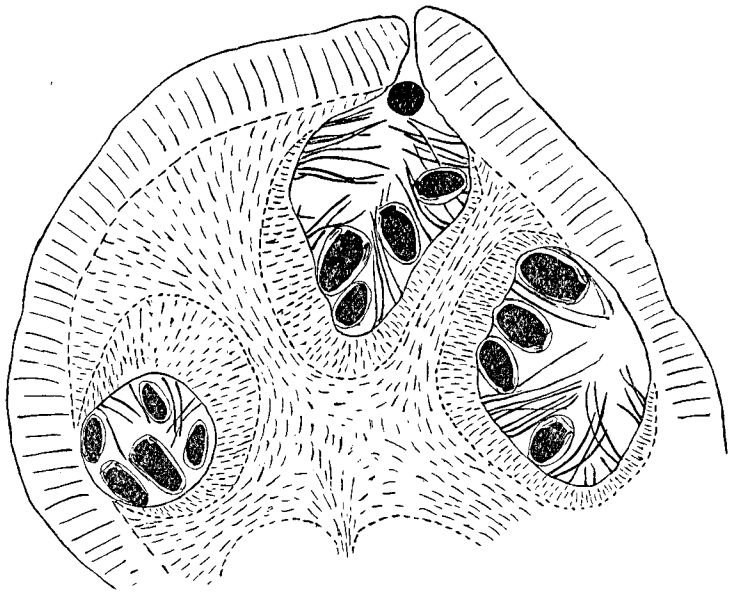


Fig. 1.—Diagrammatic representation of cross-section of female receptacle of *Marginariella Boryana* as seen with 2/3 objective and eye-piece No. 6. Outlines drawn with camera lucida.

radial depth. Each contains a large number of oogonia situated up the sides as well as along the floor of the conceptacle* and separated from each other by tufts of simple paraphyses. Some of these are short around the base of the oogonia (figs. 1 & 3); some are longer and stand up stiffly in the cavity, reaching nearly to the ostiole, but not protruding through it. All have short bead-like cells, slightly smaller in diameter towards the apex of the paraphyses, which, therefore, taper a little towards their free extremities.

* A basal cell could not be seen, perhaps owing to the nature of the material.

I. The Contents of the Female Conceptacles.

In the female conceptacles two stages of development were found:—(*a*) Containing almost mature oogonia; (*b*) containing only paraphyses and the remains (exochiton) of the oogonial walls.

(a) *Almost mature oogonia.*—Oogonia at the stage shown in fig. 2, *a*, *b*, were present. Each oogonium could be seen to contain a single oosphere narrowed towards the unattached end of the oogonium into a definite "neck." This was clearly seen after swelling for half an hour in a mixture of equal parts of lactic-phenol and sea-water, but was gradually lost after mounting in glycerine or in glycerine jelly. After this treatment with lactic phenol, the surrounding oogonial wall appeared swollen and differentiated into an outer clearly marked exochiton and an inner gelatinous region made up of two distinct layers (presumably mesochiton and endochiton), denser and more refractive around the neck of the oosphere, where, in optical section, a peculiar "ear-like" appearance suggested a fold (fig. 2, *a*, *b*; *cf.* fig. 5).

Between the top of the oosphere and the very definite cap of exochiton above it (*cf.* Delf, 1935, fig. 8) there was a refractive gelatinous substance, which could be distinguished equally in material swollen with sea-water alone, or with the sea-water lactic-phenol mixture. On staining with freshly made aqueous gentian violet (1 per cent. diluted ten times) this refractive region stained the deepest. With slight pressure this pad would extend as figured previously (Delf, 1935, fig. 8), and it was then thought that it might contribute in some way to the attachment as well as to the escape of the oosphere. However, two oogonia were at last found *in situ*, where after only slight swelling in sea-water and with no pressure (the cover-glass being well supported) this mucilage appears to have functioned in splitting the exochiton and also to have spread laterally around the top of the oosphere (fig. 2, *f*, *g*) suggesting that the latter is ultimately invested by it (*cf.* fig. 5).

(b) *Conceptacles empty of oospheres.*—In these conceptacles the oogonia had lost their oospheres and could be seen as delicate empty cups of exochiton, showing longitudinal folds as though due to collapse; from each cup protruded a long, more or less curving, thread-like projection. This stage was first seen in hand-sections (*cf.* Delf, fig. 8, D, *loc. cit.*), but by careful dissection of the tissues around a whole conceptacle these threads are now seen to pass through the ostiole (fig. 3), ending in a mass of mucilage, now almost structureless, in which they were perhaps embedded. So far as could be judged by careful focussing, these threads

were tubular, the basal part of each tube forming a delicate and almost imperceptible lining to the exochiton cup.

It seems highly probable that these threads are the agencies by which the oospheres are retained near the surface of the plant after they have been ejected from the conceptacle*. So far as could be seen by examination with a good hand-lens, no adhering oospheres or oospores were present; but this would not be surprising in view of their delicacy and the rough handling in drying or pressing the material in the first instance. It seems likely that Montagne (1842) referred to similar threads when he described the "sporæ magnæ . . ." as ". . . vero e morphosi ultimi articuli filorum, ut videtur, ortæ."

II. The Structure of the Oogonial Wall.

The investigation of the structure of the oogonial wall was attempted by means of (*a*) swelling reagents and (*b*) differential staining.

(a) *Swelling Reagents.*—Oogonia in the typical "ear" stage were mounted in solutions of caustic potash of strengths varying from 2 to 10 per cent. The ultimate effect was the same in all, but could be followed better in the more dilute solutions. It consisted of the rapid swelling of the folded upper part of the supposed mesochiton, at first vertically, giving transverse folds, and later also peripherally. By careful focussing, this now appeared like a double membrane or mantle encircling the oosphere, refractive above, attenuated and soon disappearing in the lower regions, presumably having dissolved in the potash (fig. 2, *b*, *c*, *d*). In a few oogonia, the whole membrane has slipped forwards over the neck-region and gave the appearance of a kind of handle (fig. 2, *e*; *cf.* Delf, 1935, fig. 8, F); here the exochiton appears to have ruptured at the base instead of around the apex as usual.

None of the preparations obtained by this treatment were permanent, as the potash eventually caused solution of the whole membrane. In fig. 5, *a*, *b*, *c*, an attempt is made to indicate the course of swelling in a three-dimensional diagram, for which we are indebted to the artist, Mr. Percy J. Smith.

In the middle of one conceptacle, after swelling only in sea-water, two oogonia were found in which dehiscence appears to have just started (fig. 2, *f*, *g*); in *f*, the cap is ruptured and the oosphere beginning to protrude; in *g*, the advancing oosphere has stretched without having yet ruptured the exochiton, which

* Since going to press, preserved material of *M. Urvilleana* has been received from N. Zealand through the kindness of Mr. R. M. Laing, of Christchurch, and of his friend Mr. V. W. Lindauer, Headmaster of the Russell School, Bay of Islands, N.Z. This shows clearly numbers of oospheres attached by similar threads or filaments which are certainly tubular.

has collapsed into folds at the base where the oosphere has been withdrawn.

(b) *Differential staining.*—Both mucilage and gelatinous pectic substances occur in the ripe conceptacles of the Fucaceae. Whilst there appears to be no sharp line of differentiation between these two substances, it is commonly believed that they may be

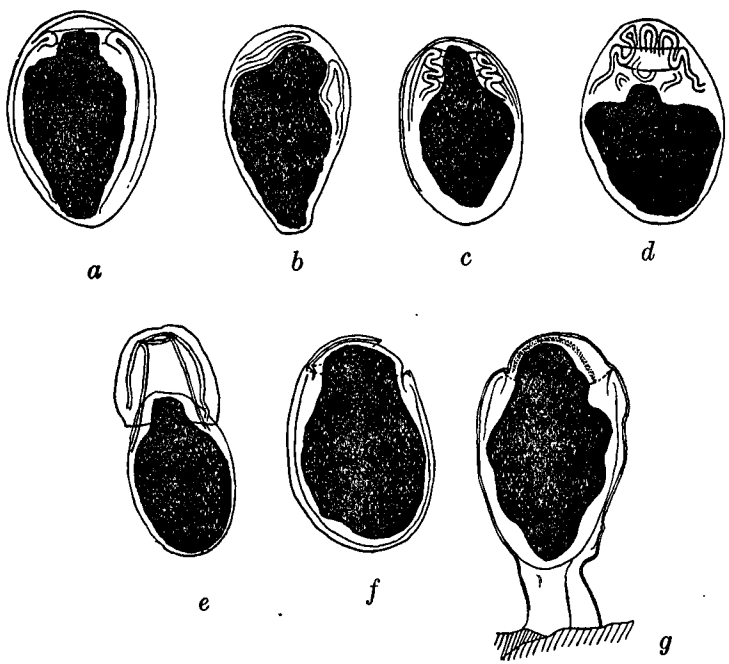


Fig. 2.—Oogonia as seen at mid-focus. *a*, mounted in sea-water, after warming in sea-water; *b*, *c*, *d*, mounted in 10 per cent. potash, showing successive stages in swelling; *e*, appearance occasionally seen after mounting in 2 per cent. potash (usually giving effect of 10 per cent., but more slowly); *f*, *g*, mounted in sea-water, cover-glass supported, so that no pressure was applied; *f*, showing lid of exochiton lifted by the swelling of the mucilage below it; *g*, showing the oosphere partially withdrawn, the exochiton stretched but not split, and collapsed at the base where it was left empty. The exochiton is shown as a double line; the shaded region represents the wall of the conceptacle.

distinguished by differential staining. A series of such tests was applied to sections of the receptacle of *Marginariella Boryana* after preliminary swelling for half an hour with lactic-phenol and sea-water, special attention being paid to the oogonial wall. By way of comparison, each test was also applied to sections of the white part of an orange rind and the outside of orange pips,

both known to contain pectic substances, also to the swollen testa of cress-seeds, known to be rich in mucilage. Where mucilage and pectic substances were present together, this was indicated by comparing the effects of corallin soda or orcein, with that of safranin or gentian violet.

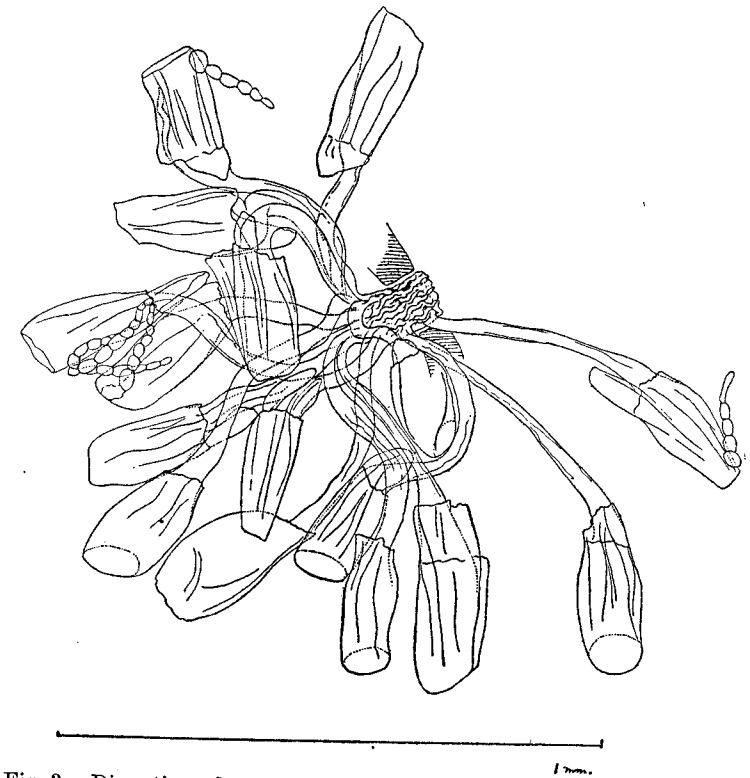


Fig. 3.—Dissection of contents of whole conceptacle after oospheres have been discharged. The position of the ostiole is shown and through it passed a number of gelatinous stalks, each reaching from the empty exochiton oogonial cup to the exterior, where presumably the oospheres were held. (In manipulation, the stalks floated apart, so that they appear to extend beyond the ostiole.) Camera lucida drawing, objective 2/3, eye-piece 10. Dissection and drawing by M. H.

Owing to the rapidity with which mucilaginous and pectic substances take up gentian violet and safranin, very dilute solutions of these stains had to be employed. A freshly prepared 1 per cent. aqueous solution was in each case diluted by about ten times its own volume of water.

The results of the most significant tests are given in the table on p. 255.

Reagent.	Orange (rind).	Orange (pips).	Cress (testa).	*Marginariella* (t. s. receptacle).	*Marginariella* (oogonia).
Gentian violet	Violet.	Violet.	Pink-violet.	Stalks and sheaths pink - violet, ground - tissue violet.	Wall violet, "ears" very violet.
Safranin	Orange.	Orange.	Orange-red.	Ground - tissue pink, stalks and sheaths and paraphyses orange.	Wall orange, space below "cap" orange-red.
Iodine+H_2SO_4	Deep blue.	Pale yellow.	Dark brown.	All walls except those of paraphyses and oogonia blue.	Colourless.
Ruthenium	Pink.	Deep pink.	Deep pink.	Ground - tissue brown, sheaths and stalks pink.	Wall pink, "ears" deep pink.
Corallin	Colourless.	Pink.	Deep pink.	Ground - tissue orange, stalks and sheaths colourless.	Colourless.
Orcein (+HCl) (after warming)	Colourless.	Colourless.	Pink.	Cell-contents pink, stalks and sheaths colourless.	Colourless, then dissolved.

The results indicated that :—

(1) In the ground-tissue of the conceptacles of *M. Boryana* the cell-walls and cell-contents gave definite reactions for mucilage. With iodine and sulphuric acid the cell-walls gave a blue colour, indicating the presence of cellulose also.

(2) The paraphyses gave predominately pectic reactions.

(3) The oogonial wall had a pectic exochiton, the inner layers giving both pectic and mucilage reactions.

(4) The empty exochiton cups and stalks remaining after extrusion of the oospheres were largely pectic in composition, though giving certain reactions for mucilage. Neither gave any reaction for cellulose with iodine and sulphuric acid.

(5) The substance in the region between the top of the oosphere and the exochiton cap appeared to be both pectic and mucilaginous in nature.

(6) The membrane, which crumpled under the action of potash, gave predominantly pectic reactions, especially where surrounding the neck of the oosphere.

Thus from the study of very limited herbarium material it appears that the oogonial wall of *Marginariella Boryana* is highly differentiated, comprising,

(1) A well-marked exochiton usually splitting transversely near the free end of the oogonium.

(2) A dense mucilaginous pad over the top of the oosphere capable of swelling on absorption of water and apparently bringing about the rupture of the exochiton. In fig. 2, *g*, it appears to be extending around the top of the oosphere, and perhaps persists as an additional mucilaginous covering (or partial covering) to the oosphere.

(3) A thin double pectic membrane, thicker at the fold which seems to encircle without closing over the free end of the oosphere (fig. 5, *a*).

In older conceptacles which have lost their oospheres each oogonium is represented by a thin-walled exochiton cup, from which runs a stalk or thread presumed to be hollow and certainly extending through the ostiole. The free ends of these stalks are not clearly distinguishable from the mass of mucilage and débris in which they are embedded ; both exochiton and stalk are mainly pectic, but partly mucilaginous in nature, and were probably highly elastic.

These various structures are presumably connected in some way with the removal of the large and heavy oosphere from the oogonium and with its forcible ejection through the ostiole. *Marginariella* is permanently submerged in habit, but the periodic changes in depth brought about by the ebb and flow must also involve changes in the intensity and nature of the light transmitted as well as in the hydrostatic pressure of the overlying

water. These may set in motion the internal expulsive mechanism, or may merely accelerate it if started by other means. The full explanation can only be obtained by critical observation of the living plant, but in the meantime, a tentative working hypothesis has been framed by the authors and illustrated in fig. 5, based on the various appearances already seen.

It is suggested that the exochiton splits transversely near the top owing to the swelling of the dense mucilaginous substance which occupies the space above the oosphere (fig. 5, *b*). The disc thus lifted is often seen as a flap of exochiton attached to the empty cup (fig. 3). At the same time the highly refractive folded region of the inner wall absorbs water, increases in area, and is thrown into folds which gradually pass through the aperture of the exochiton. The inner layer of this double membrane appears to be continuous around the base of the oosphere which is thus dragged upwards (fig. 5, *b*), possibly helped by an upward thrust of fluid osmotically absorbed from below. As the oosphere is gradually raised, the dense mucilaginous pad also absorbs water and extends downwards, enveloping the oosphere (*cf.* figs. 2, *g*, & 5, *c*). The upward osmotic thrust aided by the elastic shrinkage of the empty part of the exochiton would finally release the oosphere, which, guided by the paraphyses, would finally escape through the region of least resistance, namely, the ostiole above it. According to the belief of the authors, it is still held in position by a delicate hollow elastic thread formed under the tension of expulsion from the innermost layers of oogonial wall (figs. 3, 5, *d*), so that the oosphere appears as though attached by " stalks " to the parent plant. By analogy with *Bifurcaria*, *Sargassum*, and *Cystophyllum*, the oospheres are probably held in place for a few days, during which fertilisation and the early stages of germination may take place.

After these tentative conclusions had been reached, the investigation was laid aside in the hope of obtaining additional material from New Zealand. Some months later a letter was received from Mr. R. M. Laing of Christchurch, New Zealand, stating that one of his former students, Mr. H. W. Gourlay, now of the Boys' High School, Christchurch, N.Z., had made some unpublished observations on the genus *Marginariella*, from which he concluded that the " whole oogonium " is discharged from the cavity of the conceptacle by a " trigger-like " mechanism. No mention was made of " stalks," but it was noted that the oospheres were pyriform in shape, indented at the top by a " special infolding hyaline membrane " attached to the " basal edges of the perisporium and to the base of the egg-cell " *. It would be very easy to overlook the thin exochiton remaining

* It is to be hoped that these observations will be carried further for publication.

in the conceptacle, for it does not readily take up stains. Tahara (1909) came to similar conclusions in his examination of *Sargassum*,

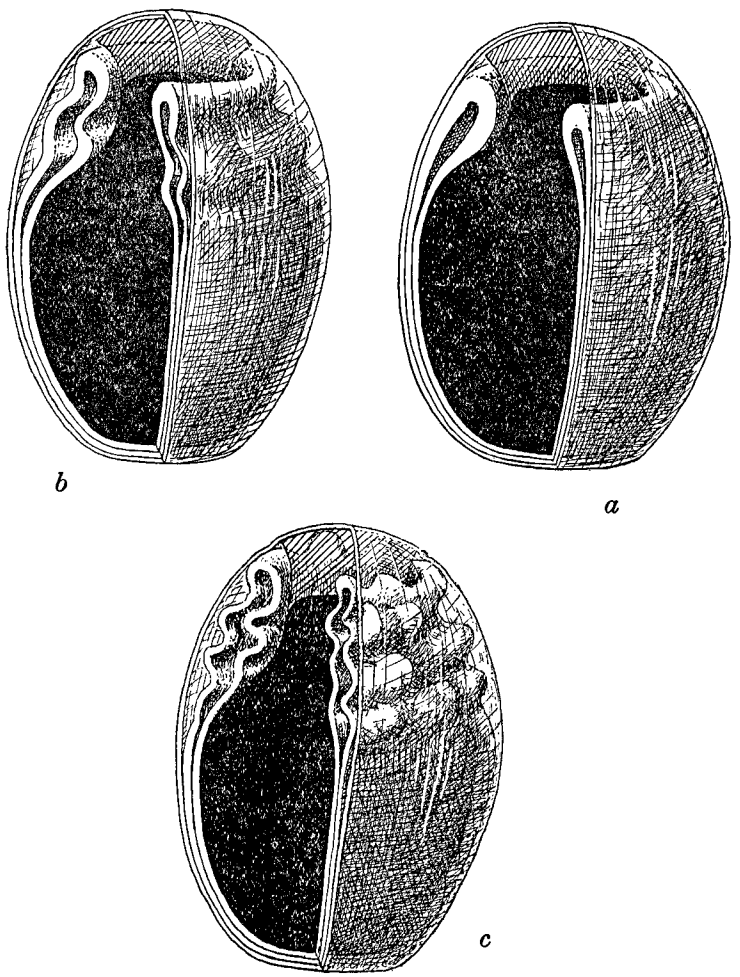


Fig. 4.—Diagrams illustrating structure of oogonial walls before and after treatment with swelling agents. *a*, after action of dilute lactic-phenol; *b*, *c*, successive stages on swelling with caustic potash.

and it was left for Kuneida (1926) to find the remaining oogonial exochiton cup in the otherwise empty conceptacles. It is, at

least, obvious that the remarkable differentiation of the wall in *Marginariella* is so great as to persist in dried and even in much

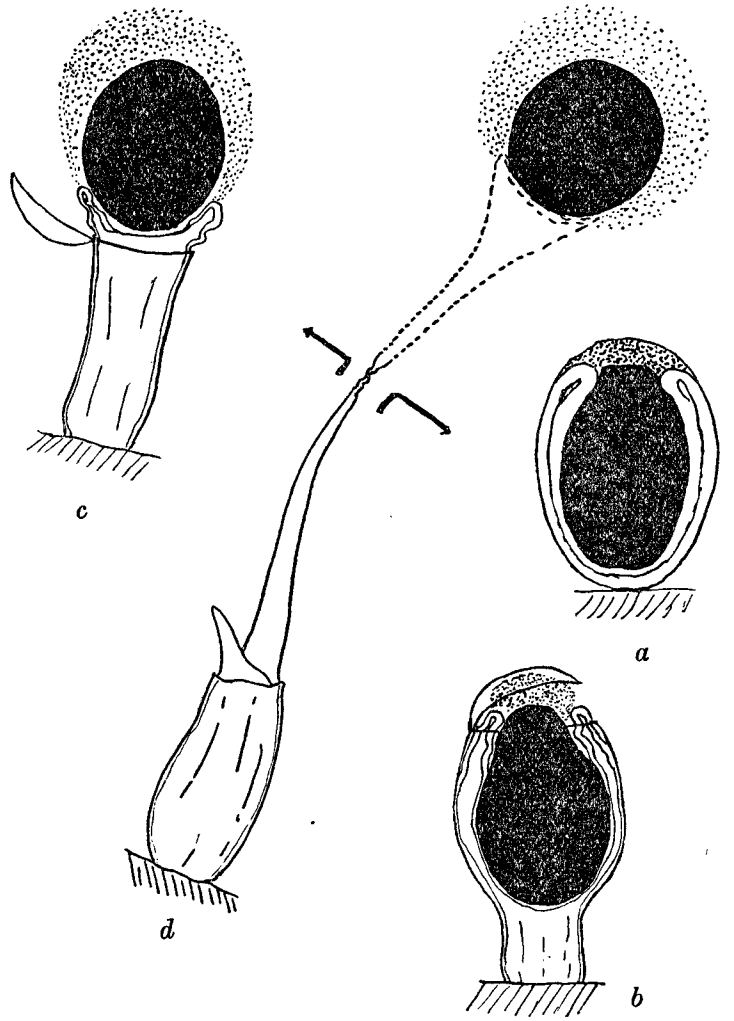


Fig. 5.—Diagrams to illustrate hypothesis of ejection in nature. Figs. *a*, *b*, and the lower part of *d* are based on observations recorded in the text; it has not yet been possible to find the oosphere in position as shown in *d*.

pressed material, and also that this differentiation is concerned with some forcible expulsive mechanism.

Summary.

From the study of herbarium material swollen with sea-water, or with sea-water and lactic-phenol, it is concluded that :—

(1) The ripe oospheres of *Marginariella Boryana* are extruded simultaneously or in fairly rapid succession until the conceptacle is emptied.

(2) An internal region of the oogonial wall, perhaps corresponding to the mesochiton appears as a folded membrane around the oosphere when the latter is nearly ready for discharge.

(4) This appears to stretch and extend ultimately into a hollow stalk which passes—with a number of others—through the ostiole and projects beyond it bearing the oosphere.

(3) The exochiton is ruptured near the top by the swelling of the dense mucilaginous mass situated above the top of the oosphere ; a circular flap is thus lifted up and pushed aside.

(5) The possible method of ejection is discussed.

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PUCCINELLIA PSEUDO-DISTANS (Crépin) Jans. & Wacht. IN BRITAIN.

By J. Edward Lousley.

The group of maritime grasses usually described in British Floras as a section of Robert Brown's heterogeneous genus *Glyceria* has been separated from the very different inland species with which they were thus associated in all recent European and American Floras of importance. The *Glyceria distans*, *maritima*, and *Borreri* of British works form a natural group undoubtedly worthy of generic separation on the standard usually adopted in this country, and the adoption of the genera *Sclerochloa* Beauv. emend. Babington, *Atropis* Ruprecht, or *Puccinellia* Parlatore, has been proposed by various authors. The first may be rejected as including other grasses of quite different affinity, and the second is antedated by the clearly defined *Puccinellia*. Several authorities have taken up Ruprecht's *Atropis*, basing their claims on a reference to 'Flores Samojedorum Cisuralensium,' 61 (1845), a small and rare work in which the name is merely mentioned without any valid indication that the author proposed

to use it in a generic sense. The reference clearly fails to fulfil the conditions of Article 42 of the International Rules, as has been shown by Fernald and Weatherby ('Rhodora,' xviii. 2 ; 1916), Fernald (*op. cit.* xxviii. 150 ; 1926), Holmberg (Bot. Not. 299 ; 1924), and by Jansen and Wachter (Nederl. Kruidk. Archief. 1930, 232). The earliest work in which *Atropis* is unambiguously defined is Ledebour's 'Flora Rossica' (iv. 388 ; 1853), which is five years later than Parlatore's fully and definitely defined *Puccinellia* (Fl. Ital. i. 366 ; 1848). The position of our *G. rupestris* Marshall is somewhat anomalous, but it is proposed to include it here, with the above three species, in *Puccinellia*.

Jansen and Wachter separate the inland from the maritime species of *Glyceria* as formerly accepted in this country as follows (*loc. cit.* 236) :—

a. Glumes both 1-nerved ; pales 7–11-nerved ; styles present ..... *Glyceria* (restr.).

b. Glumes 1- and 3-nerved ; pales 5-nerved ; styles absent ..... *Puccinellia.*

The specific names accepted by these authors for the four British species thus transferred to *Puccinellia* are as follows :—

'London Catalogue,' ed. 11. *Glyceria.*	Jansen & Wachter (*loc. cit.* 256). *Puccinellia.*
G. maritima Mert. & Koch.	*P. maritima* Parlatore.
G. distans Wahlb.	*P. distans* Parlatore.
G. Borreri Bab.	*P. fasciculata* Bicknell.
G. rupestris E. S. Marshall (*G. procumbens* Dum.).	*P. rupestris* Fernald & Weatherby.

In addition, *G. retroflexa* Curtis, which was recorded from England by C. E. Salmon in Journ. Bot. 1929, 243, is treated by these authors as *P. retroflexa* Holmberg.

The present writer's interest in this genus was aroused by a visit to a puzzling colony of these plants discovered by Miss K. Pickard near Shoreham, Sussex, and by specimens collected on the marshes of the Thames estuary in 1930, and again in 1935, which could not be referred to any published British species. A number of sheets from his herbarium were therefore sent to P. Jansen of Amsterdam for determination, and his identifications, dated November 1935, are as follows (all specimens were collected by J. E. Lousley unless otherwise stated, and the remarks in inverted commas are Jansen's) :—

P. maritima Parl. Par Sands, E. Cornwall, v.c. 2, June 12, 1934 ; above Bursledon Bridge, S. Hants, v.c. 11, July 7, 1935 ; near the Toll Bridge, N. Hayling, S. Hants, v.c. 11, July 22, 1934 ; Shoreham, West Sussex, v.c. 13, June 26, 1932, July 1, 1934 ; Pevensey Bay, E. Sussex, v.c. 14, June 26, 1932 ; Leysdown, E. Kent, v.c. 15, June 19, 1932 ; Allhallows-on-Sea, W. Kent, v.c. 16, July 2, 1933.

Forma reptans. Shoreham Harbour, W. Sussex, v.c. 13, June 26, 1932 : "a very remarkable plant perhaps a fm. *reptans*." So named no doubt on account of the very long stolons, but in the writer's experience *maritima* will often produce these when growing on the open mud free from the competition of other vegetation.

Forma major Holmb. By Sturt Pond, Milford-on-Sea, S. Hants, v.c. 11, July 7, 1935. There are similar specimens in Herb. Kew. collected from this station by W. B. Turrill. Tall stout stem, with stolons, strict, leaves more or less flat, channelled ; panicle compound, racemose.

Forma nana Lange. Leysdown, E. Kent, v.c. 15, June 19, 1932. Small plant (1–1·5 dm.) with thin wiry leaves ; spike-like strict panicle with very short branches, which usually bear poor single spikelets.

Var. DEFLEXA Syme. Egloshayle salt-marsh, Wadebridge, E. Cornwall, v.c. 2 (ref. F. 25), June 20, 1934. This is the plant discussed in Rep. B. E. C. 996 (1934), when specimens were distributed through the Exchange Club. Described by Syme as "Panicle-branches deflexed or reflexed in fruit" (E. B. xi. 103 ; 1873). There are no specimens so labelled in the Boswell–Syme Herbarium at the Natural History Museum.

P. DISTANS Parl. Bank of R. Rhymney, Cardiff, Glamorgan, v.c. 41, Sept. 6, 1931, *A. E. Wade*—"some spikelets a little abnormal" ; Saltings, Clymping, E. Sussex, v.c. 13, Sept. 8, 1925, *E. C. Wallace* (but Clymping is in West Sussex) ; by the canal, Higham, W. Kent, v.c. 16, Sept. 17, 1932 ; Weymouth Backwater, Dorset, v.c. 9, Aug. 1, 1925, *J. E. Woodhead* ; near Shoreham Bridge, W. Sussex, v.c. 13, July 1, 1934, "with very narrow leaves."

Forma virescens Jans. & Wacht. Southerham, near Lewes, E. Sussex, v.c. 14, Sept. 17, 1933.

Var. LITORALIS Hack. Near Shoreham New Bridge, W. Sussex, v.c. 13, *K. Pickard*, June 19, 1934, and *J. E. Lousley*, July 1, 1934 (specimens of latter gathering now in Herb. Mus. Brit.). A tall strong plant with thick stems, broad flat leaves, large panicles with branches up to 1 dm. long, and many-flowered spikelets.

P. DISTANS × FASCICULATA ? Old Saltings near Shoreham New Bridge, West Sussex, v.c. 13, July 1, 1934—"very probably *P. distans* × *fasciculata*. I never saw such plants ! " ; Salthouse near Blakeney, N. Norfolk, v.c. 27 or 28, June 1932, *A. L. Still*—"Somewhat abnormal panicles (of) many-flowered spikelets, probably *P. distans* × *fasciculata*. I never saw such plants."

P. DISTANS × MARITIMA. By grassy tract to Old Romney, E. Kent, v.c. 15, June 29, 1930, *E. C. Wallace*. (Doubtful—incomplete specimens.)

Forma submaritima. Near Shoreham Bridge, W. Sussex, v.c. 13, July 1, 1934 ; by the Rother, Rye Harbour, E. Sussex, v.c. 14, July 4, 1930, *E. C. Wallace*.

Forma subdistans. Leysdown, E. Kent, v.c. 15, June 19, 1932 ; Dymchurch, E. Kent, v.c. 15, June 16, 1925 (the last with some doubt).

P. PSEUDO-DISTANS (Crép.) Jans. & Wacht. Near Grain Fort, W. Kent, v.c. 16, June 30, 1935. "Young but very typical. Compare the small anthers." By salt-dyke west of Seasalter, E. Kent, v.c. 15, Aug. 3, 1930. New to Britain—see below.

P. FASCICULATA Bickn. Near Shoreham New Bridge, W. Sussex, v.c. 13, June 19, 1934 ; Allhallows-on-Sea, W. Kent, v.c. 16, June 30, 1935 ; Saltings, Farlington, S. Hants, v.c. 11, July 22, 1934—"Grazed or mown, and flowering for the second time ? "—this had been grazed.

P. RUPESTRIS Bicknell. Lyme Regis, Dorset, v.c. 9, July 7, 1932 ; Fareham, S. Hants, v.c. 11, July 17, 1931, *M. L. Wedgwood* ; Higham, W. Kent, v.c. 16, June 16, 1923, *J. L. O'Loughlin*, Sept. 26, 1931, *E. C. Wallace* ; Grays, S. Essex, v.c. 18, Oct. 29, 1927, *I. A. Williams*—see Rep. Watson B. E. C. 1927/8, 453.—"It is only a shadow plant grown between tall other grasses. The tall form of *P. rup.* (fm. *major*) is nearly 1 m. high, and has much larger panicles and leaves."

It is noteworthy that the only specimens of *P. retroflexa* accepted by Jansen in this parcel were foreign ones.

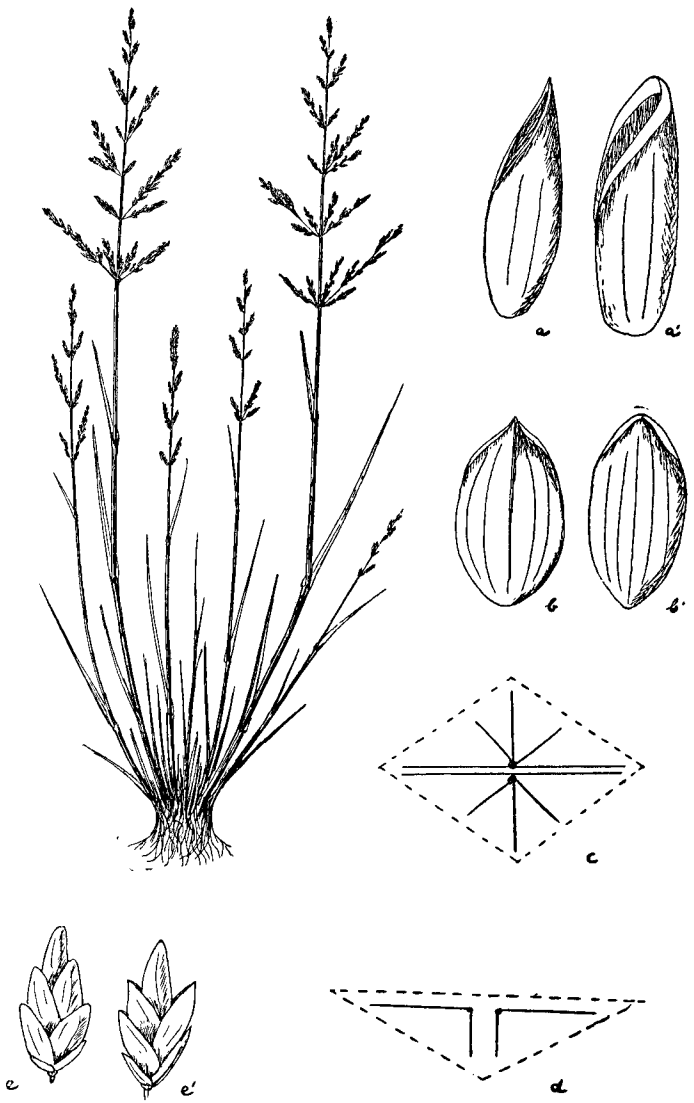
One species is new to our flora and may be described as follows :—

PUCCINELLIA PSEUDO-DISTANS (Crépin) Jans. & Wacht. in Nedl. Kruidk. Archief. xiv. 10 (1935) ; *Glyceria pseudo-distans* Crépin, Nouvelles Remarques sur les *Glyceria* du Groupe *Heleochloa*, 15 (1865) ; *Festuca pseudo-distans* Asch. & Graeb. Syn. ii. 457 (1900) ; *Atropis conferta* Rouy (including "race" *A. pseudo-distans* Rouy), Fl. France, xiv. 194 (1913).

Icones : Crépin, *loc. cit.* tab. ii. ; Jansen & Wachter, *loc. cit.* fig. 1.

Exsicc. Grain, W. Kent, England, June 30, 1935, *J. E. Lousley* ; Beauvoir, Vendée, France, *J. Lloyd*, 171, 77 (as *G. distans*)—both in Herb. Mus. Brit.

Root fibrous ; prostrate barren shoots absent. *Stem* tall (*circa* 60 cm.). *Leaves* flat, about 4 mm. broad. *Panicle* symmetrical, giving a rhomboidal projection when viewed from



Puccinellia pseudodistans (Crép.) Jans. & Wacht. Entire plant, × 1/6. *a*, lateral view of pale, × 4 ; *b*, lowest pale, × 3 ; *c*, vertical projection of panicle ; *e'*, spikelet, × 7 ; *a'*, *P. distans*, lateral view of pale, × 4 ; *b'*, *P. fasciculata*, lowest pale, × 3 ; *d*, ditto, vertical projection of panicle ; *e*, ditto, spikelet, × 10. All after Jansen.

above ; branches arising at each internode in groups of 3–5, varying greatly in length, the longer (7–8 cm.) naked from the base for about a third of their length, the shorter bearing spikelets almost to the base, all remaining obliquely erect in fruit—or a few horizontal spreading, but never deflexed, lacking the swollen tubercles of *P. distans* in their axils. *Spikelets* small, of 4–5 flowers, rather numerous, and forming lobed and interrupted spikes on the branches. *Glumes* as in *P. fasciculata*. *Lower pale* ovate, with a narrow membranous margin at the apex, and the strong mid-nerve slightly projecting through the margin in a mucro. *Anthers* small (0·4–0·5 mm. long).

Distribution.—Sardinia and Algeria (Crépin) ; Spain—Barcelona (*Jansen & Wachter*) ; S. France, near Marseilles (*Crépin*) ; W. France, Vendée (see above) ; Holland (*Jansen & Wachter*) ; England, Kent (see above).

This species is intermediate in general appearance between *P. distans* and *P. fasciculata*. From the former it may readily be distinguished by the panicle-branches never becoming deflexed and lacking tubercles in their axils, by the almost sessile spikelets, the narrower margin to the pale and the stronger mid-nerve which is usually excurrent (fig. *a*), the smaller anthers, and the stouter, less graceful appearance of the panicle. From *P. fasciculata* it may be known in the field by the rhomboidal (instead of asymmetrical) projection of the panicle, with its taller and more graceful habit. In herbarium material the presence of the longer panicle-branches naked at the base, the more elongate shape of the spikelets, and the flatter less revolute leaves, offer ready characters. The affinity is with *P. fasciculata* rather than with *P. distans*, and the writer is aware that since he first found this species in Kent in 1930 that he has passed specimens from the Thames marshes as " untypical *Borreri*."

It might be supposed from a note in ' English Botany ' (xi. 106 ; 1873) that Syme had observed this plant in Kent and Essex, but although there is very ample material of *P. fasciculata* from these counties in the Boswell-Syme Herbarium, *P. pseudodistans* is not represented. It appears, therefore, that Syme's strictures on Crépin's species were based on plants of *P. fasciculata* with abnormal symmetrical panicles.

The distribution of this species is probably even yet imperfectly known. Crépin knew of it only from the western Mediterranean, and Jansen and Wachter's discovery of the plant in the Zuider Zee appeared at first somewhat anomalous. The detection of specimens from Britain, and also from Beauvoir on the Atlantic coast of France at the approximate latitude of 47° N., however, suggests that the European distribution may be very similar to that of other plants of the Mediterranean element in our flora. It also seems highly probable that this interesting grass has been overlooked in some intermediate stations.

Pending a revision of the British species of *Puccinellia* the following key, based on that given by Jansen and Wachter (*loc. cit.* xlv. 23 ; 1935), should prove useful :—

1. Plant with prostrate barren leafy shoots. Leaves fleshy, revolute. Fruiting spikes unilateral. Pales stout, not transparent. Anthers large, at least 2·2 mm. long..... *P. maritima* Parl.
   Plant with erect leafy shoots. Leaves not fleshy, mostly flat or loosely plicate ..... 2.

2. Pales broad-membranous obtuse, with a membranous apex (the nerves not excurrent) .... 3.
   Pales with a strong mid-nerve which runs to about the apex and is often excurrent in a mucro, membranous margin narrow, frequently almost absent..... 4.

3. Stem erect or ascending, the whole plant usually grey-green in colour. Spikelets close-flowered. Upper pales broad, abruptly obtuse, truncate (fig. *a'*) ..... *P. distans* Parl.
   Plant usually spreading with stems lying on the surface of the ground (in closed associations erect or ascending), the whole plant usually pale green. Spikelets loose-flowered. Upper pales narrow, somewhat longer than in the former species, appearing pointed when viewed laterally ..... *P. retroflexa* Holmb.

4. Panicle unilateral (projection triangular) .... 5.
   Projection of panicle rhomboidal, branches obliquely erect. Spikelets extending to the base of the smaller panicle branches, but the larger ones naked for as much as 4 cm. from the base. Spikelets in clusters, almost sessile. Mid-nerves of the lower pales projecting in a mucro. Anthers small (0·4 to 0·5 mm.) ..... [Jans. & Wacht. *P. pseudo-distans*

5. Branches of the panicle erect, forming a laterally flattened spike. Spikelets linear. Pales very strongly nerved. Leaves flat and broad with split sheaths, narrowed from a broad base (" tongue-shaped ")..... [Weatherb. *P. rupestris* Fern. &
   Branches of the panicle obliquely erect. Spikelets ovate. Pales weakly nerved, the midrib reaching to the apex. Leaves narrower than in the preceding species, slightly cucullate at the apex ..... *P. fasciculata* Bickn.

The writer is greatly indebted to Mr. P. Jansen of Amsterdam for much help in the preparation of this paper and for kind permission to reproduce the figures on p. 264.

THE SOUTH AFRICAN SPECIES OF *SPILOXENE* SALISB.

BY S. GARSIDE, M.Sc.

DURING a field and herbarium study of the plant long known as *Hypoxis stellata* (Thunb.) Linn. f., the present writer examined Burmann's specimens of *Amaryllis capensis* L. (now in the Herbarium of the Conservatoire et Jardin Botaniques de la Ville, Geneva), and found that they agree in all important specific characters with the specimens of *Hypoxis stellata* in the Linnean Herbarium, London.

Amaryllis capensis L. is cited in some of the older works as a synonym of *Hypoxis stellata*, and a suggestion that the younger Linnæus was unaware that his father had already named the plant was made at an early date in Lamarck's ' Encyclopédie Méthodique,' iii. 184 (1789).

Under *Hypoxis stellata* in this work is the following statement : " je trouve qu'il a eu tort de n'avoir pas cité pour synonyme de son *Hypoxis stellata*, l'*Amaryllis Capensis* de son père. Cela est cause que dans le *Systema vegetabilium* de M. Murrai (edit. 14.), il y a un double emploi de cette plante."

In the summer of 1760, Linnæus (pater) examined Nicolas L. Burmann's herbarium of Cape plants (collected by Oldenland about 1695), and from these specimens he compiled the descriptions which he subsequently published as ' Plantæ Africanæ Rariores.' In the case of *Amaryllis capensis*, Linnæus himself wrote this name against the plants concerned, so that they are undoubtedly the type-specimens. However, when Williams (Journ. Bot. xxxix. 289 ; 1901) separated *Ianthe* Salisb. from *Hypoxis* L. the correct specific epithet was not used for the above plant, nor was the change made by Nel (Engl. Bot. Jahrb. li. 296 ; 1914) in his revision of *Ianthe*.

Fourcade (Trans. R. Soc. S. Afr. xxi. 76 ; 1932) has pointed out that *Ianthe* Salisb. Gen. Pl. 44 (1866) is invalidated by *Janthe* Grisebach, Spicileg. Fl. Rumel. ii. 40 (1844), and that the genus *Spiloxene* Salisb. *loc. cit.* being congeneric with *Ianthe* Salisb., those species which have been transferred to *Ianthe* by Salisbury, Williams, and Nel must now be placed in *Spiloxene*.

New combinations for five species have already been made by Fourcade (*loc. cit.*), but one of these, *Spiloxene stellata* (Thunb.) Salisb. is invalid for reasons already stated. He also overlooked the publication of *Fabricia alba* Thunb. and *Helonias minuta* L. (See nos. 3 and 20 below.)

The following list contains the necessary new combinations, as well as those which have already been made, the order followed being that given by Nel (*loc. cit.* 290–300). It will be observed that *Hypoxis linearis* Andr. Bot. Repos. iii. t. 171 (1801), although incorrectly reduced to a variety of *Hypoxis stellata* by Baker

(Journ. Linn. Soc., Bot. xvii. 101 ; 1880), and not mentioned in Nel's revision, has again been given specific rank. A careful examination of Andrews's plate (there is no type-specimen) shows that the plant there figured differs from *H. stellata* in the absence of the sheathing bract at the node of the peduncle which is so characteristic of the latter plant ; and in the corm, which is figured as if covered with interwoven roots and soil. Andrews's plant belongs to the section *Ovatae* Nel (of *Ianthe*), and has no close affinity with *H. stellata*. Plants from Khamiesberg (Percy Sladen Memorial Expedition, nos. 6535 and 6608 : leg. *H. H. W. Pearson*) agree completely with Andrews's figure, and are considered by the present writer to be the same species.

SPILOXENE Salisb. Gen. Pl. 44 (1866). *Ianthe* Salisb. *loc. cit.* (1866), non *Janthe* Griseb. (1844).

1. **S. Scullyi** (Baker), comb. nov. *Hypoxis Scullyi* Baker in Journ. Bot. xxvii. 2 (1889).

2. **S. Maximiliani** (Schltr.), comb. nov. *Hypoxis Maximiliani* Schltr. in Engl. Bot. Jahrb. xxvii. 89 (1899).

3. S. ALBA (Thunb.) Fourcade in Trans. R. Soc. S. Afr. xxi. 76 (1932). *Fabricia alba* Thunb. in J. C. Fabricius, Reis. Norweg. 26 (1779), pro parte, excl. vars. 1 et 3. *Hypoxis alba* (Thunb.) Linn. f. Suppl. Pl. 198 (1781).

4. **S. acida** (Nel), comb. nov. *Ianthe acida* Nel in Engl. Bot. Jahrb. li. 291 (1914).

5. S. AQUATICA (Linn. f.) Fourcade, *loc. cit.* (1932). *Hypoxis aquatica* Linn. f. *loc. cit.* 197 (1781).

6. **S. serrata** (Thunb.), comb. nov. *Fabricia serrata* Thunb. in J. C. Fabricius, *loc. cit.* 29 (1779). *Hypoxis serrata* (Thunb.) Linn. f. *loc. cit.* (1781).

   Var. **albiflora** (Nel), comb. nov. *Ianthe serrata* var. *albiflora* Nel, *loc. cit.* 293 (1914).

7. **S. Dielsiana** (Nel), comb. nov. *Ianthe Dielsiana* Nel, *loc. cit.* (1914).

8. **S. cuspidata** (Nel), comb. nov. *Ianthe cuspidata* Nel, *loc. cit.* 294 (1914).

9. **S. gracilipes** (Schltr.), comb. nov. *Hypoxis gracilipes* Schltr. *loc. cit.* 88 (1899).

10. **S. ovata** (Linn. f.), comb. nov. *Hypoxis ovata* Linn. f. *loc. cit.* (1781).

10 *a*. **S. linearis** (Andr.), comb. nov. *Hypoxis linearis* Andr. Bot. Repos. iii. t. 171 (1801).

11. **S. monophylla** (Schltr.), comb. nov. *Hypoxis monophylla* Schltr. ex Baker in Fl. Cap. vi. 531 (1897).

12. **S. curculigoides** (Bolus), comb. nov. *Hypoxis curculigoides* Bolus in Hook. Ic. Pl. xxiii. t. 2259 A (1893).

13. **S. aemulans** (Nel), comb. nov. *Ianthe aemulans* Nel, *loc. cit.* 295 (1914).

14. **S. umbraticola** (Schltr.), comb. nov. *Hypoxis umbraticola* Schltr. in Engl. Bot. Jahrb. xxvii. 89 (1899).

15. **S. capensis** (L.), comb. nov. *Amaryllis capensis* L. Pl. Afr. Rar. 10 (1760) ; Amœn. Acad. vi. 86 (1763). *Fabricia stellata* Thunb. in J. C. Fabricius, *loc. cit.* 27 (1779). *Hypoxis stellata* (Thunb.) Linn. f. *loc. cit.* (1781).

16. S. TRIFURCILLATA (Nel) Fourcade, *loc. cit.* (1932). *Ianthe trifurcillata* Nel, *loc. cit.* 297 (1914).

17. **S. declinata** (Nel), comb. nov. *Ianthe declinata* Nel, *loc. cit.* 298 (1914).

18. **S. flaccida** (Nel), comb. nov. *Ianthe flaccida* Nel, *loc. cit.* (1914).

19. **S. Schlechteri** (Bolus), comb. nov. *Hypoxis Schlechteri* Bolus, *loc. cit.* t. 2259 B (1893).

20. S. MINUTA (L.) Fourcade, *loc. cit.* (1932). *Helonias minuta* L. Mant. Pl. Alt. 225 (1771). *Hypoxis minuta* (L.) Linn. f. *loc. cit.* (1781).

I am indebted to Mr. J. E. Dandy for valuable help with the literature, and to the late Dr. J. Briquet and the late Dr. Daydon Jackson for assistance in the examination of type-specimens.

REVIEWS.

Ueber die Lebensfähigkeit alter Samen. (Skrifter Utgitt av Det Norske Videnskaps-Akademi i Oslo, i., Mat.-Naturv. Klasse, 1935, No. 13.) By THORLEIF SCHJELDERUP-EBBE. Roy. 8vo, pp. 178, 12 tabs. J. Dybwad : Oslo, 1936. Price 14 Kr.

THE longevity of seeds has always aroused considerable interest both on practical and theoretical grounds. The literature on the subject is extensive and scattered, so that the bibliography at the end of this work is particularly useful.

The author gives a short historical *résumé* of the subject, but the greater part of his work is taken up wth the results of an extensive series of germination experiments made with seeds from two collections belonging to the Botanical Museum, Tøyen, Oslo. The results confirm the conclusions of former investigators

in that the Leguminosae provide by far the greatest number of successful germinations, followed at a considerable distance by the Malvaceae. The record germination was that of *Astragalus utriger* Pall., 82 years old. Considerable longevity was also demonstrated for *Canna paniculata* Ruiz & Pav. (69 years) and *Daphne Mezereum* L. (35 years). These require special mention, since they belong to families in which long-lived seeds have not been hitherto recorded.

None of the germinations equal the British Museum record of 150 years for *Nelumbium speciosum* or Ohga's for *Nelumbium* fruits from the Manchurian peat which may be 200–400 years old, but only the *positive* results of Schelderup-Ebbe are really valid. *Nelumbium* fruits which germinate in two days when treated with strong sulphuric acid would in all probability have failed to germinate in Schelderup-Ebbe's apparatus. Professor Ohga has had some *Nelumbium* fruits in water for years without any trace of germination, while they will germinate readily after proper treatment. Each seed-sample requires a series of tests under very various conditions before non-viability can be asserted.

The author considers that some respiration must continue as long as a seed remains alive, but no production of carbon dioxide has been detected from *Nelumbium* fruits. Further experiments of great accuracy are necessary to determine the chemical processes taking place in long-lived seeds.—A. W. EXELL.

Morphology of Vascular Plants, Lower Groups (Psilophytales to Filicales). By ARTHUR J. EAMES, Professor of Botany, Cornell University, U.S.A. Pp. xviii, 433, 215 text-figs. McGraw-Hill: London, 1936. Price 24*s*.

THIS somewhat clumsy title masks a notable addition to the list of text-books dealing with the Pteridophyta, as they are commonly called, though Prof. Eames does not use that term, but supports the view that divides vascular plants into four major groups—Psilopsida, Lycopsida, Sphenopsida, and Pteropsida. The Angiospermae and Gymnospermae are, with the Filicales, concealed under the label Pteropsida, while the other groups represent the fern allies. Each chapter deals with a separate group and has a separate bibliography. The influence of Prof. Bower's work is very evident, the author laying great stress on the importance of reduction in evolution. His tables showing this are one of the most pleasing features of the book. The Marsileaceae are compared with the Schizaeaceae, and the Salviniaceae with the Hymenophyllaceae. The fossil forms are dealt with at the end of the work, an unfortunate arrangement, as it separates them from their allies and necessitates cross-references.

The book is well written and well illustrated, but is unfortunately marred by lack of attention to taxonomic and nomenclatural details. In the table on p. 281, the author states that there are about 2000 species of Polypodiaceae—the estimate in the latest supplement of Christensen's 'Index' is 7227, rather a wide discrepancy. On p. 275 the author speaks of "the large and well-known genera *Dryopteris*, *Aspidium*, and *Polystichum*," but on p. 272 he uses *Nephrodium* for *Dryopteris*, and on p. 162 *Thelypteris*; on p. 385 he is using *Aspidium* in the sense of *Dryopteris*, and on p. 164 for *Tectaria*. *Equisetum maximum* of p. 96 has become *E. Telmateia* on p. 101. Yet this is the best book for university students available in the English language.—A. H. G. ALSTON.

Monographie du Genre Cestrum L. By PIERRE FRANCEY. 'Candollea,' vol. vi, pp. 46–398, 1935, and vol. vii, pp. 1–132, 3 text-figs., 1936.

THE completion of this monograph of the genus *Cestrum* by Pierre Francey will be particularly welcome to all botanists who have had acquaintance with the genus and experience of the difficulty in identifying specimens. There has been a steady accumulation of unidentified material in herbaria and the last treatment of the genus (Dunal in DC., Prodr. xiii, 598 (1852)) had become of little use in dealing with it.

The monograph is divided into two parts. In the short preliminary part the author gives an historical appreciation of his subject and proceeds from this to discuss the distinctions between *Cestrum* and the closely related genus *Sessea*. He concludes that the two genera are only separable on the character of the fruit which in *Sessea* is a capsule and in *Cestrum* a berry, although the author points out that there are transitional species in both genera. A chapter is devoted to the vegetative and floral morphology and the first part concludes with a geographical analysis of the genus. *Cestrum* is almost exclusively a central and south American genus, although certain species have become naturalised in many parts of the Old World.

In the taxonomic part, which occupies 460 pages, Francey accepts Dunal's major division of the group into two sections, *Habrothamnus* and *Eucestrum*, and while adding 101 new species of his own refers 30 of Dunal's species to synonymy. The need for a monograph is thus apparent, and the author has had the advantage of consulting material in most European herbaria and several American, but the collections of the British Museum have not been consulted. These contain the type-specimens of Miers's species, and two of these placed by the author under

" Species incertæ " are represented in the British Museum by excellent specimens. An analytical key is provided which extends over 23 pages and for which the author claims that " *nouvelles espèces pourront facilement s'intercaler.*" The volume is adequately indexed, and an alphabetical list of the exsiccata cited is also provided.—G. TAYLOR.

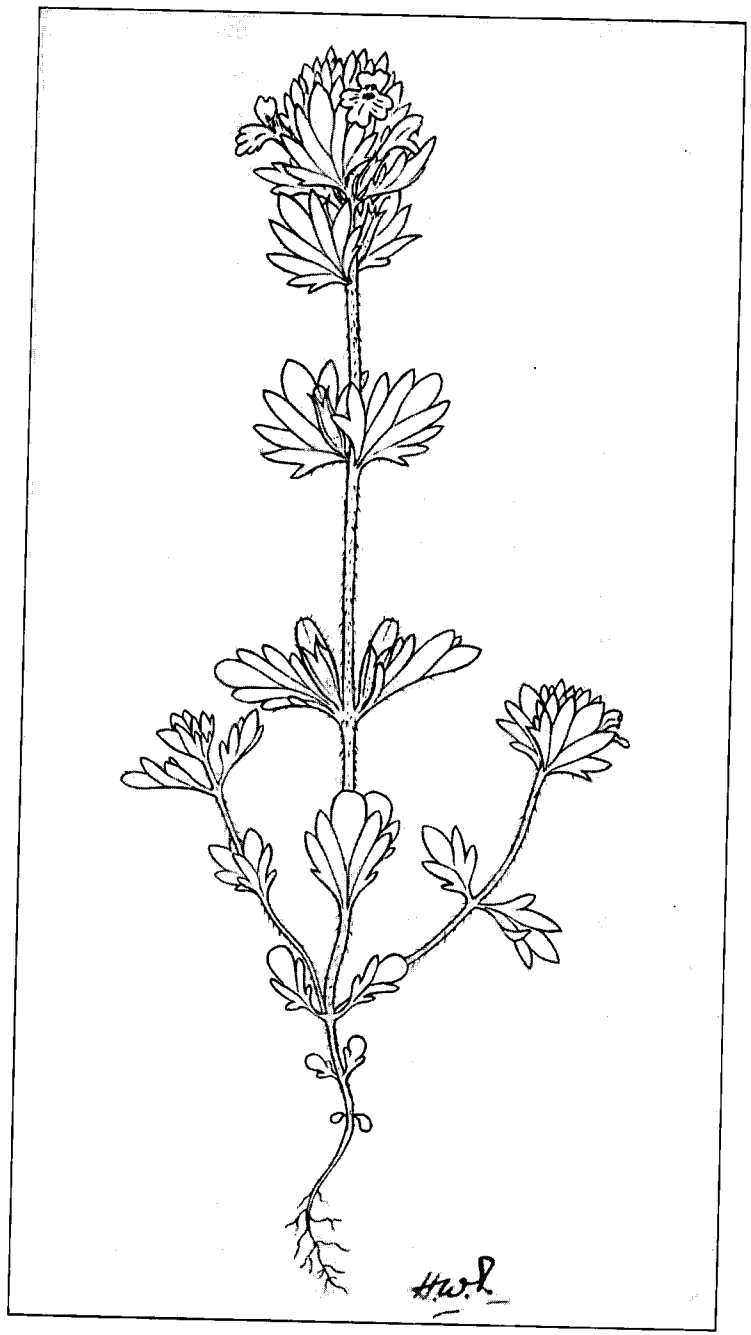
BOOK-NOTES, NEWS, ETC.

THE 'Orchid Review' for August reports an address by Mr. G. Herman Slade to the Orchid Society of New South Wales on the technique of the ' Asymbiotic Method ' of raising Orchids from seeds which has been successfully employed in Australia. The seeds are grown on agar-agar in a carefully prepared sterilized solution of nutrient salts and glucose.

FLORA OF HAWAII IS.—C. Skottsberg (Meddel. Göteborgs Botan. Trädgård, x.) continues his notes on the flora of the islands, to which he paid a second visit in 1926. A list is given of the plants collected in Oahu and Hawaii with critical notes on many of the species, the result of comparative work in European and American herbaria. Some genera are studied in considerable detail, such as *Wikstroemia* (Thymeleaceae), *Labordia* (Loganiaceae), and *Cyrtandra* (Gesneraceae). A number of new species are described.

FLORA OF FORMOSA.—Yoshimatsu Yamamoto continues his work on the flora of the island. Contributions from the Herbarium of Taikoku Imperial University, nos. 41 and 43, contains the results of his work in the herbarium of the New York Botanic Garden on collections by the late Dr. Henry and others.

GYNÆCIUM OF THE PRIMULACEAE.—Jean Dickson ('American Journal of Botany,' June 1936) concludes, from a comparative study of the development of the gynæcium in the Ranunculaceae, Geraniaceae, Caryophyllaceae, and Primulaceae, that a progressive vascular development indicates that the five main strands in the compound ovary-wall in Primulaceae represent carpel-midribs and that the bundles in the central region are mainly the marginal strands of the five carpels in varying stages of fusion. The free-central placenta of the Primulaceae may therefore be interpreted as the fused margins of five carpels that are separated from their outer portions at their origin in the receptacle. Primulaceae and Caryophyllaceae thus present fundamentally the same type of gynæcium development, the former being an evolutionary stage in advance of the latter. The paper is dated from the Imperial Forestry Institute, Oxford.



EUPHRASIA TIROLENSIS FUGSLEY.
(Twice natural size.)

ENUMERATION OF THE SPECIES OF *EUPHRASIA* L., SECT. *SEMICALCARATAE* BENTH.

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

(PLATE 611.)

SINCE the publication of my 'Revision of the British Euphrasiae' (Journ. Linn. Soc., Bot., xlviii. 467 *sq.*; 1930) I have collected Eyebrights in various habitats ranging from Dauphiny and Savoy to Germany and Tirol, as well as in many British localities, and I have been enabled to examine rich material of Greenland and other boreal forms.

The taxonomic arrangement of the Revision differed from the grouping in Wettstein's Monograph of the genus, for, like Chabert and Jørgensen, I was unable to follow his division of the *Semicalcaratae* into three subdivisions, two of which were based on the elongation or not of the corolla-tube during the period intervening between the opening of the flower and its fertilization. Reasons for this view appear on pages 473 and 477 of the Revision. The order which I adopted is a modification of Jørgensen's ('Die Euphrasia-Arten Norwegens' in Bergens Museums Aarbok, 1919), with two subsections, *Ciliatae* and *Angustifoliae*, the former subdivided into four series to cover the British species. Recently, in an account of the species known in Spain, W. Rothmaler ('Cavanillesia,' vol. vii. fasc. iii; 1935) has adopted a similar treatment, with the addition of a fifth series to include some plants unknown in Britain.

It now seems desirable to extend the new arrangement to cover the whole section. To do this accurately and completely would involve considerable work, for very many new species, which would need investigation, have been described in the last four decades. But it is thought that a fresh conspectus of the species known to Wettstein, together with some others whose rank can be confidently accepted without serious research, would be of use to botanists as a basis for the arrangement of collections, and perhaps for a more complete account of the group at some future date.

A perusal of Wettstein's Monograph shows that of his fifty-four species of *Semicalcaratae* about twelve may be termed plants of a wide geographical distribution, while the remainder are relatively local. Of the latter, some are forms of Central Europe which the monographer had seen *in situ*, but the majority were obtained from localities scattered right round the Northern Hemisphere. While most of the local species show clearly the characters assigned to them in their descriptions—perhaps because they were based on limited material—the widely spread species, most of which are now well represented in herbaria, are generally found to be eminently polymorphic; and in recent

years numerous forms of them have been raised to specific rank. Certain of these are no doubt as distinct as some of the species admitted by Wettstein. But the study of the genus in different European countries, in North America and in Japan has also resulted in the discovery of entirely new forms, together with fresh facts of distribution; and this, with the better knowledge of the older species, materially modifies some of Wettstein's conclusions respecting their status and origin. The present difficulty of the worker on the group is to retain a well-balanced idea of what should be held to constitute a taxonomic species and to avoid the temptation to create innumerable specific names that, generally applied, would finally render all taxonomy impracticable.

There are a few species of *Euphrasia* the variety of whose forms is particularly striking and difficult to understand. Many specimens named *E. stricta* Host, though possessing the essential characters, look very unlike the tall elegant plant with fine lilac flowers that grows in Austria. *E. nemorosa* (Pers.) Löhr in Britain sometimes matches the typical German form, but more often varies towards *E. curta*, *E. confusa*, *E. micrantha* or *E. borealis*. In the Arctic regions *E. frigida* Pugsl. (*E. latifolia* Pursh ex Wettst.) is very unstable. Jørgensen (*l. c.*) described several varieties from Norway; other forms occur in Iceland and the Faeroes; and in Greenland still others, including one very distinct plant with long-cuspidate bracts noticed by Lange in 1880 (Consp. Fl. Grœnl. 79) as *E. officinalis* L. α. The variability of *E. minima* Jacq. of Central Europe is proverbial. Its corolla is typically bright yellow, but it may have the upper lip blue or violet, be wholly white or lilac-tinted, or even purple. In two stations in the Isère Valley, in Savoy, I found in 1931 colonies having the corolla yellow with a chestnut-brown upper lip—a combination of colours apparently not hitherto noted. The indumentum of the foliage in this plant varies almost equally. The leaves may be glabrous, shortly pubescent or coarsely setose; and the habit, although nearly always of Wettstein's æstival or early-summer type, is anything but uniform. There is usually no evidence of these variations being due to hybridity. In 1933 I found at Mattmark, in the Saas Valley, Switzerland (8500′ alt.), within the area of a mile, no less than five colonies of totally different forms, each itself quite homogeneous, all of which could be referred only to *E. minima*. So far as could be seen, no other species was growing within several miles. *E. salisburgensis* Funck forms likewise a polymorphic group with white, lilac, blue or claret-purple flowers, and foliage varying greatly in breadth and toothing. I even found this species with yellow flowers in the Saas Valley in 1933—probably owing to crossing with *E. minima*—but with no other indication of hybridity. In Spain and other countries of southern Europe *E. pectinata* is most variable, and twelve Spanish species described by Frère Sennen have been placed under it in synonymy by Rothmaler (*l. c.*). In Asia the allied *E. tatarica* Fischer, as well as *E. Schlagintweitii* Wettst., is similarly polymorphic. There are also forms connected with *E. alpina* Lamk., both in the Alps and Pyrenees, that are perplexing, and some seem to approach the large-flowered species of the *Angustifoliae*. *E. hirtella* Jord. is eminently polymorphic throughout its range from Spain to Central Asia.

Many new species have been established in recent years by segregation from the polymorphic plants, and in some cases it is not easy to determine their actual taxonomic value. It is probable therefore that from this enumeration names have been omitted which deserve recognition, for when I have not seen authentic specimens I have admitted only such as appear from their descriptions to be obviously distinct. The species described since the appearance of Wettstein's Monograph are European, Asiatic (chiefly Japanese) and North American. Townsend, in 1898, published an account of the North American *E. canadensis* (Journ. Bot. xxxvi. 1). In 1902 A. Chabert, in "Les Euphrasia de la France" (Bull. Herb. Boiss. sér. 2, ii. 514 and 517) distinguished *E. Sennenii*, an ally of *E. alpina*, *E. Songeonii*, a "*stricta*-like" plant from Piedmont, and *E. Alboffii*, near *E. petiolaris* Wettst. but eglandular, from Circassia. F. Vollmann introduced the Bavarian *E. alpigena* and *E. praecox* (allies of *E. picta* Wimm.) in Œsterr. Bot. Zeits. lv. 456 *sq.* (1905). In 1919 Jørgensen (*l. c.* p. 255) separated a large-flowered Norwegian form from *E. borealis* Towns. as *E. hyperborea*. W. Becker (Fedde, Repert. xviii. 475; 1922) added *E. Mattfeldii*, a glandular plant near *E. drosocalyx* Freyn, from Tirol; and four years later (*l. c.* xxii. 304) *E. Preussiana*, of the *Nemorosae* series, from Westfalia. He also distinguished (*l. c.* xvii. 126; 1921) another form of this group from Corea as *E. coreana*. A Caucasian plant of *minima*-affinity was distinguished in 1923 as *E. amblyodonta* by S. Juzepczuk (Nat. Syst. Herb. Hort. Bot. Petrop. iv. 61). Six new British species were published in my Revision in 1930, viz.:—*E. rotundifolia*, *E. Marshallii*, *E. cambrica*, *E. Pseudo-Kerneri*, *E. rivularis* and *E. anglica*. Prior to this my *E. confusa* had been described (Journ. Bot. lvii. 169; 1919), and subsequently *E. asturica*, from Spain, and *E. cisalpina*, from the Southern Alps (*op. cit.* lxx. 200; 1932), as well as *E. Davidssonii* from Iceland (*op. cit.* lxxi. 308; 1933). Among Japanese forms, *E. Iinumae*, *E. idzuensis* and *E. Makinoi*, the first related to *E. insignis* Wettst., the others nearer to *E. multifolia* Wettst., were described by Takeda (Kew Bull. 1910, 193 *sq.*) Four more Japanese species followed in Fedde's Repertorium, xi. 33, 34 (1912), distinguished by T. Nakai. Three of these are high mountain plants not closely related to any previously known species. In North America two new species, *E. Williamsii* and *E. Randii*,

resembling *E. Oakesii* Wettst. and *E. bottnica* Kihlman respectively, were described in 1901 by B. L. Robinson ('Rhodora,' iii. 270 *sq.*). In 1915 ('Rhodora,' xvii. 190 *sq.*) M. L. Fernald and K. M. Wiegand reviewed the genus as represented in North America, establishing two new species, *E. Hudsoniana* and *E. disjuncta*, and substituting for *E. Randii* Robins. an earlier, overlooked name, *E. purpurea* Reeks. In addition to these new species over sixty specific names for Spanish forms have been created by Frère Sennen. Fifty-eight of these, however, have lately been relegated to synonymy by Rothmaler (*l. c.*).

In reviewing the species of Wettstein's Monograph a few points of interest have come to light. The first plant dealt with (under the group *Parviflorae*), *E. grandiflora* Hochst., is a rare species from the island of Pico, in the Azores. Wettstein was able to examine only incomplete specimens, and described the plant as " annua vel perennans," remarking that he did not know its fruit. Although he describes its corolla as 10–12 mm. long, he places it among his *Parviflorae*, presumably because he could not detect any elongation of the corolla-tube. In the British Museum Herbarium there is not only a specimen from Hochstetter, but other similar material from the neighbouring island of Terceira, which shows the plant's features more completely. Kew also possesses several specimens from different islands of the group. The plant is a true perennial, with a branching rootstock from which arise suffruticose leafy stems, bearing relatively short spikes of large flowers. The original diagnosis (Seubert, Fl. Azorica, 39; 1844) runs :—" Caule fruticuloso ramoso pubescente, foliis [omnibus oppositis] sessilibus e basi truncata ovato-subrotundis margine reflexo crenato-dentatis coriaceo-rigidis glabris præsertim subtus reticulato-rugulosis, floribus in caulis et ramorum apice congestis spicatis, corolla [speciosa, purpurascens, fauce maculis flavescentibus variegatis] calycem triplo superante"; and a good figure is given but without fruit. An examination of the exsiccatæ shows that the plant possesses the unequally spurred anther-cells of the *Semicalcaratae*, but the Terceira specimens bear capsules differing from the form prevalent in that Section, being more compressed and so deeply emarginate as to become almost bilobed. This feature of the fruit, with the perennial habit, suffruticose stem, and distinct foliage and inflorescence, renders the plant so radically different from the annual *Semicalcaratae* that it must evidently be placed in another generic Section. Its spurred anthers preclude its inclusion with the *Australes*, and as it is quite unlike the *Trifidae*, a new sectional name, *Atlanticae*, is proposed. The specimens in the British Museum Herbarium from Terceira, although very like Hochstetter's plant, are not identical. They differ in their scabrid, more finely toothed leaves, which are densely and coarsely pilose below, as well as

in their still larger white flowers (15 mm. long). The form was distinguished from *E. grandiflora* by H. C. Watson in the 'London Journal of Botany' (" Botany of the Azores "), 598 (1844), and described under the name *E. azorica*, which thus seems to constitute a second species of the Section *Atlanticae*. *E. azorica* grows also in the islands of Flores and Corvo. Watson's specimens are at Kew.

Four Japanese species are given in the Monograph, of which three are endemic. The fourth, *E. Maximowiczii* Wettst., also inhabits the Asiatic mainland, and is allied to *E. tatarica* Fischer and other Continental species, as Wettstein states. Of the three endemics, one (*E. multifolia*) is placed by Wettstein among the *Parviflorae* near *E. nemorosa*, while the two others (*E. japonica* and *E. insignis*) are treated as belonging to the *Angustifoliae*. There is material of these three species either at Kew or the British Museum, as well as of *E. idzuensis* Takeda, a large-flowered plant allied to *E. multifolia*. All of these plants have a distinctive, late-summer habit, tending to become branched high on the stem and producing leafy branches which terminate in short spikes of flowers. Their foliage also seems characteristic, for unlike both *Ciliatae* and *Angustifoliae*, the floral leaves are not broader or more deeply toothed than the cauline. The flowers are variable. The plants appear to be related and to form a distinct group of the *Semicalcaratae*, and it is therefore proposed to place them together in a new Subsection, *Japonicae*.

There are also at Kew examples of two very different Japanese *Euphrasiæ*, *E. Matsumurae* Nakai and *E. Yabeana* Nakai. These are high mountain forms of more or less æstival habit, with broad, very obtusely cut leaves, strongly cuneate below and subpetiolate. As in the other Japanese species, the floral leaves show no special development. Their flowers are large and showy, with a peculiarly broad and obtusely toothed calyx, and a white corolla marked with two dark purple spots in the throat towards the base of the upper lip, which is fringed with long, glandular hairs. The anthers are only sparingly pilose. These plants may be connected by transitional forms with the *Japonicae*, but from the present available material they seem very distinct, and are therefore treated as another separate Subsection, *Alpicolae*.

A further plant apparently allied to the Japanese species is the remarkable *E. formosissima*, discovered in 1917 by Skottsberg on Juan Fernandez, off the coast of Chile (Nat. Hist. Juan Fernandez, ii. 169; 1920). This has foliage recalling *E. idzuensis* and obtuse calyx-teeth as in *E. Matsumurae*, but it is of perennial duration, not reproducing itself by fresh shoots from the rootstock, as in the Azorean species, but by elongation and further branching of the original stem. It is notable also for the entire (not emarginate) lobes of the lower lip of the corolla, for its glabrate, unequally spurred anther-cells, and for its small,

scarcely retuse, setulose-edged capsules. Skottsberg considers it to belong to the *Semicalcaratae*, but it seems better to restrict that Section to the annual species, and to regard this new plant as constituting a distinct Section, for which the name *Paradoxae* is suggested.

A species of the *Ciliatae* was discovered in 1923 in the Great Atlas of Morocco—an addition to the flora of North Africa—in several stations, and was referred to *E. minima* DC. var. *Willkommii* (Freyn), a plant of the Sierra Nevada, by MM. de Litardière and Maire (in Mém. Soc. Sci. Nat. Maroc; 1924). A specimen of this plant in Herb. Lacaita, now at the British Museum (Jahandiez, Plantes Marocaines, 1923. Arround (Reraya); leg. Litardière), proves to be not *E. Willkommii* but a weak form of *E. pectinata* Ten. It is not known whether the plants of the other Atlas stations are identical.

As already indicated, the provisional nature of this Enumeration and some of its defects are fully realized, especially in the case of the Subsection *Ciliatae*, where the forms are so numerous, with so many cross affinities. So far as is possible, the species have been arranged in what is thought to be natural groups. The term "æstival" or "early summer" habit is here used, not only to represent such species as *E. montana*, where the cauline leaves are few and all of the internodes, even the lowest, are elongated, but also dwarfer forms, often from alpine or arctic habitats, which have a similarly small number of cauline leaves and internodes, with the latter (especially the lowest) showing less or little elongation. In the plants termed "dwarf" the internodes are much shorter than the leaves or almost suppressed. The glandular clothing of the foliage used as a taxonomic feature is, of course, the indumentum of stalked glands or glandular hairs and not the sessile glands seen on the lower surface of the leaves.

The following new species, except *E. tirolensis*, have been described from recent additions to the Herbaria at the British Museum and at Kew. The descriptions have been written in the same form as those in my Revision of the British Eyebrights, which closely follow the diagnoses in Wettstein's Monograph.

Euphrasia nepalensis, sp. nov.

Exsicc. K. N. Sharma, Chisey, Nepal (14,000′ alt.), 15. 8. 31, no. E. 141. (Type in Herb. Mus. Brit.)

Planta habitu æstivali. Caulis erectus, satis robustus, 6–12 cm. altus, fuscescens, pilis longis deflexis albidis vestitus, *foliis caulinis quam internodis* longiusculis *multo brevioribus* præditus; e foliorum pare 4°–5° florens; *simplex* vel raro 1–2 ramos breves emittens. *Folia parva* (plerumque 6–8 mm. longa), haud numerosa, verisimiliter griseo-viridia, erecto-patentia, facile caduca; caulina inferiora ovalia, basi vix cuneata, apice obtusissima

utrinque 1–2 dentibus obtusis; superiora magis ovata, inferne subtruncata vel rotundata, 2–3 dentibus obtusis, obtusa; floralia rotundato-ovata 3 (rarius 4) dentibus subacutis, apice triangulari-obtusiuscula; omnia eglandulifera *setis breviusculis* in paginis superiore et inferiore satis dense *vestita*. Spica densa, verisimiliter haud elongans. Calyx ut folia setosus, dentibus triangulari-subulatis, subsessilis. *Corolla magna*, dorso circa 8 mm. (tandem 10) longa, *lilacina*, striis purpureis picta et in labio inferiore luteo-maculata; labii superioris lobis retusis ±reflexis; *labio inferiore multo longiore* lobis (quorum medio longissimo) latis emarginatis trilobato. *Capsula*, ut videtur, parva, circa 5 mm. longa, *oblongo-elliptica, retusa*, superne ciliata, calycis dentibus brevior.

Near *E. picta* Wimm. and *E. praecox* Vollm., but with more indumentum and fewer shallower teeth to the leaves, rather smaller flowers with less elongation of the corolla-tube during anthesis, and apparently a narrower capsule. Of about forty individuals collected the lower cauline leaves had fallen in nearly every case, although no mature capsules had yet been formed.

Euphrasia setulosa, sp. nov.

Exsicc. J. H. Barbour, Gulmaig, Cashmere (10,000′ alt.), Aug. 1922, as *E. officinalis*. (Type in Herb. Mus. Brit.)

Planta habitu subæstivali. Caulis erectus, firmus, 5–10 cm. altus, purpurascens, pilis deflexis albidis dense vestitus, foliis caulinis quam internodis satis longis brevioribus præditus; e foliorum pare 6°–7° florens; simplex vel 2–4 ramos graciles ex axillis inferioribus emittens. *Folia parva* (ad 6 mm. longa), saturate viridia vel purpureo-tincta, erecto-patentia; caulina ovalia, basi ±cuneata, apice late triangulari-obtusiusculo, utrinque 1–3 dentibus brevibus obtusis; floralia ovata 3–4 dentibus breviter aristatis acuta; omnia in margine et in paginis superiore et inferiore *setis brevibus albidis* (pilis *glanduliferis* ±longis in paginâ inferiore *immixtis*) dense *vestita*. Spica densa. Calyx inferne subglaber, nervis purpurascentibus dentibusque subulatis aristatis valde setulosis præditus. *Corolla majuscula*, dorso circa 6 mm. longa, tubo verisimiliter haud elongante, *albida vel lilacino-tincta*, striis purpureis conspicuis picta et in labio inferiore luteo-maculata; labii superioris lobis subintegris reflexis; *labio inferiore multo longiore*, lobis latis emarginatis trilobato. *Capsula* parva, 4–4·5 mm. longa, *elliptica*, apice rotundato *emarginata*, margine ciliata, calycis dentibus (in exemplaribus visis) brevior.

This high-alpine Eyebright is notable for the indumentum of its foliage, the leaves being densely setulose, with an admixture of the long-stalked glands characteristic of the *Hirtellae* on the lower surface. Its strict habit, with rather leafy stem and brightly

coloured flowers, recalls *E. micrantha* Reichb. ; and it seems best placed in the Series *Latifoliae*.

Euphrasia bhutanica, sp. nov.

Exsicc. Ludlow and Sherriff, W. Bhutan (9100′ alt.), 11. 6. 33, no. 75 (type in Herb. Mus. Brit.). Kingdon Ward, Tsela Dzong, E. Himalayas, 28. 5. 24, no. 5706, in Herb. Kew.

Planta habitu subæstivali. Caulis erectus, gracilescens, 5–12 cm. altus, ± fuscescens, pilis parvis deflexis albidis parce vestitus, *foliis* (caulinis superioribus exceptis) *internoda superantibus* ; e foliorum pare 5°–8° florens ; *simplex* vel e foliorum caulinorum superiorum axillis 1–3 ramos graciles emittens. *Folia minima* (ad 5·5 mm. longa), satis numerosa, pallide viridia, erecto-patentia, haud facile caduca ; caulina inferiora ovalia basi cuneata, apice rotundato-obtusa, utrinque 1–2 dentibus obtusis ; superiora late ovalia ad ovata, basi ±rotundata, 2–3 dentibus obtusis, obtusa ; floralia rotundato-ovata, basi ± rotundata, 3–4 dentibus ±acutis, obtusiuscula ; omnia inferne valde plicata, et in paginis superiore et inferiore *setis ±brevibus hinc inde glanduliferis* immixtis, *obsita*. Spica densa. Calyx ut folia setosus, dentibus subulatis, fructifer haud accretus. *Corolla parva*, dorso circa 5 mm. longa, *præter labium superius lilacinum* purpureo-striatum *alba*, in labio inferiore luteo-maculata ; labii superioris lobis brevissimis, subintegris, reflexis ; *labio inferiore longiore* lobis retusis trilobato. *Capsula* 4·5–5 mm. longa, *oblonga*, apice *subtruncata*, superne ciliata et parce pilosa, calycis dentes subæquans.

Closely resembling some forms of *E. minima* Jacq., but of less marked early-summer habit, with more plicate, equally toothed and partly glandular foliage, larger corolla with longer lower lip, and narrower, more truncate (not emarginate) capsules.

The above description has been taken from Ludlow and Sherriff's specimens. Kingdon Ward's plants at Kew are finer, but otherwise apparently identical.

Euphrasia tirolensis, sp. nov. (Pl. 611.)

Exsicc. Pugsley, no. 526, Obergurgl, Austrian Tyrol.

Planta habitu æstivali. Caulis erectus, vix robustus, 5–8 cm. altus, viridis vel pallide fuscescens, pilis parvis deflexis crisputis albidis vestitus, *internodis intermediis quam foliis longioribus, reliquis* (præsertim infimis) *brevioribus* ; e foliorum pare 3°–5° (sæpissime 4°) florens ; *simplex vel ramis paucis* (1–2) præditus. *Folia relative majuscula* ; floralia (caulinis majora) ad 8 vel etiam 10 mm. longa, pallide viridia, subpatentia, basi ±cuneata, etiam infima haud facile caduca ; caulina inferiora oblongo-cuneata, utrinque 1–2 dentibus obtusis rotundato-obtusa ; superiora ovalia,

obtusa, 2–3 dentibus obtusis prædita ; floralia late rhomboideo-ovata, obtusa (vel suprema obtusiuscula), utrinque 3–4 (raro 5) dentibus satis longis obtusis (vel in supremis subacutis) ; omnia *subglabra*, hinc inde in margine et paginæ superioris apicem versus setis parvulis obsita, verisimiliter eglandulifera. Spica inferne laxa superne densa. Calyx angustus, brevissime pedunculatus, glandulis setisque minutis vestitus, dentibus lineari-oblongis acuminatis præditus, fructifer vix accretus. *Corolla parva*, dorso 5–5·5 mm. longa, *alba*, striis violaceis picta, labio superiore cœrulescente, inferiore pallide luteo-maculato ; labio superiore lobis retusis porrecto ; *labio inferiore paulum longiore*, lobis subæqualibus emarginatis trilobato. *Capsula* haud parva, circa 6 mm. longa, *anguste oblonga et apice attenuata, subtruncata*, pilis rigidis ciliata et superne parce pilosa, quam calycis dentes plane longior.

This remarkable Eyebright, from its long middle internodes and its dense spikes with relatively large floral leaves, recalls the typical form of *E. frigida* Pugsl. But it differs essentially in its more deeply cut foliage, with narrow but more uniformly obtuse segments, and further in its narrower attenuate and not emarginate capsules. It may possibly have arisen from the crossing of *E. minima* with *E. salisburgensis*, but neither the leaf-cutting nor the form of the capsules can be held to be intermediate ; and it certainly does not agree with the account of this hybrid, as seen at Pilatus and Sterzing, which Wettstein gives at p. 282 of his Monograph. The deeply toothed leaves and long, narrow capsules are essentially different from those of *E. minima*, and the contiguous instead of more or less distant leaf-segments are quite unlike the foliage-pattern of *E. salisburgensis*. The only remaining species with which *E. tirolensis* may be compared is apparently *E. Willkommii* Freyn, of Southern Europe. This is a dwarfer plant, with narrower, partly glandular foliage, deeply divided indeed, but with only two or three teeth on each side of the leaf. Its corolla is partially yellow and it has much shorter, emarginate fruits. The form of the capsule in *E. tirolensis* resembles that of *E. pectinata* Ten., but the two species are otherwise widely different, *E. pectinata* being normally a tall, little-branched plant with profuse, sharply toothed foliage and lilac-coloured flowers. From its ensemble of characters the new species seems best placed among the eglandular forms of the Series *Latifoliae*.

I found this Eyebright in July, 1932, in the Obergurgl Valley during a stay at Sölden, in the Oetztal. It at once attracted my notice as an undescribed form, but it occurred in no great quantity, and I was unable to collect more than twenty plants. It was not growing in company with any other species of the genus. A specimen has been placed in the British Museum Herbarium.

Euphrasia subpetiolaris, sp. nov.

Exsicc. J. F. Duthie, Khur Malik, W. Himalayas (16,000′ alt.), 16. 8. 99, in Herb. Kew. (Type). F. Ludlow, Upper Koksu, Tian Shan (8500′ alt.), 9. 8. 30, no. 752, in Herb. Mus. Brit.

Planta habitu aestivali. Caulis adscendens, flexuosus, gracillimus, 10–20 cm. altus, plus minusve purpurascens, pilis parvis deflexis crispulis albidis parce vestita ; *internodis longis* (summis exceptis) *folia longe superantibus* ; e foliorum pare 3°–6° florens ; *simplex* vel 1–4 ramos emittens. *Folia minima* (ad 5·5 mm. longa), haud numerosa, verisimiliter pallide virentia, suberecta, haud facile caduca ; caulina ovalia, basi cuneata, apice rotundata, utrinque 1–3 dentibus obtusis ; floralia subrhomboidea, basi cuneata, 2–3 dentibus ±acutis nec acuminatis, acuta ; omnia *setis brevibus* in margine dense atque in paginis superiore et inferiore parce *obsita*. Spica laxa, interrupta. *Calyx* parce setulosus, dentibus triangulari-subulatis, inferne *in pedunculum* brevem gracilem plane *contractus*. *Corolla parva,* dorso 5–6 mm. longa, tubo, ut videtur, tandem elongato, *pallide lilacina* striis purpureis obscure picta et in labio inferiore luteo-maculata ; labii superioris lobis subintegris vel denticulatis, porrectis vel reflexis : *labio inferiore longiore* lobis angustis retusis trilobato. *Capsula* parva, 5–5·5 mm. longa, *oblongo-elliptica,* apice rotundato *retusa,* ciliata, calycis dentes subæquans.

This obscure plant is allied to *E. petiolaris* Wettst. and *E. Alboffii* Chabert, but differs in its scarcely petiolate leaves and more shortly pedunculate flowers. The Tian Shan plant, which differs slightly from Duthie's material taken as the specific type, flowers from an earlier node (generally 3°–4° instead of 5°–6°) and has less acutely cut foliage. It has much the aspect of *E. pulchella* Kerner, to which I referred it in 1932 (Journ. Bot. lxix. 200). But I am now convinced that this identification was incorrect and that the plant should be regarded as a form of *E. subpetiolaris*. The position of *E. subpetiolaris* and its two allies in the Subsection *Ciliatae* is open to question, and they are provisionally placed in a separate Series, of which *E. petiolaris* is considered the typical species. Ludlow notes that in the Tian Shan *E. subpetiolaris* is a plant of open woodlands.

Euphrasia Kingdon-Wardii, sp. nov.

Exsicc. F. Kingdon Ward, Burma-Tibet Frontier (alt. 11,000′–12,000′), 2. 9. 31. no. 10,033. (Type in Herb. Mus. Brit.)

Planta habitu gracili. Caulis erectus, gracillimus, 5–15 cm. altus, purpurascens, pilis parvis deflexis crispulis albidis (superne glanduliferis immixtis) vestitus, *foliis caulinis quam internodis plane brevioribus* sed *floralibus ±contiguis* præditus ; e foliorum pare 8°–9° florens ; *simplex. Folia parva* (ad 6 mm. longa), erecto-patentia, haud facile caduca ; caulina inferiora ovalia obtusa utrinque 1–2 dentibus obtusis ; superiora ovata, basi breviter cuneata, 2–3 dentibus ±acutis, subacuta ; floralia late ovata, 3–4 dentibus breviter acuminatis ±acuta (summa dentibus longe acuminatis acuminata) ; omnia in paginis superiore et inferiore *setis atque pilis glanduliferis brevibus* satis dense *vestita*. Spica densiuscula. Calyx glandulifer setis minutis obsitus, dentibus subulatis, fructifer haud accretus. *Corolla parva,* dorso circa 5 mm. longa, (albida ?) ; labii superioris lobis brevibus vix retusis porrectis ; *labio inferiore longiore,* lobis angustis retusis trilobato. *Capsula* mediocris, 5–5·5 mm. longa, *oblongo-ovata,* apice *subtruncata,* ciliata, calycis dentibus subæquilonga.

This plant is stated to occur generally in the pastures and meadows of the district where it was found by Captain Kingdon Ward.

In habit it somewhat resembles an unbranched *E. micrantha* Reichb., but has rather broader glandular and setose foliage, and relatively broad capsules. The colour of the flowers has unfortunately become obscured in drying. The foliar glands are similar to those of *E. brevipila* Burn. & Grml. and its allies, and the plant appears to be best regarded as a species of the Series *Brevipilae* somewhat intermediate between *E. Regelii* Wettst. and *E. paucifolia* Wettst.

Euphrasia kashmiriana, sp. nov.

Exsicc. W. Koelz, in meadows, Bragnag, Ladak, Kashmir (13,000′ alt.), 1. 9. 31, no. 2795. (Type in Herb. Kew.)

Planta habitu æstivali. Caulis erectus, satis robustus, 4–7 cm. altus, purpurascens, pilis deflexis crispulis eglanduliferis albidis vestitus ; *foliis caulinis quam internodis brevioribus* præditus ; e foliorum pare 3°–4° florens ; *haud ramosus. Folia* (saltem floralia) *majuscula,* ad 6 mm. longa, saturate viridia, subpatentia, haud facile caduca ; caulina ovalia, basi vix cuneata, apice obtuso, utrinque 1–2 dentibus obtusis ; floralia majora, rotundato-ovata, basi in petiolum brevissimum contracta, apice triangulari obtusiusculo, utrinque 2–3 dentibus subacutis ; omnia in margine paginisque duabus *pilis brevibus glanduliferis vestita* et in margine sæpius setis minutis obsita. Spica densa sed interdum inferne laxiuscula. Calyx ut folia glandulifer, nervis purpurascentibus dentibusque triangularibus aristatis, fructifer satis accretus. *Corolla magna,* dorso 7–8 mm. longa, externe subglabra, tubo calycis dentes tandem paulo superante, *pallide purpurea* striis saturatioribus picta et in fauce labioque inferiore luteo-maculata ; labii superioris lobis retusis sæpe reflexis ; *labio inferiore multo longiore,* lobis latis emarginatis trilobato. *Capsula* mediocris, circa 6 mm. longa, *oblongo-ovata,* apice *subtruncata,* margine ciliata, calycis dentes paullulum superans.

This beautiful Eyebright has the short, glandular indumentum of typical *E. brevipila* Burn. & Grml. and is clearly a member

of the same group. Of the allied Asiatic species *E. Jaeschkii* Wettst. is a tall plant, larger in all its parts, with more numerous foliar teeth. *E. Regelii* Wettst. is likewise a larger, coarser plant, but with smaller flowers. *E. paucifolia* Wettst. is much slenderer, with almost filiform stems, narrower leaves with more numerous teeth, and flowers somewhat smaller. *E. Kingdon-Wardii* Pugsl. is taller and more slender, with more numerous cauline leaves and much smaller flowers. The European *E. tenuis* (Brenn.) Wettst. differs chiefly by its less robust habit and 5–6-toothed floral leaves.

Conspectus of species.

Euphrasia L., Sp. Pl. 604 (1753), ex parte; Bentham in DC. Prodr. x. 552 (1846).

Subgenus Eu-Euphrasia Jørgensen, Euphrasia-Arten Norwegens, 70 (1919): Wettstein, Mon. 68 (1896) (ut Sectio).

Folia indivisa, dentibus utrinque acutis vel obtusis, 1–10. Antheræ ±pilosæ.

Sectio I. Atlanticae, sect. nov.

Species insularum Azoricarum, perennes e basi ramosæ, folia rotundata, antheræ mucronatæ, duorum staminum posticorum breviorum loculus alter longius calcaratus. Capsula profunde emarginata, fere bilobata.

1. *E. grandiflora* Hochst. 2. *E. azorica* H. C. Watson.

Sectio II. Paradoxae, sect. nov.

Species insulæ Juan Fernandez, Chile, perennis, supra valde ramosa, folia elliptica, subcoriacea; calycis dentes obtusi; corollæ labii inferioris lobi subintegri haud emarginati; antheræ mucronatæ subglabræ-glabræ, duorum staminum posticorum loculus alter paulo longius calcaratus. Capsula parva, subretusa, superne setulosa.

3. *E. formosissima* Skottsberg.

Sectio III. Semicalcaratae Bentham, *l. c.*, emend. Wettst. Mon. 68 (ut Subsectio).

Species hemisphærii borealis, annuæ, antheræ mucronatæ, duorum staminum posticorum breviorum loculus alter longius calcaratus.

Subsectio 1. *Alpicolae*, subsect. nov.

Species montium Japonicorum, habitu ±æstivali, sæpe nano; folia dentibus paucis, glandulifera vel glabra, obtusissima, basi valde cuneata, subpetiolata; calyx ovatus vel subinflatus, dentibus brevibus obtusis; corolla magna, labii superioris glanduloso-fimbriati basin versus binis maculis atropurpureis notata; antheræ parce pilosæ; capsula lata, emarginata, ciliata.

4. *E. Matsumurae* Nakai. 5. *E. Yabeana* Nakai.

E. nummularia Nakai also seems to belong here.

Subsectio 2. *Japonicae*, subsect. nov.

Species Japonicæ habitu autumnali, superne ramosissimæ, florum spicis brevibus præditæ; folia dentibus paucis levibus glabra, floralia nec latiora nec magis dentata quam caulina; corolla parva ad magna; capsula satis parva, leviter ciliata.

* Folia elliptica. 6. *E. multifolia* Wettst. 7. *E. idzuensis* Takeda.

** Folia basi attenuata. 8. *E. japonica* Wettst. 9. *E. insignis* Wettst.

E. Iinumae Takeda, *E. Makinoi* Takeda and *E. Léveilleana* Nakai probably fall within this Subsection.

Subsectio 3. *Angustifoliae* Jørgensen, *l. c.* 61; Wettstein, *l. c.* 69 (ut Series).

Species Europæ, normaliter habitu autumnali; folia fere glabra, floralia (quam caulina sæpissime latiora) saltem duplo longiora quam lata (interdum multo angustiora), lanceolata ad linearia, dentibus angustis remotis prædita; capsula glabra vel leviter ciliata.

* Flores parvi. 10. *E. salisburgensis* Funck. 11. *E. lapponica* T. E. Fries. 12. *E. marilaunica* A. Kerner. 13. *E. illyrica* Wettst. 14. *E. dinarica* Beck.

** Flores magni, corollæ tubo sæpius tandem elongato. 15. *E. tricuspidata* L. 16. *E. cuspidata* Host. 17. *E. Marchesettii* Wettst. 18. *E. stiriaca* Wettst. 19. *E. italica* Wettst. 20. *E. Portæ* Wettst. 21. *E. cisalpina* Pugsl.

Subsectio 4. *Ciliatae* Jørgensen, *l. c.* 61.

Species hemisphærii borealis, habitu variabili; folia glabra, hirsuta vel glandulifera, floralia (quam caulina latiora) latiora quam eorum dimidia longitudo, rotundata ad lanceolata, dentibus haud remotis dentata vel rarius crenata; capsula pilis longis strictis ciliata.

a. Foliorum indumentum omnino vel pro majore parte eglanduliferum.

Series *Alpinae* Rothmaler, *l. c.* 10 (emend.).

Species habitu æstivali vel autumnali; folia glabra vel ±hirsuta, eglandulifera; corolla maxima, tubo tandem ±elongato et labio inferiore lato, porrecto, superius longe superante; capsula lata, ±retusa.

* Foliorum floralium dentes aristati. 22. *E. alpina* Lamk. 23. *E. Sennenii* (Chabert). 24. *E. Christii* Favrat.

** Foliorum floralium dentes non vel vix aristati.

! Herbæ habitu æstivali vel modice ramosæ. 25. *E. praecox* Vollmann. 26. *E. nepalensis* Pugsl. 27. *E. picta* Wimmer. 28. *E. versicolor* A. Kerner.

!! Herbæ habitu autumnali. 29. *E. alpigena* Vollmann. 30. *E. Kerneri* Wettst.

Series *Pectinatae*, ser. nov.

Species habitu ±robusto, leviter ramosæ; folia argute dentata, glabra vel hirsuta, nunquam glandulifera; corolla parva ad majuscula, labio inferiore superius superante; capsula relative angusta, haud retusa (*E. Bicknellii* exceptâ).

* Herbæ normaliter altæ, corollâ majusculâ. 31. *E. pectinata* Ten. 32. *E. tatarica* Fischer. 33. *E. Maximowiczii* Wettst. 34. *E. Hudsoniana* Fernald & Wiegand. 35. *E. cebennensis* Martin. 36. *E. Bicknellii* Wettst. ap. Chabert. 37. *E. condensata* Jord. (*E. stricta* Host). 38. *E. Songeonii* Chabert.

** Herbæ humiliores, corollâ parvâ. 39. *E. pumila* A. Kerner. 40. *E. liburnica* Wettst.

Series *Nemorosae* Pugsl. Rev. Brit. Euph. 494.

Species habitu ±robusto, sæpissime valde ramosæ, autumnales, rarius ramis paucis æstivales; folia subglabra vel hirsuta (plerumque etiam breviter glandulifera in *E. asturicâ* et *E. occidentali*); corolla parva (sed magna in *E. Pseudo-Kerneri* et *E. asturicâ*), labio inferiore superius superante; capsula latiuscula, ±retusa.

* Herbæ habitu autumnali.

! Folia subglabra. 41. *E. nemorosa* (Pers.) Löhr. 42. *E. confusa* Pugsl. 43. *E. americana* Wettst. 44. *E. canadensis* Towns. 45. *E. coreana* Becker. 46. *E. occidentalis* Wettst. 47. *E. Pseudo-Kerneri* Pugsl. 48. *E. asturica* Pugsl.

!! Folia hirsuta. 49. *E. cambrica* Pugsl. 50. *E. curta* (Fr.) Wettst. 51. *E. Marshallii* Pugsl. 52. *E. Davidssonii* Pugsl.

** Herbæ habitu ±æstivali.

! Folia glabra. 53. *E. Preussiana* Becker.

!! Folia hirsuta. 54. *E. cærulea* Tausch. 55. *E. rotundifolia* Pugsl.

E. tavastiensis Becker probably also belongs here.

Series *Latifoliae* Pugsl. *l. c.* 486.

Species habitu gracili, ±æstivali vel nano, plerumque parum ramosæ; folia subglabra vel ±hirsuta, rarius partim glandulifera; corolla parva (labiis subæquilongis in *E. scoticâ*) vel mediocris in *E. setulosâ* et *E. pulchellâ*; capsula latiuscula, retusa vel emarginata (*E. micranthâ*, *E. bhutanicâ* et *E. tirolensi* exceptis).

* Herba habitu gracili, foliis subglabris. 56. *E. micrantha* Reichb.

** Herbæ habitu ±æstivali vel nano, foliis ±hirsutis hinc inde etiam glanduliferis. 57. *E. setulosa* Pugsl. 58. *E. bhutanica* Pugsl. 59. *E. Tatrae* Wettst. 60. *E. Willkommii* Freyn. 61. *E. frigida* Pugsl. (*E. latifolia* Pursh ex Wettst.).

*** Herbæ habitu æstivali, foliis eglanduliferis. 62. *E. foulaensis* Towns. 63. *E. scotica* Wettst. 64. *E. disjuncta* Fernald & Wiegand. 65. *E. minima* Jacq. 66. *E. pulchella* A. Kerner. 67. *E. amblyodonta* Juz. 68. *E. mollis* (Led.) Wettst. 69. *E. tirolensis* Pugsl.

Series *Minutiflorae*, ser. nov.

Species habitu nano vel gracili, ±ramosæ; folia ±rotundata, glabrata vel hirsuta, eglandulifera; corolla minima (2·2–4 mm. longa) labiis subæquilongis; capsula latiuscula, emarginata.

* Herbæ nanæ. 70. *E. Oakesii* Wettst. 71. *E. Williamsii* Robinson.

** Herbæ ±elongatæ. 72. *E. purpurea* Reeks. 73. *E. bottnica* (Kihlman) Wettst.

b. Foliorum indumentum pro majore parte glanduliferum.

Series *Petiolares*, ser. nov.

Species habitu gracili, flexuoso, ±æstivali, parum ramosæ: folia glandulifera vel hirsuta; flores breviter sed plane pedunculati; corolla parva ad mediocris, tubo tandem ±elongato; capsula lata, retusa.

* Folia omnino glandulifera. 74. *E. petiolaris* Wettst.

** Folia eglandulifera. 75. *E. Alboffii* Chabert. 76. *E. subpetiolaris* Pugsl.

Series *Brevipilae* Pugsl. *l. c.* 515.

Species habitu sæpissime robusto, elato, modice ramosæ, rarius caule simplici æstivali; folia breviter glandulifera (pilis glanduliferis in *E. brevipilæ* nonnullis varietatibus longioribus), raro subglabra vel ±hirsuta; corolla vulgo majuscula, labio inferiore lato superius valde superante; capsula ±magna, retusa.

* Herbæ normaliter elatæ, ±ramosæ.

! Folia glandulifera. 77. *E. Jaeschkei* Wettst. 78. *E. Regelii* Wettst. 79. *E. brevipila* Burnat & Gremli.

!! Folia subglabra. 80. *E. borealis* (Towns.) Wettst.

** Herbæ habitu æstivali.

! Folia glandulifera. 81. *E. tenuis* (Brenn.) Wettst. ; 82. *E. paucifolia* Wettst. 83. *E. Kingdon-Wardii* Pugsl. 84. *E. kashmiriana* Pugsl.

!! Folia subglabra. 85. *E. suecica* Murb. & Wettst. 86. *E. hyperborea* Jørg.

Series *Hirtellae* Pugsl. *l. c.* 521.

Species habitu autumnali vel æstivali, raro nanæ ; folia pilis longis multicellularibus glanduliferis vestita ; corolla parva ad maxima, labio inferiore porrecto superius longe superante ; capsula lata, ±emarginata (nisi in *E. himalayicâ*).

* Corolla parva ad majuscula, tubo vix elongante.

! Herbæ habitu autumnali. 87. *E. hirtella* Jord. 88. *E. anglica* Pugsl.

!! Herba habitu æstivali. 89. *E. rivularis* Pugsl.

!!! Herbæ nanæ, alpinæ. 90. *E. drosocalyx* Freyn. 91. *E. Mattfeldii* Becker.

** Corolla magna ad maxima, tubo sæpissime tandem evidenter elongato.

! Herbæ habitu autumnali. 92. *E. Rostkoviana* Hayne. 93. *E. campestris* Jord. 94. *E. himalayica* Wettst. 95. *E. Schlagintweitii* Wettst.

!! Herba habitu æstivali. 96. *E. montana* Jord.

EXPLANATION OF PLATE 611.

Euphrasia tirolensis Pugsl., twice nat. size.

THE BRITISH ASSOCIATION AT BLACKPOOL.

BLACKPOOL proved an attractive centre for members of the British Association, nearly two thousand of whom shared with throngs of holiday-makers its spacious amenities from the 9th to 16th of September. A large gathering heard Sir Josiah Stamp's presidential address in the great ball-room at the Winter Gardens on the first evening ; this address on " The Impact of Science upon Society " has been fully reported and discussed in the public press.

The public demand for a more systematic presentation of the bearing of scientific investigation on the life of the community had been considered in the arrangement of a number of discussions and by the authors of addresses and papers.

Mr. Ramsbottom's presidential address to the botanists (Section K) dealt with the " Uses of Fungi." Except for the common mushroom there is little sale for any other species in our markets, though Blewits (*Tricholoma personatum* and its

allies) is sold in the north, midlands, and west, and *Boletus edulis* and *B. scaber* may be seen on barrows in the streets of Soho. This contrasts with the extensive consumption of fungi in many parts of the Continent, where there are special markets with their own lists of edible fungi and their inspectors, and in the Baltic States and the marsh-lands of north-east Russia fungi form the main food of the poorer classes at certain times of the year. When and where the cultivation of the mushroom began is unknown ; the methods described by Tournefort in 1707 are essentially the same as those followed at the present time, with the exception that spawn was not planted in the beds, as it was thought to occur spontaneously in horse-dung in sufficient amount. The " brick-spawn," masses of dried horse-dung permeated with fungus-mycelium, formerly used has given way to pure-culture spawn, which may be prepared from the spores, the flesh of the stem, or the gills. A substitute for horse-manure for making mushroom beds is still a desideratum. Though there is a popular idea that mushrooms can be successfully grown only in darkness it is rare to find them growing naturally in anything but full daylight.

The Japanese and Chinese are great consumers of fungi. In Japan annual picnics are held for gathering *Cortinellus edodes* in the *Pinus densiflora* forests, and *C. Shiitake* is extensively cultivated. The Chinese in Formosa have long valued as food young shoots of *Zizania aquatica* infected with *Ustilago esculenta*. The mycelium of the smut is perennial in the rhizome, so that when infection has once taken place the grass produces hypertrophied shoots each year. *Volvaria volvacea* is widely cultivated in the tropics. Truffles and morels have always been highly esteemed, but attempts to grow them as a crop have so far been unsuccessful. The intoxicating effects of *Amanita* and its uses in the religious rites of certain Siberian tribes as well as for killing flies are well known.

The larger fungi afford various other uses. From earliest times the sterile bases of puff-balls have served for staunching wounds and the soft flesh of species of *Fomes* has been used for many purposes : as amadou it was formerly used as tinder after treatment with saltpetre and is still used by dentists for absorption and compressing ; articles made from it are common in afforested parts of Germany. It was on this that Robert Hooke made the first known observations on the microscopical structure of fungi in his 'Micrographia' (1665). Luminous fungi serve a useful purpose and came under special notice during the War. Spores have served as face-powder. Wood attacked by fungi also has its uses. Some decorative woods owe their colour to fungus-infection ; the " brown oak " valued by timber merchants is the effect of the attack of the common beef-steak fungus, *Fistulina hepatica*. Ergot (*Claviceps purpurea*), principally known from rye, and the cause of plagues

of ergotism, is officinal in medicine, and fungi are used as medicines by natives in all parts of the world.

The subject of mycorrhiza, the symbiotic association of the fungus with the roots of plants, is a wide one, and plays an important part in orchid-cultivation.

The most wide-spread and important uses of fungi are due to enzyme action, "it is surprising what veritable museums of enzymes many fungi are, *e. g.*, from *Aspergillus Oryzae* have been recorded: amidase, catalase, cytase, dextrase, diastase, emulsin, α and β glucosidase, glycero-phosphatase, histozyme, inulase, invertase, lactase, lecithinase, lipase, maltase, protease, rennet, sulphatase—apparently sufficient for any purpose here below." From earliest times man has made use of the action of certain fungi for effecting desired changes in food and drink. Most of the older processes depend upon the action of yeasts, the conversion of sugar into alcohol and carbon-dioxide, as in bread-making and fermentation in production of alcoholic beverages. Power-alcohol to be obtained from carbohydrate plant-materials may be the fuel of the future.

Some fermented drinks owe their properties to the regular association of two or more organisms, such as the "ginger-beer plant," in which the yeast (*Saccharomyces pyriformis*) is associated with a bacterium (*B. vermiforme*). Tea Cider, prepared from sweetened tea, also owes its properties to a yeast-bacterium mass (*Saccharomycodes Ludwigii—Bacterium xylinum*). Fermented milk beverages—kephir, koumiss, and others—are due to other combinations with species of *Saccharomyces*. In the Orient yeasts rarely act alone in fermentation processes, the preliminary stages being most frequently associated with the activities of Mucorineae or species of *Aspergillus*. Arrack is a generic name applied to a number of spirituous liquors; the effective agent may contain many organisms. *Mucor Rouxii* is the essential ingredient in the preparation of Chinese rice. In Japanese Koji the fungus concerned is a species of *Aspergillus*; Shoyu koji is used in the preparation of Soy sauce. To prepare the national Japanese Saké the starch of the rice is converted into sugar by *Aspergillus Oryzae*, and the sugar fermented by adding yeasts. Moulds of the genus *Penicillium* play a large part in the ripening of cheeses.

The occurrence of glycerol in fermentation of sugar by yeast was developed during the War; the monthly German production of glycerine by this method exceeded 1,000,000 kilos, and twenty to twenty-five per cent. of the sugar used was converted into glycerine. Citric and gluconic acids are also now prepared commercially as products of fermentation by species of *Aspergillus* or *Penicillium*. Many other acids are formed by moulds, and "it seems to be becoming increasingly evident that compounds of almost every type known to organic chemistry can

be synthesised." Egosterol, a source of vitamin D, is produced by the growth of yeasts and moulds. During the War the use of ordinary yeast as a food-substance was developed in Germany and Russia.

Though a fairly large number of fungi have been investigated for their uses they are a very small percentage of the total; the possibilities for practical results are endless and the processes carried out are pregnant with possibilities.

Mycology was represented at the sectional meetings by several papers. Prof. Dame Helen Gwynne-Vaughan and Mrs. Q. E. Broadhead described methods of reproduction in *Ceratostomella fimbriata*, the cause of mouldy rot of the Para rubber tree; and Dr. C. E. Foister, Mr. I. W. Tervet, and Mrs. N. L. Alcock the symptoms and effects of a storage rot of potatoes much resembling Dry Rot, caused by a fungus possibly new to science. Mr. C. G. C. Chesters and Mr. C. J. Hickman dealt with the increasingly serious root and stem infections of the cultivated *Viola* due to fungi belonging to several genera, and described the field symptoms of the diseases; and Dr. M. Noble described the occurrence of heterothallism in *Typhula Trifolii*. Recent work on the nature of the virus mosaic of tobacco and the manner of infection were discussed by Dr. J. Caldwell.

Prof. F. E. Fritsch suggested an interpretation of the life-cycle of some lower Brown Algæ (the Ectocarpales), which is regarded as an alternation between diploid and haploid phases, isomorphic in the simpler filamentous types, generally heteromorphic in the more advanced forms, where the diploid phase is the elaborate macroscopic thallus, which may bear both unilocular and plurilocular sporangia, and the haploid a small filament bearing only plurilocular sporangia (gametangia). Either phase can propagate for several generations by small ectocarpoid stages, the diploid by means of the swarmers from the plurilocular sporangia, the haploid by apogamously developed gametes giving rise to accessory gametophytes. Dr. M. Rosenberg gave a survey of methods for algal cultures, discussing various factors such as chemicals, light, and temperature. Changes in external conditions have been correlated with corresponding morphological or physiological changes. Culture methods, especially among the Desmids open a wide field for investigation. Miss M. Reese gave an account of the microflora of two Cardiganshire rivers and of the effect of local lead mines on their algal population. By means of a high-speed cinematograph film Mr. A. G. Lowndes demonstrated the mechanism of flagella-movement in some uniflagellate organisms, proving that the waves are propagated from the base to the tip of the flagellum with an increase in velocity and amplitude, and hence that the flagellum is not a passive unit mechanically operated by the cell.

Mr. H. G. Chippindale discussed the remarkable vitality of grass seedlings, which will survive desiccation for several days at laboratory temperature and several months in darkness at a temperature of about 7° C. Dr. W. E. Brenchley gave an account of her work at Rothamsted on the varying response of weed species to competition with crops after fallowing; some species fail to reassert themselves, but others withstand the competition of the crop. Prof. B. Němec of Prague, a guest of the Section, described the occurrence of gold and other rare elements in plants. On analysing ashes of seeds and seedlings of corn from Oslany (West-Slovakia) there were found in the ash some elements, such as gold and titanium, hitherto rarely discovered in plants. This discovery led to the study of the ashes of other plants from the same locality. In *Equisetum* gold has been found in comparatively large amounts, and in the wood of *Fagus*, *Carpinus*, and other genera, in addition to gold, aluminium titanium, copper, zinc, vanadium, and chromium have been found: the same elements were found in *Polyporus fomentarius* growing on *Fagus* and *Carpinus*. Cultures of corn seedlings have shown that gold has a slight stimulating effect upon growth.

Details of a developmental study of the epidermis were given by Mr. G. E. Smith. Chromosome studies in the *Oryzeae* by Mr. S. Ramanujam indicated differences between the *Zizaniae*, which retained the original basic number and the *Oryzineae* (which includes rice) which developed a secondary basic number through polyploidy. The peculiar monotypic genus *Lygeum* differs from the rest of the tribe in having larger chromosomes. Mr. C. E. Ford described chromosome studies of genera of Malvaceae which indicate that the numbers 5 and 7 are basic for the family. Recent experiments on the relationships of scion and rootstock in fruit trees, carried out at Long Ashton, were described by Dr. T. Swarbrick.

Prof. R. Ruggles Gates ("The Genetic Survey as a Method of Evolutionary Study"), by collecting the wild seeds of *Oenothera* in eastern Canada at short intervals over a given area, has made an intensive genetic survey of all the existing forms, their relationships, and distribution. The resulting cultures show a surprising range of variation, including many new species and varieties. By this method, which has been intensively followed for the first time, light is thrown upon the variations, geographic distribution and phylogeny of the genus *Oenothera*. The fact that seeds from any wild plant generally breed true to type, often showing minute differences from plants of a neighbouring area, results partly from the presence of a ring of fourteen chromosomes in all these forms.

Miss A. C. Halket gave the results of a study of the flowers of some nyctanthous plants—species of *Melandryum*, *Silene*, *Schizopetalon*, and *Matthiola*. The flowers of different species open for

a varying number of evenings, many of them about six times. The hours of opening and closing vary with the weather; in most species the buds expand later in the evening than the older flowers. On wet days the flowers remain open. The "closing" of the flowers is due to the inrolling of their petals. The petals close gradually as they lose water and open as they absorb it. The percentage of water is greater in open than in closed petals. Comparison of the areas of petals when closed and open shows that they change considerably in size, owing to the contraction or expansion of the cells as water is lost or gained. The petals increase in size as they grow older; their movements are not growth movements, but depend on their water-content, and are related to the anatomical structure of the petals and the nature of their cell-walls.

Dr. G. Taylor gave an illustrated account of the "British Museum Expedition to the Mountains of East Africa." Four groups of mountains were visited to make a comparative study of the flora and insect fauna at higher altitudes, to obtain specimens, and to ascertain whether any comparable peculiarities exist between the plants and insects. Perhaps the most striking feature is the altitudinal zonation of the vegetation and the manner in which it tends to repeat itself on the different mountain groups. In the lowest zone the plants are characteristic of the African plains, but the type of vegetation changes through tropical forest and dense bamboo forest until one meets on the one hand plants strongly reminiscent of Europe and, on the other, forms characteristic only of these African mountains. The vegetational zones may be sharply defined, but, as a rule, they overlap for a considerable depth and their altitudinal range may vary on the different mountains and even on each side of the same mountain. Occasionally, but very rarely, the bamboo zone may be absent. It is in the highest zone that specialisation has proceeded furthest, and the same genus is usually represented by different species on each mountain top, and occasionally, but particularly in the arborescent Senecios, these species are local endemics. Each mountain can be regarded as an island arising from a sea of tropical vegetation, each having its own characteristic plants, though all are of the same general type. Apart from the typically African elements, the most interesting feature of the alpine zone is the presence of representatives of temperate genera—species of *Ranunculus*, *Arabis*, *Subularia*, *Cardamine*, *Limosella*, *Sibthorpia*, *Luzula*, *Anthoxanthum*, *Deschampsia*, and *Koeleria*; the species may, indeed, be identical with those found in this country. It appears probable that these are relics of a former more extensive temperate flora, and their isolated presence in the alpine zone of the African mountains can probably best be interpreted from a study of the climatic history of these regions.

Prof. J. Doyle described fertilization and pro-embryo formation in *Sequoia gigantea*: the gametophytes resemble closely those of *S. sempervirens*, but the pro-embryo is essentially Cupressinean in type.

Plant physiology was represented by communications on the relationship between respiration and oxygen concentration by Prof. W. Stiles and Dr. W. Leach; Dr. N. L. Penston demonstrated the changes during the day of dry and ash weight and potassium content in leaves of potato and maize, and the osmotic pressure changes of the sap; and Mr. J. Gillespie described the influence of iron, zinc, and manganese in culture solutions on the development of chlorophyll.

Mr. J. S. L. Gilmour advocated widening the basis of systems of plant classification to include the facts revealed by genetics, cytology, and ecology. A number of taxonomic studies have appeared on the new lines, side by side with a continuation of the old type of work based on morphological and distributional data. To-day these two streams of taxonomic activity have partially separated into what have been conveniently called the "alpha" (or old) and "omega" (or new) taxonomy respectively. It will be agreed that, while "alpha" work is still essential, especially for little-known floras of which only herbarium material is available for study, "omega" methods can be fruitfully applied to well-known floras of which ample material exists for cultural, genetical, and cytological work. These two streams should be much more clearly separated than at present if they are not to interfere with each other to their mutual disadvantage. There should be full recognition of the different concepts and terminology involved in the two taxonomies, and, if possible, the attainment of a measure of agreement between taxonomists, geneticists, cytologists, and ecologists on a common basis for further "omega" progress.

Prof. T. M. Harris showed that the apparent disagreement in vascular anatomy of some Mesozoic horsetails with recent forms as suggested by the markings at the node was due to the method of preservation. Dr. T. Johnson recorded the fruit of *Dulichium spathaceum* from turf at Corker Hill, Glasgow. This sedge, a native of the Atlantic coast of North America, has previously been recorded from the Interglacial beds of Denmark and North Germany. *Cladium jamaicense* and *Salix aurita* were also found. The cold wet habitat is further indicated by the subarctic *Sphagnum Austini*, and by (a tubular artefact of) oak-wood with rings, half the normal width. *Lastraea Thelypteris*, the marsh fern, occurred and *Pteris aquilina* was plentiful.

The final afternoon was given to a display of exhibits illustrative of the papers read during the week, with additional items of interest. The semi-popular lecture was given by

Prof. E. J. Salisbury; his subject "The Living Garden" was one in which he is very much at home. An evening lecture on "Plant-hunting in Tibet" was given by Capt. F. Kingdon Ward.

The excursions included whole day trips to the Southport sand dunes, and to the fresh-water biological station at Wray Castle on Lake Windermere.

At a well-attended sectional dinner a welcome was given to the two foreign guests, Prof. Němec of Prague and Prof. G. J. Peirce of Stanford University, California, and to Prof. T. G. B. Osborn of Sydney, N.S.W., at present home on leave.

The Department of Forestry (K*) met under the chairmanship of Mr. D. W. Young in the absence, through illness, of the President, Lord Clinton. The work included a discussion on the utilisation of home-grown timber and papers on afforestation and soil problems in forest nurseries. Prof. J. H. Priestley and Miss L. I. Scott analysed the differences between ring-porous and diffuse-porous hardwoods and discussed their significance.

Mr. Ray Bourne dealt with the "Beechwood Associations of Southern England. The beech is the principal climax dominant of the hilly country throughout southern England, irrespective of geological formation and soil. The rate of growth and dimensions attained vary with the climate and the soil. The associated species in the tree and ground layers are determined with one or two exceptions by soil rather than by climate. Three principal associations can be recognised:

(1) The beech-oak-birch association on the acid sands and gravels.

(2) The beech-oak-ash association on the neutral loams and clays.

(3) The beech-ash-yew association on the calcareous chalk and limestone brash soils.

Each association is divisible into types of distinct physiognomy and productivity. The recognition of the types which occur on an estate is an essential preliminary to the successful solution of the problems of silviculture and management.

Mr. H. A. Hyde discussed the status of beech in certain woods in the north of Cardiff on hills (100–900 ft. alt.) running W.S.W.–E.N.E. for a distance of approximately seven miles. The rock underlying the woods for the most part is Carboniferous Limestone, including Lower Limestone Shales, but some are situated on Old Red Sandstone and one on Pennant Grits (Carboniferous). There are no records of the planting of these woods, but they have decreased in area considerably during living memory due to felling. Regeneration has been observed in one wood at least, and seedlings are not uncommon throughout.

Mr. H. P. Hutchinson described the "Effects of dormant buds and roots on the wood of *Salix coerulea*—the Cricket Bat Willow."

Mr. H. D. Gordon exhibited mycorrhiza in Rhododendrons. In Nature the roots regularly contain an endophytic fungus, similar in appearance to the endophytes recorded in *Calluna*, *Vaccinium*, and the majority of the Ericaceae. The infection appears to be confined to the roots, and has not been observed in stem, leaf, fruit, or seed. The endophyte is not seed-borne, and seedlings are normally infected from the soil several weeks after germination. Seeds have been germinated, and the resulting seedlings grown, in pure culture, without the presence of the endophyte or of any other micro-organisms. Such seedlings are capable of development, and can produce a copious root system. Thus the relation of the higher plant to the endophyte is not an obligate one.

(To be continued.)

OBITUARY.

A. H. S. Lucas, M.A., B.Sc.

(1853–1936).

By the death of Professor A. H. S. Lucas, Australia has lost one of her most esteemed botanists and the leading authority on Australian marine Algæ. The late Professor Lucas was born at Stratford-on-Avon, England, on May 7, 1853, and died at Albury, a town on the New South Wales–Victorian Border on June 10, 1936, on his return home after a visit to Tasmania and Victoria. He was the son of the Rev. Samuel Lucas, F.G.S., a Methodist minister, and inherited his father's taste for natural history and scholarly studies. From the New Kingswood School, Bath, he went to Oxford and graduated as M.A., and later to London University where he graduated in Science. He arrived in Melbourne in 1883, where he was appointed Science Master at Wesley College; ten years later he was appointed Head Master of Newington College, Sydney. In 1898 he joined the staff of the Sydney Grammar School and later became Head Master. He retired in 1923 on attaining the age limit, but later acted for a couple of years as Professor of Mathematics at the Tasmanian University, Hobart.

He is best known by botanists for his work on the systematics of the Australian sea-weeds, and received specimens from all parts of Australia for identification and report. He was an indefatigable collector, and travelled widely round the Australian coast in search of his favourite plants. In addition to papers on the systematics of Australian sea-weeds in the scientific Press, principally in the 'Proceedings of the Linnean Society of New South Wales,' he was the author, with his friend the late Professor A. Dendy, of an "Introduction to Botany," a work still largely used in Australian schools. He took an active part in the working of Australian Scientific Societies, and was President of the Linnean Society of New South Wales for 1907–9.

Professor Lucas will be missed by his fellow botanists in Australia as an extremely modest man with a fund of detailed and exact information on which the enquirer never called in vain, but was always sure of a courteous reply.—C. T. White.

SHORT NOTES.

Bartsia viscosa in Norfolk.—*Bartsia viscosa* L., according to Druce's 'Comital Flora,' is confined in Britain to the south and west coasts of England, Wales, and Scotland from East Sussex to Cantyre, except for records from West Kent and Nottinghamshire, so it is of interest to record the finding of a specimen in West Norfolk on July 24, 1936. The plant was found in a "slack" behind the sand-dunes stretching from Hunstanton to Holme-next-the-Sea, growing with the salt-marsh vegetation which has persisted there in spite of the drying up of the marsh.

This part of Norfolk has an atlantic type of climate, as Salisbury has pointed out, so it is possible that the *Bartsia* has always been there, but has not been detected amongst the abundant *Rhinanthus*. On the other hand, since this area is regularly visited by parties of students from the Cambridge Botany School the possibility of the seed having been accidentally introduced in soil emptied from a vasculum cannot be entirely ruled out.

A specimen has been placed in the Cambridge University Herbarium.—T. G. Tutin, Botany School, Cambridge.

Puccinia Sonchi in Britain.—Since I announced in 'Science Gossip' in 1885 that I had found the uredo-stage of this rust in England for the first time, it has been found in considerable plenty all over England, Wales, Ireland, and the Isle of Man, in all the three stages—uredo-, meso-, and teleutospores. It appears, however, that in Scotland it produces only uredospores and mesospores, but these latter have been found as far north as Aberdeen during September and October.—W. B. Grove.

NOTES ON PAPERS OF INTEREST TO STUDENTS OF THE BRITISH FLORA.

Distribution of the Lizard Orchid (Himantoglossum hircinum Koch).—Ronald Good ('New Phytologist,' xxxv, 142–170) gives a detailed account of the distribution of the species, and discusses reasons for its increase in England since

1900 from about 20 localities to 129 localities at the end of 1933. In the writer's opinion the distribution of climatic values is the factor which has mainly influenced the distribution of the orchid in England. Dr. C. E. P. Brooks has shown that about 1900 a small but definite climatic change occurred in the climate of the British Isles in the direction of greater "oceanity." This entails a slight increase of winter temperature with a heavier rainfall extending into spring. This change, it is suggested, has brought the climate of southern England more nearly like that of west central France, where the species occurs most abundantly. The change has therefore presumably increased the total area wherein suitable conditions occur for the growth of the plant. The fact that the seeds are very minute and likely to be wind-borne for great distances, coupled with the persistent predominance of the plant near our south-eastern coast and its increasing sparsity inland, suggests that many of our wild English individuals are the result of direct seed-dispersal from the Continent.

POLLINATION OF PARNASSIA PALUSTRIS.—P. Martens (Bull. Soc. Roy. Botan. Belgique, xviii. 183–221) criticises the classic theory of entomophilous pollination in this species as favoured by dichogamy and various adaptations in the flower. His observations show that proterandry is imperfect, as the stigma is already receptive in the male period and pollen is found upon it. The pollen is conveyed from the anthers to the stigma of the same flower either directly or by the wind, but especially by the visits of small Thysanoptera which frequent the flower. The species is self-fertile and the results of direct pollination are better than those of cross-pollination as regards the number of viable seeds, the size of the seeds, and the size of the embryo.

Points in the structure of the flower which have been regarded as favouring cross-pollination are examined in detail. The shining heads of the staminodes, which bear no secretion, are not attractive to insects and the whiteness of the petals does not indicate nocturnal visits. The movement of the stamens carrying the ripe anther above the ovary favours direct pollination in view of the imperfect proterandry.

BRITISH ROBERTSONIAN SAXIFRAGES.—In Journ. Linn. Soc., Bot. l. 267–289, 1936 (with two plates), H. W. Pugsley gives a detailed historical account of the taxonomy of this group of plants. The form long known in Yorkshire is regarded as typical *Saxifraga umbrosa* L., of which the "London Pride" of gardens is treated as a variety. The Irish *S. umbrosa*, formerly confused with *S. punctata* L., is identified with *S. spathularis* Brot., and held to be a distinct species. *S. punctata* L. is shown to be the same plant as *S. davurica* Willd.

The treatment of the "*S. Geum*" forms is involved owing to Linnæus having virtually transposed the application of his two names, *S. Geum* and *S. hirsuta*, in the second edition of 'Species Plantarum,' which was commonly used by subsequent authors. *S. Geum* Auct. thus becomes *S. hirsuta* L., and *S. hirsuta* Auct. *S. Geum* L. Further, as both of these species appear to have been founded on plants of hybrid origin, the pure *S. Geum* Auct., with unspotted flowers, is described as a new species, *S. lactiflora*.

AQUATIC PHYCOMYCETES OF GREAT BRITAIN.—Dr. F. K. Sparrow, Jr. (Journ. Linn. Soc. London, Bot. l. 417–478), has studied a somewhat neglected group of British aquatic fungi. Though his work was confined to a few restricted areas, mainly in and near Cambridge, his list comprises 67 species, with many novelties, including new genera. A small stream in the grounds of Emmanuel College yielded 17 species, including two new genera and four new species. Dr. Sparrow, who is an American botanist, remarks on the great similarity between the aquatic mycologic flora in Britain, as represented at Cambridge, with that of similar sites in the eastern United States. The paper is well illustrated with eight plates.

STRUCTURE OF THE OVARY IN BRITISH PLANTAGOS.—Ruby E. Dowling (Journ. Linn. Soc., Bot. l. 323–336) finds that in the five species studied the ovary is bilocular with an axile placenta, which becomes free at the edge early in development, while remaining continuous with the wall of the ovary at the top and bottom of the capsule until this is mature. In *P. Coronopus* the apparently quadrilocular condition is due to development of placental tissue. In *P. major* there are a number of ovules and seeds in each loculus arranged on the placenta in two tiers: abortion of some of the ovules is frequent. In *P. media* there are rarely more than six ovules, three in each loculus in two tiers: several ovules usually abort, so that the ripe fruit generally contains fewer than six seeds. *P. maritima* has an axile placenta which remains attached to the top of the capsule in two places: in young capsules three ovules were found, two of which abort, giving a mature capsule with one seed. The bilocular ovary of *P. lanceolata* contains two ovules, of which one is usually abortive. It is suggested that the British species of *Plantago* present a series showing increasing sterility of the ovary from the many-seeded condition of *P. major* to the two-seeded condition of *P. lanceolata*, in which a one-seeded fruit frequently results by the abortion of one of the ovules.

It would be interesting if the author would investigate the ovary structure in some of the more recent British additions to the genus *Plantago*. What is the difference between *P. Hud-*

soniana Druce and *P. maritima*? What is the structure in *P. Edmondstonii* Druce, and how does *P. Coronopus* var. *sabrinae*, which Druce considered ought to be raised to specific rank, differ from *P. Coronopus* L. ?—E. G. B.

REVIEWS.

Evolution. By A. FRANKLIN SHULL, Professor of Zoology in the University of Michigan. 8vo, pp. x, 312, 64 figs. McGraw-Hill Publishing Co.: London, 1936. Price 18*s*.

THIS volume, one of the series of "Publications in the Zoological Sciences," of which the author is consulting editor, though written primarily from a zoological standpoint, claims the interest of biologists generally. It aims to supply a present-day concept of evolution for college students and the motive is genetical. The eighteen chapters deal successively with the general arguments for evolution, the genes as a material basis for its working and the mechanism by which they work, and, lastly, a discussion of natural selection and allied problems and the bearing upon them of genetical facts and theories.

The evidence for evolution of species is found in the diversity of living things and the degrees of likeness and difference manifested, the argument from characters of use in taxonomy, which suggest heredity from a common ancestor as the reason of similarity, geographic distribution, which is more intelligible as a consequence of a gradual unfolding than as a result of unrelated origins, and the evolutionary implication of the succession of fossil life.

The student will find that the chapters in which the genes, their properties and manner of working, knowledge of which is based on observation and deduction, demand closer reading, and these must be thoroughly mastered in order to appreciate their application to natural selection and problems presented by geographic isolation as a factor in evolution, non-adaptive characters which still lack a satisfactory explanation, geographic races whether genetic or environmental, and a culminating chapter, "the evolution of evolution."

Natural selection or Darwinism is adversely criticised, but, for the student perhaps somewhat surprisingly, rehabilitated. "While there are things in living nature which it does not explain, it gives every indication of validity in a considerable field of evolutionary phenomena. If too much is not expected of it, it should not prove disappointing. The newer estimates of it arising out of a consideration of the Mendelian mechanism and the laws of chance have tended to heighten the esteem in which it is held, provided it be not regarded as universal in application."

In the course of his argument the author throws doubt on views which have found and still find acceptance, such as warning coloration in animals, and the theory of emergent evolution which should "be promptly assigned its correct place in scientific philosophy."

The botanist will find satisfaction in the importance for the development of the argument supplied by the work of De Vries and Mendel.—A. B. R.

Flora of Jamaica. By WILLIAM FAWCETT, B.Sc., and ALFRED BARTON RENDLE, D.Sc., F.R.S. Vol. VII. Rubiaceae to Compositae. By the late SPENCER LE MARCHANT MOORE, B.Sc., F.L.S., and A. B. RENDLE. Cr. 8vo, pp. ix, 303. With 100 text-illustrations. Trustees of the British Museum: London. Price 15*s*.

THIS important Flora has taken another step towards completion. The volume now issued deals with the Gamopetalae Inferae, and the two families of Rubiaceae and Compositae occupy almost the whole of the book. In the main, the responsible author has been the late Spencer Moore, who undertook the Compositae and the greater part of the Rubiaceae. His death (and also that of the artist Mr. Highley, who drew the figures for the earlier volumes) has delayed the publication of this part of the Flora. Fortunately Dr. Rendle, now released from official duties, has gathered up the threads for this volume, and in addition has in hand the rest of the Gamopetalae which will constitute Vol. VI. This leaves for the future Vol. II., which will embrace the Monocotyledons (apart from Orchidaceae, Vol. I.) and the Ferns, which it is satisfactory to note may appear next year from the hands of Dr. Maxon of the U.S. National Museum.

The current volume in character and arrangement is in conformity with the previous volumes and exhibits the same high quality in printing and illustrations. The editing has been in the safe hands of Dr. Rendle, who has in addition completed the Rubiaceae and the minor families. The reviewer has, consequently, nothing to say in the way of criticism, and has not found in his perusal anything in the nature of minor errors and not even a misprint. Certain other aspects have attracted his attention and these may be given here briefly.

The number of endemic species for the families concerned is surprisingly high. The total number of species (excluding introductions) is 285. Of these 150 are endemic—52 per cent. approximately. Taking Rubiaceae alone, 88 out of 143 are endemic—61 per cent. Noteworthy is the record that all 21 species of *Rondeletia* and all 6 species of *Portlandia* are endemic, and 30 out of 41 species of *Psychotria*. All the Caprifoliaceae (3 species of *Viburnum*) are confined to Jamaica. Of Campanulaceae 7 species out of 12 are endemic and these are Lobelias.

The Compositae do not show so high a proportion of endemism, 52 species out of 126—41 per cent. Confined to Jamaica are all 6 species of *Vernonia*, all 6 species of *Senecio*, and all 5 species of *Chaenocephalus*, as are 18 out of 25 species of *Eupatorium*.

From the record it is evident that very few exotics of the families concerned have established themselves in Jamaica. I note some 18 and of these the only noteworthy are *Catesbaea spinosa*, *Morinda citrifolia*, *Sambucus Simpsonii*, *Lonicera confusa*, *Zinnia multiflora*, and two species of *Tithonia*.

Comparatively few of the species in this volume have attracted the notice of horticulturists in this country, if one judges from figures of Jamaican species in the Botanical Magazine and kindred journals. Leaving out species of extended distribution, I note only 3 Jamaican plants as having been thus honoured—*Portlandia grandiflora*, *Hamelia ventricosa*, and *Senecio discolor*. Evidently the Rubiaceae and Compositae of Jamaica are not the best representatives of the Jamaican Flora from the horticulturist's point of view.

The remaining Gamopetalae and the Monocotyledons (apart from Orchidaceae) constitute a still extensive residue, but the good wishes of the botanical world are with the surviving author for the completion of his task.—W. W. S.

Les Essences Forestières du Congo Belge.—II. *Les Essences Forestières des Régions montagneuses du Congo Oriental.* By J. LEBRUN. 8vo, pp. 264, map, 17 pls., & 28 text-figs. L'Institut National pour l'Etude Agronomique du Congo Belge : Brussels, 1935. Price 25 fr.

THE first part of this work was published in 1923 and re-edited in 1931 under the title 'Manuel des Essences forestières de la région équatoriale et du Mayombe.' The volume under review deals with the forests of the mountainous districts on the eastern borders of the Belgian Congo, from the neighbourhood of Mt. Ruwenzori to the northern extremity of Lake Tanganyika. The catalogue of species is preceded by a sketch of the vegetation in which the environmental factors are discussed and the characteristics of the vegetation described. The two main types of vegetation are divided by the limit of heavy rains which lies between 2200 and 2400 metres of altitude according to local conditions. Below this limit the character of the vegetation is determined mainly by the amount and seasonal occurrence of precipitation, and is sub-divided into mesophilous and xerophilous or sub-xerophilous forest according to the duration of the annual period of drought.

Above the limit of heavy rains temperature is the controlling factor and the vegetation of successive stages consists of bamboos with occasional trees, *Hagenia* parkland, arborescent or shrubby Ericaceae (*Erica* and *Philippia*), and finally alpine vegetation comprising giant *Senecio* " forests," alpine meadows of *Alchemilla*, *Helichrysum* scrub, and *Carex*.

The descriptive catalogue of genera and species is practically a forest flora of the limited region with which the survey is concerned. The specific descriptions appear to be adequate, and these are supplemented by notes on habitat and distribution, records of economic uses and vernacular names, and in many cases good drawings of the plants. There is a key to the families and another one to the principal genera and species based on vegetative characters.—B. J. R.

The Plant World. By C. STUART GAGER, Ph.D., Sc.D., Director of Brooklyn Botanic Garden. 8vo., pp. v, 136, frontis., & 78 text-figs. The University Society, New York ; Chapman & Hall, London, 1936. Price 4*s*. 6*d*.

THIS is one of the " Highlights of Modern Knowledge " in an American " University Series." The purpose of the series is to present in an attractive form and in a concise readable style an authoritative survey of the physical and social sciences and other departments of knowledge. It is not easy to present scientific facts in a form understandable by the general reader, but Dr. Gager's little book presents the story of plant-life in a very readable form. The association of the names of botanists with the story gives a helpful personal touch. Technical terms are explained as they are used, and there is also a glossary—a slip on p. 80 defines self-incompatible as " setting fruit only when self-pollinated." In a sense the work is scrappy, but, for those who wish for more, suggestions for further reading are given in a selected list of books.

There is a good index, in which a very brief biographical note is given of the botanists referred to in the text—we note that our old friend Mr. Ridley is not " a botanist," but " an English editor " !

BOOK-NOTES, NEWS, ETC.

ANTOINE-LAURENT DE JUSSIEU.—On September 17, 1836, this celebrated French botanist died in Paris in his eighty-ninth year. The earliest developments of a natural system of classification are associated with the name of Jussieu. Bernard de Jussieu, Demonstrator at the Jardin du Roi in Paris, when arranging the plants in the Trianon garden, adopted with modi-

fications and corrections the natural system suggested by Linnæus in his "Fragmenta" ('Philosophia Botanica,' 1751). But he never completed his system, and it was left for his nephew Antoine-Laurent, who joined his uncle, on leaving school, at the Royal Garden, to improve, complete, and publish in 1789 in his 'Genera Plantarum secundum Ordines naturales disposita" the first complete system which can claim to be a natural one. Ray's distinction of Monocotyledons and Dicotyledons is adopted. There are one hundred "orders" (families): these are carefully characterised and nearly all are still recognised. Dicotyledons are subdivided into Apetalae, Monopetalae, Polypetalae, and Diclines irregulares, and the orders are arranged in Classes according to the relative position of stamens and ovary. Jussieu also published careful monographs of several families, among others Ranunculaceae, and in 1796 his "Tableau synoptique de la méthode botanique." In 1793 the Jardin du Roi was reconstituted as the Jardin des Plantes and Muséum d'Histoire naturelle, and Jussieu became professor of rural botany, and subsequently director of the Museum and professor in the Faculty of Medicine. His son Adrien de Jussieu succeeded him at the Jardin des Plantes in 1826.

Floral Morphology of the Polemoniaceae.—Marion L. Dawson ('American Journal of Botany,' xxiii, 501–511), as a result of the study of the vascular anatomy of a number of species of this family, suggests that the Polemoniaceae represent a line of development from a tricarpellary Caryophyllaceous stock prior to the establishment of free-central placentation in that family. No evidence was found to support the derivation of the tricarpellary ovary of the Polemoniaceae from the 5-carpellate condition obtaining in Geraniaceae, though a similarity in derivation and type of reduction is indicated by the vascular supply to the androecium. It is suggested that the Polemoniaceae, Geraniales, and Primulales represent three distinct lines of development from the Caryophyllaceous stock. The floral disc in Polemoniaceae is the vestige of a much reduced whorl of stamens, represented by vascular stamen traces in *Cantua* and *Cobaea*, primitive members of the family. Vestigial traces of an outer third whorl of stamens opposite the sepals in Geraniaceae suggest that the characteristic obdiplostemony in that family may be due to a reduction of andrœcial whorls.

Minute Fungus on free-swimming Alga.—D. J. Scourfield ('Essex Naturalist,' xxv, 120–123, with fig.) records the finding in an Epping Forest pond of a minute Chytrid (*Phlyctidium Chlorogonii*) parasitic on a microscopic free-swimming unicellular green alga, *Chlorogonium elongatum*, a member of the Volvocales. This is the first record of the Chytrid for this country.

THE BRITISH ASSOCIATION AT BLACKPOOL.

(Concluded from p. 296.)

Dr. A. B. Rendle's presidential address to the Conference of Delegates of Corresponding Societies dealt with the preservation of native floras with special reference to the British flora. The preservation of native floras is important from a scientific standpoint. The cases of St. Helena and the Bermudas were cited as instances of the serious destruction of interesting natural floras by human action, accelerated by the introduction of alien species, which had to a greater or less extent displaced the original flora. It was important in the interests of future students that what remains should be preserved.

From the same point of view our British flora is worth preserving. It is not merely an offshoot of the Continental flora which populated the islands after the destruction of the original flora by glaciation. We believe that fragments of the original flora survived in sheltered unglaciated spots during successive periods of glaciation, and in his recent address to the Botanical Section of the South-Eastern Union of Scientific Societies, Mr. A. J. Wilmott associated various types of endemic species with successive periods of glaciation, during which specially favoured localities remained open. Our flora has been much changed by the action of man and his crops and herds, but what remains is well worth preservation from a botanical as well as from an æsthetic point of view. Intensive work on British genera and species indicates that there is still scope for investigations of taxonomic, distributional, and ecological interest.

The preservation of natural floras implies adequate records, and there is still much to be done on the British flora in this respect. The preparation of local lists affords employ for local Natural History Societies, and with the help of these a county flora may be prepared. Members of our South-Eastern Union have during the last seven years helped thus towards the compilation of a much-needed Flora of Sussex which has now been completed by Lt.-Col. Wolley-Dod. Such floristic lists are important from the point of view of plant-preservation, as they indicate, by recording distribution through a limited area over a period of years, the increasing frequency or rarity of individual species and varieties and therefore the necessity for protection in special cases Vegetational surveys may be of much interest from the same point of view.

Advocates of wild plant conservation may find themselves in conflict with those who, with the best intentions, seek to remedy the destructive effects of man's action or even to improve upon Nature. There may be no objection to re-establishing a species in an area where it has been destroyed as the result

of human action if it is done with certain precautions and if an accurate record is kept. And care must be taken to ensure that the form re-introduced is the same as that which it replaces. But the introduction of species in presumably suitable places, but where they do not grow now and have never been known to grow, that is, attempting to improve upon Nature or perhaps with a view to amenities, is to be deprecated. Even if a record be kept it is introducing a strange element into a natural community the effect of which is uncertain. If no record is kept and the plant survives it is making trouble for future students of the flora and of its distribution The introduction of species into new areas for ecological experiment may give valuable scientific results but such investigations should be confined to very definite areas and be carefully controlled and recorded.

Generally speaking introduction by sowing of seed is to be deprecated. It is largely a waste of seed ; in most cases the seeds either do not germinate or if they do the plants cannot compete with the existing flora. Also it may be some years before the plant sown, even if it survives, becomes a noticeable feature of the flora, perhaps not until the original interest in the locality has lapsed. On the other hand, the newcomer might be too successful and displace the original flora, or even develop into a nuisance. Indiscriminate broadcast scattering of seed is a foolish practice with nothing to recommend it.

Members of scientific societies will realise the inadvisability of introducing alien plants into a flora. It is difficult enough already to decide sometimes whether a plant is native or alien, and we would not add to the difficulty for those who come after us. To introduce, for instance, alien alpines on a British mountain is unscientific and thoroughly reprehensible.

Various societies and individuals have worked and are working for the preservation of our flora. Before the War a Plant Protection Section of the Selborne Society started active propaganda, and a bill was prepared for presentation to Parliament, but the War stopped legislative action. More recently, ' Flora's League,' initiated by Sir Maurice Abbot Anderson, has popularised the idea, and the Society for the Promotion of Nature Reserves works to the same end. In 1931 the Wild Plant Conservation Board of the Council for the Preservation of Rural England (C.P.R.E.) was appointed. It represents a large number of interested Societies, Councils, and Institutions, and meets at intervals for study and discussion of relevant questions.

The subject of Nature Reserves was admirably dealt with by Sir David Prain in his address at the York Meeting in 1932 on " Local Societies and the Conservation of Plant Life." Those of you who have visited Nature Reserves at Home or abroad will appreciate their value as conserving special types of

vegetation. The more we can do in this way the better, but the conservation of our native flora as a whole is a wider problem and needs the help of all in fostering a love for wild nature and in developing a public feeling for its protection.

Legislation and Education are two methods of approach. Under the Local Government Act of 1888 County Councils are empowered to adopt bye-laws for the conservation of wild plants. The most recent form approved by the Home Office reads as follows :—

" No person shall without lawful authority uproot any ferns, primroses or other plants growing in any road, lane, roadside waste, roadside bank or hedge, common or other place to which the public have access."

Bye-laws have been adopted by about fifty County Councils and a number of Town Councils, and wide publicity has been given by means of the local press, exhibition of notices at police stations and other suitable places, and distribution of copies to Urban and Rural District Councils, Schools, Boy Scout and Girl Guide organisations, etc.

Schedules of plants recommended for special protection in individual Counties, prepared by Mr. H. W. Pugsley, have also been distributed.

It has been objected that the bye-law forbidding uprooting involves hardship to students of the flora and also prohibits the uprooting of herbs for use as drugs.

As regards students, a plant can be studied without uprooting it. We are, in fact, coming to realise that plants may best be studied as they grow, and especially in their natural environment. A great deal of information about a plant may be obtained without uprooting it, and if such a course is necessary there is the permissive clause in the bye-law which may also be employed by collectors of herbs for use as drugs. In the latter respect Mr. T. F. Wallis, of the Pharmaceutical Society, tells me that dealers in drugs generally prefer those grown in quantity for the express purpose as offering a standardised product.

Much has been said as to the difficulty of enforcing a bye-law. This is admitted, but as so much of the damage caused is due to ignorance or thoughtlessness the knowledge that an act is illegal does bring the matter under notice.

Again, it has been suggested that County and Urban Councils are among the worst offenders in destroying rural amenities. Bird-lovers and botanists share a grievance against local authorities in the lopping of hedges and cutting of the grass verges along country roads. The verges are the home of many of our common plants, and their ruthless cutting by the local authorities in the spring or early summer is most regrettable. In March 1934 the C.P.R.E. approached the County Councils Association on the subject, but the Association, while sym-

pathising with the Council in their desire to prevent the indiscriminate destruction of wild plants, did not consider it feasible for the highway authorities to take any action in the matter, especially in view of the provisions of the Corn Productions Acts with regard to the destruction of injurious weeds, and the impossibility of expecting roadmen to exercise the necessary discrimination. Farmers ask to have the verges cut as soon as the plants are in flower so that seeds should not be dispersed; and postponement of cutting until July would allow the spread of injurious weeds. Moreover, the verge provides a way for pedestrians and cattle and must therefore be kept clear, and it is also a margin of safety for motorists. It is, however, encouraging to learn that some County Councils are alive to the importance of saving the verges. The North Riding County Council recently called the attention of the Highways and Bridges Committee to the necessity, so far as possible, of limiting the cutting down of plants in the byways and lanes, so as to preserve the natural beauties and flora, and we are informed that in Derbyshire the County Council cut only a certain portion of the roadside herbage and that the workmen discriminate between injurious and other plants.

Up to the present the Conservation Board has been unable to effect any modification of the bye-law that would protect wild plants on private property.

But at best legislation is only the next best thing. In an ideal community, where no one wants for himself what should be for the common enjoyment, legislation will be unnecessary. Meanwhile, education of the community is necessary.

Education of the average adult to respect our wild flowers may seem well-nigh hopeless. He is not interested. And thoughtlessness, even in those who should know better, is a frequent cause of damage. Occurrences of vandalism are too well known to need reference here.

The spirit of acquisitiveness, of getting something for nothing, is hard to fight. The gain, too, is often short-lived and scarcely worth while. To dig up primroses and plant them in a garden is less effective than sowing a few pennyworth of seed. Many of the flowers picked are withered before they reach home. It is, of course, the picking wholesale that should be discouraged. No one should want to prevent a child picking a handful of flowers, nor to forbid the use of wild flowers for class-lessons in schools. But wherever possible the school should have a garden which should, so far as possible, supply the material required for study. Let the children collect seeds, sow them, and study the plant as it grows. Seeds of our wild plants are available to members of the British Empire Naturalists' Association and of the South-Eastern Union of Scientific Societies through the seed exchange section of the Union managed by

Mr. B. T. Lowne. The list of seeds available is published in the spring number of *Countryside*, the organ of the B.E.N.A. Wild flower seeds may also be obtained from the Green Cross Society. Flora's League publishes a booklet by Mr. T. A. Dymes on "Growing Wild Flowers from Seed." His rules on practical methods, if followed, should ensure success. Mr. Dymes also insists on the advantage of this method for an educational herbarium, as specimens of a species at different life stages, or growing under different conditions, may be added from one's own rearing.

Schools may also obtain supplies of wild flowers from firms advertising in the *School Nature Study Journal*, which guarantee to collect wild plants only without risk to injury of the native flora.

The public press might be a more efficient help in propaganda, and advertisements of wild plants for sale, obviously uprooted without discrimination, or notices of excursions for picking wild flowers in choice localities, should be refused. Effective work by the B.B.C. might be done from time to time by selected speakers.

Education of the children is the most promising method. A memorandum, prepared for the Board by Professors Salisbury and Weiss, has been distributed by thousands throughout the teaching profession. The county lists of species needing protection will indicate where plants of special interest, from their rarity or because they are in danger of extermination, occur in the district. Such might be the subject of a special lesson and the interest of the children enlisted in their preservation.

The great enemy of our rare species is the collector; the general public takes no interest in them, but the collector wants them for his herbarium. He knows he is doing wrong when he confiscates a single specimen or takes from a small patch of a rare plant not only for his own collection but also for purpose of exchange. Increasing interest in the study of the mosses is threatening the extermination of some of our rarer species because collectors want specimens for their own herbarium or to supply friends at home and abroad.

To sum up. Native floras are worth preserving in the interests of science, and our own flora is of sufficient interest, quite apart from its beauty, to merit conservation. Of the three methods for promoting preservation—nature reserves, legislation, and education, the most important is education.

The Conference passed a resolution, moved by Dr. Herbert Smith, asking that the British Association would support the Council for the Preservation of Rural England in their request to the Government to take action in the matter of provision of National Parks.

A second resolution deploring the menace of rubbish-dumping in places of natural beauty, moved by Sir Albert Kitson, was also passed.

" National Parks and the preservation of Nature in England " was the subject of an address by Dr. Vaughan Cornish to the Geographical Section. He pleaded for the preservation of a contemporary background, wherever possible, for the monuments of antiquity, such as Stonehenge and the camp at Housesteads on the Roman Wall, where the reservation from all building should be on the scale of a National Park. Educative bodies should aim to inculcate an appreciation of the flowering plant as a living thing which should not be wantonly destroyed. Small areas where rare species grow should be protected as Nature Reserves. National or local authorities should ensure the reservation of an open space along our sea-cliffs; a strip 110 yards wide would be adequate. The three stretches of cliff at the Land's End, the Lizard, and from Boscastle to Tintagel are specially suited for reservation. Forestry Commissioners should not be allowed to mar the natural beauty of the New Forest and the Forest of Dean by planting conifers. The Lake District is on the scale best suited to the purpose of a national park, and the several groups of the open Fells should be placed under the ægis of a national park authority with powers to secure them from encroachments of motor roads, pylons, and unsuitable afforestation.

The meeting of the Association in 1937 will be held at Nottingham under the Presidency of Sir Edward Poulton, F.R.S., late Hope Professor of Zoology, University of Oxford. Following meetings will be at Cambridge in 1938 and Dundee in 1939.—A. B. RENDLE.

BUD POLLINATION AND SELF-FERTILISATION IN *MELANDRYUM NOCTIFLORUM* FRIES.

BY A. C. HALKET, B.Sc., F.L.S.

MELANDRYUM NOCTIFLORUM Fries (*Silene noctiflora* L.), the Night-flowering Catchfly, is an annual plant and grows in waste places or as a weed on arable land. It is locally abundant in south-eastern England, becoming rarer northwards and westwards, and is found generally, though somewhat sporadically in Europe and Asia (Compton, 3).

Varying descriptions of the flowers are given. Compton (3), Hegi (4), Blackburn (2), and others state they are monoclinous. According to Knuth (6), MacLeod describes the plant as gynomonœcious in Belgium, Warnstorf as gynodiœcious at Ruppin, and Schulz as gynodiœcious as a rule, though in some places both androdiœcious and andromonœcious plants may occur. Plants* grown during the last five years in the botany garden at Bedford

* The original seed was kindly presented by Mr. Hales, Curator of the Chelsea Physic Garden.

College, Regent's Park, London, were gynomonœcious; no " male " flowers were found.

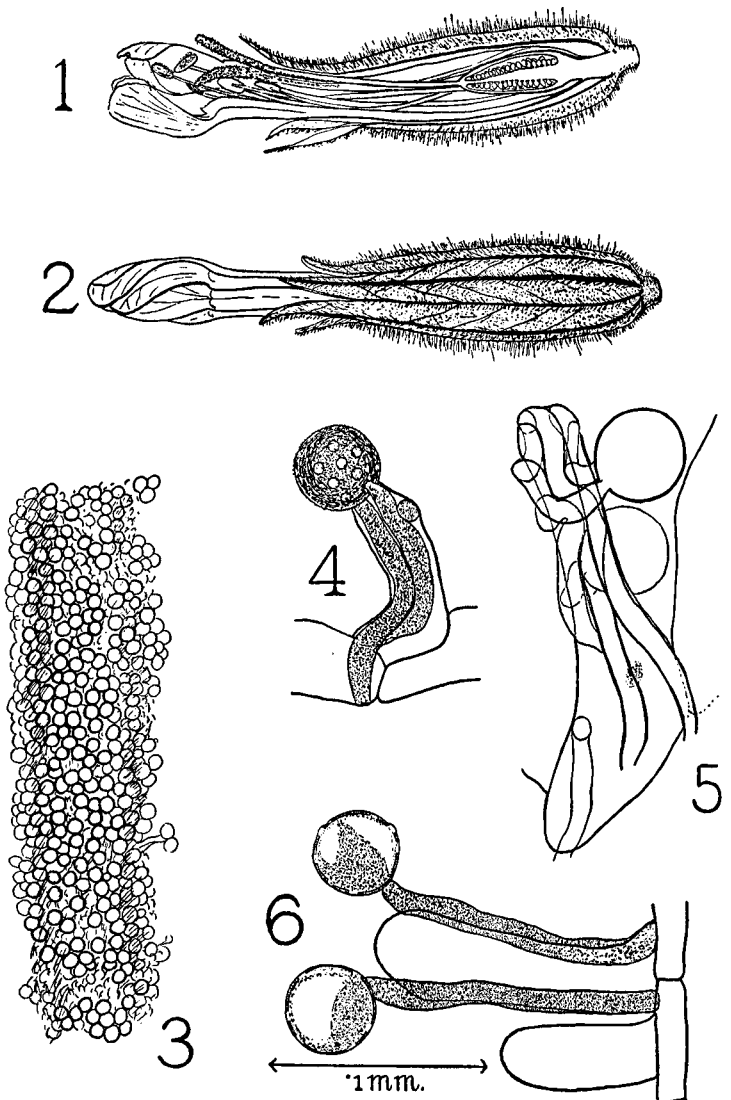
The petals of the " female " flowers are distinctly smaller than those of the hermaphrodite ones. The flowers become " female " through the abnormal development of the stamens, which have abortive anthers and short filaments, as is the case in many species of the nearly-allied genus *Silene*, e. g., *S. Saxifraga*, *S. Vallesia*, *S. nutans*, etc. Transitional forms showing abortion of only some of the stamens were also found. The majority of the flowers examined were hermaphrodite; for example, out of one hundred buds examined from different plants, seventy-nine were hermaphrodite, eleven were " female," and ten were transitional forms with one or more aborted stamens.

As its name denotes, *Melandryum noctiflorum* is nyctanthous, the petals of the buds unfolding in the evening. The hour of opening varies with the weather and possibly also with the habitat. In Regent's Park, London, on fine days the buds expand about 7 P.M. (G.M.T.); on damp and wet days they open earlier. At Upsala for the floral clock of Linnæus (5) the time of opening is given as from 9–10 P.M., and in the Jardin botanique de Bergielund, Lindman (7) records that the flowers open at 6 P.M., and other observers give other times. The flowers remain open all night and until about 8 o'clock the next morning, when the petals begin to roll up and the flowers gradually close.

The majority of the hermaphrodite flowers open only once: for instance, of sixty labelled buds forty-seven opened one evening, closed the following morning, and did not open again; while thirteen opened on two successive evenings and then remained closed. The " female " flowers may open more often, since of sixteen labelled flowers nine opened one evening only, four opened on two evenings, one on three evenings, and two on four evenings; the number of times may possibly depend on the pollination of the flower as well as on the weather. In wet weather the flowers do not close, but remain open until they wither.

Since these flowers open at night and are very sweetly scented then, it is generally concluded that they are pollinated by night-flying insects (Knuth, Lindman, Hegi, and others), though statements to the contrary are made; thus Kerner (5) notes that the anthers dehisce in the bud and the stigmatic papillæ are dusted with the pollen from the five short stamens, and he suggests that a selection of pollen by the stigma probably occurs with preference for the foreign pollen; while Hegi (4) states that self-pollination sometimes occurs; Blackburn (2) that the flowers are self-pollinated. MacLeod, however, states that the protandry is so marked that self-pollination is excluded (Knuth, 6).

The " female " flowers must be pollinated by night-flying insects, but the hermaphrodite ones are invariably self-pollinated,



Melandryum noctiflorum Fries.—Figs. 1 & 2. Two buds picked at 4.30 P.M. (G.M.T.), two to three hours before opening, ×2·5. Fig. 1. Bud cut longitudinally to show dehisced anthers, pollen on stigmas, and relative position of anthers and stigmas. Fig. 2. Bud as picked. Fig. 3. Pollen-grains on part of stigma from unopened bud, picked at 4.30 P.M., 45 approx. Figs. 4, 5, & 6. Germinating pollen-grains on papillæ of stigmas from unopened buds. Fig. 4. Pollen-grain in surface view showing numerous pores on wall and parts of three pollen-tubes. Fig. 5. Tortuous growth of pollen-tubes from two pollen-grains. Fig. 6. Optical sections of two pollen-grains, germinating on papilla at base of stigma.

Figs. 1, 2, & 3, from photographs of fresh material; figs. 4, 5, & 6, from hand-sections, with the aid of a Zeiss-Abbe camera lucida.

as the anthers dehisce before the bud opens. They dehisce somewhat irregularly; also the time of dehiscence varies and apparently is influenced by the weather. In some buds dehisced anthers are found as early as 1.30 P.M., and all the numerous buds examined had some anthers dehisced by 3.30 P.M. Sixty-eight buds were examined on different days between 4.15 and 5.30 P.M.; of these forty-seven had all their ten anthers dehisced, twelve had only the anthers of the outer whorl of stamens dehisced, while nine had more than five and less than ten anthers dehisced.

A normal well-developed endothecium is present in the anther-lobes, and the walls of the dehisced pollen-sacs curl back so that the pollen-grains are freely exposed. The papillose stigmas lie among the anthers and become entirely covered with pollen-grains, as is shown in figs. 1 & 3.

The pollen-grains germinate quickly and send out one or more tubes from their numerous germ-pores. These tubes grow vigorously, but in the humid atmosphere inside the bud the direction of growth is not always towards the style; in some cases the tubes curl round and round the papillæ and in others they grow over the top of a papilla before penetrating the tissues of the style. Some pollen-grains and their tubes are shown in figs. 4, 5, & 6. The tubes grow some distance through the tissues of the style before the bud opens; in one stigma and style, about 14 mm. long, taken from an unopened bud, the ends of pollen-tubes were found 8 mm. from its apex, and in a newly-opened flower the ends of pollen-tubes were seen a few millimetres from the base of the style.

The stigmas are so closely covered with pollen-grains and the tubes are so far developed before the bud opens that self-fertilisation seems to be inevitable unless the flowers are self-sterile. That this is not the case was proved by covering the flower-buds with bags. The flowers so treated produced good seed as abundantly as flowers unprotected from insect visitors. It may be concluded, therefore, that except in the unlikely event of apogamy, bud pollination is followed by self-fertilisation in *Melandryum noctiflorum*.

The above observations, made in the course of a study of the periodic movements of flowers, are considered to be worth recording, not only because of the unusual and interesting method of pollination of the flowers, but also because these flowers may be regarded as showing an intermediate state between that of the cleistogamous, self-fertilised flowers of *Silene vilipensa* Kunze (Batalin, 1), *S. apetala* (Lindman), etc., and that of the normal chasmogamous cross-pollinated flowers of most species of *Silene*, e. g., *S. nutans*, *S. Saxifraga*, etc.

Furthermore, it is suggested that one or more "pure" strains or races within the species may have arisen in different localities through the recurring self-fertilisation of the hermaphrodite

flowers and the pollination of the " female " flowers with pollen produced on the same plant or on neighbouring plants of the same stock. The occurrence of these " strains " would explain the differences in the plants described by various observers.

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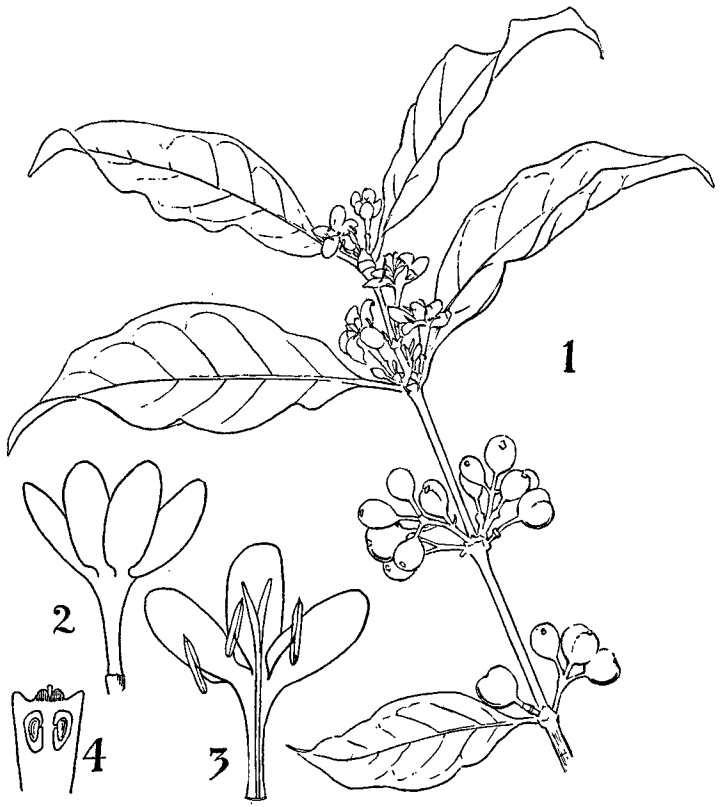
A NEW *COFFEA* FROM PORTUGUESE EAST AFRICA, WITH ECOLOGICAL NOTES ON THE GENUS.

BY C. M. F. SWYNNERTON, F.L.S., AND
W. R. PHILIPSON, B.A.

Coffea salvatrix, sp. nov. *Frutex* magnus vel *arbor* parva, forma pyramidalis, glaber, copiose ramosus, ramis patentibus plus minusve horizontalibus, ramulis gracilibus aliquando compressis rubescentibus bene foliosis; *foliis* oppositis, ovato-oblongis, acuminatis, basi leniter angustatis, aliquantum coriaceis, nervis lateralibus utrinque circa 7 ascendenti-patulis marginem versus aperte fornicatis, stipulis brevibus basi latis apice obtusis acumine brevi; *floribus* usque 7 in utraque axilla, pedicellis plerumque brevibus in fructu elongatis; *calyce* parvo breviter dentato, tubo (ovario) oblongo-turbinato; *corolla* pentamera hypocrateriformi, tubo infundibuliformi, lobis late obovatis quam tubo paullo majore; *staminum* filamentis corollæ tubi 1/3 longitudine paullo majoribus, antheris exsertis linearibus plus minusve acutis; *stylo* exserto filiformi, ramis stigmaticis loriformibus per anthesin recurvatis; *bacca* subglobosa, inter semina leviter constricta, seminibus plerumque 2 vel interdum 1.

Folia perennia 4–12 cm. longa, 1·6–4 cm. lata, in sicco olivacea, in recenti obscuro-viridia, aliquantum nitidula, subtus pallentia; acumen circa 0·5–0·8 cm. longum, basi 0·5 cm. latum, ubi distingui potest; petioli 0·5–1·2 cm. longi, canaliculati; stipulæ in ramis junioribus usque ad 0·25 cm. longæ. Calyculus circa 0·05 cm. longus; pedicelli 0·2–0·7 cm. longi. Flores albi. Calycis tubus

0·15–0·175 cm. longus. Corollæ tubus 0·6–0·9 cm. longus, basi 0·1 cm. latus, fauce 0·3 cm. diam., lobi 0·7–0·9×0·5–0·6 cm. Filamenta 0·3 cm. longa. Antheræ 0·6–0·7 cm. longæ. Stylus circa 1·2 cm. longus, ramis 0·35 cm. longis. Bacca in sicco 0·9×1·1 cm., immatura viridis roseo-striata, matura nigra.



Coffea salvatrix Swynnerton & Philipson.

1. Twig drawn from fresh material, ×½. 2. Corolla, ×1½.
3. Dissection of flower, ×1½. 4. Longitudinal section of ovary, ×7.

Hab. PORTUGUESE EAST AFRICA: Mossurise district, Sitatonga Hills. Typus in Herb. Mus. Brit. (Chirinda Forest, S. Rhodesia, *Swynnerton* (cultivated)).

Resembles *C. eugenioides* S. Moore, but differs in the obovate and less strongly acuminate leaves, and in the more numerous flowers in the axils of the leaves.

NOTES ON THE ECOLOGY. BY C. M. F. SWYNNERTON.

A small grove of these trees, forming a remarkably pure stand, was found by me growing on the lower margin of a fair-sized rain-forest patch, at probably little more than 1,200 feet above sea-level, 20° 12′ S. lat. on the eastern, gentler aspect of the Sitatonga Hills in the Mossurise district of Portuguese East Africa, seventeen years ago. Two or three were found also on the edge of a dense thicket near the bottom of the deep gorge of the Inyamadzi River, also in Mozambique, at about 2,200 feet. Seedlings occurred in the forest, but the trees that had grown into flourishing giants were those on the outskirts.

The Sitatonga Hills are a prominent razor-backed range with a quartzite ridge and flanks of schist and trap, which runs from north to south from the Lusitu River to the Buzi. The soil in which the trees were growing was, to the best of my recollection, a good red loam with much humus. The rainfall, which is fairly high, has only been recorded from the west of the hills, at Gogono at 1,200 feet, where it will, however, have been lower than where the coffee trees were found. On the foot of the hills on the east, on which side they were found, occurs also a very fine type of savanna wooding characterized by the paper-barked *Millettia Stuhlmannii* Taub. and *Pteleopsis myrtifolia* Engl. & Diels, of the aspect of " monsoon " forest, but this interzone gives way in turn to extensive *Isoberlinia-Brachystegia* wooding on granite gneiss further east (figured in Swynnerton, 1921 *, as pl. xv. fig. 1), with basalt, ill-drained ground, and tree-*Combretum* to the south (*ibid.* pl. x. fig. 2), astride of the river Buzi. A general, partly vegetational map of the area, is given in the same publication.

The soil, at the point in the Inyamadzi gorge where the remaining few coffee-trees were found, was equally good, probably a colluvial derived from schist, and, higher up, dolerite, again with much humus ; and the thicket was small and of secondary type, containing such shrubs and trees as *Maesa lanceolata* Forsk. and *Bridelia micrantha* Baill. The rainfall at the top of this scarp, at 3,700 feet at Spungabera, where good rain-forest is present, has been taken for many years : the average (1930 to 1933) is 49·66 inches. There is a marked dry season from April to October, and a heavy wet season during the rest of the year. The short dry season that characterizes so much of East Africa farther north is here almost absent.

Another set of data can be provided from a locality to which I transplanted a number of the Sitagonga seedlings and in which they have flourished, though they have not shot up into the tall bushes of their place of origin, and cultivation has during most of the seventeen years been exceedingly poor. This third

* "The Tsetse Problem in North Mossurise," Bull. Entom. Res. xi. pt. 4.

locality consists of two small fields of fair to poor red loam, without much humus, owing to previous heavy cropping and (further field) earlier erosion, just outside the northern outskirts of the Chirinda rain-forest at 3,800 feet and about 20° 30′ latitude, on my farm in the Chipinga sub-district of Southern Rhodesia. The soil, derived from sub-ophitic dolerite, is in one field deep, a pit of 21 feet having been dug in the neighbourhood before the shale rock under the dolerite soil-cap was struck. Meteorological readings have been taken for very many years at the Mount Silinda mission, a mile away, on the outskirts of the same forest, and the Table given on p. 318 (from the official ' Meteorological Report for Southern Rhodesia ' for 1934, p. 30) shows the monthly figures for a year of average rainfall, though with an unusually light February–March. The last column but one gives the average rainfall per month and year for past years. This Table was kindly supplied me by the office of the High Commissioner for Southern Rhodesia in London.

The climate of Mount Chirinda supports exceptionally fine four-storeyed rain-forest in patches (the largest, Chirinda, being of 1,200 acres) which still survive native cultivation and the firing of the grassland outside that had destroyed the old continuous rain-forest of this area before its present owners arrived and protected it. Despite the elevation it is of tropical, not temperate, type, being characterized by Meliaceæ and Sapotaceæ and large lianas. Its dominant tree species near the field is *Schefflerodendron gazense* Bak. fil. Its more striking trees are *Trichilia chirindensis* Swynn. & Bak. fil., *Khaya nyasica* Stapf, *Lovoa Swynnertonii* Bak. fil., *Chrysophyllum fulvum* S. Moore, *Maba mualala* Welw. ex Hiern, and (outskirts tree and chief pioneer) *Albizzia chirindensis* Swynnerton, a very different-looking tree from the ordinary forms of *A. gummifera* (formerly *fastigiata*). It is figured as pl. ix. in my paper of 1921.

African rain-forest occurs under considerable variations of climate. These rain-forests of the Rhodesian–Portuguese border, with their long dry season, are indicative, for this coffee, of the toleration or requirement of lower and less continued atmospheric humidity than is associated with, for example, the rain-forest of Amani and the Usambaras, with much rain monthly, and, as Moreau found, atmospheric saturation which was commonly greater outside the forest than in it.

Outside the riot of the outskirts vegetation, with its tangles of *Dioscorea Schimperiana* (deterioration-zone No. 1), one breaks straight away into *Andropogon-Hyparrhenia-Acacia natalitia* grass jungle savanna (deterioration-zone No. 2), as the effect of past cultivation and grass-fires. *Pterocarpus sericeus*, tall grass savanna (deterioration-zone No. 3) next follows, and, with loss of humus and erosion yet further advanced since the forest left the ground, and the underlying shale becoming exposed, *Isoberlinia-Brachystegia-Uapaca* short grass savanna appears

Temperature, humidity, cloud, and precipitation at Mount Silinda, open station, in 1934, with average rainfall for previous years.

Lat. 20° 26′ S., long. 32° 41′ E., alt. 3,510 feet. Time of observation 7.30–8 P.M.

1933–34.	Temperature in Stevenson screen °F.						Rel. hum.	Dew point.	Cloud amt.	Precipitation.		
	Absolute.		Mean.									
	Max.	Min.	Max.	Min.	½ max. min.	Dry bulb.	Wet bulb.	Per cent.	°F.	0–10.	Hours.	Normal.	No. of days.
July	78	44	68·3	50·3	59·3	57·4	53·4	77	50	2·7	1·16	1·05	6
August	81	46	69·1	50·3	59·7	56·4	52·8	80	50	3·7	1·18	0·71	5
September	90	47	72·2	52·3	62·2	60·3	55·2	73	51	3·3	0·01	1·06	1
October	94	44	80·0	58·3	69·2	66·8	(58·0)	(59)	(52)	3·2	0·93	1·93	5
November	94	54	75·3	61·4	68·4	66·2	62·6	82	60	6·7	8·07	4·68	19
December	83	53	75·0	59·9	67·4	66·2	62·1	80	60	6·2	10·51	8·91	13
January	84	49	77·4	62·4	69·9	68·4	65·2	84	63	4·8	14·04	14·96	11
February	85	59	75·4	62·6	69·0	66·4	64·1	88	63	6·5	8·15	11·31	15
March	83	54	74·8	61·5	68·1	66·3	63·5	86	62	6·1	7·62	11·78	12
April	81	54	73·4	60·0	66·7	65·0	62·5	87	61	4·3	4·35	3·37	13
May	80	51	70·06	54·1	62·4	61·1	58·0	84	56	3·6	1·26	1·58	4
June	75	46	63·0	51·0	57·0	55·7	54·1	91	53	6·2	5·24	0·76	13
Year	94	44	72·9	57·0	64·9	63·0	59·3	81	57	4·8	62·52	60·95	117

(deterioration-zone No. 4). The last is in places close up to the rain-forest through the narrowing or elimination of the earlier deterioration zones.

The *Coffea* has been planted on deterioration-zone No. 3.

Dispersal, for this species, is mainly the work of the smaller frugivorous forest-birds. Both in the Sitatonga Hills forest, from which the plants came, and in Chirinda, these birds form a very differently constituted community from those of the savannas outside, and, the coffee-trees being mainly on the outskirts, the frugivorous birds of the savanna (*Pycnonotus tricolor layardi* Gurney in particular) feed also to some extent on the glossy jet-black berries, and seedlings were found under some Eucalyptus, which these bulbuls regularly use. The berries are abundantly borne and ripen with apparent suddenness, one here, one there, in the axils daily over a period of some weeks that ends in early October, the unripe berries around them, forming always the great majority and preserving, till they in turn ripen, a light green colour with russet streaking. Several of the forest-birds are frugivorous, but the species which, in Chirinda, has attached itself with special devotion to this coffee, is the Chirinda Greenbul—*Arizelocichla milanjensis milanjensis* (Shelley). Throughout the period of the ripening these birds may be found in many pairs even in the patch of coffee furthest removed from the forest, perhaps 300 yards from it, an unusual distance for these Greenbuls to travel from the forest. They move quietly, concealed in the hearts of the bushes, and slip out thence along the twigs to the ripe berry and back. They kept anticipating the pickers with remarkable success when, lately, visiting the farm, I wished for all the seed I could get.

Enemies.—During the first few years of their bearing, the crops from these trees appear to have been characterized wholesale by empty berry. The berries ripened, but it was difficult to find a sound bean. Last season, when I was there, this condition was less frequent, and the cause, possibly *Antestia*, now not seen, was not discovered. Apart from this defect no evidence of enemy-attack has been noted. The trees are not attacked by *Hemileia vastatrix*, though they have grown interspersed with trees of *Coffea arabica* that each season were heavily attacked; and, what is of greater importance, the species is not attacked by the large brown-banded coffee stem-boring Longicorn, *Anthores leuconotus* Pascoe.

Coffee made from the beans is very bitter. Mixed with that of *C. arabica* in the proportion of four of the latter to one of *salvatrix* the effect was rather that of coffee with chicory, though bitter at that. The Imperial Institute has very kindly obtained an expert verdict for me on the product. This describes it as "abnormally small; very mixed defects. Dull and poor roast. Liquor: very common, very strong, rancid and completely undesirable."

Coffea robusta Linden, resistant to " borer," is already being tried in East Africa at Amani and Liamungu, as a stock on which to graft *C. arabica*, with a view to protecting it from the borer above-named, which mostly attacks near the ground. The coffee we are describing repels borer equally and, like *robusta*, has a stem thick enough, I judge, for the successful attachment of *C. arabica*. Some experiments in grafting the latter on to *C. salvatrix* carried out by myself, by inarching, have been, I am informed, successful. A large number of the seedlings, with those of *arabica* alongside, have been set out in nursery with a view to inarching later, and it is hoped that it will be found from this larger experiment that *salvatrix* is a good stock for *arabica*. It may, at least, help to resuscitate the coffee industry in the Chipinga district, where *C. robusta* so far has been less vigorous, even should it be less useful than the latter elsewhere. It is in this hope—which, of course, may be disappointed—that I have been so rash as to suggest the name *salvatrix* for the species.

" Gazaland," an area lying mainly in Portuguese Territory, but comprising also the Chipinga sub-district of Southern Rhodesia, boasts of no fewer than three wild coffees. These are, firstly, *Coffea ligustroides* S. Moore, found abundantly in the Chirinda forest at from 3,700 to 4,000 feet, and, more abundantly, in Chipete (about 3,800 feet)—a satellite of Chirinda that is marked by a relative abundance (now much diminished) of the rosaceous tree *Pygeum africanum* Hook. fil. and of a large rubber-yielding liana *Landolphia Swynnertonii* S. Moore ; and, secondly, *Coffea Swynnertonii* S. Moore, a species of the Portuguese lowlands.

C. ligustroides is a slender, rather delicate-looking bush with small leaves (length 4–12 mm.) more delicate and varnished in appearance than those of privet, which bears beautiful orange-coloured berries with almost an amber-like semi-transparency. These are smaller—or narrower—than those of *C. salvatrix*, but contain pale, greenish " beans " of about the same size (average about 8 by 5·1 mm.), in a delicate transparent silon-skin in a parchment of ivory-like appearance that is very different from the coarser, brown inner integument of *C. salvatrix*. *C. ligustroides* is found both on the rich red soil of the dolerite cap and on a sandy soil with humus, derived from a sandstone-shale-quartzite. It is not infected by *Hemileia vastatrix* but is heavily attacked by *Anthores*, yet, with plenty of helpful dispersers and a good germination, it manages to survive in abundance. It is eaten by baboons and is also spread by the forest bulbuls, robins, and thrushes (amongst bulbuls the *Arizelocichla* referred to above, *Phyllastrophus flavostriatus* Sharpe, and *Ph. terrestris suahelicus* Reichw., two robins—*Swynnertonia swynnertoni* (Shelley) and *Pogonocichla stellata transvaalensis* (Roberts), and the thrush *Turdus olivaceus swynnertoni* Bannerman. It flourishes and bears especially in the more open spaces of the rain-forest, forming, in Chipete, pure stands. Unlike *C. salvatrix* and *C. Swynnertonii*, the species has been difficult to establish right outside. It commonly bears few berries, but this is evidently (as happens with *C. arabica*) a matter of low light-intensity, low average temperature, or both. An experimental opening-up of the less desirable elements of the undergrowth in a portion of Chipete produced great crops. Owing to its slender habit and susceptibility to borer *C. Swynnertonii* will be useless as a stock. Its product is sometimes used locally, being pleasanter, at any rate, than that of *C. salvatrix*, and a favourable verdict was obtained on it thirty years ago in London, not as a drinking coffee, but as belonging to a type of coffee in demand for blending ; but the latest verdict, by the expert by whom the product of *C. salvatrix* was condemned, was the very reverse of favourable. Possibly this type of coffee is no longer in demand for this purpose, or the expert had not been in touch with it, for he said " we have never seen such small bean coffees." "A further disadvantage of such small beans is that such coffees can only be roasted in machines with closed cylinders .... This would further restrict the use of such coffee."

C. Swynnertonii is stouter than *C. ligustroides* and has pomegranate-like leaves. I have seen less of this species. It resists *Hemileia* and apparently borer as well, but is hardly a large enough species to serve as a stock for *C. arabica*. Its own product, however, seems to be of definite use. It occurs near the southern Chipinga border on the Juababa Stream in Portuguese territory at about 1,000 feet, but also in the Madanda rubber thickets, characterized by *Erythroxylon emarginatum*, *Landolphia Kirkii*, and much else, and figured by me in 1921 as pl. xi. These thicket forests cover much country, at 400 feet and less, in the Portuguese lowlands between Sprungabera and Sofala, even on a highly sandy grey soil, and I here found this coffee also in tree savanna. Near the actual coast, what was apparently the same species was grown in small plantations under the name of Inyambine coffee and developed a slightly larger leaf than the wild shrub.

These three coffees—*C. ligustroides* of the rain-forest proper at nearly 4,000 feet, *C. salvatrix* of the outskirts of rain-forest and thicket at 1,000 feet to 2,000 feet, and *C. Swynnertonii* of dry thicket and savanna in the lowlands right down to coast-level—occur naturally under very different climates and eco-climates. It is unlikely that either *C. ligustroides* or *C. salvatrix* will grow excepting under " *C. arabica* " conditions as regards rainfall and soil, though *C. salvatrix* will flourish at medium-low elevations. It is unlikely, one supposes, as a stock, to confer

the resistance to *Hemileia* on its *arabica* scions that will enable the latter to exclude the fungus effectively at these lower elevations, but this can be told only by experiment. *C. ligustroides* might find a use as a parent of hybrids between itself and *C. arabica*. I successfully obtained such hybrids when experimenting for the Southern Rhodesian Government for the combating of *Hemileia*, but they were lost during my subsequent absence of many years from my farm.

C. Swynnertonii, however, not only flourishes at low elevations, including coast-level, but endures a relatively low rain-fall (in Madanda), grows in sandy grey soils of, probably, rather low fertility, and yields what used to be thought locally a fairly good coffee of its own. If this last is confirmed, the species might be worthy of extended experiment at cultivation under low-elevation conditions as a possible crop for the natives. It might, further, in that case, prove a useful constituent in the "thicket barriers" against the encroachments of tsetse-flies of the *morsifans* group on which I am experimenting in Tanganyika Territory.

BIBLIOGRAPHICAL NOTES.

CII. Don's 'Monograph of the Genus Allium.'

George Don the younger's 'Monograph of the Genus *Allium*,' a work still of value for its references to pre-Linnean literature which is ignored in Eduard v. Regel's later 'Alliorum adhuc cognitorum Monographia' (Act. Hort. Petrop. iii. pt. ii. 1–266; 1875), was published in vol. vi. pp. 1–102, of the 'Memoirs of the Wernerian Natural History Society' at Edinburgh; it was read to the Society on April 22, 1826 (*cf.* Mem. vi. 1 & 560), but the title-page of the entire volume (Mem. . . . for the years 1826–31) is dated 1832, and this has been taken as the date of Don's work, *e. g.*, by Prokhanov (Bull. Appl. Bot., Leningrad, xxiv. no. 2, 131, 181; 1930) and by Merrill (Comm. Loureiro's Fl. 106; 1935). Several contemporary references establish that it came out earlier. Thus J. A. and J. H. Schultes in 1830 based their account of *Allium* in Syst. Veg. vii. pt. 2, 1000–1133 (preface dated Oct. 1830) on Don's work, with a note "in hoc genere monographiam recentissimam cl. Don secuti"; the Catalogue for 1827 of the Library of the Linnean Society (Trans. Linn. Soc. London, xv. 517; 1827) records "Don's (G.) Monograph of the Genus *Allium* (from Mem. Wern. Soc. vol. vi.)" as a gift from the author; Robert Sweet, after describing *Allium neapolitanum* in the British Fl. Gard. iii. pt. 51, t. 201 (May 1827), remarks that of the whole genus "an excellent Monograph has lately been published in the Memoirs of the Wernerian Natural History Society of Edinburgh, from the pen of Mr. George Don . . . it contains above a hundred closely printed pages"; J. C. Loudon's Gardener's Mag. ii. no. 8, 452 (July 1827) repeats this. Hence it was probably published early in 1827. *Allium uliginosum* G. Don, *l. c.* p. 60, thus antedates *A. uliginosum* Ledebour, 'Icon. Fl. Ross.' i. 20, t. 83(1829), 'Fl. Altaica,' ii. 16 (1830), and the Schultes acted rightly in renaming the latter *A. Ledebourianum*.—W. T. Stearn.

THE BRASSICA OF LUNDY ISLAND.

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

In a Supplement to this Journal for November 1933, Dr. F. R. Elliston Wright reported *Brassica Cheiranthus* Vill. as an undoubted native of Lundy, and in March last he furnished in a further Supplement an account of the same plant as a new species, *Brassicella Wrightii* O. E. Schulz, remarking that "the plant must date at least from early Pleistocene time." As this addition to the British flora seems somewhat surprising, and as other species of *Brassica*, including *B. oleracea* L., had already been recorded for Lundy, I recently obtained for examination, through the kindness of the officers of the Devon Association, the collection of *Brassicae* from the herbarium of the late W. P. Hiern, who, I knew, had botanised on the island. In this parcel is a cover of specimens named *B. oleracea*, consisting of several examples from well-known stations, and ten sheets from Lundy, collected by Hiern himself in June 1884 and September 1890. The Lundy specimens, however, although so labelled, are not *B. oleracea*, but the plant now described as *Brassicella Wrightii*. It is strange that such a serious misidentification should have been made by so good a botanist as Hiern, and it now seems reasonable to assume that *B. oleracea*, which is usually a plant of calcareous ground, does not occur on Lundy. But it is clear that *B. Wrightii* was growing there in 1884, and hence quite probable that it was the "wild Brassica" on which Wollaston detected two peculiar beetles recorded in 1845. It does not follow that *B. Wrightii* is endemic on Lundy. *Brassica Cheiranthus* Vill. looks wild on the sandy common at Par, in Cornwall, from which district it was first recorded by Pascoe in 1850, but it has always been regarded as an introduction there; and similarly in Glamorgan, although there is a specimen from that county at Kew collected by Borrer in 1846. Weedy crucifers often appear as escapes and sometimes readily become naturalised, and *B. Wrightii* has the aspect and indumentum of a Mediterranean species. Nevertheless, it may possibly be an endemic as Dr. Wright supposes.

The significance of the association of beetles with *B. Wrightii* can easily be overestimated. Of some 3630 species recorded for Britain, the distribution of a large proportion is very imperfectly known, as is well shown in Dr. K. G. Blair's " Beetles of the Scilly Isles " (Proc. Zool. Soc. Lond. 1931, 1211), where 574 species recorded for Scilly are contrasted with 471 for Lundy, 1107 for Braunton, and only 223 for West Cornwall. Four species of coleoptera, and two varieties, are noted by Dr. Blair (*loc. cit.*) as first recorded as British from Lundy ; and of these, he states, two species are now known to occur elsewhere in Britain, and a third, *Psylliodes luridipennis* Kuts., whose host on Lundy is *B. Wrightii*, has since been recorded, though with some uncertainty, from Brittany. The other beetle especially affecting this crucifer, *Ceuthorrhynchus contractus* var. *pallipes* Crotch, is reported, according to Dr. Wright, from St. Kilda ; so that neither of these two insects (which belong to large genera several of whose species haunt cruciferous plants) can be said to be peculiar to Lundy and *B. Wrightii*. And when coleopterists investigate other districts where *B. Cheiranthus* or other allied species grow, especially in south-west Europe, it is likely that one or both of these particular beetles will again be collected.

An examination of Mr. Hiern's material of the Lundy plant clearly shows its identity with the specimens from which Dr. O. E. Schulz's description was taken. *Brassicella Wrightii* is evidently at least as distinct from *Brassica Cheiranthus* Vill. as is *B. monensis* Huds. In general features *B. Cheiranthus* seems more or less intermediate between the other two, and although it is a variable species, of which Rouy and Foucaud (Fl. France, ii. 56) give no less than fifteen subspecies and varieties, in essential features it seems readily separable in all its forms from the Lundy plant. So far as is known, *B. monensis* is a British endemic, and, if *B. Wrightii* is also endemic on Lundy, it is remarkable that in Britain there should exist two distinct local allies of *B. Cheiranthus*, which has a wide range in Western Europe, one diverging towards a low-growing, glabrous, and less leafy form, and the other becoming perennial, with ampler foliage and a dense indumentum. Until it can be identified with some form at present undescribed, probably from the Mediterranean region or the Canaries, *B. Wrightii* must apparently be treated as a new endemic species.

It will be noticed that the description of *B. Wrightii* in Dr. Wright's paper ends with a paragraph contrasting it with *B. monensis*, while no allusion is made to *B. Cheiranthus*, to which it is obviously more nearly related. In his Monograph in the ' Pflanzenreich ' (Heft 70, iv. 105, p. 112 ; 1919) Schulz states that *B. Cheiranthus* is a plant of the central European mountain region, and most of the habitats cited are in Western Germany. A few French localities are given, but these are not maritime.

Under *B. monensis* (loc. cit. 113) the well-known English and Scottish stations are shown, together with Jersey, Alderney, and Guernsey ! Schulz appears to have seen no material from the Channel Islands, and to have erroneously assumed, because the stations are maritime, that the plant there must be the *B. monensis* of Great Britain, albeit British authors have consistently treated it correctly as *B. Cheiranthus*. He may thus have considered it superfluous to distinguish *B. Wrightii* from a species which he supposed was not British.

While the resuscitation of Fourreau's genus *Brassicella* by Schulz may doubtfully commend itself to botanists in view of its very close resemblance to *Brassica* and *Sinapis*, his adoption of the trivial *Erucastrum* (*Brassica Erucastrum* L. Sp. Pl. 667 ; 1753) in place of *Cheiranthus* (*Brassica Cheiranthus* Villars) seems certainly undesirable. The closely allied *B. monensis* was treated by Linnæus as a *Sisymbrium* (*S. monense*, Sp. Pl. 658 ; 1753), and the plant intended, being based solely on the *Eruca monensis laciniata flore luteo majore* of Dillenius, is unmistakable. The name *Brassica Erucastrum* L., often identified by modern authors with *Erucastrum obtusangulum* Schleicher, is of doubtful application, but if Linnæus had had *B. Cheiranthus* in view, he would hardly have placed it in any genus but *Sisymbrium*. Neither the description nor the habitat of ' Species Plantarum ' is precise, and of the synonyms cited by Linnæus, that from Caspar Bauhin's ' Pinax ' points mainly to *Erucastrum obtusangulum*, while the *Eruca sativa* of Fuchsius is admittedly *Diplotaxis tenuifolia* DC. The citation from Hort. Cliff. (*Sisymbrium foliis pinnato-dentatis*, from which the word " linearibus " of the original has been omitted) also indicates *D. tenuifolia*, and the relative specimen, now in the British Museum Herbarium, belongs to this species. The sheet in the Linnean Herbarium, labelled " 7. Erucastrum ? " by Linnæus, contains two small plants of *Raphanus Raphanistrum* L. that look much more like *Erucastrum obtusangulum* than *Brassica Cheiranthus*. It is not easy therefore to see any valid ground for substituting the trivial *Erucastrum* in place of *Cheiranthus*.

It may be useful to show concisely the contrasting characters of the three British species of *Brassicella* :—

1. *B. monensis* O. E. Schulz in Engler's Bot. Jahrb. liv. Beibl. n. 119, 53 (1916) ; Pflanzenreich, Heft 70, iv. 105, p. 112 (1919). *Sisymbrium monense* L. Sp. Pl. 658 (1753). *Brassica monensis* Huds. Fl. Ang., ed. 2, 291 (1778).

Biennial, with spreading branches from the basal rosette ; glabrous or with a few scattered hairs below and about the apex of the sepals. Leaves nearly all radical, narrow, with small or finely dissected segments. Racemes very lax. Sepals as long or longer than the pedicels. Ovary glabrous.

2. **B. Cheiranthus** (Vill.), comb. nov. *Brassica Cheiranthus* Vill. Prosp. Pl. Dauph. 40 (1779). *Brassicella Erucastrum* O. E. Schulz in Engler's Bot. Jahrb. liv. Beibl. n. 119, 53 (1916); Pflanzenreich, Heft 70, iv. 105, p. 107 (1919); non *Brassica Erucastrum* L.

Biennial, normally taller, erect and branched above; ±hispid, chiefly towards the base of the stem, with scattered, patent or deflexed hairs, also about the apex of the sepals and frequently on the underside (rarely also on the upper side) of the leaves. Leaves radical and cauline, the lower broader than in 1, with larger, less finely cut segments. Sepals as long or longer than the pedicels. Ovary normally glabrous.

3. *B. Wrightii* O. E. Schulz apud Elliston Wright in Journ. Bot., Suppl. I. 1 (1936).

Short-lived perennial, normally taller, erect, and branched above; densely pilose on the stem, both sides of the leaves, and the sepals, with finer deflexed hairs. Leaves radical and cauline, still broader and more lyrate than in 2, with broader and less divided segments. Sepals shorter than the pedicels. Ovary pilose.

There is a specimen labelled *B. monensis* Huds. in Herb. Hiern, collected on the sea-shore at Woolacombe, North Devon, June 23, 1909, by W. T. Wainwright. The example is a small one, but appears rightly named. This is a new record for v.c. 4.

AN ABNORMAL INFLORESCENCE OF *ORCHIS MASCULA* L.

By Patrick M. Hall, F.L.S.

The abnormalities which occur in the flowers of Orchids are of many kinds, among which the most commonly noted are (*a*) pelory, (*b*) decrease or increase in the number of perianth segments, and (*c*) the production of organs which are suppressed in the normal flower.

Pelory in Orchids represents a throw-back to the ancestral type of flower, which is believed to have had a regular perianth of two whorls each consisting of three segments: and this type of abnormality may be of two kinds. In one case the labellum is reduced to a more simple organ resembling the upper petals, its spur disappearing or becoming rudimentary. In the other case the upper petals assume the appearance of labella, sometimes even to the extent of having spurs. Godfery, 'Monograph and Iconograph of Native British Orchidaceae,' illustrates on Plate 39, fig. B, a flower of *O. morio*, in which all three petals are similar and resemble labella.

Reduction in the number of perianth segments appears to be rarer than increase, which is caused by the doubling of one or more of the segments, or by median or axillary prolification. A case of duplication of all the segments in *Cephalanthera grandiflora* (L.) Bab. was given by myself in Journ. Bot. lxxii. 50 (1934).

The production of additional organs normally suppressed is an abnormality of different origin to the last and resembles pelory, in so far as it represents a throw-back to an ancestral type. In this case, however, it is the six anthers (in two whorls of three each) of the ancestor which are manifested. All the British genera of Orchids except *Cypripedium* belong to the Monandrae, and have but one fertile anther, with two others present in some genera in a rudimentary form as small knobs at the base of the column known as staminodes. The one fertile anther is the upper anther of the outer whorl, and those represented by the staminodes are the upper (lateral) anthers of the inner whorl. One or more of the five suppressed anthers occasionally appears, either as a more or less normal anther or anther-sac, or transformed into a petaloid organ which is in some cases a labellum. An instance of the transformation of anthers into labella in *Cephalanthera* is given by myself (*loc. cit.*), while Rendle (Journ. Bot. lxxi, 353; 1933) illustrates a very rare case of the former type in a flower of *Orchis mascula*, in which five anthers were present, the anther still missing being the lower anther of the inner whorl. The production of this anther seems to be of the greatest rarity, and I have only been able to find three cases recorded, (i.) in *Isochilus* (Godfery, *loc. cit.* pl. 9, fig. 18), where five anthers are shown fully developed and the sixth represented by a filament, (ii.) in *Ophrys tenthredinifera* (Maige, Rév. gén. bot. 1909, 316, where in an abnormal inflorescence at least one flower had six anthers and others five, and (iii.) in *Ophrys sphegodes* (Masters, Journ. Linn. Soc., Bot. viii, 207; 1865). In this case one flower had five petals and four anthers, while the ovary was 2-celled with four placentas. The two supernumerary petals were labelloid, one bearing a half-anther, and represented the missing anthers of the outer whorl, while the three anthers of the inner whorl were all present.

I have made these rather full introductory notes in order to stress the exceptional interest attaching to an inflorescence of *O. mascula*, which was gathered by Mr. J. D. Grose in N. Wilts on May 17, 1936, and kindly sent to me for examination. It consisted of ten flowers, which from the abnormal development of labellum-like organs gave the plant a most handsome appearance. One of the flowers was detached and dissected, with the result that it was found to consist of the following twelve parts:—

(*a*) Three normal sepals. (*b*) One normal labellum.

(*c*) Two upper (lateral) petals, abnormally developed, with the markings and outlines of labella.

(*d*) A column bearing the normal upper (fertile) anther of the outer whorl.

(*e*) Two labella, with spurs, protruding from the throat of the flower, parallel to and facing one another, in a vertical plane, *i. e.*, at right angles to the labellum (*b*). These represent the lower (lateral) anthers of the outer whorl.

(*f*) Two other labellum-like organs which were separately and tightly rolled up in the throat of the flower, and had incipient spurs protruding forwards, toward the front of the flower. These represent the upper (lateral) anthers of the inner whorl, normally appearing in *O. mascula* as staminodes.

(*g*) A growth attached to and protruding upwards and forwards from the base of the column. Though not fully developed it was clear that this was also tending to become labelloid in form. This undoubtedly represents the lower anther of the inner whorl.

So far as could be seen without dissecting every flower, all were abnormal and similarly abnormal. This was also the case in the example described by Rendle, but it seems to be more usual for only one flower of the inflorescence to be abnormal.

The foregoing analysis of the components of one of the flowers reveals the following points of interest :—

(i.) This plant combines both types of atavism referred to earlier, (*a*) pelory, and (*c*) the production of suppressed organs.

(ii.) The manifestation of all six anthers is of the most extreme rarity, and has only been recorded once previously in Britain, and then in a different manner.

(iii.) All the abnormality of the flower is directed towards the production of labella. Not only does the pelory take the less usual form of producing three labelloid petals, but the five normally-suppressed anthers all appear in the form of labella, four of them even having spurs.

(iv.) The particular combination of abnormal features described here does not appear to have been recorded before. Jacob, ' Catalogue of the Plants of Faversham,' 1777, illustrates " a perfectly regular double flower of *O. morio*," but the figure is very crude and gives no idea of the composition of the flowers. From the number of parts credited to the flowers it appears probable that this was a case of prolification, at least in part. In another case (Masters, *loc. cit.* ix. 349; 1867), " On a Double-flowered Variety of *Orchis mascula* ") there was substitution of petals for anthers in combination with axillary prolification.

The dissected flower, together with photographs of the inflorescence, has been placed in the Herbarium of the British Museum.

NEW HYBRID MARSH ORCHID.

By Patrick M. Hall, F.L.S.

× **Orchis latirella,** hyb. nov. *O. latifolia* L. (*O. incarnata* auct., non L.) × *O. purpurella* Stephenson.

Exsicc. P. M. Hall, nos. 1171 A (in Herb. Mus. Brit., *typus*), 1183, 1211, and 1441 in Herb. P. M. Hall.

Planta habitu inter parentes intermedio. Folia angustiora et pallidius viridia quam *O. purpurellae*, nonnunquam maculis paucis parvis et obscuris maculata. Inflorescentia cylindrica ; corolla lobis labelli lateralibus reflexis ut in *O. latifolia* sed colore *O. purpurellae* tincta.

Plant intermediate in habit between the parents. Leaves narrower and paler green than in *O. purpurella* : sometimes spotted with a few small indistinct spots. Inflorescence cylindrical, and corolla with the side lobes of the labellum reflexed as in *O. latifolia*, but coloured as *O. purpurella*.

Distribution. This hybrid may be expected to occur in any of the numerous localities in northern Britain, where the two species are found together. It has as yet been recorded only from the following localities, where isolated specimens grew among the parents :—

V.c. 46, Cardiganshire, near Borth (No. 1441).

V.c. 64, Mid-West Yorkshire, Wharfe Wood, Austwick (No. 1171 A), *type*. Austwick Moss (No. 1183). Kilnsey (No. 1211).

I am glad to have the opportunity of acknowledging the help of Mr. A. J. Wilmott in this matter, as in many others.

REVIEWS.

Joachim Burser's Hortus Siccus mit Erklärungen herausgegeben von H. O. Juel. Edited after the Author's death by N. Svedelius. Symbolae Botanicae Upsalienses, ii. 1. Uppsala, 1936.

The ' Hortus Siccus " of Joachim Burser is not only an interesting record of European taxonomy in the first half of the 17th century, but is of special value for botanical nomenclature from its use by Linnæus in his preparatory work for the ' Species

Plantarum.' Burser, originally Burscher, was born at Kamenz in Saxony in 1583, and in 1625 became Professor of Medicine and Botany at Sorö in Denmark, where he died in 1639. After his death the herbarium was bought by a Danish Reichsrat, with whose library it passed to Sweden as spoil of war, and through the offices of Olof Rudbeck ultimately found a home in the Upsala University. The late Prof. Juel of Upsala devoted some years of work to the preparation of a catalogue of the volumes. This had been completed at the time of his death in 1931 and his successor, Prof. Svedelius, is responsible for its publication, which has been made possible by a grant from the Royal Society of Sciences of Upsala.

The Herbarium was contained in 25 volumes, two of which (vols. ii. & v.) were lost in the great fire at Upsala in 1702, together with several thousand blocks of wood-cuts that had been prepared for Rudbeck's 'Campus Elysii.' The Catalogue contains photographs of the herbarium *in situ*, the title-page, and two sheets of specimens—these measure 20 by 35 cm. Each sheet bears a label in Burser's hand giving the name of the plant according to Bauhin's 'Pinax,' by which the herbarium is arranged, and often also synonymy according to Tabernæmontanus, Lobel, and other authors. New species bear only a name given by Burser himself; in these cases a definite locality is added, but in the case of known species only a general distribution is given. In some cases the German popular name is added. Burser had travelled widely in Europe, but in addition to the plants collected by himself are those received from correspondents. Prof. Juel gives a list of 26 North American species. Burser was closely associated with Caspar Bauhin, and many species described in the 'Prodromus' were received from Burser, who has indicated on the ticket in his herbarium "Bauhino attuli." In a recent communication to our Linnean Society Mr. Savage has shown the importance of Burser's herbarium in relation to Linnæus's 'Species Plantarum.' His discovery of a MS. list of Linnæus's determinations of the species, with a tabular list comparing the volume numbers of the herbarium with the Book, Section, and number of pages in Bauhin's 'Pinax,' indicates the close relation of the herbarium to the nomenclature and synonymy of the 'Species Plantarum.' It is certain that Burser's Herbarium contains many of the type-specimens that are not found in the Linnæan Herbarium. Prof. Juel gives a list of 41 species which he suggests may be thus typified, but the evidence of the Linnæan MS. suggests that the number is far greater than this.

Prof. Juel has added the modern species-name after the original name and notes given in the Herbarium. An index of species arranged under families makes reference easy.—A. B. R.

Natural History of the Danish Lichens. Original Investigations based upon new Principles. By OLOF GALLØE, Ph.D. Parts I.–V. 4to. Levin and Munksgaard, Copenhagen, 1927–36. Price 40 Dan. Cr. per part.

THE object of this work, of which Part V. has recently appeared, is "to describe the natural history of Danish lichens, species by species." Whereas the aim of every naturalist investigating a limited group must be to give a full account of each species, phylogenetically, ontogenetically, physiologically, ecologically, and sociologically, this is at present an unattainable ideal and the author has been obliged to confine himself to certain limited problems. In his general Introduction published in Part I., issued in 1927, he refers to the difficulties of the present-day taxonomist owing to the fact that the majority of descriptions of species dating from earlier times were not based on single specimens and were often made at a time when microscopical technique was very undeveloped. Granted access to type-specimens relationship by similarity may be determined, but the genetic relationship remains unknown, and certainty can only be reached by culture experiments. The author envisages an international institute for housing type-specimens, with specialists to do the work of determination, thereby saving the investigator trouble and time, and also an institute for the culture of lichens and the examination of their genetic relationship. The establishing of such institutes is beyond the powers of a single person, but the minute examination of the species is possible if the right method be adopted. The method used by the author is to describe a single individual morphologically and anatomically in full detail. If several specimens are used each is described separately. To avoid multiplicity of names based on minute differences, if various types are found within one group of individuals that are presumably conspecific a typical specimen of each is described without giving separate names. "I am thereby enabled to express that I consider them to be related to one another as species (which for the present is only an assumption until culture-experiments can satisfy me) and also that every type has been so closely described after examinations based upon one single individual that it cannot be split up into further units."

In selecting a name the author has a method of his own. If he can find in the literature on the subject a good description which seems to correspond minutely to the individual examined, he adopts the name used regardless of whether it is the oldest or not. He does not quote synonyms; for these the original author is alone responsible. It would have been helpful if the reference had been given for the name adopted.

The great value of the work lies in the detailed descriptions and the numerous careful illustrations which have been drawn

by the author. The wealth of illustration may be judged by the fact that for the twenty-eight species of *Lecidea* there are 160 plates. For *L. elaeochroma* Ach., of which thirteen specimens are described, there are 39 plates.

But little value is assigned to chemical reactions, which, in the opinion of the author, have been considerably over-estimated, more especially the iodine and chlorine reactions. But the KOH reaction may often be a valuable help in a diagnosis.

In each genus a discussion of the phylogeny and of the natural history of the Danish species precedes the description of the species. This discussion under *Lecidea* in Part I. includes a presentation of the author's views on the origin of lichens generally and also on evolution. He favours Lamarckism, natural selection, and adaptation as factors.

The absence of an index or table of contents renders reference difficult. Each part is an independent monograph, separately paged. The genera treated are as follows :—

Part I. (1927). Introduction, *Lecidea*, pp. 93, pls. 160.

,, II. (1929). *Psora, Catillaria, Bilimbia, Bacidia*, pp. 84, pls. 128.

,, III. (1930). *Lecanactis, Arthroraphis, Microphiale, Bryophagus, Biatorella, Mycoblastus, Blastenia, Catocarpon, Rhizocarpon, Diplotomma*, pp. 114, pls. 127.

,, IV. (1932). *Buellia, Catolechia, Lecanora*, pp. 81, pls. 133.

,, V. (1936). *Aspicilia, Placodium, Lecania, Candelariella, Candelaria, Haematomma, Schismatomma, Acarospora, Ochrolechia, Pertusaria, Gyalolechia, Caloplaca, Gyalecta, Diploschistes, Thelotrema, Phlyctis, Rinodina*, pp. 117, pls. 140.

A final volume is contemplated, giving a general survey of the taxonomy and general natural history of Danish lichens.—A. B. R.

Botany : a Text-book for Colleges. By J. Pen Hill, Lee O. Overholts, and Henry W. Popp, Pennyslvania State College and Agricultural Experiment Station. Cr. 8vo, pp. xiii, 672, frontispiece, and 335 text-figs. McGraw-Hill Publ. Co., Ltd. : New York and London, 1936. Price 24*s.*

This comprehensive text-book for college students by three American authors is designed to cover the work of a " two-semester college course in general botany." In mimeographed form it has been in use for some years, and has gone through several revisions prompted by experience gained in using it as a text and " by changing emphasis in the teaching of botany."

It is divided into two parts, of fairly equal length—Part I. " Structure and Physiology of Seed Plants " and Part II. " The Plant Groups." The sequence of subjects presupposes that work starts in the autumn, and Part I. begins appropriately with a chapter on coloration in plants, to which the coloured frontispiece forms an illustration. Plant-cells and their contents are considered in detail, after which are studies of Leaves, followed by a chapter on " Food-synthesis," Roots, followed by " Absorption from the Soil," Stems, followed by " Growth and Movement," and Flowers, Fruits, Seeds, and Seedlings, followed by the " Catabolic Phase of Metabolism." The matter is well arranged in the familiar manner of text-books, and the intercalation of more detailed notes in smaller type (which may, if necessary, be omitted) is helpful. The classes of plant-organs are treated as entities, and the authors avoid discussion of debatable theories, such, for instance, as the relation of the leaf to the stem or the morphology of the flower. The stem-structure described is that of typical stems in the three divisions of seed-plants ; in the dicotyledon that showing regular annual increments of growth ; some reference to other types of secondary growth, in the smaller type, would have been useful. A description of the types of steles and vascular bundles is added in the smaller print.

Part II. deals successively with the great groups, Thallophyta, Bryophyta, Pteridophyta, and Spermatophyta : a note is included on the more recently suggested classification of the vascular plants as Lycopsida, Sphenopsida, and Pteropsida. The general characteristics of the groups and of their main subdivisions are clearly described. Six representative families of Angiosperms are described in more detail.

A final chapter briefly discusses Mendelism and the mechanism of heredity.

The book is adequately illustrated by text-figures, nearly all of which are new and original.

Symbolæ Sinicæ. Botanische Ergebnisse der Expedition der Akademie der Wissenschaften in Wien nach Südwest-China, 1914/1918. Edited by H. Handel-Mazzetti. VII. *Anthophyta.* By H. Handel-Mazetti. Lief. 5. 8vo, pp. 1187–1450, 12 text-figs. Julius Springer : Vienna, 1936. Price R.M. 59.70.

This part of Dr. Handel-Mazetti's contribution to Chinese floristic work follows closely on Part 4 of the volume noticed in the May number of this Journal. It concludes the volume on the flowering plants and incidentally the editor's personal contribution. Of the seven volumes of the work, I. and II. dealing respectively with Algae and Fungi have not yet appeared. Vol. III. Lichenes by Alexander Zahlbruckner appeared in 1930 ;

IV. Musci by V. F. Brotherus in 1929; V. Hepaticae by W. E. Nicholson, Th. Herzog, and Fr. Verdoorn in 1930; and VI. Pteridophyta by H. Handel-Mazetti in 1929. The five parts of VII. Anthophyta have been completed in seven years (1929–36). The conclusion of the whole work, promised for the spring of 1937, will present the most critical and exhaustive study of the South-west Chinese flora that has yet appeared, and the editor is to be congratulated on the imminent completion of his work.

The present part deals with the Monocotyledons; Juncaceae and the genera *Alisma* and *Potamogeton* have been elaborated by Prof. Gunnar Samuelsson of Stockholm. The representation of *Potamogeton* by only seven species, including *P. lucens, crispus*, and *pectinatus*, suggests that there is more work to be done on the aquatic flora. Liliaceae is well represented; there are twelve species of *Lilium* and six of *Nomocharis*, all previously known, and sixteen of *Smilax*, including one novelty. Iridaceae is represented by eleven species of *Iris* and *Belamcanda chinensis*—all known species, as are the fifteen species of *Dioscorea*. *Carex*, in the elaboration of which Dr. Kukenthal has taken part, includes sixty-six species and some novelties. Grasses are also well represented and include six new species of *Arundinaria* and novelties in other genera. Also the Orchids, especially in the widely spread north temperate genera; *Symphyosepalum* is a new monotypic genus of Ophrydineae. Of Palms, there are three species of *Trachycarpus* and *Didymosperma nanum*. The largest genus of Araceae is *Arisaema* with twenty species. A list of addenda and corrections precedes the index to the whole volume, which occupies ninety pages.

BOOK-NOTES, NEWS, ETC.

LINNEAN SOCIETY OF LONDON.—Fellows and their guests met for the Annual Dinner at the Comedy Restaurant on Oct. 15. The President, Dr. W. T. Calman, C.B., F.R.S., was in the Chair, and after the dinner received Fellows and their friends at the Society's rooms in Burlington House. A number of exhibits had been arranged in the Library, including contributions from the Royal Gardens, Kew, the Natural History Museum, and individual Fellows. An interesting selection from Linnæus's library had been arranged by the Assistant Secretary. During the evening Mr. A. C. Gardiner gave a lecture on the biology of the London Waterworks, illustrated with lantern-slides.

QUEKETT MICROSCOPICAL CLUB.—The Club entertained members and friends at a Conversazione held, by kind permission, in the rooms of the Royal Society, Burlington House, on October 13. Guests were received by Mr. John Ramsbottom, O.B.E., Vice-President, and a large number of exhibits were arranged in the library. These were mainly microscopic, illustrating habit and structure of minute plant and animal life, contributed by members, by other Microscopical Societies, the British Museum (Natural History), the Ministry of Agriculture and Fisheries, and the Natural History Society of South Africa. An exhibit by the Royal Society included original communications from the fathers of microscopy, Anton van Leeuwenhoek (1632–1723), Robert Hooke (1635–1705), Malpighi and Swammerdamm. During the evening the Kodak Company gave demonstrations of some interesting cinematograph films.

The Quekett Club was founded in 1865, principally through the exertions of the mycologist Dr. M. C. Cooke, and has done most useful work in the encouragement of the study of microscopy and as a bond of union between microscopists.

'BULLETIN DU JARDIN BOTANIQUE DE L'ETAT, BRUXELLES.'—In vol. xiv. fasc. 1 (July 1936) L. Hauman and S. Balle give a revision of the species of *Alchemilla* from Abyssinia and Madagascar. The extreme reduction of the inflorescence to one or a few flowers concealed in the sheath, stipules, or bract, characteristic of the little-known *A. cryptantha* Steud., proves on investigation to occur in several species and to be merely a *facies* of no taxonomic value. Normal inflorescences occur also in *A. cryptantha*, which is found to be a species of remarkably wide distribution with various synonyms, occurring in Abyssinia, East and West Equatorial Africa, Cameroon, South Africa, and Madagascar. The cryptanthy is not necessarily accompanied by cleistogamy. The authors include a synoptic table of the African species of the genus. In the same fascicle R. Mosseray has a monograph of the Belgian species of *Senecio*, sixteen including introduced species; and the botany of the Congo is represented by a mycological paper by M. Beeli, a descriptive note on a grass, *Schizachyrium kwiluense* Vanderyst, by W. Robyns, and critical notes on some Compositæ by H. Humbert and P. Staner.

'BLUMEA.'—Vol. ii. no. 2 of this Journal from the Rijksherbarium, Leiden, Holland, contains illustrated descriptions of various novelties. A new species of the Lichen-genus *Moriola*, hitherto known only from Norway, found by P. Groenhart at 3000 m. on Mt. Welirang in Java (by E. Bachmann); *Archboldia*, a new genus of Verbenaceae from New Guinea (by E. Beer and H. J. Lam); a new *Amorphophallus* from Celebes (by M. B. Bok and H. J. Lam); *Decalobanthus*, a new genus of Convolvulaceae, allied to *Merremia*, from Sumatra (by S. J. van Ooststroom); a new species of *Schizostachyum*, *S. biflorum*, from specimens collected by Blume in Java (by F. A. McClure); this is compared with the type-species of the genus, *S. Blumei* Nees, and a full description of Nees's type-specimen is given. J. Th. Henrard gives an exhaustive critical account of *Chloothamnus* Buse (1854), a valid genus, which has been misunderstood by all subsequent workers on the Bamboos owing to failure to consult the excellent

type-material at Leiden. B. H. Danser continues his Miscellaneous notes on Loranthaceae (nos. 9–15), which include a new delimitation of genera of *Elytranthinae*, and lists with descriptions of new species of collections in Celebes by Dr. Kaudern, on Mt. Kinabulu by Clemens, and in Yunnan and adjacent regions by Forrest, with a key to the species of *Hyphear*. Tyôzaburô Tanaka discusses the taxonomy and nomenclature of the Rutaceae-Aurantioideae. W. J. Lütjeharms and S. J. van Ooststroom give an account, with facsimile photographs, of an illustrated 15th century botanical manuscript found in the library of the Rijksherbarium. The first part is missing, and information as to its origin will be welcomed by the writers.

Geobotanische Forschungsinstitut Rübel Zurich.—The Report for 1935 of the Institute by the President, Prof. E. Rübel, contains an account of its constitution and activities during the year and a report of the Committee for preparation of an International Vegetation-Map of Europe, by H. Brockman-Jerosch. Scientific papers include a congratulatory address by Prof. Rübel to Carl Schröter on the completion of his 80th year, with a list of his publications since 1926; and three papers on pollen-studies. A. Bachmeister describes a number of pollen-forms from the upper miocene fresh-water chalk deposits of the "Öhninger Fundstätten" on the Boden-see; G. Erdtmann describes new methods of investigation of pollen-containing material; and W. Lüdi and V. Vareschi give a detailed account of the distribution, and the periods of flowering and pollen-emission of "Hay-fever plants" in the high valleys of Davos. The list is a long one, consisting mainly of grasses, willows, and Composites, but with representatives of other families.

Plant-hunting in the Caucasus.—The Journal of the Royal Horticultural Society (October) contains an account by W. E. Th. Ingwersen of an expedition in search of rare alpine plants to the mountains of the Caucasus. Dr. P. L. Guiseppi acted as guide, and the account gives some idea of the wonderful mountain scenery and the variety and beauty of the alpine flora, illustrated by a series of photographic plates.

Notes on Mesembryanthemum and Allied Genera, Part III. (University of Cape Town, July 1936, Price 4*s*.).—Mrs. H. M. Bolus, continuing her notes, describes thirty new species, including seventeen of *Conophytum*, four of *Pleiospilos*, and two of *Stomatium*, with a new genus *Henricia* closely allied to the last. There is also a discussion on the genus *Rhinephyllum* with a key to the species.

Mr. R. Ross, B.A., Scholar of St. John's College, Cambridge, has been appointed Assistant Keeper in the Department of Botany, British Museum. He will work epecially at the fresh-water Algae and the Diatoms.

NOTES ON THE FLORA OF JAMAICA.

By A. B. Rendle, F.R.S.

(Continued from vol. lxxiii. p. 279.)

Begonia peponifolia Vis.

In the 'Flora of Jamaica,' v. 253 we remarked that this species, "a plant cultivated in various botanic gardens has been ascribed to Jamaica, but we have no evidence of its occurrence."

Mr. Axel Lange, Curator of the Copenhagen Botanic Garden, has kindly supplied an explanation of the reported occurrence of this South American species in Jamaica. It is due to a confusion of the species with *Begonia macrophylla* Lamarck and to a wrong citation of locality.

Lamarck (Encycl. Méthod. 1783) describes *B. macrophylla* as an erect-growing species from Martinique.

Dryander, in his "Observations on *Begonia*" (Trans. Linn. Soc. i. 164; 1791), cites *B. macrophylla* Lam. from the West Indies.

Otto and Dietrich (Allgem. Gartenzeit. 1841, 58) refer to *B. macrophylla* as belonging to the *Lignosae*, but in the same journal of 1843, p. 34, speak of it as "Eine bereits von Dryander in vorigem Jahrhundert in den Act. Soc. Lond. i. p. 164 beschriebene Art, die aber erst vor einige Jahren bei uns eingefuhrt wurde; sie gehört zu den mit *kriechenden Wurzelstock*." Mr. Lange suggests that this species (in the Berlin Garden) "with creeping rootstock" is *peponifolia* Vis. which was described by Visiani in 1847 (Ind. Sem. Hort. Patav.), but had already appeared in 1845 (or before?) in the catalogue of Van Houtte, Belgium.

Klotsch, in his "Monograph of Begoniaceae" (Phys. Abh. K. Akad. Berlin, 1854, 216; 1855), has *Gireoudia macrophylla* Klotsch, with synonymy *Begonia peponifolia* Hort. Berol. and *B. macrophylla* Dryand., "rhizomate crasso." "Wachst auf gebirgen der Insel Jamaica, Im Kultur." Mr. Lange suggests that Klotsch, who was Kustos in the Berlin Botanic Garden, has confused the plant in the gardens with a creeping rhizome, i. e., *B. peponifolia*, with the erect-stemmed *B. macrophylla* Lam. cited by Dryander, and has misquoted the locality given by him "West Indies."

Thus there is no evidence for the existence in Jamaica either of *B. peponifolia* Vis. or *B. macrophylla* Lam.

Mr. Lange also points out that the 'Kew Index' has *B. macrophylla* Lam.=*diptera*; "this must be wrong, as *B. diptera* is a stemless species." The 'Index' also gives *B. macrophylla* Dryand., "Jamaica," and *B. peponifolia* Vis., Jamaica.

APEIBA (TILIACEAE).

We did not include this genus in the 'Flora' as we had no evidence of its occurrence in Jamaica. H. Uittien (Rec. Trav. Bot. Néerland. xxxii. 248; 1935) describes *Apeiba tibourbou* Aubl. var. nov. *Krukoffii*, based on a specimen collected by Krukoff in Matto Grosso, and cites also Jamaica: Harris 6506 [L.] with the remark "Not mentioned in Fawcett and Rendle's 'Flora of Jamaica,' v. (1926)."

Harris's specimen which the author saw in the British Museum Herbarium is labelled "Hope," and is obviously a cultivated specimen from the Hope Botanic Gardens, and not a native of Jamaica. This explains the rather remarkable geographic distribution given for the new variety.

In reply to my enquiry Mr. M. S. Goodman, Superintendent of Public Gardens, Jamaica, writes:—

"I have been making enquiries with reference to the *Apeiba Tibourbo*, and have also gone through our old Bulletins, and can only find mention of this plant being grown at Castleton Gardens. The Foreman at Castleton, who has been there for forty years, informs me that there were four trees at Castleton, but they died many years ago. These were planted at Castleton before he went to work there. I can get no information on the tree that was planted at Hope in 1896. There is in our Herbarium a specimen, No. 6506, labelled 'Hope—Sept. 28th 1896. 600 ft. elevation.'

"It appears that this plant was introduced, as surely there would have been more specimens in our collection if the plant was found growing about the country."

Under *A. Schomburgkii* Szyszyl. Mr. Uittien says there is a specimen in the British Museum labelled "Catey—Jamaica"—Fawcett and Rendle's 'Flora' does not mention the genus: it might be a mistake. It is a mistake—George Caley (not Catey) was Superintendent of the Gardens at St. Vincent; there is no evidence that he ever collected in Jamaica, and the label should have been corrected. The author quotes the species for Trinidad, Tobago, and St. Vincent, but does not record the genus farther north in the West Indies.

ASCLEPIADACEAE.

In notes on the types of some Linnæan species of *Asclepias* in the 'Proceedings of the Linnean Society' (Session 1935–36, p. 2) I pointed out that *A. nivea* was not represented in the Herbarium and that the figure and description of Dillenius cited by Linnæus (Hort. Eltham. 33, t. 29, f. 2) should be regarded as the type, being presumably the plant Linnæus had in mind when describing his species. I added the remark "According to Druce and Vines ('The Dillenian Herbaria') there is no specimen in the Dillenian Herbarium at Oxford," but in a recent visit to Oxford I found, with the help of the Curator, Mr. H. Baker, a specimen in the Sherardian Herbarium, written up by Dillenius, which is undoubtedly the type of the species. The specimen is referred by Dillenius to "Apocynum americanum foliis Amygdali longioribus Plum.," and corresponds with the Dillenian figure. I also found in the Sherardian Herbarium the Dillenian specimen corresponding to his figure t. 28, fig. 31, cited by Linnæus under his *Asclepias purpurascens*; this is also recorded as missing in "The Dillenian Herbaria."

This repeats my experience in connection with the type of *Spermacoce tenuior* L. in the Dillenian Herbarium (see Journ. Bot. 1934, 329), and suggests the importance of checking generally the list given by Druce and Vines. The Sherardian Herbarium was evidently inadequately combed for Dillenian originals.

METASTELMA R. Br. Brown founded this genus (in Mem. Wern. Soc. i. 52; 1809) on two specimens in Herb. Banks collected respectively in St. Croix and St. Christopher's Islands by von Rohr and Masson. Brown says "this is the *Cynanchum parviflorum* of Swartz" (Prodr. 53; Fl. Ind. Occ. i. 537), which Swartz identifies, probably rightly, with Plumier's *Periploca foliis ovatis* etc. (Plant. Amer. (Burm.) Ic. 215, fig. 1), but Brown does not definitely make the combination *Metastelma parviflorum*; he has, however, so written it in his manuscript description in Herb. Mus. Brit., and has been credited with the combination from Roemer and Schultes (Syst. vi. 120; 1820) onwards. The species is distinguished by its relatively long-stalked gynostegium.

Schlechter (in Urb. Symb. Ant. i. 247) quotes it from Jamaica, but I have seen no Jamaican specimen. Specimens of *M. albiflorum* Griseb. have been ascribed to it in herbaria. Schlechter has misinterpreted *M. albiflorum*, of which he describes the coronal lobes as semi-orbicular (in Urb. Symb. Ant. v. 468), whereas Grisebach (Fl. Brit. W. Ind. 147) states that they are linear. I cannot distinguish *M. Hartii* Schlechter, based on a single specimen (*Hart*, no. 895, from Jamaica), from *M. albiflorum*.

The species of this genus that are more or less aphyllous when flowering would repay careful study in the field. Herbarium specimens are unsatisfactory; few have any leaves, and the flowers, as seems general in the genus, soon wither and drop, so that satisfactory specimens are often wanting. I cannot find characters to separate *M. leptocladon* Schlechter (*Amphistelma leptocladon* Griseb.) from *M. filiforme* Wright (*A. filiforme* Griseb.), and Schlechter himself suggests that they may be conspecific.

Metastelma Priorii, sp. nov. ex affinitate *M. Harrisii* Schlechter, differt autem floribus minoribus, gynostegio stipitato, coronæ foliolis anguste triangularibus.

Planta volubilis glabra ramis teretibus tenuibus, ultimis filiformibus ; *foliis* patentibus lanceolatis acutis breviter mucronatis, margine integro ; petiolo tenui brevi ; cymis extra-axillariis inconspicuis paucifloris petiolum paullo excedentibus, floribus minimis ; calycis segmentis 5 breviter et late ovatis obtusis ; corollæ lobis 5 ovatis acutis superne puberulis ; coronæ foliolis angustis et superne angustatis, supra basin gynostegii oriundis et gynostegium paullo excedentibus.

Hab. St. George's Mts,, Oct. 1843, *Purdie* ! Union Hill, Moneague, St. Ann, Apr. 1850, *Prior* ! (type). Herb. Kew.

A slender branched twiner, internodes on flowering shoots 3–4 cm. long. *Leaves* when dry papery, somewhat shiny above and becoming dark-coloured beneath, venation inconspicuous beneath, up to 3–4 cm. long by 1·2–1·5 cm. broad ; petiole 5–7 mm. long. *Cymes* solitary at the nodes, peduncle shorter than the petiole, pedicel 2–3 mm. long ; flowers soon falling. *Corolla-lobes* 1·7 mm. long. *Corona-lobes* free, narrow, and tapering from the base to an acute apex, attached well above the base of the definitely stalked gynostegium. *Stigma* low, rounded.

ROULINIELLA A. M. Vail in Bull. Torr. Bot. Cl. xxix. 662 (1902), replaces *Roulinia* Dcne in DC. Prodr. viii. 516 (1844), a homonym of *Roulinia* A. Brongn. in Ann. Sci. Nat. sér. 2, xiv. 320 (1840). The new name has not been generally adopted, but is inevitable under the present rules of nomenclature. The genus is represented in Jamaica by one endemic species, **Rouliniella jamaicensis**, comb. nov. (*Roulinia jamaicensis* Griseb. ex Jackson, Ind. Kew. ii. 743 ; 1895), known only from a single specimen in Herb. Kew., without definite locality, collected by Wilson. It is most nearly allied to *R. columbiana* A. M. Vail from the United States of Colombia, which, however, has smaller flowers and 3-lobed corona-segments.

JACAIMA *, gen. nov. (*Gonolobeae*).

Calyx late urceolata lobis suberectis ovatis subacutis. *Corolla* intra glabra, lobi tubo sublato duplo longiores supra medium reflexi, parte inferiore concavi et dorso carinati. *Corona* simplex lobis 5 latis crassis rotundatis e dorso antherarum oriundis. *Pollinia* horizontalia oblique oblonga. *Stigma* depressa umbone centrali. *Folliculus* brevis suboblongus acuminatus, angulis 5 prominentibus.

Frutex scandens ramis tenuibus teretibus. *Folia* opposita patentia oblonga acuta, petiolis subbrevibus tenuibus. *Flores* parvi in cymis extra-axillariis ad quemque nodum solitariis, pedunculo pedicellisque brevibus.

Jacaima costata (Urb.) comb. nov. Species unica. (Fig. 1.)
Poicilla ? costata Urb. Symb. Antill. vi. 38 (1909).

A slender-stemmed branched twiner, branchlets very slender,

* An anagram of Jamaica.

puberulous becoming glabrous. *Leaves* when dry papery, glabrous except for sparse pubescence on back of veins, oblong, acute or shortly acuminate, base rounded or slightly cordate,

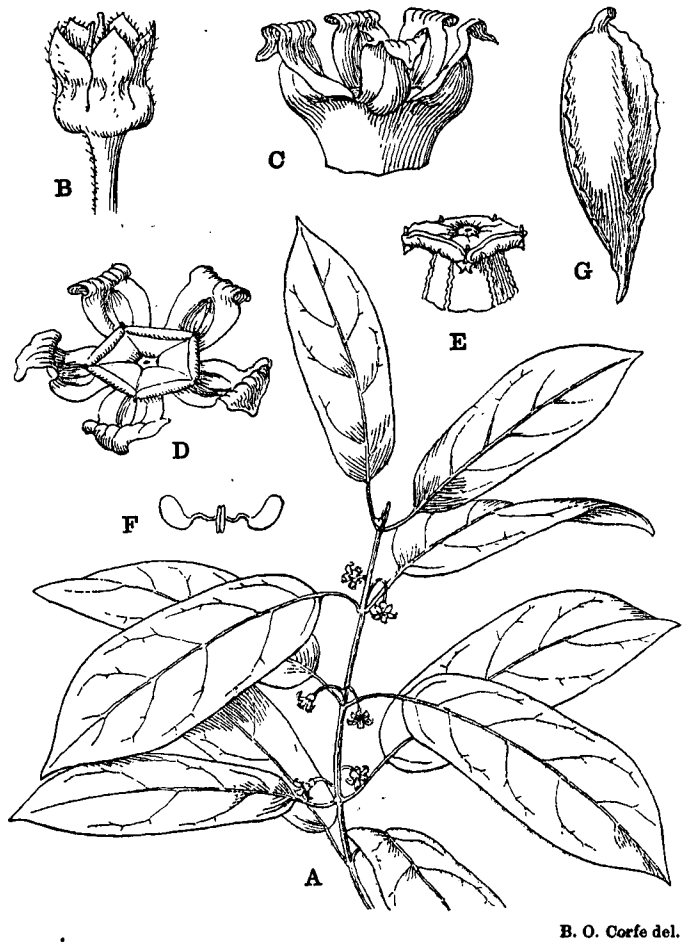


Fig. 1.—*Jacaima costata* (Urb.) Rendle. A, branchlet with flowers, × ⅔ ; B, calyx enclosing the very young fruit, × 6 ; C, corolla, × 8 ; D, corolla and gynostegium, seen from above, × 8 ; E, gynostegium, × 8 ; F, pollinia, × 16 ; G, follicle, × ⅔.

5–10 cm. long, 1·5–3 (rarely 3·5) cm. broad ; petiole slender, puberulous but becoming glabrous, 1–1·5 cm. long. *Peduncle* puberulous, less than 0·5 cm. long, pedicels ultimately recurved, puberulous, about 0·5 cm. long ; flowers to 9 in a cyme, soon

falling, greenish yellow. *Calyx*: back and margin shortly pilose, scarcely 2·5 mm. long, lobes about 2 mm. long. *Corolla* slightly pilose without, barely 4 mm. long, lobes about 2·5 mm. *Gynostegium* attached to the base of the corolla, pedestal 1 mm. long. *Follicle* about 6·5 cm. long.

Hab. Without locality, *Wright*! *Purdie*! Long Mt., road to Wareka; twining and climbing over shrubs and trees to a height of 25 feet. Flowers greenish yellow, stems full of milky juice. *Harris*! Flor. Jam. 9590, 10,006 (type in Herb. Mus. Brit.).

The genus is readily distinguished from other genera of *Gonolobeae* by its open cup-shaped corolla with reflexed petals and the corona of short broad fleshy lobes attached at the top of the gynostegium.

Urban includes this species tentatively in *Poicilla* Griseb., and cites *Harris* 9590 and 10,006. He suggests, however, that it may represent a new genus of *Gonolobeae*.

Poicilla, as described by Grisebach (Cat. Cub. 176) contains two species, *P. tamnifolia* and *P. ovatifolia*, based on plants collected in Cuba by Wright. It is described as having a rotate corolla, a corona inserted below the middle of the corolla, the lobes hiding the anthers, produced inwards into a membrane, hooded or emarginate-inflexed, and distant at the base. Schlechter (in Urb. Symb. Ant. i. 278) regards *P. ovatifolia* as distinct from *P. tamnifolia*, to which he restricts *Poicilla* as a monotypic Cuban genus. It is known only from Wright's specimen "in Monte Toro prope Potosi," which I have not seen. *P. ovatifolia* Griseb., founded on Wright's Cuban specimen no. 2965, has a rotate corolla and obovate corona-lobes with an appendage on the inside, arising from a ring round the base of the gynostegium. Schlechter (*tom. cit.* 278) transfers this species, together with *Orthosia acuminata* and *oblongata* Griseb. and *Ibatia mollis* Griseb. (all described from Wright's Cuban specimens), to *Ptychanthera* Dcne. Later (in Urb. Symb. Ant. v. 469) he points out that *Ptychanthera* Dcne., based on *P. Berterii* (DC. Prodr. viii. 606; 1844), is a homonym of *Gonolobus pauciflorus* Spreng., and forthwith transfers Grisebach's four species back to *Poicilla*. This, as Urban points out (*op. cit.* vi. 38), was a blunder, as he is using *Poicilla* in two senses. Later (*op. cit.* vii. 339; 1912) Schlechter tacitly admits his error, and renames the four Grisebachian species under a new genus *Poicillopsis*, adding a fifth species from San Domingo (*v. Turckheim*, 3466).

Schlechter gives no diagnosis of his new genus, for the characters of which we must refer to *Ptychanthera* in his clavis of genera under *Gonolobeae* (Urb. Symb. Ant. i. 239)—anther-cells more or less horizontal, corona simple, adnate to the staminal tube, lobes connate into a ring, and head of the stigma depressed.

There has been confusion in the conception of *Poicilla* by authors since the description of the genus by Grisebach.

Bentham and Hooker (Gen. Pl. ii. pt. 2, 768; 1876) restrict it to *P. ovatifolia* and say that they saw only a single imperfect specimen (Wright, Cuba, 2965), which is mixed with *Astephanus ovalifolius* Rich. and at first sight very like it, but "flores longe diversi." They were unable properly to examine the structure of the gynostegium, and give the characters on Grisebach's authority.

The sheet of Wright, 2965, in the Kew Herbarium bears two small specimens, one with imperfect flowers the other with fruit only. The second specimen has been ruled off in pencil, and Hooker has written beneath it *Astephanus*. The two specimens are conspecific; there has been no mixture beyond the inclusion of the leaf of some other plant on which the *Metastelma* is twining. In the British Museum Herbarium is a sheet of Wright, 2965, with two very fair specimens in flower. These are identical with the Kew specimens.

On the other hand, K. Schumann, in the 'Pflanzenfamilien,' iv. pt. 2, 299 (1895), mentions only *P. tamnifolia* (*errore tamifolia*) after his brief diagnosis of *Poicilla*, which he apparently based on this species.

Dr. Sprague agrees with me that in spite of the earlier restriction of *Poicilla* Griseb. by Bentham and Hooker to *P. ovatifolia* the definite subdivision of the genus dates from Schlechter's restriction of it to *P. tamnifolia* in 1899 (in Urb. Symb. Ant. i. 278).

As Schlechter's diagnosis of his new genus *Poicillopsis* depends merely on the key-characters of *Ptychanthera* Dcne. (*tom. cit.* 239) I have given a description, and also a figure of what I suggest as the type-species, *P. ovatifolia*; it is the only other species included by Grisebach in his *Poicilla*.

POICILLOPSIS Schlechter in Urb. Symb. Antill. vii. 339 (1912) sine diagnosi. *Calyx* parvus patens 5-partitus. *Corolla* rotata 5-partita, lobis ovato-oblongis obtusis. *Corona* simplex tubo stamineo adnata, lobis basi in annulum adnatis, intus varie ornatis. *Pollinia* horizontalia pyriformia vel oblique oblonga, corpusculo minuto. *Stigma* depressum. *Folliculus* parvus tenuis.

Fruticulus gracilis volubilis alte scandens ramis filiformibus teretibus. *Folia* opposita patentia acuta vel acuminata petiolo gracile. *Flores* parvi, cymis brevibus ad nodum solitariis.

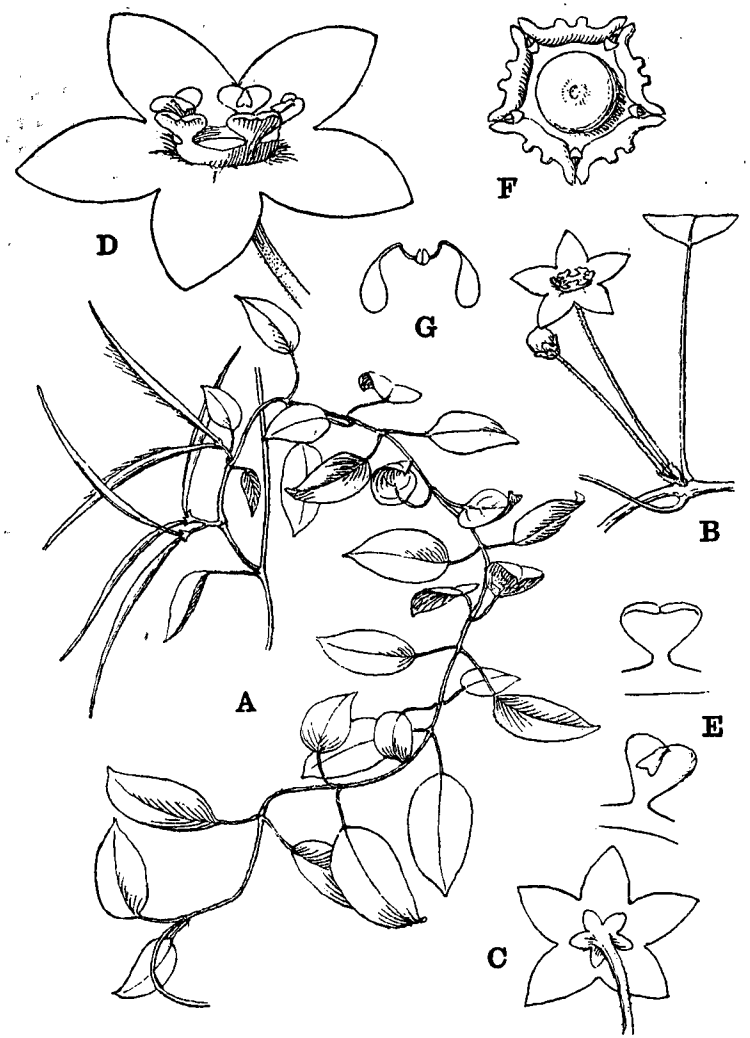
Species 5, Cuba, San Domingo.

POICILLOPSIS OVATIFOLIA Schlechter, *loc. cit.* (Fig. 2.)

Poicilla ovatifolia Griseb. Cat. Cub. 176 (1866); Benth. & Hook. f. Gen. Pl. ii. pt. 2, 768.

Ptychanthera ovatifolia Schlechter in Urb. Symb. Antill. i. 278 (1899).

A slender twining plant with small spreading ovate or ovate-oblong leaves and short generally 2-flowered extra-axillary



B. O. Corfe del.

Fig. 2.—*Poicillopsis ovatifolia* Schlechter. A, branchlet in fruit, ×¾; B, pair of flowers at one node, ×2½; C, flower, back view, showing calyx, ×3½; D, Flower, showing corolla and corona, ×6, the gynostegium has been removed and is shown viewed from above and more enlarged at F, ×10; E, outer and inner views of a corona-lobe, ×10; G, pollinia, ×16.

A, from specimen in Herb. Kew.; B–G, from specimen in Herb. Mus. Brit.

subsessile cymes. *Corolla* about 4 mm. long, minutely puberulous above, lobes bluntly oblong-ovate, 3 mm. long. *Corona* glabrous, about level with the top of the short gynostegium, about 1·5 mm. long; lobes united below into a low ring, shortly obovate, thickened and emarginate above, with a flat projecting emarginate appendix from the notch. *Gynostegium* 2·5 mm. across at the top, margin lobulate. *Pollinia* pyriform, barely 0·5 mm. long, corpusculum small, arms slender, a little shorter than the pollen-masses. *Follicles* slender, tapering, about 3 cm. long.

Cuba, *Wright*, 2965, Herb. Kew., Herb. Mus. Brit.

"GONOLOBUS ROSTRATUS Br." is credited to Jamaica by Schlechter (Urb. Symb. i. 284). The species is founded on *Cynanchum rostratum* Vahl, Symb. iii. 45 (1794) and Ic. viii. (1798), based on a plant from Trinidad collected by J. von Rohr. A specimen from von Rohr in Herb. Banks (to whom vol. iii. of the 'Symbolæ' is dedicated) agrees well with Vahl's figure. It has deeply cordate leaves, a character not mentioned in his description by Schlechter, and is not known from Jamaica.

The species has been wrongly attributed to Brown (Mem. Wern. Nat. Hist. Soc. i. 35) by authors from Roemer and Schultes onwards and the 'Index Kewensis.'

Brown's note in establishing the genus *Gonolobus* reads as follows:—

"GONOLOBUS, R. Br.

"Obs. *Cynanchum maritimum* Linn., *suberosum* Linn., *crispiflorum* Hort. Kew. belong to this genus; and I suppose also *C. planiflorum*, *grandiflorum*, *rostratum*, *nigrum*, *racemosum*, *Carolinense*, *obliquum*, *hirtum*, *prostratum*, and *undulatum* of Willdenow's Spec. Plant.: these, however, I have not determined, and the whole genus requires to be re-examined."

Roemer and Schultes (Syst. vi. 60–62; 1809) include all these species under *Gonolobus*, attributing the combinations to Brown, as do subsequent authors and the 'Index Kewensis.' They should be cited as of Roemer and Schultes; especially in view of Brown's doubt as to the position of all but the first three, which also under strict rules of nomenclature should not be attributed to him.

Schlechter cites under *G. rostratus* R. Br. two specimens only, both from Jamaica—Hart 968 (loco haud indicato), which I have not seen, and Harris (near Vinegar Hill) 6368. As this species lacks a name and is apparently endemic in Jamaica I propose **Gonolobus jamaicensis,** nom. nov. Syn. *G. rostratus* Schlechter, non [R. Br.] Roem. & Schultes.

Hamilton, Prodr. 32 (1825) describes very briefly and inadequately two species of *Gonolobus* as named in Desvaux's herbarium, *G. stapelioides* from Tobago and *G. virescens* from

Jamaica. Schlechter (in Urb. Symb. Ant. i. 283) adopts the name *G. stapelioides* Ham. for the Jamaican species described later as *Fischeria cincta* by Grisebach (Fl. Br. W. Ind. 421; 1861) (*Gonolobus cinctus* Benth. & Hook. fil. ex Ind. Kew. i. 1054; 1893), and suggests that Hamilton has transferred the names of the localities of Desvaux's two species, as the distribution Jamaica and Tobago seems unlikely. *G. virescens* is a *species incerta*. Decaisne omits both species from his monograph of the family in de Candolle's 'Prodromus.'

LICHENS FROM BAHREIN ISLAND.

By I. Mackenzie Lamb, B.Sc., F.L.S.

The following notes refer to a small collection of lichens from Bahrein Island, in the Persian Gulf, made by Mr. J. Fernandez, and sent by him to the British Museum for determination.

Dermatocarpon (sect. *Endopyrenium*) hepaticum (Ach.) Th. Fr. in Nova Acta Reg. Soc. Sci. Upsal. ser. 3, iii. 355 (1861). (*Endocarpon hepaticum* Ach. in Kgl. Vetensk.-Akad. Nya Handl. 156; 1809.) Forma *nigratum* (Müll. Arg.) Zahlbr. Cat. Lich. Univ. i. 217 (1922). *Endopyrenium hepaticum* f. *nigrata* Müll. Arg. in Rev. Mycolog. vi. 14; 1884.

On calcareous sandy soil, slope of Jebel Dukhan. Material completely agreeing with Müller's description and with Persian material thus named by him in Herb. Kew.

Thalline squamules 2–3 mm. diam., 0·2–0·3 mm. thick, isolated or several connate, but scarcely imbricate, orbicular or lobato-crenate, slightly concave or plane, dark reddish brown to brownish black when dry, dark tawny brown when wet, whitish pruinose. *Upper cortex* above gonidial layer 50–60 μ thick, of clear paraplectenchymatous cells 5–7 μ diam., arranged in $\pm$distinct vertical rows, the outer two cell-layers of brown-walled rounded cells 6–8 μ diam. *Gonidial stratum* 90–120 μ thick, the gonidia discrete, 7–12 μ diam., no pyrenoid apparent. *Medulla* entirely paraplectenchymatous, of clear cells 5–9 μ diam., on the under surface giving rise to colourless rhizoidal hyphæ 3–4 μ diam., which anchor the thallus to the substratum.

Undersides of squamules colourless except near the edges, where the outer brown cellular layer extends round the sides. Sterile.

Distribution of f. *nigratum*: Palestine, Persia.

Dermatocarpon (sect. *Endopyrenium*) **tumidulum,** sp. nov.

Thallus late effusus, margine haud effiguratus, e squamulis tumidulis acervatis constans, ad 2·5 mm. crassus, siccus dilute umbrino-fuscus vel pallide cervinus, parce albopruinosus aut partim epruinosus, opacus, madefactus obscure viridis, KHO—, $CaCl_2O_2$—, et his ambobus immutatus, sorediis isidiisque destitutus, hyphis rhizoideis incoloribus fuscescentibusve ad substratum adhærens; squamulis 0·5–1 mm. diam., 0·2–0·4 mm. crassis, congestis acervatisque, verrucas inæquales formantibus, rotundatis, in margine subintegris vel irregulariter lobatis, convexis, subtus pallidis vel fuscescentibus, cortice superiore 30–35 μ crasso, e cellulis paraplectenchymaticis leptodermaticis angulosis 5–8 μ diam. et plus minus in seriebus verticalibus dispositis composito, serie exteriore cellularum fusca, ceterum incolore, superne strato amorpho incolore lutescentive 3–7 μ crasso supertecto; stratum gonidiale sat continuum, etiam paraplectenchymaticum, 60–120 μ crassum, gonidiis non glomerulos formantibus, læte viridibus, globosis, 8–15 μ diam., sæpe guttulas oleosas continentibus, sed corpore pyrenoideo haud manifesto; medulla incolor, 60–135 μ crassa, KHO—, $CaCl_2O_2$—, I—, omnino paraplectenchymatica, cellulis coartatis subglobosis 5–9 μ diam., subtus serie unica duplicive leviter fuscescentibus.

Perithecia in tuberculis subglobosis 0·5–0·9 mm. diam. immersa, ostiolo minuto punctiformi disco nigro 0·1–0·3 mm. diam. circumdato; nucleus perithecii 360–420 μ diam., gonidia hymenialia non continens, pariete incolore vel leviter fuscescenti circiter 30 μ crasso e cellulis tangentialibus coartatis prosoplectenchymaticis 9–20 $\times$ 3–4·8 μ, circa ostiolum paraplectenchymaticis et obscure fuscis constanti; paraphyses obsoletæ, gelatinoso-diffluxæ; hymenium gelatinosum, guttulis oleosis non impletum; asci oblongo-clavati, convergentes, pariete incolore ad 2 μ, apice ad 4 μ incrassato; sporæ octonæ, in ascis subbiseriales, simplices, incolores, ellipsoideæ, utrinque æqualiter rotundatæ, membrana tenui cinctæ, guttulis minutissimis impletæ, 12–14·4 $\times$ 6·1–7·2 μ (proportione long./lat. circa 2). Iodo plasma ascorum lutescit, pariete incolorato; sporæ lutescunt, gelatina roseo-rubescit, strato subhymeniali cærulescenti. *Conceptacula pycnoconidiorum* immersa, globosa, perifulcrio incolore; pycnoconidia cellulis globosis angulosisve 3–6 μ diam. enata, breviter bacillaria, recta, utrinque obtusa, 2–3 μ longa et 0·5–1 μ lata.

Hab. On calcareous sandy soil, slope of Jebel Dukhan. Type in Herb. Mus. Brit.

Somewhat comparable with *D. imbricatum* (Nyl.) Zahlbr. and *D. rufopallens* (Nyl.) Zahlbr.; from the former it differs in its paler, smaller, less imbricate and more turgid squamules, and in the internal morphology of the thallus; from the latter in its differently coloured thallus and the much less developed amorphous layer over the upper cortex (in *D. rufopallens* this layer is 20–30 μ thick). It appears in some respects to approach *D. Latzelii* Zahlbr., a Dalmatian plant, which differs widely, however, in the anatomical structure of the thallus.

D. verruculosum (Müll. Arg.) Zahlbr. *Endopyrenium verruculosum* Müll. Arg. (in 'Hedwigia,' xxxi. 159; 1892) is closely related to *D. tumidulum*, but is distinguished by its larger spores (17–24 × 8–9 μ), while the rather similar *D. Myogiense* Asahina (in Journ. Jap. Bot. ix. 64; 1933), a Japanese lichen, differs in its larger less tumid squamules and in internal anatomy.

RAMALINA (sect. *Euramalina*) MACIFORMIS (Del.) Bory, in Dictionn. Class. Hist. Nat. xiv. 458 (1828). *Parmelia maciformis* Del. in Descript. de l'Egypte, ii. 288 (1813).

On quartzose rocks. This is the typical form, with thallus and medulla KHO—, $CaCl2O_2$—. The internal anatomy corresponds exactly with the description given by Hue of the form *metabola* (Nouv. Archiv. du Muséum, sér. 4, i. 62; 1899).

Distribution.—North Africa; Palestine; Arabia.

CALOPLACA (sect. *Eucaloplaca*) AEGYPTIACA (Müll. Arg.) Steiner in Sitzungsb. K. Akad. Wiss. Wien, math.-nat. Cl. cii. Abt. 1, 169 (1893). *Callopisma aegyptiacum* Müll. Arg. in Rev. Mycolog. ii. 73 (1880).

On calcareous rock, Jebel Dukhan. In association with *Buellia subalbula* v. *fusco-capitellata*.

This plant corresponds very well with the typical plant of Müller's description. *Thallus* white, tartareous, up to 0·8 mm. thick, showing no appreciable colour-change on application of KHO or $CaCl_2O_2$. *Apothecia* up to 0·6 mm. diam., black both wet and dry, with a white thalline margin, and ±sunk in the thallus. In section the anatomy of the thallus agrees entirely with Steiner's description of var. *circinans* (in Annal. Naturh. Mus. Wien, xxxiv. 55; 1921); below the upper layer of confused dead tissue the cortex shows a violet coloration with KHO in thin section. The gonidia of var. *circinans*, according to Steiner's description (*l. c.*) are 14–24 μ in diameter, and contain no central "nucleus" or pyrenoid; those of the present specimen, however, which is the typical form, are 9–18 μ diam., discrete, with a colourless wall up to 1 μ thick, granular bright green protoplasm, and a distinct central spherical pyrenoid 2–4 μ in diameter. *Hymenium* 50–65 μ high; paraphyses discrete, about 2 μ thick, often branched, septate, the septa mostly visible in water and 9–15 μ apart, the apices thickened up to 4 μ, occasionally submoniliform, and smoky grey or blackish; the epithecium formed of pale yellowish granules. *Ascus wall* 1–1·5 μ thick, at the apex thickened up to 3 μ. *Spores* (4)–6–8 in ascus, bi- or rarely uniseriate, the septum about half the length of the spore in thickness, traversed by a thin, often evanescent canal; 12–15 × 7·5–9 μ. *Hypothecium* colourless, of paraplectenchymatous cells 3–12 μ in diameter; containing gonidia.—Upper part of hymenium purple with KHO. With I, asci blue, becoming darker; mature spores brownish; paraphyses light blue; hypothecium sordid bluish. [No pycnidia seen.]

Distribution of *C. aegyptiaca*: Egypt; Palestine; Persia.

BUELLIA (sect. *Eubuellia*) SUBALBULA (Nyl.) Müll. Arg. in Rev. Mycolog. ii. 79 (1880). *Lecidea subalbula* Nyl. in Bull. Soc. Linn. Normand. sér. 2, ii. 516 (1868).

A cotype of "*Lecidea subalbula*" Nyl. from Montes Negros, Angola, leg. Welwitsch, is in the British Museum Herbarium, and since no full modern description of this species exists I have reinvestigated it:

Buellia subalbula (Nyl.) Müll. Arg.—Cotype specimen. *Thallus* about 0·3–0·4 mm. thick, effuse, indeterminate, continuous or showing faint irregular cracking, white, tartareous, KHO—, $CaCl_2O_2$—. No hypothallus visible. Upper cortical layer above gonidia 27–35 μ thick, of interwoven, ±vertically arranged hyphæ, not forming any regular paraplectenchymatic tissue, and dying off on the upper surface, which in section has an irregular decorticate outline; hyphæ densely nubilated with an exterior covering of minute elongated crystals about 0·5 μ long which dissolve on application of HCl. *Medulla* of loosely interwoven colourless hyphæ 2–4 μ thick, with walls about 0·5 μ thick, septa 5–15 μ apart, densely nubilated as in the cortical layer; containing particles of the substratum. Gonidial layer 30–45 μ thick. Medulla and cortex unchanged by KHO or I. *Gonidia* protococcoid, discrete, 6·5–14 μ diam., bounded by a colourless wall up to 1 μ thick; contents too disorganized to ascertain whether any pyrenoid is present. *Apothecia* up to 0·4 mm. diam., at first plane with a very thin margin and innate in the thallus, then emergent and convexo-immarginate, often white-pruinose, and usually surrounded by an evanescent pseudothalline margin. *Hymenium* 45–53 μ high, colourless, smoky grey or sordid greenish grey above. *Hypothecium* dark reddish brown in thin section, 90–120 μ deep in the centre, resting on the medullary tissue with a flat straight base; of closely packed rather indistinct dark brown hyphæ forming a confused paraplectenchymatic tissue of cells 3–8 μ diam., often elongate and ±radiate in vertical section, particularly in the subhymenial region; purplish with KHO. A faint indication of an excipulum is formed by the radiate continuation of the hypothecial cells round the sides of the hymenium. *Paraphyses* 1·5–2 μ thick, fully discrete, occasionally branched, apparently eseptate except at the apices, which are clavate, up to 4 μ thick, sometimes submoniliform, and smoky grey or in some places almost colourless. *Asci* with walls about 1 μ thick at sides, but thickened up to 7·5 μ at apex. *Spores* 8 biseriate, very dark brown, not constricted at septum, the wall equally thickened, about 0·7 μ, the septum of the same thickness; 12–12·6 × 5·7–6 μ in those measured. Asci and paraphyses blue with I. [No pycnidia seen.]

Var. **fuscocapitellata,** var. nov. *Lecidea subalbula* Nyl. in Flora, lix. 281 (1876) (sed non ex anno 1868). A forma typica epithecio fusco vel rufofusco recedit. Paraphyses subdiscretæ.

Hab. On calcareous rock, Jebel Dukhan. In association with *Caloplaca aegyptiaca* (Müll. Arg.) Steiner.

The Bahrein Island plant agrees closely in all respects with the Egyptian specimen collected by Larbalestier, but both differ from the Angolan type in having fuscous-brown apices to the paraphyses; in the type-specimen, and also in the other Angolan specimens in the British Museum Herbarium, the heads of the paraphyses are smoky grey, blackish or sometimes almost colourless, but never brown. The gonidia of the Bahrein lichen are discrete, 6–17 μ diam.; with KHO a central spherical pyrenoid 2–3 μ diam. becomes visible in some of them.

Distribution.—Species: Angola. Var. *fuscocapitellata*: Egypt, Persia.

Xanthoria (sect. *Euxanthoria*) **Steineri,** sp. nov. *Thallus* foliaceus, suborbicularis, pulvinatus, sine sorediis isidiisve, plagas formans 0·7–2·8 cm. diam., 0·2–0·5 mm. crassus, ambitu lobatus et late crenatus, laciniis marginalibus usque ad 2 mm. latis et 3 mm. longis, increbre divisis, ad apices retuso-rotundatis, irregulariter incisis crenatisve, haud fibrillosis, superne lævigatis, substrato laxe applanatis; centrum versus haud raro e substrato ascendens vel etiam fere evanescens et plus minusve apotheciis numerosis obtectus; minute albopruinosus, siccus pallide helvolus, madefactus flavens vel viriduli-flavens, opacus, KHO purpureo-rubescens; subtus albidus, peripheriam versus leviter flavescens, rhizinis paucis tenuibus substrato affixus. *Cortex superior* pallide luteolus, 15–24 μ crassus, e serie duplici triplicive cellularum paraplectenchymaticarum 3–7 μ diam. formatus, KHO purpureo-rubescens, hoc colore maculis dispersis in stratum gonidiorum perlato; *cortex inferior* præter marginem externum decolor et KHO non mutatus, 9–20 μ crassus, cellulis ut in cortice superiore dispositis, sed vulgo nonnihil majoribus, 3–9 μ diam. *Medulla* alba, stuppea, ex hyphis intricatis haud inspersis formata. *Gonidia* non glomerulos formantia, stratum 20–45 μ crassum efficientia, protococcoidea, læte viridia, globosa, 6–14·4 μ diam., interne minute granulosa, sed corpore pyrenoideo haud manifesto.

Apothecia plicis insidentia, in centro thallum tegentia, usque ad 2 mm. diam., primo orbicularia et plano-concava, dein flexuosa et inter se plus minusve imbricata, basi bene constricta, lecanorina, disco pulverulento, sicco pallide rubrofusco, madefacto subfusco, KHO purpureo-rubescenti denique fere nigrescenti; margine thallino crassiusculo, primo integro, demum in apotheciis majoribus valde crenulato, thallo concolore. *Hypothecium* incolor, e hyphis crebre contextis formatum, strato gonidiali superpositum, iodo nonreagens. *Hymenium* 50–75 μ altum, superne flavens, ceterum incolor, strato flavo KHO erubescente; paraphyses discretæ, septatæ, cellulis 4–12 μ longis, ascis subæquilongæ vel paulo longiores, parce ramosæ, 1–2 μ crassæ, apicibus septato-capitatæ granulisque flavis inspersæ; asci oblongo-clavati, apicibus rotundato-obtusi, 45–57 × 10–15 μ, pariete usque ad 2·4 μ crasso instructi; *sporæ* octonæ, plus minusve biseriales, rectæ, hyalinæ, ellipsoideæ, utrinque rotundatæ vel rarius paulum acutato-rotundatæ, polari-diblastæ, septo crassitudine usque ad dimidium sporæ longitudinis isthmoque tenui haud raro evanescente percurso, 10·8–12 × 5·7–6·2 μ (proportione long./lat. circa 2). Iodo parietes ascorum bene cærulescunt, paraphysibus immutatis. [Pycnidia non visa.]

Hab. On decorticated twigs of *Lycium arabicum*, New Camp. Type in Herb. Mus. Brit.

A striking species on account of its pale buff colour, changing to a greenish yellow when wetted; this paleness in its coloration is not due to shade conditions, since the plant in its natural habitat is exposed to intense insolation. It differs from *X. polycarpa* in the character of the thallus and apothecia, and from *X. polycarpoides* Steiner in its larger apothecia and thicker spore-septa; from all varieties of *X. parietina*, except v. *australis* and v. *ectanoides*, it is distinguished by its narrower spores, and from the two varieties mentioned by other characters.

Named in honour of Dr. J. Steiner († 1918), whose studies on the lichens of the Near East form so valuable a contribution to the botany of this part of the world.

OBITUARIES.

D. A. Jones

(1861–1936).

The news of the death at Bristol of Daniel Angell Jones came as a shock to his numerous bryological friends. In the early part of this year ill-health caused him to resign the secretaryship of the British Bryological Society, but hopes were entertained that he would resume his normal activities. These hopes were, however, doomed to disappointment, as he went into hospital at the end of September pending an operation, which, however, was not performed, and he gradually sank into unconsciousness and died on October 6.

Jones was born in Liverpool on July 14, 1861, and when a schoolmaster at Machynlleth and Harlech became well known to botanists interested in the flora of Carnarvonshire and Merionethshire. On the hard road the way was long and scarcely endurable to him, but when fields of floristic richness were reached all weariness disappeared, the crags were scaled with the sureness

and activity of a mountain goat, the boggy land was warily and thoroughly explored, and no amount of toil was too arduous when floristic treasures were obtainable.

His knowledge of the flowering plants and ferns of North Wales was remarkable. The need for a county Flora of Merionethshire was suggested to him many years ago, but his scholastic duties and his bryological work prevented him from devoting the time necessary for its preparation, even if sufficient funds had been available.

He will be remembered chiefly for his bryological work. His keen eye and wonderful memory of detail, habitat, and locality made him unrivalled as a showman for these small plants. The great progress during this century in the knowledge of the distribution of bryophytes in the British Isles owes a great deal to Jones's work. From 1907 he was secretary to Section II. of the Moss Exchange Club. When the two sections of the club were merged in 1922 to form the British Bryological Society he continued as secretary till the spring of this year. This secretarial work entailed such a vast amount of correspondence that he contributed little to botanical literature except in the Society's Reports. In this Journal an article on Killarney bryophytes was published in 1913, and four new varieties of mosses were described in 1917. In the 'Naturalist' of 1925 an account of the lichens of Ingleton appeared. His investigations, however, added a number of bryophytes to the British flora.

During the war he was an agricultural lecturer under the University of Wales, and was granted the degree of M.Sc. in 1918. In 1925 he was elected an Associate of the Linnean Society, and at the time of his death was the President of the British Bryological Society. Since his retirement from scholastic work he has devoted himself to bryological and lichenological studies, and has resided on the Riviera, at Cheltenham, and at Bristol.

During recent years he has done good work in furthering the knowledge of the distribution of lichens. He was an interesting companion in the field, and his marvellous power of detecting uncommon or strange plants was a source of wonder and stimulus to those who had the advantage to be with him. His death will leave a gap difficult to fill.—W. Watson.

William Harrison Pearsall

(1860–1936).

The Botanical Society and Exchange Club of the British Isles has suffered a severe loss by the death of its Secretary, Mr. W. H. Pearsall, who died very suddenly at his home at Matfield, Kent, on August 12, 1936. Born on June 6, 1860, of a Worcestershire family, he was educated at Stourbridge Grammar School, and took up teaching as a profession. In addition to an aptitude for all kinds of sport in his younger days, he always had a pronounced scientific bent and a strong interest in outdoor things. This was considerably increased by his removal from Birmingham to Dalton-in-Furness, and his interest in Botany was still further strengthened by his son (now Dr. W. H. Pearsall, D.Sc., F.L.S.) also taking up Botany. While his own interest was taxonomic his son's was ecological, and so they combined to make a study of the flora of the English Lakes which was both intensive and congenial. Pearsall's interest was greatly increased by the discovery of *Hydrilla* and *Najas* in Esthwaite in 1914, and his long friendship with the late Dr. G. C. Druce was a still further stimulus, leading to a specialized study of such aquatic genera as *Potamogeton*, *Batrachium*, *Callitriche*, and also *Carex*. His work with his son culminated in the publication of a joint paper in Journ. Linn. Soc., Bot. xliii. (1925) on the Plankton Algæ of the British Lakes.

Pearsall's activities in Dalton-in-Furness were not only botanical: a member of the Urban District Council for many years, he took a prominent part in local government and politics, and was also in demand as an accomplished organist. On his retirement to Kent in 1925 he became an active member of the Tunbridge Wells Natural History and Philosophical Society.

On the death of Dr. Druce in 1931 Pearsall was elected to the Secretaryship of the B. E. C., in whose interests he worked unsparingly for more than five years until the day of his death. He gave meticulous attention to a very heavy correspondence, and all those who had occasion to apply to him for help will have cause to thank him for the painstaking detail of his replies and to remember with gratitude his fine handwriting. The strain of this arduous correspondence must have contributed to his sudden collapse. He is survived by his widow and three children, the son already referred to and two daughters.

In addition to editing five B. E. C. Reports (1931–5) he completed the editing of the 'Flora of Surrey,' on the death of the late C. E. Salmon. A paper on *Potamogeton Macvicarii* Ar. Benn. was published in this Journal, lxxi. 1933, and the B. E. C. Reports of recent years contain the following papers by him:—"*Sagina Reuteri*" (1927); "The British *Batrachia*" (1928); "Notes on *Potamogeton*," i. (1929) and ii. (1930), forming together a Monograph of the British species; "×*P. Bennettii* Fryer," "*Zannichellia*," and "The British Species of *Carex*" (1932); "Beginning the Study of Grasses" and "Some Hybrid *Carices*" (1933); "Notes on the Umbelliferae" and "The British Species of *Callitriche*" (1934).—P. M. Hall.

SHORT NOTES.

LOBELIA URENS L. IN HEREFORDSHIRE.—On October 22nd last, specimens of *Lobelia urens* found "four miles from Monmouth" were sent to this Department for confirmation. Later I visited the locality (actually in Herefordshire), in the company of the discoverer (Mrs. P. Wiseman), and found that it was a neglected heathy pasture, at about 300 feet altitude, on a moderate slope facing west. The vegetation consisted of *Festuca ovina* and *Rubus* spp., together with *Juncus "communis," Calluna vulgaris, Teucrium Scorodonia*, and other species, including seedlings of *Crataegus monogyna* and *Acer Pseudoplatanus*. I saw perhaps a dozen plants of the *Lobelia* scattered in small groups over an area of about an acre. The tallest plant was about 1 foot high: some heads appeared to have been grazed. The locality is situated in a thinly populated rural district well off the nearest road (a narrow country lane), and quite away from houses: facts which, taken with the obviously natural vegetation, point to the occurrence of the species as being quite natural. Previously *Lobelia urens* has been recorded only from five vice-counties in Britain, all of them on the south coast. The new Herefordshire locality is nearly 80 miles from the nearest known station in the south of England (near Axminster), and the distances between the various stations in the southern counties are of about the same order, so that the present discovery implies at the most only a slightly greater discontinuity in its British distribution than was previously known to exist.—H. A. HYDE, Department of Botany, National Museum of Wales.

PICRIS SPINULOSA Bertol.—Under this name plants found by Mr. A. Beadell in West Kent were distributed by the writer through the Bot. Exch. Club in 1935, and formed the subject of notes in the Report for the year mentioned. Criticisms and views advanced include (1) that the species *P. spinulosa* was disowned by the author of the name, (2) that modern writers reduce the plant to a form of *P. hieracioides*, (3) that certain observers are of the opinion that the peculiar habit of *P. spinulosa* in southern Europe is due to hot and dry conditions of climate, (4) that similar conditions of recent summers in England may have produced a corresponding habit in native plants, and (5) further field observations and gathering in a wet season were desirable. It is not the object of this note to reply to the criticisms referred to, but to give additional evidence concerning this peculiar form. In the writer's note in the Report, the opinion was expressed that the plant was a recent introduction, and that in view of its abundance and copious production of seed, it was likely to become established in the south of England.

Mr. Beadell gave further attention to this plant during the past summer, and found it still abundant at Longfield, and also growing plentifully in the adjoining districts of Horton Kirby and Fawkham. Although the summer of 1936 was wet and cool, the plant everywhere presented the aspect of the gatherings of the previous year. According to my own observations, the plant is well-established in West Kent over an area of several miles, and my belief still holds that it is a recent introduction, and is not derived from the native *P. hieracioides*. It is found in the following situations:—grassy banks by open cultivated fields; waste grassy places; roadside grass-grown banks; above and on both sides of a railway cutting; and on grassy borders of railway track. Where it occurs it is abundant, and in places it grows so closely that, as the original finder said, it could be mown by the scythe as grass is cut. I have grown both this and *P. hieracioides* from seed, and find that in their first season there are differences in their leaf-rosettes.—C. E. BRITTON.

RANUNCULUS LINGUA L. AND ULEX GALLII Planch. IN SURREY.—The first of these, said by Salmon, in the 'Flora of Surrey,' to be now extinct in the county, was seen during 1935 growing in a locality near Chertsey. The second species, not accepted as a Surrey plant by Salmon, grows near Haslemere, in a locality well within the county boundary. I have seen fresh flowering examples.—C. E. BRITTON.

BUPLEURUM FRUTICOSUM L.—This shrubby umbellifer is naturalised in West Kent in the neighbourhood of Horton Kirby. It is abundant on both sides above a railway cutting, where it does not appear to have been planted, and has also established itself on the chalky faces of the cutting.—C. E. BRITTON.

PODOCARPUS SPECIES IN THE CONGO.—W. Robyns (Bull. Inst. Roy. Colon. Belge, vi. pt. i.) gives a detailed comparative account of the two species *P. usambarensis* Pilger and *P. milanjianus* Rendle, and their distribution in the Belgian Congo and Ruanda-Urundi. Study of the leaf-anatomy shows striking differences between the two species, *milanjianus* having stomata on the lower face only, differentiation of the mesophyll into palisade and lacunar tissue, accessory transfusion tissue throughout the breadth of the leaf, and three resin-canals below the mid-vein, and *usambarensis* stomata on both faces, mesophyll scarcely differentiated, wings of transfusion tissue right and left of the median bundle, and one resin-canal below the latter. *P. milanjianus* varies in habit; the type-specimen in the British Museum Herbarium from Mt. Milanji in Nyasaland, at 2000 m. altitude, contains male and female shoots with the characteristic short leaves. In mountain forests the species varies according to exposure and altitude from a large tree to a very small stunted tree.

In both species juvenile plants have much longer, relatively narrower leaves and longer internodes than the adult, a difference

that is shown in cultivated specimens ; but the distinction does not seem to be universal, as there are flowering specimens of *P. milanjianus* in the British Museum Herbarium from East Africa with relatively narrow leaves up to 6 inches long.

In subalpine stations towards the limit of tree-vegetation excessive shortening and dense arrangement of the leaves gives in *milanjianus* an ericoid habit. These variations are merely responses to external conditions and have no systematic value. Dr. Robyns protests against the unauthorised publication as a new species by H. Scaëtta of specimens with an ericoid habit, to which he had tentatively attached names in the herbarium.

The geographical epithet originally assigned to this species now serves merely to indicate the type-locality : it is now known to be widely distributed in tropical Africa, from the Cameroon, South Sudan, and Kenya, where it forms extensive forests, to Nyasaland and Southern Rhodesia.—A. B. RENDLE.

REVIEWS.

J. Arthur Harris, Botanist and Biometrician. Edited by C. OTTO ROSENDAHL, ROSS AIKEN GORTNER, and GEORGE O. BURR, University of Minnesota. Cr. 8vo, pp. viii, 209, frontisp., 7 pls., text-figs., and tables. (University of Minnesota Press.) Oxford University Press : London, 1936. Price 11*s.* 6*d.*

THIS is an appreciation of the life and work of an American scientist by three of his colleagues in the Minnesota University. A chronology of his career indicates the variety and main trend of his work. Born in 1880 he graduated in 1901 at the University of Kansas, and until 1907 worked under Prof. William Trelease at the Missouri Botanical Garden. Here the task of incorporating new specimens with the herbarium gave him a knowledge of plant-species as such, but his chief interest was in the nature and origin of variation, origin of species, and similar problems. In 1904 he met Hugo de Vries at St. Louis and a series of papers on the application of the mutation theory to problems of evolution was the result. In 1907 he became Investigator in Botany at the Station for Experimental Evolution of the Carnegie Institute of Washington where he remained until 1924. His great interest was in methods of statistical analysis, which he studied during the winters of 1908 and 1909 in association with Karl Pearson at the Galton Laboratories in London. From 1911 onwards he devoted himself to the study of the physico-chemical properties of plant saps and their bearing on plant-distribution. These were carried out in every kind of locality possible in the States, between the Atlantic and Pacific. From 1924 until his death in 1930 he was Professor of Botany and Biometry in the

University of Minnesota, and in his preface to the volume the Dean speaks highly of his work in reorganizing and equipping the Department of Botany and in remodelling the course of teaching.

The man, the botanist, and the biometrician are treated successively. Harris was unconventional, tremendously energetic, and a pioneer, with little respect for red tape and unrestricted organization ; a humorous address, printed in full, on a proposed Institute for the Psychology of the Mule is a skit on organisation run mad. The reprint of a thesis, by a pupil working under his guidance, on some chemical factors of the soil that influence the distribution of desert vegetation, indicates the methods of his work and their thoroughness. His work as a biometrician is described by the Assistant Professor of Biometry, Alan E. Treloar, and illustrated by a joint paper on the distribution of errors of analyses and four joint papers on subjects dealing with human birth and fecundity. The volume closes with a detailed bibliography of his published works—a long list of notes, critical reviews, and original papers.

The frontispiece is an excellent photograph of the man, and the other plates illustrate his work in the field.—A. B. R.

Fifty Years of Field Experiments at the Woburn Experimental Station. By Sir E. J. RUSSELL, D.Sc., F.R.S., and Dr. J. A. VOELCKER, C.I.E., M.A. With a Statistical Report by W. G. COCHRAN, B.A. Cr. 8vo, pp. xvii, 392, 4 plates and 39 text-figs. Longmans, Green & Co. : London, 1936. Price 21*s.*

THIS volume is one of the Rothamsted Monographs on Agricultural Science edited by the Director of the Experimental Station, Sir John Russell. It gives an account of the experiments that have been carried out at the Woburn Experimental Station since its foundation in 1876 by the Duke of Bedford and the Royal Agricultural Society. An important problem was to discover the effect on the productiveness of the soil by feeding concentrated foods to the live-stock on the farm. This affects the amount of compensation due from the landlord to a tenant on leaving his farm, but, as Sir John remarks in the preface, even after 60 years of work, it remains uncertain whether any rigid basis of compensation can be drawn up. Experiments akin to those initiated at Rothamsted on the continuous growth of wheat and barley have yielded valuable information as to relative effects of soil and climatic conditions and those of fertilizers and manures on plant growth. Another series dealt with the effects on the subsequent crop of green manuring—an intricate subject that still awaits a definite solution.

The two Voelckers, father and son, have been the guiding spirits of the work since its inception, Dr. Augustus Voelcker,

till his death in 1884, and Dr. J. A. Voelcker, until it was taken over by the Lawes Agricultural Trust in 1926, and became an appanage of Rothamsted, with Dr. Voelcker as Honorary Local Director.

An historical chapter and a detailed account of the experiments by Dr. J. A. Voelcker forms Part I. Part II. is a statistical examination of the results by Mr. Cochran, and Part III., by Sir John Russell, deals with the bearing of the results on agricultural science and practice. In Part IV. Dr. E. M. Crowther gives an account of the soils of the Woburn plots and their analyses. An Appendix contains the primary data calculated from the field records.

The frontispiece is an admirable portrait of Dr. A. J. Voelcker, and a portrait of his father faces page 2.

Candollea—Organe du Conservatoire et du Jardin botanique de la Ville de Genève. Edited by B. P. G. Hochreutiner. Vol. VI. 8vo, pp. lxxxvi, 488, 2 portraits. Conservatoire Botanique, Genève, 1934–1936. Price 40 fr.

This volume contains communications which have been issued since December 1934. The frontispiece is a portrait of the life-like bust of the late Dr. Briquet in the Geneva Conservatoire, and the pages in Roman numerals contain a list of his publications supplementary to previous lists and a list of the " names and combinations of names " for which he is the authority —these have been compiled by Fr. Cavillier. Other communications are a note by Briquet (posthumous) on two species of Meliaceae, one by A. Becherer on two species of *Asplenium*, one by Ch. Baehni on the systematic position of *Goethalsia*, and a biographical notice of Alfred Saint-Yves (1855–1933) with portrait, by Fr. Cavillier. Plantae Hochreutineranae, Fasc. iv., is a continuation of the list of plants collected by Prof. Hochreutiner (1903–5), mainly in the Nederland Indies, by various specialists. The greater part of the volume is occupied by P. Francey's Monograph of the genus *Cestrum* which was noticed in its separate form in the September number of this Journal.

BOOK-NOTES, NEWS, etc.

Linnean Society of London.—At a Special General Meeting on October 29, the President, Dr. W. T. Calman, C.B., F.R.S., in the Chair, Mr. M. A. C. Hinton, F.R.S., was elected as Zoological Secretary for the present Session in place of Dr. Stanley Kemp, F.R.S., who had resigned on his appointment as Director of the Marine Biological Laboratory, Plymouth.

Sir Edward B. Poulton contributed some further observations in support of the stimulation of the growth of the Dead-nettle, *Lamium album*, by the presence of the Stinging-nettle, *Urtica dioica*.

Mr. S. Savage read a paper on a newly discovered enumeration of the Linnæan herbarium. A copy of the 14th edition of Murray's ' Systema Vegetabilium ' (1784) was found to be marked throughout by Sir J. E. Smith, and the accompanying notes show that it is a record of the Linnæan herbarium as it reached Smith from Sweden six years after Linnæus's death. (During seven months in 1784–5 Sir Joseph Banks, Smith and Dryander compared the Linnæan with the Banksian herbarium.) Amongst other points was mentioned the fact that Dr. Jackson's ' Index ', 1912, omitted a great many of the type-specimens of the ' Supplementum plantarum,' this being due to the basis on which that work was compiled. A list of the 83 Linnæan specimens given by Smith to Sir Joseph Banks is given in the paper ; 32 of these are of species first published in the ' Supplementum.'

Dr. I. Reichert (Visitor) gave an account, illustrated with lantern-slides and maps, of ' Steppe and Desert in the Light of Lichen Vegetation.' A study of the lichens in the steppes and deserts of Palestine and the adjoining countries has shown that these plants are commonly distributed throughout these regions. Lichens are common, even in the desert where no flowering plants occur, but have been hitherto mostly overlooked by botanical collectors. It was found that lichens may be used for the characterisation of various floristic regions, and may complement the general phanerogamic indications ; sometimes, indeed, they may reveal new distinctions. With the help of lichens, for instance, it was possible to distinguish the Russian type of steppe from that of Mesopotamia and Transjordania. The desert of Egypt has been identified with that of South Palestine and partly with that of Algeria. It was also found that with the help of a terrestrial species of *Diploschistes* it was possible to determine the arable character of the soil. This lichen grows only on arable soil, and so may be a useful indication of its agricultural value.

At the General Meeting on November 12, the President in the Chair, Prof. G. D. Hale Carpenter read an unpublished letter from Sir Joseph Hooker to Dr. William B. Carpenter, dated August 9, 1847, giving his opinion as to the value of spirits as a stimulant or beverage from experiences, during his service in the Royal Navy, on the Antarctic Expedition. The letter gave an interesting account of the very trying conditions under which officers and men worked during the expedition.

Sir Daniel Hall gave an account of polyploidy in the genus *Tulipa*. Seventy to eighty species had been grown and examined, and cases of polyploidy were recorded. The difficulty of the

study of the species from herbarium specimens was emphasized and also the taxonomic problem as to the nomenclature of forms differing only in cytological characters. The discussion which followed suggested that cytological characters should be considered only in conjunction with other characters in determining species rank.

SOUTH LONDON BOTANICAL INSTITUTE.—The Annual Meeting was held at the Institute on October 16. In his report the Curator, Mr. W. R. Sherrin, A.L.S., stated that the membership stands at 281. During the past year 675 visits have been paid to the Institute, and help in the determination of wild plants has been given, also in the preparation of microscope-slides and of specimens for the herbarium. Evening lectures have been given at intervals by well-known botanists. Saturday rambles for botanizing have been conducted, and visits have been paid to the Geological Museum, South Kensington, and the Royal Botanic Gardens, Kew. A number of rare sedges and other plants of interest have been added to the Garden. The President (Dr. A. B. Rendle) gave an address on the preservation of our native flora.

COUNCIL FOR THE PRESERVATION OF RURAL ENGLAND.—The monthly report for October contains the text of the Report of the Joint Informal Committee of the C.P.R.E. and the Forestry Commission on "Afforestation in the Lake District." The Committee "recognised that large-scale afforestation and the preservation of areas of typical natural beauty are both necessary on national grounds, and that the land available for both purposes is limited; further, that there are localities where preservation should be the primary consideration, subject to the maintenance of the existing woodlands, and other localities where afforestation, subject to considerations of amenity, should come first." The Committee have approached their problem in the sincere belief that both national interests can best be secured, where possible, by co-operation or at least by a just correlation wherever otherwise the two would conflict. The result of their deliberations as regards Eskdale and Duddondale, and the Lake District generally, are stated in detail. It is encouraging to note that the use of broad-leaved trees on suitable ground is contemplated.

Copies of the Report may be obtained from H.M. Stationery Office, price 3*d*. each.

VICE-COUNTIES.—Mr. P. M. Hall writes urging that "authors of papers should refer to localities by vice-counties, not merely by counties. Supplements to 'Topographical Botany' have been published in the Journal and it is still a standard work of reference, and most field botanists work by it. It is a small point, but attention to it would save a good deal of trouble for those who try to keep their Topographical Botany up to date."

INDEX.

For Classified Articles, see—Obituaries; Reviews. New Genera, species, and varieties, and new names are distinguished by an asterisk.

The Index to the Supplements is included above.
