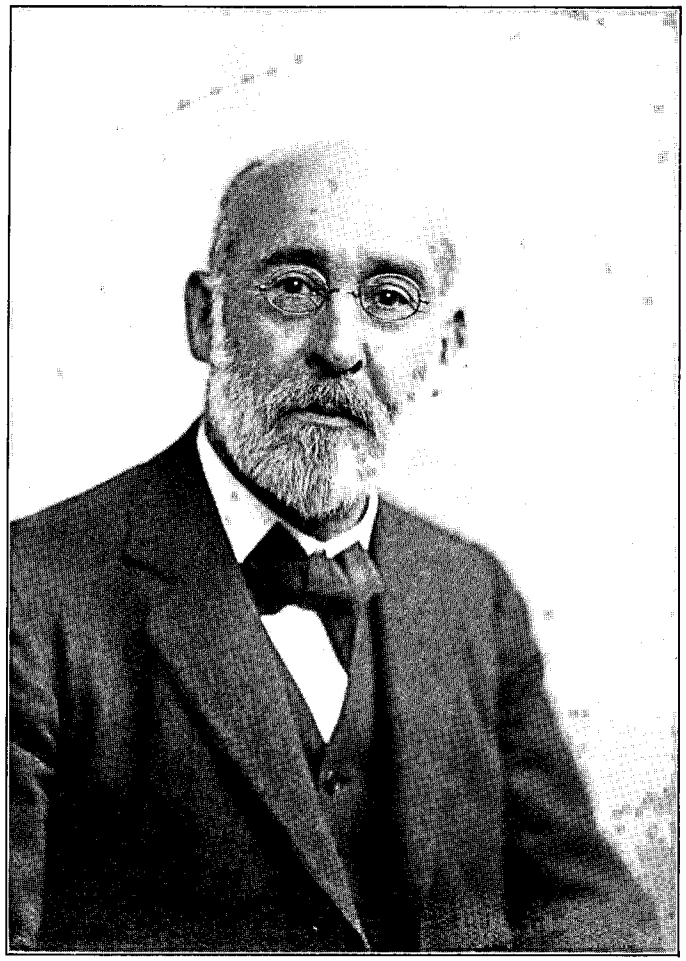


Yours truly,
A.B. Rendle

THE

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BRITISH AND FOREIGN

EDITED BY

A. B. RENDLE, D.Sc., F.R.S., P.L.S.
KEEPER, DEPARTMENT OF BOTANY, BRITISH MUSEUM (NAT. HIST.).

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CORRECTIONS.

P. 116, line 6, *for* Paulo *read* Pauls.
P. 169, ,, 4, ,, habitat ,, habit.
P. 188, ,, 29, ,, *Perpusianæ* read *Purpusianæ*.
P. 193, ,, 19, ,, he *read* the.
P. 193, ,, 20, ,, hat ,, that.
P. 215, ,, 19 from bottom, *for* LUISBAUER *read* LINSBAUER.

THE

JOURNAL OF BOTANY

BRITISH AND FOREIGN.

THE BRITISH ASSOCIATION VISIT TO CANADA.

By R. D'O. Good, B.A., and A. B. Rendle, F.R.S.

The ninety-fourth meeting of the British Association was held at Toronto, under the presidency of Sir David Bruce, K.C.B., from August 6th to August 13th, 1924. This was the first time since the War that the Association had met outside the British Isles, the last occasion being the visit to Australia in 1914. An account of this visit appeared in volume liii. of this Journal.

The majority of the members from the British Isles made the journey by way of the St. Lawrence, visiting *en route* Quebec, Montreal, and Ottawa. The two days at Montreal gave opportunity for visiting Mount Royal, a magnificent conical hill, little short of a mountain, rising directly out of the city, from which a fine panorama of the city and the St. Lawrence is obtained. It is preserved as a local park, and its woodland covering is in an almost natural condition. Visits were also paid to the MacGill University and to Macdonald College. A day was devoted by the botanists to a motor excursion to a maple-sugar grove at St. Jérome, about thirty miles north of Montreal, under the guidance of Professor Lloyd of MacGill University. At the sugar-grove, which is a part of the forest in which the Sugar Maple (*Acer saccharum*) predominates, we were hospitably entertained by some Brothers forming the staff of the École Commerciale des Frères Chrétiens, who had set up a small maple-sugar factory there. In spite of rain, an interesting afternoon was spent botanising in the forest. Many familiar Old-World genera were represented, but by species unfamiliar to European botanists. Among the deciduous trees were *Quercus rubra*, *Fagus americana*, *Ulmus americana*, *Tilia americana*, *Betula lutea*, and *Ostrya virginica*. Conifers were represented by *Pinus Strobus* and *P. resinosa*, *Abies balsamea*, *Picea nigra*, and *P. canadensis*. The undergrowth was bright with the scarlet berries of the little Canadian dogwood, *Cornus canadensis*, and various liliaceous herbs were also in fruit, such as *Clintonia borealis* and species of *Streptopus*, *Uvularia*, *Smilacina*, *Polygonatum*, and *Trillium*; also two species of *Actæa* (*rubra* and *alba*). Among the late flowering plants were Spiræas (*S. tomentosa* and *latifolia*), *Impatiens fulva*, species of *Aster*, *Solidago*, *Crepis*, and *Tanacetum*, *Erigeron canadense*, *Lobelia*

inflata, species of *Pyrola*, and of Orchids—*Goodyera*, *Spiranthes*, and *Corallorhiza*. Ferns were represented by *Osmunda*, *Dryopteris*, *Onoclea*, *Botrychium*, and species of *Lycopodium*. One of the most interesting plants was the Indian Pipe or Corpse Plant (*Monotropa uniflora*), a perfectly white saprophyte growing among the fallen leaves.

The meetings were held at the University, which is situated in the Queen's Park, away from the business part of Toronto. Many of the visitors were accommodated in the various University hostels.

The inaugural meeting of the Association and the address of the President, on "Prevention of Disease," took place on Wednesday evening, Aug. 6, in the Convocation Hall of the University, and succeeding days (until Aug. 13) were devoted to the business of the various Sections. Section K held its meetings in the Anatomy buildings. Prof. V. H. Blackman's Presidential Address was on "Physiological Aspects of Parasitism. The key-note of the address was that disease is abnormal physiology, and it is necessarily the result of the interaction of the physiological processes of the host and parasite. The differences between animal- and plant-diseases were commented on. Chief attention was, however, paid to the mode of entry of parasites. A consideration of the nature of disease-resistance in plants gives no hope of finding means for endowing plants with artificial disease-resistance.

A discussion on the ascent of sap and transport of food-materials in trees, included papers from Prof. H. H. Dixon, Dr. O. F. Curtis, and Dr. D. F. MacDougal. Prof. F. E. Lloyd illustrated by aid of colour-process lantern-slides the fluorescence of various pigments in the Cyanophyceæ, and Prof. E. C. Jeffrey discussed the present status of the Biogenetic Law. More directly bearing on Canadian Botany were a lecture by Prof. F. J. Lewis, of Edmonton, on the vegetation of the Canadian Rockies, and papers on Sir Joseph Banks's expedition to Newfoundland, Belle Isle, and the Labrador coast in 1766, and on the past and present distribution of the Magnolieæ, and one by Mr. E. H. Moss on parasitism in *Comandra*, a genus of Santalaceæ, represented in Canada by four species.

Besides papers dealing with other branches of botany, three inter-Sectional discussions were held. These were with Section M (Agriculture) on "Forest Problems," with Section D (Zoology) on "Species and Chromosomes," and again with Section M on "Forest Problems in Canada." In the course of the daily sectional committee meetings it was decided to form a Forestry sub-Section.

During the week of the Meeting, three successful botanical excursions were conducted by Professor R. B. Thomson of Toronto University. The first was to High Park and the Humber Valley to the west of the city. This was specially designed to include characteristic portions of the vegetation of Southern Ontario, which is of particular interest on account of the large number of rather southern types which have their northern distribution limits here. The Sassafras (*Sassafras officinale*), the Hickories (*Hicoria*), and the Cut-leaved Maple (*Negundo*) among trees, and the Witch-Hazel (*Hamamelis virginica*), Smilax (*Smilax herbacea*), and *Menispermum canadense* may be mentioned as examples. The Poison Ivy (*Rhus Toxicodendron*) was everywhere common in bushy places. Among the numerous aquatics, *Calla palustris* and *Wolffia* were of particular interest.

The second excursion comprised a week-end at Niagara Glen. Leaving Toronto on Friday afternoon, we crossed Lake Ontario by steamer and, landing at Queenston on the Canadian side of the Niagara River, proceeded up the gorge to the Glen, where a canvas camp had been prepared for us by the military authorities. Saturday was mainly devoted to a botanical ramble through the dense woods which line the sides of the gorge. The area is a government reserve, and strictly preserved, but Section K was permitted to botanize. The local flora of the damp woods bordering the river is rich and interesting. Among the great variety of trees, shrubs, and herbs may be mentioned numerous species of Vines, our familiar Virginia Creeper, several species of *Cornus*, *Trillium grandiflorum* in fruit in great profusion, the large Pink-flowered Raspberry (*Rubus odoratus*), the Green Violet (*Hybanthus concolor*), *Liatris* (Compositæ), *Caulophyllum* (Berberidaceæ), *Botrychium virginianum*, and on the rocks near the river the Walking Fern (*Camptosorus rhizophyllus*). On Sunday morning, through the kindness of the Mayor of St. Katherine's, a small fleet of motor cars awaited us, in which we were driven to the Falls, and then through the rich fruit-growing region of "Vineland." The Province of Ontario is "dry," but a concession has been made to the vine-growers by which wine may be made from the grape and sold in cask for local use or exportation.

The Vineland Experimental Fruit Farm was inspected and a visit paid to the Dominion Plant Pathology station at St. Katherine's. The return journey to Toronto across the lake was memorable for a fine sunset and a clear moonlit evening.

The third excursion from Toronto was to the Holland river sphagnum-bog at Aurora, thirty miles north of the city. In the course of the drive out a stop was made at the Connaught Research Laboratories of the University, in which, during the War, a large proportion of the antitoxins used by the Army were prepared. Unfortunately, the time available allowed only a brief examination of the bog, which stretches for miles up a wide valley, but we were able to see one of the most interesting of the local plants, *Sarracenia purpurea*, in profusion.

This concluded the purely local part of the Toronto meeting, but as soon as the buisness of the Section was finished, the botanists left once more for another and more comprehensive trip, arranged by Professor J. H. Faull of Toronto University, and comprising a stay of four days on Lake Timagami, 300 miles to the North. On arrival at Timagami station a small steamer carried the party up the lake to Bear Island, one of the innumerable islands with which the lake is dotted. Here there is an Indian village, which is also used as a holiday camping centre. The botanists were accommodated here and at another camp on Garden Island about a mile away.

Timagami Lake is one of the many scattered throughout the great subarctic forest-region of the Archæan shield of North-East Canada. The country is not mountainous nor even hilly, but consists of undulating surfaces of hard rock. The islands vary in size from those measurable in miles to tiny ones just emerging above the water and bearing only a single tree. The result is a peculiar type of topography, monotonous in outline, but varying in detail and with a distinct fascination of its own.

The four days' stay gave a good opportunity of studying the flora, and, under the leadership of Professor Faull, who knows the country well and has established a small laboratory on Bear Island, the time was utilized to the fullest extent. To many of the party the vegetation of virgin coniferous forest was something entirely new, and some remarks upon its chief features will not be out of place. Although the forest would be more accurately described as mixed, the vast majority of the trees are Conifers belonging to six species. These are the White Pine (*Pinus Strobus*), Red Pine (*Pinus resinosa*), Jack Pine (*Pinus Banksiana*), White Spruce (*Picea canadensis*), Balsam Fir (*Abies balsamea*), and White Cedar (*Thuja occidentalis*). The Canadian Yew (*Taxus canadensis*) here only reaches the dimensions of a small shrub. The chief hardwoods are the American Aspen (*Populus tremuloides*), the Balsam Poplar (*Populus balsamifera*), the Yellow and Paper Birches (*Betula lutea* and *B. papyrifera*), and various Maples. The size of the trees is not very great, individuals of more than 2 ft. in diameter being very rare; but considering the thinness of the soil, even this size is remarkable. At the season of our visit, late summer, the ground flora is chiefly remarkable for the number of berry-bearing plants in ripe fruit. Blue-berries (*Vaccinium*), dogwoods (*Cornus*), raspberries and brambles (*Rubus*), elders, guelder-roses (*Viburnum*), and *Amelanchier* all contribute towards a feast of colour. Many of the herbaceous plants also produce berries, and a surprisingly large number of these are *Monocotyledons*. The family *Ericaceæ* is also well represented, especially in the damper places. Another feature of special interest to the English botanist is the large number of plants which at home are rare but which here are common—such are *Corallorhiza*, *Goodyera*, *Pyrola*, and *Actæa*. This forest-region is the centre of the great wood-pulp industry. Apart from this, the whole area is carefully protected and preserved. Its greatest danger is from fire, and there is a very complete preventive organization, including aeroplane patrols.

The visit to Timagami marked the close of the first part of our stay in Canada. The second part consisted of the Western trip to the Pacific coast. About 400 members took part, and were accommodated in two special trains, provided by the Canadian National and Canadian Pacific Railways respectively. The excursion began and ended at Toronto, and was of the nature of a circular tour, following the C.N.R. track westward and returning over the C.P.R. These railways form a network which serves the great cities of Eastern Canada, and then further to the west converge at Winnipeg. From here they again

diverge to meet again at Vancouver, the C.N.R. taking the northern route through the mountains by way of the Yellowhead Pass, and the C.P.R. taking a more southerly route by way of the Kicking Horse Pass. The trains left Toronto on August 17th and arrived back on September 4th.

Making a very early start from Bear Island, the botanists arrived at Timagami station to meet the first train, on which a coach had been reserved for the party. During the day several stops were made in the mining district. At Cobalt facilities were afforded for visiting the silver mines and the agricultural belt which stretches beyond. At Kirkland Lake a new town was springing up round the gold mines in a clearing of the forest, and the branch line was completed only just in time to allow the passage of the special trains. The following day the famous gold mines at Timmins and the large wood-pulp paper-mills at Iroquois Falls were visited. A long day's ride through undulating spruce-forest and lake-country, passing towards evening to the open country of the prairies, brought us to Winnipeg. A visit was paid to the new Agricultural College, and some of the botanists made a short drive out on to the prairie. The Canadian prairies consist of three steppes rising in height towards the West. The surface of the land is gently undulating, a character which is the cause of one of its marked features, namely the absence of extensive views and distant horizons. The soil is almost black, and the climax vegetation is a rich coarse grassland. With the exception of a few clumps of willows in the damper hollows, trees are almost entirely absent, except along the river-valleys, probably owing to the absence of natural wind-breaks, and the most conspicuous woody plant is the grey-leaved *Shepherdia* (Eleagnaceæ). Among herbaceous plants the prairie is, above all, the home of the yellow *Compositæ*, which give a characteristic colour to the general scheme. These belong chiefly to the genera *Grindelia*, *Solidago*, *Chrysothamnus*, *Gaillardia*, *Rudbeckia*, and *Helenium*. Purple flowering kinds are also common, especially *Asters*. Among the numerous other plants, the Indian Paint Brush (*Castilleia coccinea*) is very conspicuous. In spring the ground is bright with several kinds of *Anemone*.

At Saskatoon the Association attended the opening, by the Provincial Premier, of the new Chemistry buildings of the University of Saskatchewan. The botanists visited the Forestry farm, and saw some successful experiments which have been made in growing trees between wind-breaks until they have become established. A large number of trees thus grown have been distributed to farmers on the prairie. Afterwards a short botanical excursion was taken along the banks of the Saskatchewan River, and some interesting representatives of the prairie flora were found. Short sessions were held of several Sections, and papers on photosynthesis were given by Professors Baly, Priestley, and others.

At Edmonton a combined session of the Botanical and Agricultural Sections was held, and addresses were given by Professor E. C. Jeffrey, Professor Ostenfeld, and Dr. A. W. Borthwick at the

University of Alberta. Here the Botanical Section divided, a party of twelve leaving the main excursion for a five-day motor trip in the mountains arranged by Professor F. J. Lewis, the remainder going on to Vancouver.

By breakfast-time next day the trains were among the foot-hills of the Rockies, and now began the long climb up to the summit of the Yellowhead Pass. We were now in the mountain forest-zone, a vegetation reminescent of Timagami, but composed of quite distinct elements. During the morning some hours were spent at Jasper Park, a large national reserve. Early in the afternoon from the head of the pass a view was obtained of Mt. Robson, 13,000 ft., the highest peak of the Canadian Rockies. It is interesting that the highest mountain and the lowest pass are within a few miles of one another. On descending the Pacific slopes the difference of climate between the two sides of the mountains is at once apparent. Here the size of the individual trees, which include the Douglas Fir (*Pseudotsuga Douglasii*) and *Thuja plicata*, is much greater. The increased humidity is also shown by the presence of the lichen, *Usnea*, hanging in festoons from the branches. The railway in its descent follows the courses of the North Thompson and Thomson rivers, and for the most part runs along ledges hewn out of the rocky sides of the gorges. The scenery in this part is very grand.

Along the Fraser River the landscape becomes more and more English in character, and many parts of British Columbia are very like our own country. The trains arrived at Vancouver early in the morning, in time to allow those who wished to catch the morning boat to Victoria, on Vancouver Island. This city, the capital of British Columbia, is reached by a passage of a few hours across the Strait of Georgia. The trip across is a very beautiful one, the strait being dotted with many tree-covered islands, the whole backed by the mountain-ranges of the mainland, while in the distance towards the South the magnificent outline of Mt. Baker raises its snow-clad head above the mists. The trees of the islands are mostly Conifers, but an *Arbutus* (*A. Menziesii*) is conspicuous at a great distance on account of its bright brown bark. At Victoria a local botanist, Mr. Pemberton, kindly guided us to some of the more botanically interesting spots—namely, a wood of *Abies grandis*, which, under favourable conditions, reaches huge dimensions; some striking examples of naturally distorted growths were seen; a wood of *Quercus Garryana*, a local endemic species; and, lastly, one of the numerous sandy sea-beaches. There great numbers of *Nereocystis* plants had been washed up. This is one of the largest brown seaweeds, with stipes which may be twenty feet in length.

In the evening most of the party visited the Dominion Astrophysical Laboratory and saw the great telescope in action.

A day was spent at Vancouver in botanical excursions under Professor Hutchinson of the University of British Columbia, including a visit to Stanley Park. This is a portion of the primeval coniferous forest, preserved as far as possible in its natural condition, where many of the local trees are to be seen at their best. The *Pseudotsugas* and *Thuja plicata* are particularly fine. Many of the largest have had

to be felled, as they were in a dangerous condition, but there are one or two left with diameters of trunk approaching 20 ft. at the base. During the afternoon a visit was also paid to the University of British Columbia, now being built on a splendid site not far from Vancouver.

The trains left on the return journey to Toronto in the evening, and by the next day were again approaching the mountains. Although the whole mountain system is usually spoken of as the Rockies, it consists of a series of ranges. Nearest the sea is the coastal range; then across a wide valley come the Selkirks, and finally the Rocky Mountains proper. The country between the two first-named is, owing to the surrounding mountains, cut off from moisture-laden wind, and has a very arid climate; it is known as the Dry Belt. Its vegetation is almost that of a desert. The only really prominent tree is *Pinus ponderosa*, but the individuals are scattered and do not form woodland. The ground flora is scanty, being composed chiefly of semi-xerophytic *Compositæ* belonging to the genera *Bigelovia* and *Artemisia*. There are also one or two small species of *Opuntia* and a *Clematis* very like our own, but with a trailing habit.

A short stay at Glacier, in the heart of the Selkirk Mountains, gave time for a hurried visit to the glacier. The first part of the way led through beautiful coniferous woods with very thick and varied undergrowth, in which two plants were conspicuous by their berries—the Hercules Club (*Fatsia horrida*) and the dainty little *Rubus pedatus*, a creeping herb with digitate leaves, white flowers and fruits of from two to six bright scarlet drupelets; in autumn the leaves become beautifully coloured. A related species, the large *Rubus odoratus* of East Canada, is here represented by an almost similar but white-flowered species, *R. parviflorus*. Higher up the woods become thinner, and such plants as *Cassiope*, *Phyllodoce*, and species of *Saxifraga* were prominent. There was no alpine meadow-zone, and almost as soon as we left the trees we were on the rocky slopes below the glacier. The flora of the rock near the ice consisted of only three species—a small bushy *Salix*, *Oxyria digyna*, and *Epilobium* (*Chamænerion*) *latifolium*. The last is very like *Epilobium angustifolium*, which also is common here at lower levels as it is throughout Canada, but is smaller, with broader leaves and fewer, much more handsome flowers. The upper and lower limits of the two species are, in places, very near or even overlap, and it seems probable that they frequently hybridise.

After ascending the Rockies proper and passing the Great Divide, the boundary between British Columbia and Alberta, a few hours' stay was made at Lake Louise, on the eastern side of the range, whence some of us climbed the mountain-side to Mirror Lake and Lake Agnes. The latter is a magnificent glacial cirque at a height of nearly 7000 ft., and here at last we were among a real and rich alpine flora. Many of the plants, such as *Dryas*, *Saxifraga oppositifolia*, *Potentilla nivea*, and *Silene acaulis* were familiar species, but there were a host of others which we had not previously met.

Next morning at Banff the main party was rejoined by the botanists who had broken off at Edmonton.

The small party under the guidance of Professor F. J. Lewis had motored across the prairie for the 200 miles from Edmonton to Calgary, an interesting but tiring experience, for a prairie "trail" is soft and often very like a ploughed field; thence westwards into the Rockies, reaching Banff through the great National Park, and camping on Mt. Sulphur, about 800 ft. above the little town. Four nights were spent at different mountain-camps, and during the day visits were made to places of special interest to botanists. These included a climb through a forest-trail following the Boom River up to the lake at the foot of the Boom Mountain glacier, passing in succession through a forest-flora and a swamp-flora, and finally reaching the alpine flora on the sides of the mountains above the spruce woods (*Picea Engelmannii*). Also a day's botanising along the Vermilion River trail, again through spruce forest, and finally a scramble up the steep slope left by a snow-slide and now covered with almost impenetrable scrub, in which we disturbed a moose. On the last day a tramp along Lake Louise to the great glacier at the head of the valley yielded a harvest of many alpines growing on the moraine and sides of the valley. It was interesting to note that the pines and spruces of the forests on the eastern slopes of the Rockies were of different species from those of Eastern Canada, *Picea Engelmannii* and *Pinus Murrayana* representing *P. canadensis* and *P. Strobus*; on the higher mountain-slopes *Larix Lyallii* was seen. Those who took part in this very enjoyable, if somewhat strenuous, trip gratefully remember their guide and friend, Professor Lewis, and his young helpers from Edmonton University who rendered no easy service in driving the cars.

During the return journey east we stopped at Kenora, a town on the northern extremity of the Lake-of-the-Woods, where a day was spent in visiting some of the numerous islands on the lake. We had now re-entered the eastern forest-region, and the scenery and vegetation was very like that of Timagami, but with many of the later flowering plants, especially *Asters*, in full bloom. From Kenora the railway runs through a country of many lakes to the twin cities of Port Arthur and Fort William on the north-west shore of Lake Superior.

Leaving Port Arthur, the railway closely follows the northern shore of Lake Superior, and short stops were made at Coldwell and at Heron Bay, giving opportunities for botanising. After leaving Lake Superior a stay was made at Sudbury, in the rich nickel-mining district, and opportunity given of visiting the mines and smelting works and of observing the destructive effect of the latter on the surrounding vegetation. Toronto was reached next day after an absence of nearly three weeks. From here some of the members made the trip to Montreal by water, crossing Lake Ontario and going down the St. Lawrence through the Thousand Islands and the rapids. At Montreal we took ship once more for Europe.

From the botanical, as well as from other points of view, the whole visit to Canada was one of extraordinary interest. Thanks to the never-failing energy and hospitality of our Canadian colleagues, we were able to see the vegetation of the country in various aspects

and to obtain a very fair general impression of it. To many of us the visit was an entirely new experience, and one which must be of great and lasting value. It is impossible to express adequately our appreciation of the great hospitality which we experienced, not only from our official hosts, but from all with whom we came in contact. The visit also presented a welcome opportunity of meeting many of our North American friends, with whom the interchange of opinions and ideas was of the greatest value. Finally, Section K, as a unit, owes a very great deal to the geniality and organizing ability of the Chairman, Prof. J. H. Faull, and the Secretary, Prof. R. B. Thomson, of the local Sectional Committee at Toronto.

THE CLASSIFICATION OF DICOTYLEDONS.
I. GENERAL PRINCIPLES.

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

1. Synthetic and Analytical Methods.

"It is evident, I think, that our taxonomy has been based on the fundamental error that the plant world is to be regarded as divisible into smaller and smaller groups, rather than following nature and proceeding on the theory that it is built up of greater and greater ones; the science should be synthetic rather than analytic" (N. L. Britton in *American Naturalist*, 1908, 241).—The synthetic method adds group to group according to the measure of agreement between the respective sums total of their characters, whereas the analytical one divides and subdivides the vegetable kingdom according to the incidence of selected characters. An extreme case of the analytical method is exemplified by classifications such as those proposed by Van Tieghem, which are based on the incidence of *single* characters. The evolution of a natural classification has proceeded *pari passu* with the gradual replacement of analytical methods by synthetic ones.

The contrast frequently drawn between the "artificial" system of Linné and the "natural" one of A. L. de Jussieu has tended to obscure the fact that both were partly natural and partly artificial. Linné's *species* and *genera* were largely synthetic, though his higher groups were analytical. Jussieu extended the application of synthetic methods, and proposed natural *families*; nevertheless, his "*classes*" were purely analytical. Many of the *orders* now recognized are aggregations of related families, but others are more or less artificial groups obtained by analytical methods. The reconstitution or replacement of the latter will be the next step in the evolution of a natural system. Engler's *Geraniales* and *Sapindales* are good examples of such unnatural *orders*, their sole distinguishing character being the orientation of the ovule. The result is that *Limnanthaceæ* are divorced from *Geraniaceæ*, and *Anacardiaceæ* from *Burseraceæ*. Comparatively little harm would have been done had it been recognized that *Geraniales* and *Sapindales* were artificial groups; Engler,

however, apparently regarded them as natural: having, in the first place, assumed that the orientation of the ovule was a character of primary importance, he proceeded to draw the conclusion that *Anacardiaceæ* and *Burseraceæ*, for example, were not in reality closely related, because they differed in this respect (Nat. Pflanz. iii. Abt. 4, 234). The large measure of agreement in the external and anatomical characters of these two families hardly bears out this view.

The growth of a natural system has been continuously retarded by the desire for easily recognizable groups. Even forty years after the publication of Jussieu's *Genera* many botanists still adhered to the sexual system of Linné, and the natural system had to contend with a great deal of deeply-rooted prejudice (Lindley, Introd. Nat. Syst. Bot. pp. vi, xii–xvi; 1830). The same reluctance to abandon convenient though artificial arrangements is still in evidence. On the whole, the larger a natural group is, the more difficult it will be to define, owing to the greater number of characters to be taken into account, and the more frequent exceptions; hence there is a tendency to adopt analytical methods to obtain groups higher than the family. Most authors of new systems have had two aims: to arrive at a more natural classification of plants, and to obtain a convenient arrangement for purposes of identification. It should be realized that the latter aim may be inconsistent with the former: a natural arrangement may be almost useless as a clavis.

The subclasses of Dicotyledons, namely *Monochlamydeæ*, *Polypetalæ*, and *Gamopetalæ* (*Archichlamydeæ* and *Metachlamydeæ* of Engler, *Choripetalæ* and *Sympetalæ* of Eichler) are purely analytical groups. Warming long ago (Haandb. Syst. Bot.; 1879) divided the *Sympetalæ* into *Pentacyclicæ* (=*Heteromeræ*) and *Tetracyclicæ* (=*Inferæ*+*Bicarpellatæ*); he considered that the *Pentacyclicæ* were more closely allied to the *Choripetalæ*, and that it was very doubtful whether they had any close relationship with *Tetracyclicæ*. Wernham came to the conclusion that "the *Sympetalæ* should not exist as a separate group in a natural system of classification, however convenient such a separation may be for practical purposes. They are capable of division into groups, each of which may be associated with a natural group of the so-called *Archichlamydeæ*" (New Phytol. 1912, xi. 388). He believed that the sympetalous Dicotyledons had descended from *Archichlamydeæ* along seven distinct lines (*op. cit.* 383). But the tracing of such lines of descent involves the recognition of natural groups of higher rank than the order; and until the orders themselves have been placed on a synthetic basis, no great progress can be made in the circumscription of the higher natural groups.

2. Critical Characters and Tendencies.

The necessity for broadening the basis of classification has been urged by Hallier (New Phytol. iv. 152; 1905), and is now generally recognized. No category of characters, whether morphological, anatomical, chemical, or physiological, should be neglected. Differences

in geographical distribution, however, should not be treated as taxonomic characters, except in so far as they can be shown to be the result of special climatic or edaphic requirements—otherwise the resulting groups will be relatively unreliable so far as any phytogeographical deductions are concerned. Floristic geography is based on taxonomy, not *vice versa*. Study of the geographical distribution of related groups may, however, *suggest* possible modifications in their classification, especially in groups of lower rank than species; and apparent phytogeographical anomalies often lead to the detection of characters previously overlooked. Thus the remarkable discontinuous distribution attributed to *Amoreuxia palmatifida*—Arizona, Sonora, Vera Cruz, Colombia—led to the discovery that three distinct species had been included under that name (Kew Bull. 1922, 97–105, t. 1).

It is an axiom that the value of a character for a particular group increases with its constancy. But *tendencies* should not be disregarded. In Wernham's words, "the general relation between the significant features of the ancestry and those of the descendants is, that in the former the characters in question are not constant throughout the group, nor may they be completely evolved. In other words we are dealing with tendencies to characters, and not with the critical characters themselves, in the case of the ancestry. In the progeny, on the other hand, the characters are constant and completely evolved, and the line which unites ancestor and descendants represents the transition between tendencies and their realization. The descendants in their turn may reveal tendencies to other characters, to be realized in groups still more advanced. It is in this connexion that the significance of constancy and inconstancy of characters emerges; and it will be appreciated that a character may be of relatively rare occurrence within any group, and yet have considerable phyletic value, in so far as it throws light upon the evolutionary history of the group and its allies. Critical tendencies are no less important than critical characters" (New Phytol. 1912, xi. 390). For example, the tendency in the *Berberidaceæ* to valvular dehiscence of the anthers may be used in support of a relationship with the *Lauraceæ*, in which valvular dehiscence is constant.

3. Variable Characters.

For diagnostic purposes, only constant characters are generally taken into account, yet the existence of an unusual amount of variability of a particular character may have considerable taxonomic significance. Certain groups exhibit a large degree of fluctuating meristic floral variation, while others exhibit hardly any. Some families are definitely homomeristic, e. g. *Compositæ*, while others are markedly heteromeristic, e. g. *Crassulaceæ*, in which the flowers are 3–30-merous (see Journ. Bot. 1922, 231). The anomalous genus *Dipentodon*, which was provisionally referred by its author to the *Celastraceæ* (Kew Bull. 1911, 310) possesses certain characters which suggest that it should be transferred to the *Samydaceæ*. The

fact (hitherto unpublished) that the flowers of *D. sinicus* are 5–7-merous affords valuable confirmation of this view, since the *Samydaceæ* frequently exhibit a similar degree of fluctuating meristic floral variation, whereas the flowers of the *Celastraceæ* do not vary to the same extent.

4. Different Categories of Characters.

Wernham (*op. cit.* 392) distinguished two classes of characters, *fortuitous* and *biological*, the former being those which have "no relation to the environment nor to any biological function," and the latter being "such as are in direct relation to some vital function or advantage."

Diels (*Die Methoden der Phytographie und der Systematik der Pflanzen*, 136) also recognized two main classes, namely the *constitutive*, which are unconnected with any function, and correspond to Wernham's fortuitous group; and the *non-constitutive*, which are unmistakably related with the functions of the plant, and coincide with the biological class. Diels further distinguished three categories of non-constitutive characters:

(1) *Functional.* These are intimately connected with some special function, but are uninfluenced by the external conditions, *e.g.*, the so-called adaptations of flowers to particular insects and of fruits for dispersal.

(2) *Epharmonic.* Such as are apparently connected with the mode of life of the plant, but nevertheless remain constant under varying external conditions, *e.g.*, the microphylly of the *Ericoideæ*, the succulent nature of the *Crassulaceæ*, and the formation of bulbs in many species of *Oxalis*. These remain essentially constant under cultivation, and may be regarded as "adaptations" which have become fixed.

(3) *Adaptive.* Such as vary according to the external conditions, *e.g.*, the absolute size of members, and the degree of hairiness.

The distinction between constitutive and non-constitutive characters is largely subjective, as it may be a matter of opinion in many cases whether a particular character is or is not connected with the general mode of life of the plant or with some special function. A more natural primary division would be into *inherent* characters, which are hereditary, and comprise Diels's constitutive, functional, and epharmonic categories, and *non-inherent* (adaptive) characters, which appear in the individual under particular external conditions.

5. Relative Value of Characters.

In a general way it may be stated that fortuitous (constitutive) characters possess a higher taxonomic value than biological (non-constitutive) ones. In Darwin's words, "the less any part of the organisation is concerned with special habits, the more important it becomes for classification" (*Origin of Species*, ed. 6, 365; 1882). This view has been developed by Wernham in the following propositions: "The occurrence of several common fortuitous characters in a series of plant-forms is valid evidence of their mutual affinity; and the greater the number of common characters, the closer the affinity." "A group of plants may share a number of biological characters in common without being therefore closely related" (*op. cit.* 393, 394). The same biological character, or even combination of biological characters, may appear in quite different lines of descent, and may indicate not genetic relationship, but merely the particular evolutionary stage at which the groups in question have arrived. Hence the taxonomist has a twofold task: to trace the general course of evolution, and to distinguish the numerous separate and often parallel lines of descent.

SOME VARIETIES OF RUBUS.

By the late Rev. W. Moyle Rogers and the Rev. H. J. Riddelsdell.

This paper publishes certain varieties of *Rubus* which have hitherto been quoted *Rogers MS.* All the work done at them lies to the credit of Rogers, whose name must therefore, even at this distance of time, be permanently associated with them. His notes are taken pretty much as he left them, and made into valid descriptions with his name attached.

Rogers made it a rule not to create new names for forms found only in one Vice-County. In almost all the cases cited below, more than one v.c. is known to possess the form. If one or two of the varieties are slight, they are quite remarkable so far as they go, and thus worthy of note. At any rate, if they are to appear at all in a new edition of the *London Catalogue*, it is better they should stand on firm ground.

Rubus incurvatus Bab. var. subcarpinifolius var. nov. Upper Wye form, Rog. Handb. 28, "Differs from the type in leaves thinner with closer greyer felt beneath, and teeth much less compound and less deeply incised, and terminal leaflet usually narrower and less cordate: and especially in the broader and more leafy panicle with longer lower branches and with leaves nearly to the top (instead of with upper half or two-thirds leafless). The stem is also less deeply furrowed, the prickles are slenderer and longer, and the sepals more conspicuously subpatent on the fall of the petals, so it may be said to go off from typical *incurvatus* towards *R. carpinifolius* and *R. rhombifolius*." (Journ. Bot. 1899, 194.) v.c. 13, 16, 17, 22, 33, 36, 42, 43.

A typo differt foliis tenuioribus, subtus tomento adpresso canescentibus, multo simplicius dentatis, multo minus incisis; foliolum terminale angustius, minus cordatum. Inflorescentia latior, superne foliifera, ramulis inferioribus longioribus. Turio minus profunde sulcatus, aculei tenuiores longiores: sepala post anthesin subpatentia.

(Var. rotundifolius Rogers MS. I do not yet understand this well enough either from descriptions or specimens to be able to deal

with it. It is therefore omitted from Lond. Cat. Would any reader who has in his possession specimens named *rotundifolius* by Rogers be so kind as to let me see them ?—H. J. R.)

R. LINDLEIANUS Lees var. LATIFOLIUS var. nov. Stem-leaves with all leaflets broad, and the terminal leaflet roundish-cordate, acuminate, with petiolule nearly to quite half the length of the leaflet, green and thinly hairy beneath, becoming nearly naked.

Rog. Handbk. 28 and Watson Ex. Cl. Rep. 1900/1, 12. Cos. Armagh and Down, Ireland.

Occasionally plants occur in England and Wales which approach this variety.

Foliola omnia lata; fol. term. subrotundo-cordatum, acuminatum, petiolulo fere duplo longius; subtus viride, sparse pilosum, demum subnudum.

R. NEMORALIS P. J. Mueller var. CORNUBIENSIS var. nov. Leaves greenish white and felted beneath; lts. plicate, convex, rather small, longish-stalked, with more truncate and irregularly toothed top. Panicle elongate cylindrical, usually without simple floral leaves, but with many short-stalked glands. Stem prickly, deep vinous red; sepals very grey, usually somewhat aciculate. See Journ. Bot. 1909, 174. v.c. 1 and 2, over a large area.

Folia subtus albo-viridia, adpresso-tomentosa. Foliola plicata, convexa, parvula, obovato-truncata, in parte superiore dentibus inæqualibus prædita. Petioluli longiores. Inflorescentia elongata, apicem versus vix decrescens, inferne tantum foliifera; glandulifera. Turio aculeis crebris præditus; sepala incana, vulgo sub-aculeolata.

R. DUMNONIENSIS Bab. var. CORDATIFOLIUS var. nov. " Leaflets with lobate-serrate teeth and greenish-ashy felt beneath, and a terminal leaflet which is broadly ovate with gradually acuminate point and deeply cordate base." Its panicle also has one or two simple leaves with cordate base. See Journ. Bot. 1898, 86, and Rog. Handbk. 32.

Guernsey and Sark in quantity.

Plants from South Essex and Oban make a considerable approach to this variety.

Folia lobato-serrata, subtus cinereo-virentia, tomentosa; fol. term. late ovatum, sensim acuminatum, cordatum. Inflorescentia 1–2 fol. simplicibus cordatis prædita.

R. THYRSOIDEUS Wimm. var. VIRIDESCENS var. nov. Ls. narrower, with greenish-white felt beneath, soon bare; lts. narrow cuspidate-acuminate, somewhat obovate, nearly parallel-sided below and often cordate. Pan. strongly branched throughout, with wavy rachis, large ultra-axillary part, strong falc. prk. above, and roundish, reddish or purplish petals. *Cf.* Brit. E. C. Rep. 1904, 17, and Journ. Bot. 1909, 174. v.c. 1 and 4, 45.

Fol. angustiora quam in typo, subtus albovirentia tomentosa, mox nuda. Foliola angusta, cuspidato-acuminata, oblongo-obovata, sæpe cordata. Inflorescentia ramulis permultis composita; inferne tantum foliifera; rachis flexuosa, superne aculeis robustis falcatis munita. Petala subrotunda, rosea vel purpurascentia.

R. IRICUS Rogers var. MINOR var. nov. Stem densely hairy. Lts. rather small and narrow, with nearly parallel sides, deeply and irregularly toothed. Pan. narrower, much less robust and more nearly pyramidal in outline, usually considerably glandular above. *Cf.* Journ. Bot. 1910, 318. v.c. 1, 2, 3, 4, 34, 36, 40, 41, 42, 44, 46; thus wholly Western and South-Western.

Turio dense hirsutus. Foliola subangusta, parvula, suboblonga, dentibus incisis inæqualibus. Inflorescentia angustior quam in typo, multo minus robusta, apicem versus decrescens; superne vulgo glandulifera.

R. CORYLIFOLIUS Sm. subsp. CALCAREUS subsp. nov. Stem uniformly angled and more conspicuously so than in *conjungens*; slender. Prickles with stout base as in *conjungens*, but usually fewer and more strictly confined to angles. Ls. 5-nate; term. lts. ovate-acuminate, narrow, with close finely-pointed teeth as in *sublustris*, but neither lobate towards point nor cleft at base. Usually eglandular. v.c. 33 only.

Turio semper angulatus, minus robustus quam in *R. conjungente*. Aculei e basi lata angustati, rariores quam in *R. conjungente*, ad angulos exactius dispositi. Folia quinata; fol. term. ovato-acuminatum, angustum, dentibus argutis crebris præditum; nec apicem versus lobatum nec basin versus fissum. Vulgo eglandulosa.

REPRODUCTIVE MECHANISM IN LAND FLORA.

II. LIFE-CYCLES (*continued from* vol. lxii. p. 275).

BY A. H. CHURCH, M.A.

Meiosis in the Benthic Phase.—The Benthic Phase covers more precisely the period in the evolution of a recognizably multicellular (multiseptate) plant-soma in the submerged environment of the sea, but now attached to a substratum, as the general case of the sea-weed algal form. It is evident that there can be little to show in the way of a life-cycle, until there is a specialized body to exhibit it; and with the elaboration of the dominant plant-soma, any expression of the cytological cycle will be coordinated. Hence it is to the sea-weed that one must look for the best indication of the significance of such somatic progression; since with the evolution of a new type of somatic individual, the racial mechanism of reproduction has to be fitted in. Once such a soma is in existence, with this reproductive mechanism successfully established in such primary environment, no subsequent change, as involved in subaerial transmigration or migration to fresh-water, can do more than build with the original equipment; either adding something, or even losing features of specialization. In either case all new somata of the land are based on the equipment attained in the phase of marine algæ [1].

The benthic soma of an alga, as convincingly illustrated in the Phæophyceæ and Florideæ of the sea, and by many Chlorophyceæ of

[1] Leaving on one side cases of direct migration of plankton forms to subaerial conditions (Mycetozoa, Myxobacteria, Cyanophyceæ).

both sea and fresh-water, is to be interpreted as the product of a sessile encysted plankton-flagellate, continuing its binary fission in such a way that the products of division remain in plasmic connection, and so associated to build a cellular soma, massive, monaxial or branched, in all the endless variation of the *algal thallus*. But, being so far sedentary, anchored hormon, and attached to the substratum, the inevitable death of the individual soma necessitates that some method be retained for the inception of a new thallus to replace the old one, as also for increase of numbers and dispersal to new stations. The method adopted is simplicity itself: the soma alone is the new departure, as a photosynthetic mechanism, amplified for purposes of improved metabolism. At a certain stage, indicated conventionally as that of the 'adult,' certain protoplasts of somatic cells 'rejuvenate,' regress, or revert to the older plankton condition, to be discharged from the 'cells' producing them, and to escape as free-swimming plankton-flagellates of the ancestral pattern of their race, or but little changed. So far is the accepted story of modern Flagellate Theory; since the life-history of the alga appears to admit of no other more reasonable interpretation. All reproductive cells, defined as marking a change of phase in the life-cycle, are thus at bottom regressive flagellates; so far more conservative in detail, as the new conditions of relation to the environment affect at first the somatic tissue by means of which the individual gets its living. However much they may be modified in subsequent evolution, all such flagellate reproductive cells are free-swimming plankton zoïds, and so far *haploid*. Retaining the older tendency of the original plankton zoïds for cell-fusions in a later stage of their career, such regressive zoïds act as 'gametes' in the older medium of the sea, and so effect in the free state the older 'sexual process' of plasmogamy and karyogamy—presenting phenomena, that is to say, of plasmic and nuclear fusion. This also seems plain-sailing; but the conclusion is enforced—all gametes are essentially regressive flagellates, and all are haploid, in retaining this much of the primitive equipment of their race. No such ancient gamete requires any special preparation (as by 'maturation' in the cytological sense) for its function, although it may require to be 'matured' physiologically. The gamete is, in fact, older than the benthic soma, and may be now freely produced from the cell of a haploid plant-soma. The idea that the gamete is a mysterious 'sexual' unit, involving a complex story of gametogenesis, requires to be wholly scrapped. In its original condition an algal gamete is merely a regressive zoïd of the plankton, following its ancient reproductive avocation, and the spermatozoon of the highest animal body is little more, and is hence primitively haploid.

Taking the gametes apart as merely the older stage of the plant, it now remains to consider the effect of such nuclear relation on the new and progressive benthic soma of the attached alga; and it is evident that different cases may arise. But, as all have been subjected in past ages to the sieve of natural selection, the conclusion is warranted that at this late date one is justified in regarding the predominant case as being in some way superior to the others, or so far

'fit' because it has survived. It is evident that if the gamete is merely a regressive zoïd, capable of fusion with a similar unit to form a diploid zygote of the plankton order, the same conditions will supervene as in the older plankton life-cycle. Karyogamy, conceived as an intensive stimulus to the nucleus, should cause the latter to swing back, possibly at the first opportunity, to its original organization; and in such case meiosis might be expected to occur at the next spindle—*i. e.*, at the first somatic division of the zygote nucleus in 'germination.' This may be termed meiosis at the '*first intent*.' Such a case holds for several common types of green Algæ (Chlorophyceæ), including *Spirogyra* and *Volvox*, *Coleochæte*[1], *Chara*[2], and may be reasonably inferred for *Œdogonium*[3] and *Hydrodictyon*[4]. The difficulties of the situation may be considered:—

(1) It is obvious that since no individualized soma can be built from two unlike complementary nuclei, at least 50 per cent. of the dyad meiotic nucleus will have to be scrapped—the decision as to which half presenting a further problem; or, taking the four nuclei of the completed meiotic tetrad, three may be lost, leaving only 25 per cent. effective to build the new individual. This is the case already noted for *Spirogyra*—obviously a bad business, and hence to be interpreted as a very secondary version of an older story[5]. The same may probably be said of *Chara*, also with three nuclei of a tetrad group suppressed.

(2) Such loss, however, may be avoided, provided the first four nuclei are themselves liberated as flagellated zoïds; and, as no true tissue wall-building can very well follow a meiotic spindle[6], the cellular soma is still wanting. This is the suggestive story of *Œdogonium* and *Hydrodictyon*, for which the cytology is still unknown.

(3) Or, the meiotic division of the zygote may be followed by further mitosis, and all the resultant cells give regressive zoïds, as shown by *Coleochæte*.

All these cases, again, refer to highly specialized minor types restricted to fresh-water, and are associated with the production of a massive perennating zygote of secondary nature—a feature unknown in the sea (Phæophyceæ)[7]. Similar meiosis of the zygote may occur in Fungi (possibly *Mucor*), as forms obviously derivative from Algæ, and in a condition of somatic deterioration following heterotrophic habit. In no case does meiosis at the first intent give very satisfactory results: the new individual being wholly haploid may be said to lack the educative benefit of biparental inheritance, or of double

[1] Allen (1905), Ber. Deutsch. Bot. Gesell. 23, p. 285.
[2] Oehlkers (1916), Ber. Deutsch. Bot. Gesell. 34, p. 223.
[3] West (1916), Algæ, p. 397: also for *Bulbochæte*.
[4] West, *loc. cit.* p. 221: Oltmanns (1922), Algæ, vol. ii. p. 283.
[5] Akontæ having, presumably lost with their flagellated phases the older omission of small free gametes.
[6] Following a meiotic division, cell-walls can be only laid down by 'free-cell-formation,' or by an ingrowing septum.
[7] The case of *Nemalion* (50 per cent. loss), and *Scinaia* (75 per cent. loss) marks another version of decadence in a life-cycle of much greater attainment (Florideæ).

nuclear control; and meiosis at the first intent may be so far accounted one of the failures of biological progression. While it undoubtedly expresses the first and oldest method of the plankton-phase, following karyogamy and setting free the daughter cells, it does not appear primitive for the benthic soma, and it admits no advance on the plankton-scheme.

In another case, however, following what has been already observed in more specialized plankton-somata, karyogamy is something more than a mere stimulus. The nucleus does not immediately respond, but remains apparently passive, retaining the diploid set of chromosomes over the first mitosis. The latter, followed up by a cell-wall between the daughter nuclei, marks the initiation of a true cellular soma. In such case a normal thallus-growth proceeds directly from the state of 'germination.' There is no loss of nuclear material or organization; from this point alone, the method marks a profound advance in evolution, and all the cells retain the diploid nucleus with its full biparental equipment, presumably with a gain of inherited experience; the initial rejuvenescence effect of the fusion being followed up by the full and continued control on the part of the doubled nucleus. There is no necessitated 'resting stage' at this point in the sea, and syngamy now appears as the hastener of the individual life, as well as of the race.

But meiosis has to be put in somewhere, and sooner or later. There is no ready means of isolating a cell for the purpose until a change of state is required—*i. e.*, until a new insistent stimulus makes itself felt, as expressed in the approach of the time for the emission of the secondary regressive zoïds which can function as gametes. Meiosis can be effected in their preparation, so that the flagellated zoïds may be set free in their original haploid plankton phase [1]. Here meiosis is interpolated in 'gametogenesis,' or at what is obviously the *second intent*; or, again, it may be said to be 'delayed' until the reproductive stage. The process is admirably illustrated in the larger Brown Algæ (Fucoids). The cells set apart for the process begin with a meiotic spindle and pass on through the normal homotype division to four nuclei so rapidly that no wall of waste is laid between the nuclei of what thus appears as a cœnocytic 'organ'; and further mitosis may follow, increasing the output of flagellated zoïds. So far as *Fucus* is concerned, the gametangium is thus *unilocular* and *cœnocytic*, with an output (antheridial) of 64 regressive flagellates each retaining an 'eye-spot' from a residual chloroplast, implying four mitoses subsequent to the formation of the meiotic tetrad. But *Fucus* is by no means wholly primitive. It presents an advanced phase of heterogamy; only the microgamete is a short-lived regressive flagellate; the megagamete is large, several thousand times the volume of the antherozoid, passive, spherical, immobile, with abundant

[1] As already suggested for some of the larger somata of existing Plankton forms, the normally haploid gamete is to be regarded as the fixed point in the life-cycle, or as a base-line for reference in connection with new departures; not because it is to be employed in the climax of a sexual fusion, but because it is the oldest thing in the life-history.

chloroplast-content. The megagametangium reduces its mitotic divisions to the limiting term of one only; hence the megagametes (oospheres) are eight in number, and further restriction in more advanced Fucoid genera leads to an output of one mature gamete only, with aborted relics of seven nuclei (*Himanthalia*). Again, the facts of this present-day, living, highly-specialized form sufficiently indicate that there lies behind it an older stage of reproduction, in which isogamy still prevailed between similar regressive flagellates of the type of the modern *Fucus* antherozoid [1].

The case of *Fucus*, and all other Fucoids giving fundamentally the same nuclear story, is the more remarkable, as it is often regarded as unique in the plant-kingdom. Fucoids have no other means of reproduction. Meiosis, similarly, at the second intent (or meiosis in gametogenesis) is also the normal case for the whole of the animal kingdom (Metazoa). This fact is so remarkable that it requires consideration. The animal story is, if anything, one degree more advanced, in that the gametangial cells give meiotic tetrads only, with no subsequent mitoses. They present a wholly comparable advanced stage of heterogamy, and are clearly at an identical horizon in the reproductive scheme—a method so curiously uniform in the animal, as expressed in ova and spermatozoa, that zoologists have persistently regarded such meiosis at the second intent as the significant story for all organism, or the mechanism as originally designed for a primitively diploid soma [2].

The advantages of this arrangement are thus taken from the accepted speculations of zoologists. The double inheritance of the new soma, as an individual, appears obvious: segregation is postponed beyond the limits of this somatic period: in the case of the animal only one meiotic tetrad is produced from each mother-cell, with survival of one ovum and four spermatozoa respectively: and, from the fact that this scheme is adopted as the uniform mechanism of higher animals, it may be inferred that it is the optimum solution of the problem, spacing the reproductive phases of cell-units, which in the maturation of such regressive protoplasts will have to be fed at the expense of the somatic tissues, well apart from the actual somatic units (in the case of the plant photosynthetic; and even in the heterotrophic animal separated from the complex feeding and locomotor mechanism, as the 'germ-cells' of Weismann). The scheme works so satisfactorily that it supersedes all others under pressure of competition—in fact, one says this because no other is left.

On the other hand, it may be pointed out that *Fucus* is not a solitary type, but the local representative in British Seas of the dominant class of Algæ, preponderant in the sea in variety and number of types, also in mass-production of forms, as the Sargasseæ of tropical seas, the Cystoseiras of sub-tropics (N. and S.), and the Fucoids of

[1] In case of heterogamy the microgamete (♂) is the original zoïd, as in heterospory the microspore is the original spore-form.

[2] Tischler, Allgem. Pflanzenkaryologie, p. 530; Doncaster, Cytology, p. 78.

temperate regions (N. and S.) [1]. Fucoids thus appear as representatives of the climax formation of benthic algal types in the sea; and, though the period at which they may have attained their present position in heterogamy is unknown, the fact that all Metazoa have attained an equal horizon in this respect suggests a parallelism and probable contemporaneity of development in remote ages. It is interesting to note that even man has passed, in all essentials of gamete-construction, but little beyond the horizon of *Fucus*, though on different flagellate lines [2]. The essential point to note is, that not only is the correspondence in degree of heterogamy very similar, but the life-cycle is identical, and there is no other stage in the life-history [3]. The dominant plant-race of the sea and the dominant Metazoan of the land (following on from the fish as dominant animal form of the sea) share the same reproductive cycle, as both solving the same problem in the same optimum manner.

Conversely, all plants not attaining this cycle-scheme must have been so far at one time of inferior calibre. The Fucoid never makes a land-plant; although, as in British seas, some species come out of the water on the tide-range for more than half their total time. There is further no indication of any means by which they might ever pass to the land—that is to say, the dominant alga of the sea remains in the sea to the present day. Land Flora must have originated from sub-dominants presenting some other essential factor lacking in the Fucoid.

[1] Fucaceæ 26 genera: *Fucus* 16, *Cystoseira* 60, *Cystophora* 30, *Sargassum* 150 · Kjellmann (1893) in Engler and Prantl, Pflanzenfamilien. *Fucus* extends to meet the Laminarians of cold sub-Arctic and sub-Antarctic seas: the latter a special type enduring the cold and deteriorated light-supply of Northern and Southern Latitudes, but in no sense dominant in the sea as a whole. The Fucoids which go farther north are those which by free exposure on the tide-range obtain a light-supply sufficient to compensate the reduced intensity of the insolation.

[2] Bower, Kerr, and Agar (1919), Lectures on Sex and Heredity, p. 5, comparison of the two types. The human ovum is given as 200 μ in diameter; the oosphere of *Fucus* 80 μ, that of *Himanthalia* 300 μ.

[3] *Fucus* presents a perfectly straightforward story. It stands on its own merits. In older phraseology the soma is a gametophyte, because it actually is a plant (phyton) which produces gametes (and nothing else). To call it the converse, merely to bolster up what is now an ancient speculative suggestion of Strasburger (1894), is the *reductio ad absurdum* of ill-advised theory. The same interpretation applied to a man would at once be regarded as ridiculous (Beard, 1895, Annals of Botany, 9, p. 444; *cf.* Yamanouchi (1909), Bot. Gazette, 47, p. 190; Oltmann's (1922) Algæ, vol. ii. p. 277, "The *Fucus* plant is a sporophyte"; also (1923) vol. iii. p. 144, "It produces microsporangia and macrosporangia; only these give spermatozoids and ova"). Such statements are wholly gratuitous cooking, without even the saving grace of making anything clearer. Even in the diluted form, that the haploid phase is included in the diploid (Fischler, *loc. cit.* p. 358), there is still a suggestion that *Fucus* is in some way anomalous.

LINNEAN SOCIETY OF LONDON.

At the General Meeting of the Society on December 4, the following change in the Bye-Laws proposed by the Council was passed by the Fellows:—

In Chapter II. Section 1, shall read:

> Every Fellow shall upon his Election, and before he is admitted, pay the Sum of Four Pounds for his Admission Fee, provided that should he be under the age of Thirty-five he shall be exempt from payment of any Admission Fee; and if any Person shall fail to pay the Amount due, unless the same be remitted in whole or in part by special Order of the Council, his Election shall be void.

The effect of the alteration is to reduce the admission fee from six pounds to four pounds, except in the case of Fellows under the age of thirty-five, who will be exempt from payment of any admission fee. This alteration will confer a distinct advantage on young scientific workers, many of whom would find the payment of ten pounds (the sum of the former admission fee and the annual subscription) in one year to be inconvenient.

At the same meeting three vacancies in the list of Associates were announced in consequence of the deaths of William Barclay, Charles Chubb, and James Alfred Wheldon.

The President referred to the decision of the Council that vacancies in the list of Associates should remain open for six months in order that Fellows overseas might have the opportunity of sending in recommendations.

OBITUARIES.

William Botting Hemsley, LL.D., F.R.S. (1843–1924).

By the death of William Botting Hemsley on October 7th, 1924, botanists have lost one of the few remaining links between the present generation and the early days of Kew, as re-organised and opened to the public during the last century. Hemsley not only worked in the Herbarium under its first Keeper, Prof. D. Oliver, and under the Directorship of Sir Joseph Hooker, but he commenced work as a lad in the Gardens under its first Curator, John Smith, and under the administration of its first Director, Sir William Hooker.

Hemsley was born at East Hoathley, Sussex, on December 29th, 1843, and came of a family long associated with horticulture. Showing an ardent love of plants and botany, he was at the age of 16, as he tells us in an article entitled "Early Reminiscences of Kew" (*Journal of the Kew Guild*, 1893, 31–35), recommended by Mrs. Eardley Hall, a daughter of William Borrer, to Sir William Hooker, and he entered Kew as an improver in 1860. He attended lectures by Prof. Oliver (delivered in those days in the Herbarium) on chemistry, physics, and electricity, as well as botany. In 1861 he was offered temporary work in the Herbarium, which, in spite of John Smith's

admonitions "as to the evil effects it might have on my career" (*l. c.* 37), he eagerly accepted, fully appreciating the opportunity it would afford of prosecuting his botanical studies. Fours years later he succeeded Alexander Smith as Herbarium Clerk and became a Civil Servant.

From that time onward Hemsley devoted all his leisure to his favourite science, and papers began to appear under his name. In his enthusiasm he apparently overtaxed his strength, since, in 1867, his health broke down, and to his great grief he was compelled to leave Kew. As soon as recovery permitted he recommenced work, and during his retirement he set himself the task of mastering French, German, and Latin, and published several botanical papers, the latter bringing him in 1875 the Associateship of the Linnean Society. In 1874 he returned to Kew, but as an independent worker, and commenced the two series of investigations for which he was most famous—namely, that on the material brought home by the 'Challenger' Expedition and that on the botany of Central America, particularly Mexico.

In 1883 Hemsley rejoined the Kew Staff, being appointed Assistant for India, and in 1890, having been re-admitted to the Civil Service, he was appointed Principal Assistant under Mr. J. G. Baker. During this period he produced the greater part of his third most famous work, namely the *Index Floræ Sinensis*. In January 1899, when Baker retired, Hemsley was apointed Keeper of the Herbarium and Library, which post he held till December 28th, 1908, the eve of his 65th birthday. During the whole of this period Hemsley was exceedingly active, his output of sound systematic work being exceeded by few of the Kew botanists. For a complete list, reference should be made to numbers of the *Kew Bulletin* dealing with the list of works published by the staff, viz. 1897, 1–84, and 1907, Appendix v., whilst for the years 1906 to 1914 the *International Catalogue of Scientific Literature* should be consulted. Other information will be found in an article by Sir William Thistelton-Dyer (Gard. Chron. vol. xlvi. 381–2) and in two obituary notices which have already appeared (*Nature*, Oct. 25, 1924, 616 and 617, and the *Kew Bulletin*, Dec. 1924, 389–392).

In recognition of his services Hemsley was elected an Honorary Member of the Natural History Society of Mexico, of the Royal Society of New South Wales, and of the New Zealand Institute. He was elected to the Royal Society in 1889 and awarded the Victoria Medal of Horticulture in 1909. At his own request he was in 1896 transferred from the Associateship to the Fellowship of the Linnean Society. The honorary degree of LL.D. was conferred upon him in 1913 by the University of Aberdeen.

Hemsley remained modest to the end. His career affords another instance of the success which can be obtained by industry, perseverance, and courage against the heavy odds of ill-health. He possessed an extremely sensitive nature, which showed itself in a reserved and somewhat abrupt manner. Those who knew him well appreciated his scholarly mind and his kind and genuine nature. For the last years of his life, which were spent in a nursing-home at Broadstairs, Hemsley was bedridden and helpless, but his mind

remained perfectly clear till a few days before his death. He was greatly pleased with the congratulatory address sent him by his friends on his 80th birthday in December 1923, and when the writer last saw him, in June 1924, he still evinced great interest in botany and intense love for all that pertained to Kew.

A. D. C.

Charles Bailey, M.Sc., F.L.S.
(1838–1924).

With unfeigned regret, his many friends learnt that, on 14th September last, Charles Bailey had passed away at St. Mary Church, Torquay.

He was the eldest of four brothers, their parents living at Atherstone, Warwickshire, where Charles was born, 14th June, 1838. His next brother in age, John Eglington Bailey (1840–1888), rose to considerable eminence as an antiquarian and genealogist. An account of his career is to be found in the 'Dictionary of National Biography' (Supp. i. 99).

Both he and his eldest brother, Charles, through the influence of their uncle, John Eglington, were, at an early age, admitted into the business of the large and important firm of Ralli Brothers, East India Merchants, of London, Manchester, and Calcutta, and Charles, indeed, remained attached to the firm for no less than fifty-five years.

The motto and lode-star of his whole career may be summed up in one word—"Thorough." It was thus in everything he put his hand and thought to: he was endowed with special gifts as a most consistent Sunday School teacher: his business methods, his botanical collecting and research, all were characterized by extreme care and thoroughness. His actions and conclusions, once drawn, ever to be relied upon, his judgment on any point ever well-considered and correct.

In commercial circles he became widely known for his scientific study of Trade-marks, and a very complicated matter this often was to deal with. Owing to their growing multiplicity, infringements, intentional or otherwise, became more frequent than hitherto was the case, and his services, freely given, were often invoked to deal with difficult cases. He acted on more than one Special Commission in connection with this, and his opinion was authoritative and always listened to with respect.

In the account of his Herbarium, presented by him to the Museum of the Victoria University of Manchester (1917), some interesting remarks as to its formation are given (see Mem. & Proc. Manch. Lit. & Phil. Soc. lxi. pt. 2).

The foundations were laid in 1860, when Bailey was attending a course of lectures by the late Professor W. C. Williamson of Owen's College. These imbued him with the desire to take up the study scientifically, and he considered Dr. Williamson the "mainspring" therefore of the whole scheme developing in his mind, and, on that ground, primarily, his decision to bequeath the completed collection to its present destination was matured.

I have several times inspected it, both when at Whalley Range, Manchester, St. Anne's-on-Sea, and Cleeve Hill, Cheltenham. At St. Anne's two contiguous houses were purchased, one of which was entirely filled with it. At the latter place he erected (on a site commanding to the westward a wonderfully beautiful and extensive view) a house planned to contain a very large room, measuring 42×25 feet, connected with the house itself by a long passage, where the Herbarium was very methodically arranged *en bloc*. All care was taken as to heating, dryness, and lighting; and, though many sheets contained unmounted examples, this has since been rectified by a considerable sum presented by him for this special purpose.

All plants collected by himself—and these were mostly British—were recorded precisely in a two-volumed MS. book, kept written up to date for over fifty years.

The main Continental and General Palæarctic portion was arranged in accordance with "Nyman's Conspectus Floræ Europeæ" and Boissier's "Flora Orientalis." All critical genera are specially treated—such, for example, as *Rubus*, *Rosa*, and *Hieracium*—and extensive series of names compiled, *e. g.*, of the Brambles 6,900 items, of Rosa 10,000, of the Hawkweeds no less than 17,600. The total number of sheets were: of British 88,823, of foreign 209,397.

Mr. Bailey also presented his Library to the University, containing not only botanical works, but archæological and other branches of science, especially referring to Palestine, Egypt, and Chaldæa.

I mentioned just now that it was chiefly British plants he collected himself, but he found time for three expeditions to Europe—viz., to Norway and the Dovrefeld Mountains, to Switzerland, and the Rhine.

In the Botanical Exchange Club of the British Isles he took the greatest possible interest, being a Member from 1869–78 and, on its reconstruction, from 1879–1918; acting as Secretary and Treasurer, and occasionally as Distributor, during that long period.

In 1865 he was elected a Member of the Manchester Literary and Philosophical Society, and for many years served on its Council, acting as its Treasurer, and occupied the Presidental chair for two years (1901–3).

He was a Member of the Manchester Field Club, and served as President more than once.

He also founded a small and select society in Manchester devoted to microscopical research, called the Leeuwenhoek Club, mainly composed of a few intimate friends.

He was elected F.L.S. in 1878, and, in 1902, the honorary degree of M Sc. was conferred upon him by the University of Manchester.

His writings were mostly confined to short notices of the occurrence of a rare plant or variety in Great Britain or Ireland, published in the volumes of the Memoirs and Proceedings of the Manchester Lit. and Phil. Society between 1866 and 1909; but an important paper, entitled "On the Structure, Occurrence in Lancashire, and

probable Source of *Naias graminea* Delile var. *Delilei* Magnus" (Mem. & Proc. L. & P. Society, vol. x. ser. 3 (1884), and Journ. Bot. 305 *et seq.* (1884) pls. 249–252), calls for special mention. It was in this same locality that Mr. Bailey first gathered *Chara Braunii* Gmelin.

"Some Notes on the adventitious Vegetation of the Sand-hills at St. Anne's-on-Sea, W. Lancashire" (Mem. & Proc. &c. vols. xlvii., li, & liv.) are of general interest.

Gradually his health began to fail, soon after he and Mrs. Bailey had taken up their residence at Cleeve Hill, and, a change to a more equable climate being recommended, a move was made to St. Mary Church, Torquay, where, after a few years of quiet repose, he passed away, his devoted wife surviving him.

In conclusion, I would quote a few sympathetic words from the 'Manchester Guardian,' written by his friend, Dr. F. E. Weiss, F.R.S., the present Professor of Botany at Manchester University:—

"Through all recognition by his fellow-citizens and fellow-scientists of his merits, Charles Bailey preserved his innate modesty, and always shrank from taking a prominent position such as his distinction warranted. Ever anxious to help, he preferred to be a private in the ranks, where he could always be relied upon to do more than his share of the work. His integrity and kindliness endeared him to a large circle, and all who came into touch with the charm of his personality will mourn his loss as that of a true and sincere friend."

J. Cosmo Melvill.

A bryologist whose death, which occurred in 1922, has not yet been recorded in these pages was Edward Cleminshaw, of whom a notice (to which we are indebted) appears in the *Report of the British Bryological Society for* 1924. He was born in 1849, and educated under Temple at Rugby School, where he took a prominent part in the foundation of the School Natural History Society; he obtained a scholarship at Merton, and graduated with first-class honours in Natural Science. On leaving Oxford he became Science Master at Sherborne School, and later entered Messrs. Chance's works at Oldbury, Birmingham, as analyst. Cleminshaw was a prominent member of the Birmingham Natural History Society, devoting himself especially to Mosses; he joined the Moss Exchange Club in 1901, and co-operated with J. E. Bagnall, who induced him to take up the study in the paper on "The Mosses and Hepatics of Warwickshire," published in this Journal for 1903. Among other work on Mosses he arranged the important collection belonging to the University of Birmingham. His extensive collections are in the possession of Rugby School.

NOTES ON BRITISH PLANTS.

LOBELIA URENS L. IN SUSSEX. A specimen of this species has been received at the Natural History Museum from Mr. E. J. Bedford, sent to him from a heath in East Sussex. Another specimen brought for determination by Mrs. E. Rothwell was from near Christchurch in Hants, which, I think, is a new locality for it. There seems no reason to doubt the natural origin in the first case, and, though in the second there were several interesting aliens close by, the habitat was such that the plant might well be an overlooked native. These records are of special interest, following as they do upon the relatively recent first Hampshire record, which was an eastward extension of its known British range and which the Sussex record increases.—A. J. WILMOTT.

RANUNCULUS GRAMINEUS L. IN BRITAIN. A good specimen of this plant has been found by me lying in the Stephens Herbarium belonging to the old-established Bristol Naturalists' Society. It is beyond doubt the correct species, and the sheet is marked with its name and the locality, "Lundy Island."

The Herbarium was mainly formed by Dr. H. O. Stephens, a Bristol medical man, who collected and wrote about local plants between 1835 and 1860. There is no date on the sheet or collector's name, and the writing is not that of Dr. Stephens, but from comparison of local events it seems probable the specimen is the one gathered by Mr. Robert Etheridge, F.R.S., on Lundy Island in 1854 or 1855, and the record of it was communicated by Mr. J. G. Baker to *The Phytologist*, 1855-56, 120.

R. gramineus has for many years been omitted from the British Flora, because no authentic specimen was forthcoming. Dr. G. C. Druce, in a paper on "Dubious Plants of Britain" in the *B. E. C. Report*, 1919, 740, gives the history of the plant as then known, but regards Withering's example from N. Wales as of doubtful origin and Etheridge's as probably a form of *R. Flammula*. It is a native of south-west Europe, extending through South Switzerland.

Robert Etheridge resided in Bristol between 1840 and 1858, and was thus a contemporary in this city with Dr. Stephens. He is better known as a Geologist than a Botanist, and was a man of much ability. He was the Curator of the important Bristol Institution, a scientific forerunner of the present Bristol Museum, as well as Lecturer on Botany at the Medical School. He was afterwards Assistant-Keeper in the Department of Geology, British Museum, and died in 1902.

Lundy Island is a mass of granite, and its northern part is about 200 feet above sea-level. As *R. gramineus* is considered a plant of dry high-lying pastures, this altitude may not seem sufficient to suit a native growth, but the heavy mists always prevalent may make the dry soil similar to the high hills of Wales, the most likely locality for its discovery by some ardent enthusiast. Sea-birds or privateers in olden times might have accidentally brought seeds to the island, but, on the other hand, it is not reasonable to suppose any islander

obtained and grew seeds for the garden, because the inhabitants have always been very few and isolated.—IDA M. ROPER.

THE Lancashire sand-dunes and their vegetation are described by Dr. Otto Darbishire and illustrated by twelve photographic plates in the last number of the *Vegetationsbilder* (Series xvi. Heft. 1 & 2), edited by Dr. Karsten and Dr. Schenck.

REVIEWS.

Flora of South Australia. Part II. *Casuarinaceæ–Euphorbiaceæ.* By J. M. BLACK. With Illustrations by the Author. Pp. 155–358. Adelaide: Rogers, 1924. Price 5*s*.

THE first part of this important work was noticed in this Journal for 1923 (p. 27), when its general scope and plan were detailed at some length. The second part appears with commendable promptitude, and exhibits the many excellent features as well as the few points suggesting criticism that were indicated on the former occasion—we still miss any indication whether any of the species to which the author's name is appended (*e. g.*, 7 of the 23 species of *Swainsona*) are here first described, though the fact that new combinations are specified as such leads one to suppose that such is not the case. These new combinations, by the way, have evidently been carefully done; in some instances they result from transference—thus *Hutchinsia* is enriched by three species previously placed in *Thlaspi* and *Capsella* which "only differ from the hitherto accepted Hutchinsias by having the pod more or less winged at summit." In others they are caused by the adoption of the earliest trivial, the dates of the synonyms being given—thus under "*Pachycornia triandra* (F. v. M.) comb. nov." we find "*P. robusta* (F. v. M.) Hook. f. (1883); *Arthrocnemum triandrum* F. v. M. (1859); *Salicornia robusta* F. v. M. (1868)"; with a note that Mueller's earliest name was given under a misapprehension, "his later name was more appropriate but cannot be maintained under article 50 of the International Rules, which does not allow a published name to be changed on the ground that it is badly chosen."

The number of introduced plants, only those which are well established being included, is very large; these are more fully treated in the author's *Naturalised Flora of South Australia*. *Trifolium* and *Medicago* (the former represented by 17 species, the latter by 12) are introductions, as are 7 of the 11 Euphorbias and 5 out of the 7 Mesembryanthemums.

The illustrations by the author should be very useful, though the grouping of two or more species on the same page ("plate" is hardly the right word for figures in the text) is inconvenient, especially as, though each is referred to in the text relating to it, the page on which it is to be found is not there indicated. The figures of the fruits of *Atriplex* and *Bassia* should be helpful. Many of the figures (notably those of plants which are also British) are from other

sources, and, though useful, are less satisfactory than those by the author.

Numerous small indications show that the work as a whole has been very carefully executed; its cheapness (five shillings for two hundred pages) should facilitate its distribution and promote the knowledge of the Flora among those for whom it has been produced. We, however, venture to repeat the suggestion with which our former notice ended—that the blank pages at the end, or for that matter the wrapper, might be used for a temporary index to the genera, or at least the families, contained in each part.

JAMES BRITTEN.

Contributions to the Knowledge of the Vegetation of the Canary Islands (Teneriffe and Gran Canaria). By F. BØRGESEN, in D. Kgl. Dansk. Vidensk. Selsk. Skr., naturvid. og mathem. Afd. 8. Række, vi. 3 (1924); 4to, pp. 285–398. Price 7 kr. 50.

DR. F. BØRGESEN stayed in the Canary Islands from January to April 1921, with the main object of collecting Algæ along the coasts. His interest in the terrestrial flora was aroused and the result is a paper of 113 pages. This paper is of special interest for two reasons: firstly, because of the detailed field-notes concerning individual species, and, secondly, because the author has applied the methods of Raunkiær in determining the life-form of all the species collected, and tabulating his results, for each type of vegetation, in the form of biological spectra contrasted with Raunkiær's normal spectrum. The following associations are considered in some detail: sandy beach, dunes, rocky shore, dry flats and hills, rocky slopes and lava-streams of the lowlands, and maqui, laurel-wood, and pine-wood of the montane altitudinal zone, or, as it is called, the "montanic region."

In spite of the fact that the species collected only represented the flora of about a quarter of the year over a limited area comparison of the spectra of the different associations yields some interesting facts. Thus for the lowlands the therophyte percentage is relatively high especially for the rocky slopes, though in the associations of the lava-streams, rocky shore, and dry hills and flats the nanophyte and chamæphyte percentages are increased and approach that of the therophytes. In the montane zone, on the other hand, the phanerophytes become the dominating group. In the laurel-wood the percentage of hemicryptophytes follows in numerically decreasing order that of the phanerophytes and there is an approach to the normal spectrum.

The paper is illustrated by fifty-eight figures, the majority reproductions of photographs, and is accompanied by a bibliography. An appendix by E. A. Wainiö is a list of the lichens collected, with the description of eight new species and several new forms, together with some systematic and descriptive notes of other species.

It is possibly of interest to readers to have the following references

concerning Raunkiær's work on life-forms and the biological spectra. It is unfortunate that more attention has not been given to the subject in this country, and it is suggested that any new British flora should give the life-form for each species. Of Raunkiær's own papers the following are easily read with a sufficient knowledge of French and German:—"Types biologiques pour la Géographie Botanique" in Oversigt. K. D. V. S. Förhandl. 1905, 347; "Statistik der Lebensformen als Grundlage für die biologische Pflanzengeographie" in Beih. Bot. Centrallbl. xxvii. 171 (1910); "Recherches statistiques sur les formations végétales" in K. Dansk. Vidensk. Selskab. Biol. Meddel. I. (1918). An excellent summary, in English, of those of Raunkiær's papers which had been published up to the early part of 1913, is given by W. G. Smith in the Journal of Ecology, i. 16 (1913).

W. B. TURRILL.

The Biology of Flowering Plants. By MACGREGOR SKENE, D.Sc. Pp. xi, 523, with 8 half-tone plates and 68 illustrations in text. London: Sidgwick & Jackson, 1924. Price 16*s*.

THE author is Lecturer in Plant Physiology in the University of Aberdeen, a centre where—first under Professor Dickie and later, and even more especially, under the late Professor Trail—practical botanical training in the field and forest has been supplemented by work in the laboratory rather than *vice versa*. It is understandable therefore that Dr. Skene should approach the subject from the dual standpoint of the physiologist and the plant-naturalist.

In former works the author has dealt with Systematic Botany and some aspects of Ecology, but here he studies the plant from another view-point. While it is not a book on ecology, it may be looked upon as one which in part supplies the kind of training necessary for this subject—a subject which suffers more from its non-physiological and non-systematic friends than from all its enemies. Dr. Skene treats the plant as an individual, a unit in relation to its own particular environment, and not as a member of a plant community. He gives an up-to-date presentment of the natural history of the flowering plant, summarising and co-ordinating the results of many recent researches. Naturally, the subject is by no means exhausted, but the volume contains a great amount of valuable information.

The book is divided into six chapters: I. The Absorption of Water and Salts; II. Assimilation and Transpiration; III. Special Modes of Nutrition; IV. Mechanical Problems: Protection; V. Reproduction and Dispersal; VI. Development. Each chapter is conveniently split up into sections, the pages of which are given in the general table of contents. For instance, the shortest chapter (III) contains the following sections: Parasites, 218; Saprophytes, 240; Mycotrophic plants, 244; Bacterial Symbiosis, 258; and Insectivorous plants, 267. After a short introduction the sections are usually again subdivided, each subsection being headed by a name in bold type.

In the case of Mycotrophic Plants the subsections are: Ectotrophic mycorhiza; Endotrophic mycorhiza; *Calluna*; the Orchids; Germination of Orchid Seeds; *Gastrodia*; Relation to the Fungus; and Other Cases. It is pleasant to find in a work of this kind prominence given to researches admittedly interesting and important, but often regarded as too technical or specialised for publication outside text-books and scientific journals. It is difficult to make a representative selection, but among others may be mentioned the investigations of root-systems by Cannon and Weaver, with copies of the original illustrations, the work on cell-absorption by Stiles and Kidd, Brown and Escombe's diffusion of gases through pores, leaf-nodules due to bacterial symbiosis, Czaja's recent investigations on the mechanism of the opening of the valve in *Utricularia*, and Von Frisch's experiments on the colour-sense of insects. From these excerpts and examples it will be appreciated that the subject-matter is conveniently arranged for the student and easy of access for the more advanced worker. Especially to the latter, by no means the least important feature is the up-to-date bibliography, comprising more than 600 references. For convenience of consultation, these should have been consecutively numbered.

The book is well illustrated with eight half-tone plates and sixty-eight carefully selected text-figures, mostly the work of Miss A. M. Davidson; many of them are original. It is unfortunate that it has not been possible to publish the book at a lower price than 16*s*., for it is a work that should be in the hands of all students and lovers of botany; it is a mine of useful information, from which the treasure can be extracted easily and pleasantly.

K. W. Braid.

The Cultivated Evergreens. By L. H. Bailey. In the Review of this book published in the December number of the Journal the price was given as 3*s*. 6*d*.—it should have been 31*s*. 6*d*.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on November 20, Prof. F. W. Oliver, F.R.S., by means of a series of lantern-slides, illustrated the changes which had taken place in the vegetation of certain areas after a lapse of years. These included the development in a salt-marsh at Erquy after 18 years; the spread of *Spartina Townsendii* at Poole Harbour after 13 years; the rise of sand-dunes under *Psamma* at Blakeney Point, and a topographical series of aeroplane photos from the same locality.

Miss E. M. Blackwell showed the graft-hybrid *Cytisus Adami* in fruit, from the garden of the Royal Holloway College. The fruiting is a rare occurrence, but last summer the tree, for the first time since it was planted 30 years ago, bore three kinds of fruit, namely, of the hybrid and of the two parents—*C. purpureus* and *C. Laburnum*. The fruit of the hybrid contained no seeds, but was an insect-gall.

At the meeting on December 4, the President (Dr. A. B. Rendle) exhibited specimens of *Rafflesia Arnoldi* and *Brugmansia Lowii*, which had been sent to the British Museum by Mr. Edward Jacobson, of Fort de Kock, Sumatra. The specimens came from a forest near the West Coast of Sumatra, at an altitude of 800–1200 metres. Both plants are parasitic on the roots of a vine (a species of *Cissus*), and, except for slender threads permeating the tissue of the host, consist merely of a large flower; that of *Rafflesia* measured 18 inches across. Some lantern-slides were shown depicting plants of *Rafflesia* in their native habitat, and also details of the floral structure.

Dr. G. Claridge Druce showed a series of rare British plants: *Plantago Edmonstonei* (possibly a hybrid—*P. lanceolata* × *P. maritima*); *Epipogum aphyllum* Sw., of which the recent history was given; *Taraxacum Drucei* Dahlst.; and *Senecio aquaticus* var. *ornatus* Druce.

Miss V. Hay gave an account of the young and adult stages of *Sophora tetraptera*, a species of Leguminosæ from New Zealand. First, such well-known instances as *Ulex* and *Eucalyptus* were referred to, where the seedling foliage differs widely from the adult. Lantern-slides were shown illustrating the persistence of juvenile leaf-form during several years, seedlings of *Sophora tetraptera* and var. *microphylla* with the two forms of leaves, juvenile and adult; also var. *prostrata* in similar conditions. Thus, adopting Cheeseman's views, we have one species with three varieties, or there may be three closely-related species. The plants may be set out thus:—

Var. *microphylla* ..... Seedling → Juvenile → Adult.
„ *prostrata* ..... Seedling → Persistent Juvenile.
„ *grandiflora* ..... Seedling → Adult.

Usually the opinion of Goebel is adopted in considering the juvenile form as one adapted to less light and more moisture than the adult, but this explanation seems to fail in these instances, as both sets of phenomena can be found side by side under identical conditions; it seems to be a problem calling for investigation by botanists in New Zealand.

Miss Violet M. Grubb followed with a paper on "The Development and Liberation of Spermatia in some Undescribed Cases among the Red Algæ." Although nearly 150 years have passed since the first record of spermatia in the Red Algæ was made, little is known about them. The author has collected twenty-three species, in fifteen of which this stage was practically unknown. In *Nitophyllum Hilliæ* Grev. the mother-cells of the antheridia are cut off on both surfaces of the single layer of thallus cells, and each mother-cell puts up in succession three beak-like protuberances, enclosed in the gelatinous extended mother cell-wall. The contents escape when ripe through an apical slit as a single spermatium clothed in a delicate

wall. A similar development is found in *Callithamnion brachiatum* Bornem., where the antheridia are borne in clusters on the terminal pinnæ; secondary and tertiary antheridia grow up within the empty sheaths of the primary ones. The cytology is the same in every case. All cases of antheridial development do not follow the same course as the above, but the comparative study of the spermatia in the Red Algæ emphasises in a striking way the fundamental resemblances of the species throughout this group, and adds another link to the proof of their common origin.

Royal Institution and the British Association. On the evening of December 17th a pleasant réunion was held at the Royal Institution, when the members of the British Association were the guests. A large number of sketches and photographs taken by the members during the recent Canadian trip were exhibited and also geological and botanical specimens. Short addresses were given on agricultural and geological impressions, and a cinema film taken under the direction of the Ontario Government, and featuring aspects of the meeting at Toronto and incidents in the subsequent Western tour, was exhibited and explained. One section of the film illustrated the trip made by the botanists to Lake Timagami.

We note with regret that Mr. R. Irwin Lynch, A.L.S., Curator of the Cambridge Botanic Garden from 1879–1919, died at Torquay on December 7 last. Several generations of Cambridge botanists have a very grateful remembrance of help received from Mr. Lynch in the course of their work. In recognition of his services to botanical science at the University, he was awarded the Honorary Degree of M.A. in 1906, and in 1908 he received the Victoria Medal of Honour from the Royal Horticultural Society. He was elected to the Associateship of the Linnean Society in 1881.

We have also to announce the death of Mr. J. A. Wheldon, M.Sc., A.L.S., of Liverpool. He contributed a paper on "Additions to the Scottish Sphagna" to the *Journal* as recently as November last. A notice of his life and work will appear in our next number.

The death is also announced of Mr. A. N. McAlpine, Professor of Botany at the West of Scotland Agricultural College, at Glasgow on Dec. 2. A writer in the *Gardeners' Chronicle* (Dec. 13) describes him as "a most popular demonstrator and one of the best-known figures in educational circles in Scotland," and "the only remaining member of the original staff of the College, which attained its majority this year."

Lt.-Col. Sir David Prain, C.M.G., C.I.E., F.R.S., formerly Director of the Royal Gardens, Kew, has been appointed a Trustee of the British Museum.

A small Handbook on the British Seaweeds is in course of preparation by Dr. Lily Batten, and will be issued during the coming year by the Trustees of the British Museum.

At the Publishers' request a portrait of the Editor has been included in the present issue.

THE FERTILISATION OF OPHRYS SPECULUM, O. LUTEA, AND O. FUSCA.

By Colonel M. J. Godfery, F.L.S.

The method of pollination of the flower in the genus *Ophrys* has been a riddle which, until recently, baffled all attempts at solution. Darwin showed that, with the exception of *O. apifera*, the flowers are only fertile if visited by insects. He mentioned that the two metallic "eyes" at the base of the lip, which are "curiously like a drop of fluid," gave some colour to Sprengel's idea of sham nectaries, but neither adopted this theory nor proposed an alternative. He stated that Müller observed drops of fluid on the lip of *O. muscifera* and saw a fly licking them up, but it did not remove the pollinia. He quoted G. E. Smith's statement that "Mr. Price has frequently witnessed attacks made upon the Bee Orchid by a bee" (see G. E. Smith, Cat. Pl. S. Kent, 25; 1829), but did not connect it with the pollination of *O. apifera*, which he thought was wholly self-fertilised. Müller stated that the base of the lip in *O Arachnites* is rich in glycose (Anat. Blumenbl. 90). The possibility of any attraction for insects other than nectar or edible tissue does not seem to have been even suspected. It is due to the brilliant observations of Monsieur M. Pouyanne*, Conseiller à la Cour d'Appel, Alger, that at length an intelligible solution of the problem has been reached.

Ophrys speculum. The species which furnished the key to the puzzle was *O. speculum*, a North-African plant of remarkable appearance. The lip is like an oval convex mirror (hence the name speculum) of a curious metallic violet-blue, glittering in the sun, with a narrow yellow border and a thick fringe of long *red hairs*. The short side-lobes, similarly fringed, overlap the mid-lobe in the attitude of wings at rest. The thread-like dark red petals resemble antennæ, recalling those of *O. muscifera*.

M. Pouyanne found, as a result of twenty years' observation, that *O. speculum* is visited by one insect only, *Dielis ciliata* F. (*Colpa aurea*), a bee rather longer than a hive-bee, each segment of whose abdomen is fringed with long *red hairs*. Only the males visit the flowers, the females paying no attention whatever to them. Very different is the behaviour of the males, which eagerly seek out any plants growing near the burrowing grounds, and are able to perceive them at some distance. One only needs to sit in the sunshine with a few spikes of *speculum* in the hand, when *Dielis* is about, to attract the insects. Before long some will settle on the flowers, sometimes two or three hustling each other on the same flower, till one remains in sole possession, and are so absorbed that they do not notice the presence of a spectator. This experiment, often repeated in successive years at various places in Algeria, always had the same result. If the labellum was cut off, no notice was taken of such mutilated flowers, the sole source of attraction being evidently in the lip. Detached flowers laid face upwards on the

* Correvon et Pouyanne, Journ. d'Hort. de France, Feb., Mar. 1916, 1, and Aug. 1923, 1.

ground are quite as attractive as when on their spikes, and are quickly found, but if placed face downwards, so that the mirror is hidden and only the green under surface with the fringe of red hair is visible the flowers are to some extent visited, but it takes the bees much longer to find them. A dozen spikes were concealed in newspaper; the bees became conscious of their presence, five or six alighted on the paper, going and coming with an agitated air, and two tried to crawl inside. Flowers hidden in a cardboard-box gave inconclusive results: on one occasion they clearly attracted the insects, on another no notice was taken of them. The bees were evidently able to perceive the presence of *speculum*, though hidden from sight, so long as the covering was not too thick. This may be due to a sense of smell keener than ours, for to us *speculum* has no perceptible scent. It is possible, however, that the males possess some sense at present unknown to us, akin to that by which the males of certain moths will find their way to a female shut up in a box. Several species of *Ophrys* have a distinct smell, that of *O. lutea* suggesting lemons, whilst *O. arachnitiformis* has an indefinable scent, and I was recently surprised to find that *O. aranifera*, in bulk, also emits an elusive odour. It would be interesting to ascertain whether the female of the visiting insect has a similar smell.

It is unquestionable that *O. speculum* possesses a mysterious attraction for the males of *Dielis ciliata*, which does not appear to be exercised by any other species of *Ophrys*. On the other hand, M. Pouyanne has never seen the flowers of *speculum* visited by any other insect. It appears to be so highly specialised as to appeal to only one species, and, further, only to the males to the exclusion of the females. It is evident, therefore, that in some way or other the question of sex comes into play.

The lip of *speculum* bears a curious resemblance to the female of *D. ciliata*. The dense fringe of red hairs suggests the red-haired abdomen of the queen bee, the base of the lip looks like the thorax and head of an insect, and the dark-coloured filiform petals resemble antennæ, which in *Dielis* are much shorter in the female than in the male. But what is the meaning of the mirror-like centre of the lip? M. Pouyanne asked himself this question in vain till he was able to observe the females of *Dielis* at close quarters. He found that when these are at rest, or crawling on the ground, with the wings half-crossed, the latter, which are strongly suffused with dark blue, present beautiful metallic reflections, especially in sunlight. It is difficult, he says, to escape the conviction that the mirror of *speculum*, with its sheen of violet-blue, corresponds to the reflections from the wings of the female, and contributes powerfully to attract the males, whose wings are whitish and transparent. The resemblance of the flower to *D. ciliata* ♀ is not close enough to deceive the human eye. The sight of insects is myopic and very inferior to ours—what is a superficial resemblance to us appears to suffice for them. The likeness need not be perfect, so long as certain salient points are suggested. The males have an imperious and irresistible sex-instinct, and in their eager haste to perform the task which is the supreme

object of their lives, in the face of considerable competition, have no time for discrimination, and cannot afford to neglect any possible chance of finding a mate.

Dielis ciliata belongs to the *Scoliidæ*, a family of burrowing hymenoptera whose burrows are made in dry sandy banks exposed to the sun. The larvæ live underground, the males emerging about one month before the females. M. Pouyanne informs me that the latter lead an almost subterranean life, searching for worms (which they paralyse with their stings as food for their larvæ), and hardly leave the soil except for nourishment and to perpetuate the species. The males may very often be seen in March, skimming, with a swift zig-zag flight, the ramparts and railway-banks in Algeria, which are also the favourite stations of *O. speculum*. There they perform an intricate and endless dance in the hope of finding some female emerging from the earth. Immediately, they are on the spot, three or four at a time, eager to fight for her possession. "Il est de règle que les mâles, plus précoces, font bonne garde autour du lieu natal, et surveillent la sortie des femelles, qu'ils harcèlent de leurs poursuites aussitôt venues au jour" (Fabre, Souvenirs entom. iii. 5).

M. Pouyanne found that the flowers of *speculum* are not visited for nectar or any sweet edible tissue, in which case they would be attractive to males and females alike. Both sexes visit other flowers for nectar, and may be seen on *Reseda Phyteuma*, *Centaurea pullata*, *Galactites tomentosa*, and *Malva sylvestris*. Then they visibly employ the proboscis to suck up nectar. Nothing of this sort occurs when the males visit *speculum*. The proboscis is not brought into play and the head does not come into contact with the labellum, as verified at close quarters by M. Pouyanne on many occasions. The male places himself on the flower lengthwise, head inwards, just beneath the rostellum, and plunges his tail into the fringe of long red hairs at the tip of the lip. "Le bout de l'abdomen est alors agité contra ces poils, de mouvements désordonnés, presque convulsifs, et l'insecte tout entier se trémousse; ses mouvements, son attitude paraissent tout à fait semblable à ceux des insectes qui pratiquent des tentatives de copulation" (Correvon et Pouyanne, Journ. d'Hort. de France, Févr.–Mars, 1916, p. 5). In the course of these brusque movements the male never fails to carry off the pollinia, adhering, like two little horns, between the eyes, often collecting two or three pairs, easily visible during flight by their bright yellow colour. After the usual movement of depression, the pollinia project horizontally forward, thus coming into contact with the stigma of the next flower visited and effecting its pollination.

The flowers are only visited before the females emerge, which they do about a month later than the males. If *speculum* flowers later, or the females come out earlier than usual, this period may be shortened.

The first flowers opened are therefore the most likely to be fertilised—the later ones are often not visited at all. A calm atmosphere and bright sunshine are essential, for the males are not active in wind or rain—a fact which further reduces the number of days when

pollination can take place. The males seldom quit the ground where the female pupæ lie, so that the extent to which *O. speculum* is fertilised depends largely on its proximity to the burrows of *Dielis*. The great abundance of the latter round Alger makes it easy to witness its visits to *speculum*, and accounts for the relatively large proportion of seed-capsules produced, the average yield according to M. Pouyanne's estimate being 40 %, whilst *O. fusca* barely gives 20 and *O. lutea* often only 5 to 10 %.

Such is the evidence of M. Pouyanne, whose refusal to admit the conclusiveness of his observations till confirmed by repeated experiments in successive years is beyond all praise. I may say that whilst watching *O. arachnitiformis* at Hyères I have seen facts closely analogous to those described by him. I often witnessed the swift skimming zig-zag flight of the males without realising that they were quartering the ground in search of a mate. It was long before I saw one alight on a flower, but when it did so it was at once knocked off by an impetuous newcomer. On another occasion I caught three bees on the same flower with one sweep of the net, showing the same keenness of competition as in the case of *Dielis*. This was near a dry sandy bank facing south, where the plants were few and scattered, and almost every flower open was fertilised (Journ. Bot. 1922, 359). It did not then occur to me that this great fertility was due to the proximity of an ideal bank for burrows, although I noticed on moving off to flat ground half a mile away, where *arachnitiformis* was much more plentiful, that there were no more bees to be seen flying about.

M. Pouyanne has kindly informed me that on several occasions in 1924 he saw *Dielis* males pursuing the females, especially when crawling on the ground. They alighted on the back of the latter, and performed exactly the same movements as he had so often seen executed on the flowers of *speculum*. This supplies the last link required to complete the chain of evidence as to the object of their visits.

Ophrys lutea Cav. Although this plant is widely spread in the environs of Alger, and is more abundant than *O. speculum*, it is extremely difficult to see any insect visit the flowers. The opportunities of doing so are limited, as it flowers in March, when calm sunny days are comparatively few. The visiting insects are smaller and less conspicuous than *Dielis*, and much more difficult to see, and are relatively so scarce that a large proportion of the flowers of *lutea* are never visited at all. In 1891 M. Pouyanne witnessed the pollination of *O. lutea* in a particularly favourable station, since destroyed. It was effected by small hymenoptera half the size of a bee, which placed themselves on the flower in what he calls the *reverse* position, *i. e.* with the head directed *outwards*, and carried off the pollinia not on the head, but on the tail! Since that date, although he several times caught insects with the pollinia of *O. lutea* on their tails, he never succeeded again in witnessing an actual visit to the flower until 1924, when fortune unexpectedly favoured him. Previous observations had showed him that in some stations, *e. g.*, 1 km. from Alger, not a single flower was fertilised—perhaps the requisite insect

did not occur so near the town. At another station, where *lutea* was so abundant that it could almost be mown, it yielded barely 5 to 10 % of seed-capsules. Here it grew in rather damp flat clayey meadows admirably adapted for the germination and vegetative increase of the plant, but where the insects were rare, the ground being unsuitable for their burrows. In a large meadow several kilometres from the town, four groups of *O. lutea*, 50–100 m. apart, gave the following results: 1st and 2nd groups, 10–12 % of flowers fertilised, 3rd group 30 %, 4th group 3 %. Here the ground was more broken up, and there were small banks suitable for burrows, to the immediate proximity of which the fertility of the third group was no doubt due. At Fort l'Empereur, 4 km. from Alger, the enormous proportion of 70 to 80 % of capsules was produced. Here then was a station where the visiting insect was plentiful, and observation likely to succeed. On March 23rd, 1924, M. Pouyanne repeatedly witnessed small hymenoptera, subsequently identified at the Paris Museum as *Andrena nigro-olivacea* Dours ♂ and *A. senecionis* Perez ♂, place themselves on the flowers in the reverse position, exactly on the dark marking (representing the female) in the middle of the bright yellow lip, and carry off the pollinia attached to the upper part of the extremity of the abdomen. One insect which alighted in the direct position (head inwards) at once turned round and assumed the reverse position. A few days later, he exposed cut flowers of *lutea* brought from another station, and before long the little bees visited the flowers, on which they remained from 1 to 2 minutes. Some were so engrossed that they were not disturbed by taking the flower in the hand. M. Pouyanne was thus able to watch them sufficiently near to make sure that they were not seeking honey or edible tissue, but made exactly the same movements as those of *Dielis ciliata* on *O. speculum*, plunging the abdomen into the cavity at the base of the lip with its cushion of hairs, and agitating it nervously from right to left. These observations were made on a steep bank with only four or five plants of *lutea* in one corner, and four or five others some 50 metres away. They were rendered possible by the fact that the insects were more abundant than the plants, giving rise to keen competition. In fields elsewhere, in which *lutea* was extremely plentiful, nothing of the sort was to be seen, and the number of subsequent capsules was very small.

The construction of the labellum in *O. lutea* is essentially different from that of all other species of *Ophrys*, except *O. fusca* and its near ally *O. atlantica*, which are built on the same plan. The lip is oblong with short rounded side-lobes and a broad emarginate mid-lobe, and has a wide bright-yellow border and a dark-coloured raised area in the centre shorter than the lip, and with blue reflections towards the base. This, in M. Pouyanne's opinion, represents the queen bee at rest on a broad yellow flower, head outwards, and the male accordingly faces the same way and is of correspondingly small dimensions. In *O. speculum* the *whole lip* simulates a female facing inwards, and the male is proportionately larger and faces in the same direction. The resemblance of the lip in *O. speculum* to the rather

conspicuous *Dielis ciliata* ♀ is so close as to attract the males of that species only, but in *lutea* the marking simulates a darker and smaller insect, much less distinctive in appearance, and the likeness is more general and less definite. As a result, two species of *Andrena* visit the flowers, and a third hymenopteron, believed to be a species of *Halictus*, was also taken on them. These are all much smaller than *Dielis*, and about ½ to ⅓ the size of a hive-bee. A small-flowered form, sometimes called *O. lutea minor*, has two dark curved marks near the apex of the lip, which are suggestive of the fore-legs of an insect and perhaps add to the illusion that it is facing outwards. In the case of the *Andrenæ* the viscid discs were attacked a little above the end of the abdomen, the lower part of the caudicle resting on its last segment and the pollinia projecting a little beyond the tip.

On March 24th, 1924, M. Pouyanne wrote:—I was able yesterday, at least a dozen times, to see these little hymenoptera visit the flowers of *lutea* under my very eyes. All assumed the reverse position, placing themselves exactly on the markings representing the insect, and remained on the flower "un bon moment." They made the same movements with the abdomen as those of *Dielis* on *O. speculum*, the tail being plunged most of the time into the cavity at the base of the lip.

Ophrys fusca Link is much less frequent in Algeria than either *lutea* or *speculum*, and as it flowers so early (Jan.–Feb.) it is much more difficult to witness its pollination. M. Pouyanne has only once succeeded in doing so, on the railway embankment at Blidah, in 1905, all subsequent attempts having been in vain. The insect, which was unfortunately never identified, assumed the "reverse" position on the dark-coloured marking on the inner half of the lip and plunged its tail into the cavity at its base, finally emerging with one pollinium on the tip of the abdomen. M. Pouyanne had previously seen, at Alger, a black hymenopteron flying round a group of *O. fusca* with 4–6 pollinia on its tail at the end of January when no other species of *Ophrys* was in flower, and he has since twice seen similar insects on the wing with the pollinia of *O. fusca* on the tail, one of which was twice as big as the other and probably belonged to a different species.

Two varieties of *O. fusca* which flower in April occur in Algeria: one has very small flowers ½ to ⅓ as big as the type, and the other, rather frequent in sand near the sea at Sidi Ferrueh, has flowers about twice the ordinary size. These variations in size and in the time of flowering are no doubt correlated with the dimensions and dates of appearance of different species of insects concerned with the pollination of the flowers. A small-flowered form (var. *funerea* Viv.) and a form with flowers at least twice as big as the type occur also on the French Riviera.

On April 1st, 1924, I was looking at some orchids which I had planted in the garden of the Hôtel Continental at Hyères, when I saw a blackish insect alight on a flower of *O. fusca*. I knelt down, put on my eye-glasses, and saw the whole process clearly. He entered the helmet head-first, but at once turned round and, grasping the

sides of the labellum with his feet, fixed himself firmly there, with his tail in the cavity at the base of the lip. He paid no attention to me, but all the time kept wriggling his body and moving his abdomen about in a very lively manner. He continued to do so for what seemed quite a long time, more than a minute, perhaps two minutes. When he finally withdrew his tail from the throat of the flower, it had two bright yellow pollinia on it. I noticed that they were not symmetrically arranged, but one projected farther out than the other. He rested a few moments on the lip, and I tried to catch him by snapping off the flower with my eyeglass-case, but he was too quick for me, and I had the mortification of seeing him fly away with his yellow appendages. On examining the flower I found the anther empty, a quantity of pollen on the stigma, and one pollinium attached to the right-hand sepal by its viscid disc. It would seem therefore that he had brought one pollinium with him, with which he had pollinated the stigma, and withdrawn the two pollinia from the anther, one of which, in the course of his strenuous movements, had been rubbed off against the sepal before the viscid matter of the disc had had time to set firmly.

The next day was wet, but the following morning, when watching with my net, I saw a similar insect settle on *O. fusca*. I lowered the net over him, so that he was in a cage, and, although I accidentally touched the plant, it did not disturb him. I saw him go through exactly the same evolutions as his predecessor, and secured him when he flew up into the net. It never rains but it pours. On March 31st Mr. St. Quintin and Major Van der Weyer saw at Costebelle a bee leaving *O. fusca* with pollinia on its tail, but could not catch it, and on the very day on which I caught my specimen the latter took a bee on *O. fusca* with two pollinia on its tail. These bees were identified at the Paris Museum of Natural History as *Andrena trimmerana* Kirby ♂ and *A. nigrocænea* var. *nigrosericea* Dours ♂ respectively.

A. trimmerana had been previously taken by me on *Ophrys arachnitiformis* at Hyères on March 14th, 1921, bearing its pollinia (Journ. Bot. 1922, 359). This bee therefore assumes the direct position when visiting the latter species, carrying off the pollinia on its head, and the *reverse* position on *O. fusca*, withdrawing the pollinia on its tail.

The lip of *O. fusca* resembles that of *O. lutea*, but is somewhat longer and narrower, dark purple in colour, and in some localities has a very narrow golden-yellow edge. The marking which simulates the insect is lighter than the rest of the lip, of variable and indefinite coloration, but more or less iridescent with greys and blues, probably suggesting, like the mirror of *O. speculum*, reflections from the closed wings of a bee.

I must confess that I have been unable to detect any obviou resemblance to an insect in the markings of the lip of *O. lutea* an *O. fusca* at all comparable with that of *muscifera* to a fly, nor coul I see anything to suggest that the insect supposed to be represente was in the reverse position. Nevertheless, it is undeniable that onl

males visit the flowers, that they seek neither nectar nor edible tissue, and that they act in exactly the same manner as if the marking on the lip were really a female of their own species. Nothing short of seeing this with my own eyes was sufficient to dismiss all doubts from my rather incredulous mind. It then became clear that, however fantastic the idea might appear, the behaviour of the male was only capable of one interpretation, and that, however vague the resemblance of the labellum might be to a female *Andrena*, it was sufficient to attract the males and retain them for some time on the flower. The observations made by Mr. St. Quintin, Major Van der Weyer, and myself at different localities near Hyères confirm those of M. Pouyanne in Algeria. It can be taken, I think, as established that *Ophrys speculum* is visited only by *Dielis ciliata* ♂, which carries the pollinia on its head, and that a similar service is performed for *O. lutea* by *Andrena nigro-olivacea* ♂ and *A. senecionis* ♂, and for *O. fusca* by *Andrena trimmerana* ♂ and *A. nigroænea* ♂, all of which remove the pollinia attached to the tail.

I am indebted to M. Lucien Berland of the Paris Muséum d'Histoire Naturelle for his kindness in identifying the insects named above.

THE HOME OF SEMPERVIVUM ARBOREUM L.

By R. Lloyd Praeger, D.Sc.

The origin of this well-known plant is something of a mystery. Linnæus, Sp. Pl. 464, defined its distribution as in "Lusitania, Creta, Corcyra, Zacintho," but the majority of later botanists have looked on it as introduced in Europe, although it is widely spread along the basin of the Mediterranean. *S. arboreum* is and has long been in cultivation; it is common in European gardens, also in and about gardens at Funchal in Madeira. It is generally set down as a Canarian plant, and has been definitely recorded from several of the islands of this group, but none of the native stations which have been assigned to it have stood the test of critical enquiry. It was unknown as a Canarian species to Webb and Berthelot (Phyt. Canariensis; see also Christ in Engler's Bot. Jahrb. ix. (1887) 108–113). R. T. Lowe, who describes the plant correctly and ought to have been familiar with it from his Madeiran work, recorded it (Man. Fl. Madeira, i. 337) from Tenerife, Hierro, and Lanzarote. R. P. Murray (Journ. of Bot. xxvii. (1899) 202) doubted these records, believing them to refer to the allied *S. holochrysum*. As regards the Tenerife station, Barranco de Martianez, where Lowe says it occurs "in vast profusion," Murray himself, Dr. Perez, Dr. Burchard, and I have all sought it without success, finding only *S. holochrysum* there. A specimen of Lowe's "*arboreum*" in the British Museum, collected by him in the Barranco de Martianez in 1857, has the glabrous inflorescence and sepals of *holochrysum*. The Lanzarote locality, El Valle or Los Valles, I searched recently without seeing a trace of it. At the Hierro station, "Las Vueltas above

Casa Blanca" (that is, the zig-zag road which ascends from El Golfo to the Risco de Jinama), *S. holochrysum* (?) occurs abundantly, but no *arboreum*. O. Kuntze (Rev. Gen. Plant. i. 229) "lumps" *arboreum*, *holochrysum*, and *Manriqueorum*, and his records of *arboreum* from Tenerife and Palma no doubt refer to the second of these species. Bornmüller (Engler's Bot. Jahrb. xxxiii. (1903) 430–431) and Christ (*loc. cit.*), both of whom paid much attention to the Canarian Semperviva, have nothing new to say regarding *S. arboreum*. Murray (*loc. cit.*) considered *S. arboreum* L.= *Manriqueorum* Bolle=*Doramæ* Webb, and claimed Gran Canaria as its home, on account of a plant which he gathered at El Dragonal, which "agreed perfectly with Portuguese *arboreum*." There is no specimen from this station among Murray's plants in the British Museum, but it seems likely that his plant was *Manriqueorum*, which is frequent on Grand Canary, but is certainly not identical with *arboreum*. Finally, Pitard and Proust (*Iles Canaries: Flore de l'Archipelago*, 1908) only quote Lowe's records for the plant.

Sempervivum arboreum is a widely-known species, and has been excellently figured several times, presumably from European specimens (De Candolle, Pl. Grasses, 125, 125 *bis*; Sibthorp, Fl. Græca, 473, Bot. Register, 99), and there is little reason for the confusion regarding it in the Canary Island records. Its rediscovery there—if it occurs at all!—is much to be desired. Botanical visitors to Tenerife wishing to familiarize themselves with the plant may see it in abundance in the garden of the Hotel Benitez, above Santa Cruz—the only place where I saw *S. arboreum* during three months spent in hunting Semperviva on the seven islands of the Canary archipelago.

But whatever may be its standing on the Canaries, it would appear that, after all, this species is native in the Mediterranean, for it is referred to by Dioscorides, and illustrated in the fine copy of his *Materia Medica* known as the "*Codex Vindobonensis*." The work of Dioscorides was written in the first century A.D. The passage in question runs as follows (I quote from the Latin translation in Sprengel's edition, i. 584, 1829):—

"Cap. LXXXVIII [De Sempervivo magno]. Sempervivum magnum ita nominatur quoniam folia semper virent. [Alius dicitur sempervirens, ambrosion, chrysospermon, zoophthalmon, buphthalmon, stergethron, sempiternum, aïchryson, holochryson, chrysanthemon, protogonon, borion, notion, prophetis paronychia aut chrysitis, Romanis ceracusia, aut Iovis caulis, diopetes etiam, aut sedum majus, Aegyptiis pamphanes.] Caules edit cubitales, aut majores, crassitudine pollicari, pingues, satis virentes, incisuris praeditos, ut tithymallus characias; folia pinguia, pollicia magnitudine, versus apicem linguæformia: et inferiora quidem folia in terram sunt reclinata: summa vero ita conferta, ut orbiculato ambitu oculum repraesentent. Nascitur in locis montanis: et in fictilibus nonnulli id plantant, quae super domibus collocantur." [Notes on its medical properties follow.]

The illustrated copy known as the "*Codex Vindobonensis*,"

which was published in facsimile at Leyden in 1906, is dated at about 512 A.D. The passage relating to *S. arboreum* (*Aeizoon to mega* is the Dioscoridean name) is illustrated by a figure of a large plant without flower, unquestionably *S. arboreum*, which appears on fol. 12 *verso*. (The following figure, *Aeizoon to mikron*, is an excellent representation of one of the *S. tectorum* group, which "nascitur in muris, rupibus, maceriis et sepulcris umbrosis" (Sprengel's translation, p. 585).

Some later (but still tolerably early) evidence of the occurrence of this plant in south-eastern Europe may be gleaned from Mattioli's Commentaries on Dioscorides. My references are to the Venice edition of 1583. In addition to *S. tectorum vel aff.* (p. 461, sub *Sedum majus*) he illustrates:

(1) "*Sempervivum arborescens* [a Sempervivum allied to *arboreum*, and possibly a young vigorous specimen of that species] (p. 464).

(2) "Sempervivum arborescens alterum" [*S. arboreum*, excellently portrayed] (p. 465). On p. 463 the author says, "Ceterum duas arborescentis Sempervivi plantas, quarum imagines hic appingi curauimus, alteram, quae major et fruticosior est Clarissimo Viro Augerio de Busbeke Flandro, qui eam Constantinopoli secum adduxit; alteram verò Iacobo Antonio Cortuso viro optimo atque doctissimo, cui Corcyra allata est, acceptas refero."

If the former of the two figures represents a second arborescent Sempervivum, it is certainly a pretty puzzle; but at least there is no doubt about *S. arboreum*.

In the British Museum (Dept. of Botany) there is a vellum folio volume of 418 plates copied from the Vienna Codex abovementioned; it dates from the second half of the 15th century. The Greek names are written above the figures in a contemporary hand; and pre-Linnean Latin names are added in a later hand below. Here *S. arboreum* is named *S. arborescens* and *S. tectorum* is named *S. majus vulgare*.

I think the Dioscoridean evidence in favour of this plant's being native in the eastern Mediterranean is incontrovertible. The suggestion, which might be made, that it was brought from the Canaries (to which its nearest allies are confined) by, say, the Phœnicians, who certainly explored that region, savours too much of romance; and we are faced by the fact that the plant can be nowhere found in its supposed Canarian home, where its allies are abundant. European botanists have not been unanimous in branding it as an escape; Boissier (Fl. Or. ii. 797) thinks it may be indigenous in Spain, and Nyman (Conspectus, Suppl. ii. 126) reports it as possibly a native in Mallorca. It is not likely to become extinct readily, as it affects rocks and cliffs; and it is to be hoped that we shall have news of it some day from Mediterranean habitats that are free from suspicion of introduction.

I have only one other word to say about this plant. The late James Britten drew attention (Journ. of Bot. lv. 15) to a drawing by James Forbes of "the Wild Sedum or House-leek Tree" (*S. arboreum*), made on St. Helena; he pointed out that a specimen collected by Banks and Solander in 1771 is in the British Museum, without any accompanying indication of its being a cultivated plant; and that Melliss in his *St. Helena* (1875) includes "S. sp. (?) yellow-flowered Crassula: cultivated and rare, in Gardens on the upper land. Hab. Canaries." The Banksian specimen is poor—a small inflorescence without leaves,—but it appears to be correctly named; and the occurrence of the plant on this remote rock so early as 1771 challenges the theory of introduction, and invites investigation.

THE GENUS PLEIOTAXIS STEETZ (COMPOSITÆ).

By SPENCER MOORE, B.Sc., F.L.S. *.

Pleiotaxis was founded by Steetz in Peters's *Reise nach Mossambique* (1863), and at the time (1877) when vol. iii. of *Flora of Tropical Africa* was published it still remained mŏnotypic, Welwitsch's material not being then available for description. However, in 1893 O. Hoffmann (Engler's Bot. Jahrb. xv.) described seven new species; he subsequently added two more and these, together with one each for which Hiern, R. E. Fries, and myself are respectively responsible, made up till the present time the thirteen known species of the genus. In addition to these, however, the Museum contains ten which appear to be new and one well-marked variety, and there is also one at Kew. Adding to these a species named in manuscript by Muschler, the total number of species now amounts to twenty-five.

The range of *Pleiotaxis* is a belt across the continent extending from Sena in Portuguese East Africa, where it was originally discovered, and Western Tanganyika Territory to Angola and the Kasai basin in the Belgian Congo. The genus is well-known for the size and beauty of its flowering heads with their conspicuous homogamous almost always brilliant red or purple florets. The tribe *Mutisieæ* to which it belongs is but poorly represented in Africa, as indeed in the Old World generally; largely on account of this, as well as the habit and broad involucral leaves, the genus is scarcely likely to be mistaken when specimens occur in a tropical African parcel, except in the case of five species (*P. fulva, macrophylla, racemosa, clivicola*, and *vernonioides*) which suggest *Vernonia*, but are distinguished by the long anther-tails and entirely different style-arms.

In the accompanying clavis O. Hoffmann has been closely followed. For his prime distinction he relied on the solitary or racemose heads—a distinction not easy to apply in a few cases where two or even three heads may be seen on a specimen identical in other respects with

* The types described are in the British Museum Herbarium, except *P. latisquamea* which is at Kew.

monocephalous ones, from which the racemose condition might easily be brought about by no very great elongation of the plant's main axis. A more consistent character is found in the clothing of the involucre; but even here there are transitions from a thick and permanent tomentum to a condition where nearly all signs of a tomentum vanish after a time. The foliage-leaves of some species are strongly rugose on the upper side, those of others perfectly flat—a very good distinction; but here again difficulty may arise, for a Museum specimen with precisely all the characters of *P. Antunesii*, a rugose-leaved species, has the leaves perfectly flat. These differences and the shape of the involucres and of their individual leaves, together with the clothing of the achenes, are the chief points requiring attention in naming specimens—a work it is hoped the clavis will tend to make easier:—

SPECIERUM CLAVIS *.

Capitula solitaria.
Involucri phylla glabra.
Folia lata.
Folia plana.
Folia supra glabra. Capitula sessilia vel breviter pedunculata.
Involucra obovoidea; phylla oblonga, obtusa ..... 1. P. pulcherrima [Steetz.
Involucra subhemisphærica; phylla obovata obtusissima.
Folia obovato-oblonga ..... 2. P. Sapinii, sp. n.
Folia lanceolata ..... 3. P. latisquamea, [sp. n.
Folia supra glabra. Capitula longipedunculata. Achænia pilosa. 4. *P. Dewevrei* [O. Hoffm.
Folia supra glabra. Capitula longissime pedunculata. Achænia sericea ..... 5. P. macrophylla [Muschl.
Folia supra arachnoidea. Capitula longissime pedunculata. Achænia glabra ..... 6. *P. Newtoni* [O. Hoffm.
Folia rugosa.
Capitula magna. Involucra campanulata. Folia supra glabra . 7. P. rugosa [O. Hoffm.
Capitula majuscula. Involucra hemisphærica. Folia supra arachnoidea.
Folia elliptica. Achænia pilosa . 8. *P. affinis* O. Hoffm.
Folia lineari-lanceolata. Achænia sericeo-pubescentia ..... 9. P. vernonioides [S. Moore.
Capitula mediocria. Involucra cylindrica. Achænia glabra ... 10. P. Gossweileri, [sp. n.

* Names of species in italics are those of which a specimen has not been seen.

Folia angusta.
Folia anguste linearia. Involucri phylla int. lineari-oblonga, obtusa. Achænia glabra ..... 11. P. linearifolia [O. Hoffm.
Folia anguste linearia. Involucri phylla int. late oblonga obtusissima. Achænia sericea ..... 12. P. ambigua, sp. n.
Folia lineari-oblonga. Achænia sericea. 13. P. Baûmii, sp. n.
Involucri phylla tomentosa interdum tandem glabrescentia.
Folia ovata vel ovato-oblonga.
Capitula magna, breviter pedunculata.
Involucri phylla anguste triangularia, acuta. Achænia sericea ..... 14. P. eximia O. Hoffm.
Involucri phylla late triangularia, obtusa. Achænia pilosa ..... 15. P. Welwitschii, [sp. n.
Capitula magna, longe pedunculata. Achænia sericea ..... 16. P. Kassneri, sp. n.
Capitula majuscula, longe pedunculata.
Involucri phylla obtusa. [O. Hoffm.
Folia rugosa ..... 17. P. Antunesii
Folia plana ..... P. Antunesii var. [planifolia, var. n.
Involucri phylla acuta ..... 18. P. amœna [R. E. Fries.
Folia lanceolata subtus arachnoidea. Capitula majuscula..... 19. P. sciaphila, sp. n.
Capitula racemosa, mediocria. Involucra cylindrica.
Folia plana. [O. Hoffm.
Folia elliptica, minute denticulata ..... 20. *P. racemosa*
Folia ovato-oblonga, dentato-serrata ... 21. P. clivicola, sp. n.
Folia lineari-lanceolata. Involucri phylla oblonga ..... 22. P. Davyi, sp. n.
Folia linearia. Involucri phylla ovata... 23. P. Rogersii, sp. n.
Folia rugosa. Involucri phylla dense fulvo-tomentosa ..... 24. P. fulva Hiern.
Capitula racemosa, majuscula. Involucra campanulata ..... 25. *P. huillensis* [O. Hoffm.

Pleiotaxis Sapinii, sp. n. *Herba*; *caule* valido eximie striato tela subtili araneosa arcte tecto; *foliis* magnis sessilibus obovato-oblongis obtusis inferne angustatis basi amplexicaulibus margine undulatis papyraceis supra glabris in siccoque fuscis subtus araneoso-argyraceis; *capitulis* magnis solitariis terminalibus sessilibus necnon foliis ultimis perpaucis involucratis; *involucri* subhemisphærici circa 7-serialis phyllis glabris obovatis obtusissimis interioribus gradatim majoribus omnibus subtiliter ∞-striatis; *corollis* exsertis; *antherarum* caudis ciliatis; *achæniis* 5-costatis costulis paucis interjectis fulvo-sericeis quam pappus plane brevioribus.

Belgian Congo, Bienge; *A. Sapin.*

Folia usque 15 × 7 cm., superiora minora, summa capitulum

amplectantia verisimiliter circa 3 cm. long.; costæ lat. utrinque circa 10 pag. inf. eminentes; reticulum sublaxum pag. sup. magis visibile. Corollæ tubi pars angusta 18 mm. long., pars ampliata 2 mm.; lobi circa 5 mm. Antherarum caudæ vix 1 mm. long. Achænia 8·5 mm., pappus ægre 15 mm. long.

Affinity with *P. pulcherrima* Steetz; easily distinguished by its foliage and capitula.

Pleiotaxis latisquamea, sp. n. *Herbacea*; *foliis* sessilibus lanceolatis mucronatis basi amplexicaulibus supra planis leviterque scabriusculis subtus minute griseo-tomentosis; *capitulis* magnis solitariis ad apicem caulis sessilibus; *involucri* subhemisphærici phyllis 7-serialibus late obovatis obtusissimis (intimis spathulatis) glabris; *corollis* exsertis; *achæniis* oblongis 5-costatis inter costas striatis subtiliter fulvo-sericeis; *pappi* setis dilute stramineis quam achænia longioribus.

N.W. Rhodesia, Bwana Mkubwa, 4500 ft.; *F. A. Rogers*, 8381 (in hb. Kew.).

Folia usque 16×3·5 cm., supra in sicco fusca necnon pallide nitida; costæ lat. (uti reticulum) utrobique bene visibiles. Capitula pansa 4×4 cm. Achænia 10 mm., pappus 15 mm. long.

Differs from *P. Sapinii* mainly in the foliage and the broader involucral leaves.

Pleiotaxis macrophylla Muschl. MSS. in herb. Berol. ex De Wildem. in Ann. Mus. Congo Belge, sér. iv. ii. 176. *Herba* subacaulis eramosa; *foliis* amplis ad basin caulis rosulatis late ovatis sursum rotundatis basi in petiolum brevem latum canaliculatum breviter angustatis margine dentatis pergamaceis supra glabris subtus puberulis margine breviter minuteque floccosis; *capitulis* mediocribus solitariis pedunculo longissimo distanter parvibracteato aliquanto araneoso; *involucri* anguste campanulati phyllis 7-serialibus ovatis obtusissimis intimis angustioribus obtusis omnibus glabris lineaque centrali nigra percursis; *corollis* exsertis; *antherarum* caudis villosulis; *achæniis* paucicostatis fulvo-sericeis; *pappo* sordide albo achæniis longiore.

Belgian Congo, Luente, under trees; *Kassner*, 2497.

Folia usque 17×13 cm., sed sæpe minora, *e.g.* 10–12×7–8 cm., utrobique concoloria, in sicco fusco-brunnea; petioli 5–15 mm. long. Pedunculus erectus, usque 34 cm. alt.; hujus bracteæ subulatæ, circa 7 mm. long. Capitula pansa 24×18 mm. Corollæ tubi pars angusta 10 mm. long., pars inflata ægre 2 mm. Antherarum caudæ vix 1 mm. long. Achænia 3 mm., pappus 10 mm. long.

Remarkable for its broad, rosulate, concolorous leaves, long peduncles, and habit reminiscent of *Gerbera*. The corollas would seem to be yellow (or possibly white), like those of *P. racemosa* and *clivicola*.

Pleiotaxis Gossweileri, sp. n. *Herba* perennis, erecta, sursum sparsim ramosa; *caule* striato arcte tomentoso; *foliis* pro genere parvis sessilibus oblongo-lanceolatis apice mucronulatis basi leviter amplexicaulibus margine denticulatis papyraceis supra rugosis arachnoideis tandem fere glabris subtus molliter albo-tomentosis; *capitulis* mediocribus ad apicem ramorum solitariis pedunculatisque; *involucri* cylindrici phyllis circa 7-serialibus ovatis obtusissimis intimis paucis ovato-oblongis omnibus glabris fuscisque; *corollis* longe exsertis; *antherarum* caudis villosulis; *achæniis* compressis basi callosis 5-costatis inter costas striatis glabris; *pappo* stramineo quam achænia paullulum longiore.

Angola, Kaconda, in rocky situations at Landingo; *Gossweiler*, 1255.

Planta circa trispithamea. Folia ±6×1·5–2 cm., supra in sicco griseo-viridia. Pedunculi plerique circa 10 cm. long., tomentosi, bracteis perpaucis foliis similibus nisi minoribus onusti. Capitula pansa fere 3 cm. long. Involucra 20×12 mm. Corollæ tubi pars angusta 10 mm. long., pars inflata 5-angulata 2×2 mm.; lobi 3 mm. long. Antherarum caudæ 2 mm. long. Achænia 9–10 mm., pappus 11 mm. long.

An elegant plant at once recognised by its small leaves and longthily peduncled cylindrical heads with dusky purple involucral leaves.

Pleiotaxis ambigua, sp. n. *Herbacea*, erecta; *caule* sursum pauciramoso striato subtiliter araneoso dein glabro; *foliis* sessilibus anguste linearibus acutis basi breviter amplexicaulibus margine revolutis supra glabris planisque subtus albo-tomentosis; *capitulis* majusculis breviter pedunculatis ad apicem ramorum solitariis; *involucro* campanulato 8-seriali phyllis ovatis obtusissimis (intimis paucis late oblongis) omnibus glabris; *corollis* exsertis; *antherarum* caudis ciliatis; *achæniis* striatis fulvo-sericeis pappo brevioribus.

Angola, Munongue; *Gossweiler*, 4146 (in part.).

Planta trispithamea. Folia 4–5 cm. long., 1–1·5 mm. lat. Pedunculi longit. 10 mm. nunquam attingentes, bracteis perpaucis abbreviatis sæpe donati cito glabri. Capitula pansa 2·8×1·8 cm. Corollæ tubi pars angusta 10 mm. long., pars inflata 2·25×2·25 mm.; lobi circa 7 mm. long. Antherarum caudæ 2 mm. long. Achænia 7 mm., pappus 9 mm. long.

This might easily be mistaken for *P. linearifolia* O. Hoffm., to which it is closely allied. It differs from that chiefly in the somewhat longer and broader capitula with broader involucral leaves in 8 (not 6) series, and in the silky (not glabrous) achenes.

Pleiotaxis Baumii, sp. n. *Herba* erecta perpauciramosa; *ramis* striatis subtiliter araneosis; *foliis* sessilibus lineari-oblongis mucronulatis basi breviter amplexicaulibus integris nisi (rarissime) minute denticulatis supra planis araneosis subtus tomentosis; *capitulis* majusculis solitariis breviter pedunculatis; *involucri* anguste campanulati phyllis 6-serialibus oblongis obtusis intimis oblongo-linearibus omnibus glabris; *corollis* exsertis; *antherarum* caudis ciliatis; *achæniis* striatis fulvo-sericeis a pappo facile superatis.

South-West Africa, R. Chitanda, under trees; *Baum*, 170.

Folia pleraque 6–8 cm.×5 mm.; pag. sup. in sicco viridia. Pedunculi 1 cm. long., tomentosi, bracteis paucis brevibus onusti. Capitula pansa 2·8×1·2 cm. Corollæ tubi pars angusta 12 mm. pars dilatata 3×2·5 mm.; lobi circa 8 mm. long. Antherarum caudæ fere 2 mm. long. Achænia 6 mm. long.; pappus 11 mm.

To this is referred Gossweiler 2643 from R. Cuanaval and 4146 (in part.) from Munongue, both with narrowly linear upper leaves (of these the type-specimen is deprived).

This also is close to *P. linearifolia*, under which name the Baum plant was distributed (and noted in Baum Kun.-Zamb. Exped. 425).

It has the narrower fewer-seriate involucres of *P. linearifolia* and the silky achenes of *P. ambigua*.

Pleiotaxis Welwitschii, sp. n. *Frutex* 3–5 pedalis, basi lignosus, patentim ramosus (ex schedis cl. detectoris); *ramis* validis striatis araneoso-tomentosis; *foliis* sessilibus ovato-oblongis mucronulatis basi auriculatis (auriculis caulem amplectentibus breviterque incisis) margine indurate serrato-dentatis chartaceis supra rugosis araneosis deinde glabrescentibus subtus albo-tomentosis; *capitulis* magnis breviter pedunculatis pedunculis tomentosis; *involucri* subhemisphærici phyllis 7-serialibus late triangularibus obtusis araneoso-tomentosis mox glabrescentibus; *corollis* exsertis; *antherarum* caudis villosulis; *achæniis* compressis 5-costatis inter costas striatis sparsim pilosis pappo stramineo fere æquilongis.

Angola, Golungo Alto, Alto Queta Mts; *Welwitsch*, 3893.

Folia usque 18×7 cm., pleraque ±12×5 cm., supra in sicco brunnea; costæ lat. pag. inf. eminentes, utrinque 12. Pedunculi 2–4 cm. long., tomentosi. Capitula pansa 4·5×4 cm. Corollæ tubi pars contracta 21 mm. long., pars inflata 5×3 mm.; lobi 11 mm. long. Antherarum caudæ 4 mm. long; achænia 12 mm., pappus 14 mm.

O. Hoffmann (Bol. Soc. Brot. xiii. 35) referred this to his *P. eximia*, which, besides silky achenes, has larger heads with differently shaped densely tomentose involucral leaves. It is more like *P. rugosa* and might easily be mistaken for it, both having almost glabrous achenes; but the leaves of *P. rugosa* are smaller and narrower, its involucres quite glabrous, and corollas markedly shorter in the tube.

Pleiotaxis Kassneri, sp. n. *Herba* trispithamea; *caule* robusto erecto arcte fulvo-tomentoso; *foliis* oblongo-ovatis obtusis basi in petiolum latum canaliculatum breviter amplexicaulem breviter angustatis margine indurate dentato-serrulatis supra rugulosis laxe arachnoideis subtus fulvo-tomentosis; *capitulis* magnis terminalibus solitariis pedunculo sat longo tomentoso insidentibus; *involucri* subhemisphærici phyllis 6-serialibus ovatis (intimis oblongis) obtusis obtusissimisve valde coriaceis fulvo-tomentosis; *corollis* exsertis; *antherarum* caudis villosulis; *achæniis* paucistriatis fulvo-sericeis quam pappus stramineus duplo brevioribus.

Belgian Congo, Kundelungu, under trees; *Kassner*, 2770.

Folia usque 17×5 cm., sæpius 14–15×4–4·5 cm., supra in sicco griseo-brunnea; petioli summum 3·5 cm. long. sæpius vero breviores. Pedunculi 6·5 cm. long. Capitula pansa 4·5×4·5 cm. Corollæ tubi pars angusta 17–18 mm. long., pars dilatata 4·5×3·5 mm.; lobi 7 mm. long. Antherarum caudæ 2 mm. long. Achænia 7 mm., pappus 14 mm. long.

To be referred here is the same collector's 2801 (in part) from Lukonsolva, Lake Mweru, with leaves much like those of *P. Antunesii*, but with the broader very coriaceous involucral leaves of the species under notice. It may be distinguished as *P. Kassneri* var. nov. **angustifolia**, foliis angustioribus infra griseo-tomentosis.

P. ANTUNESII O. Hoffm. var. **planifolia**, var. nov. A typo discrepat solummodo ob folia plana supra in sicco læte viridia.

N.E. Rhodesia, Luwingu, 4500 ft.; *Mrs. Philip Jelf*, 46.

One is tempted to propose this as a distinct species on account of the bright green (on the upper side) perfectly smooth leaves, those of *P. Antunesii* being markedly rugose, a difference of importance in the genus. But for this no other difference is discoverable.

Pleiotaxis sciaphila, sp. n. *Herba* circa bispithamea; *caule* erecto simplici araneoso-tomentoso; *foliis* sessilibus anguste lanceolatis obtuse acutis basi breviter amplexicaulibus margine minute denticulatis papyraceis pag. utraque laxe arachnoideis; *capitulis* majusculis pedunculatis solitariis; *involucri* campanulati phyllis 6-serialibus extimis ovatis ceteris ovato-oblongis intimis oblongis omnibus obtusis nisi obtusissimis minute tomentosis margine fusco-purpureis; *corollis* exsertis; *antherarum* caudis apice penicillatis; *achæniis* fulvo-sericeis quam pappus stramineus multo brevioribus.

Belgian Congo, Lukonsolva, Lake Mweru; *Kassner*, 2801 (in part).

Folia 9×1·5 cm., perpauca summa 5–7 cm. long., in sicco fusca; costæ lat. pag. inf. prominentes utrinque 9. Pedunculus tomentosus, 3 cm. long. Capitula pansa 3·5×3·5 cm. Corollæ tubi pars tubulosa 13 mm. long., pars ampliata 5-angulata, 3·5×2·25 mm.; lobi 9 mm. long. Antherarum caudæ 2 mm. long. Achænia 5 mm., pappi setæ usque 2 cm. long.

A very distinct species recognised by the, for the genus, rather narrow dark-drying leaves *araneose on both sides*. The heads somewhat recall those of *P. Antunesii*, but they are smaller and, except for the innermost, the involucral leaves are shorter and relatively broader.

Pleiotaxis clivicola, sp. n. *Herba* circa bispithamea; *caule* simplici valide striato tela araneosa circumdato tandem glabro; *foliis* sessilibus ovato-oblongis obtusis vel obtuse acutis basi breviter amplexicaulibus margine dentato-serratis papyraceis supra glabris pallideque nitidis subtus præsertim in nervis subtiliter araneosis dein glabrescentibus; *capitulis* mediocribus paucis (4) racemosim ordinatis pedunculis araneosis se ipsa æquantibus vel excedentibus insidentibus; *involucri* cylindrici phyllis circa 8-serialibus exterioribus oblongis vel ovato-oblongis araneosis interioribus ovatis obtusissimis glabris intimis obtusis; *corollis* breviter exsertis albis (anne dilute flavis?); *antherarum* caudis villosulis; *achæniis* pro genere parvis striatis secus strias sparsim ciliolatis ceterum glabris.

Belgian Congo, slopes of Mt. Kundelungu; *Kassner*, 2741.

Folia pleraque 10–12×3·5–4 cm. pauca summa gradatim usque 2 cm. longit. imminuta in sicco griseo-brunnea; costæ utrobique bene visibiles. Pedunculi 2–3·5 cm. long. Involucrum 18–20×10–12 mm. Corollæ tubi pars tubularis 9 mm. pars ampliata 2 mm. long.; lobi 5 mm. long. Antherarum caudæ circa 1 mm. long. Achænia (haud matura) 3 mm., pappus 14 mm. long.

On a first view this would be likely to be sorted into *Vernonia*. It is very close to *P. racemosa* O. Hoffm. from Tanganyika Terri-

tory, with which it shares the peculiarity of yellow (perhaps white) corollas. The foliage at once serves to distinguish the two.

Pleiotaxis Davyi, sp. n. *Herba* circa 4-spithamea; *caule* erecto striato araneoso-tomentoso; *foliis* sessilibus lineari-lanceolatis acutiusculis basi vaginatis (vaginis apice breviter incisis) margine minute denticulatis papyraceis supra glabris subtus tomentosis; *capitulis* racemosis paucis (in exempl. viso 3) breviter pedunculatis pedunculis involucro subæquilongis nisi longioribus tomentosis; *involucri* cylindrici 5-serialis phyllis griseo-araneosis oblongis obtusis; *corollis* exsertis; *antherarum* caudis apice villosulis; *achæniis* paucicostatis fulvo-sericeis; *pappo* dilute stramineo quam achænia paullulum longiore.

Belgian Congo, near Elisabethville; *Burtt-Davy*, 17853.

Folia ±10 cm. × 12 mm., in sicco utrobique grisea. Capitula pansa 20–25 × 10 mm. Pedunculi 1·5–5 cm. long. Corollæ tubi pars angusta 8 mm., pars dilatata 1·5 × fere 2 mm.; lobi 5 mm. long. Antherarum caudæ fere 2 mm. long. Achænia 7 mm., pappus 9 mm. long.

Close to the following species, but differing in respect to the foliage and narrow involucral leaves.

Pleiotaxis Rogersii, sp. n. *Herba* erecta circa trispithamea; *caule* striato araneoso-tomentoso; *foliis* sessilibus elongatis linearibus obtusis basi caulem vaginantibus (vaginis breviter incisis) margine revolutis minuteque denticulatis papyraceis supra glabris subtus griseo-tomentosis; *capitulis* apicem versus caulis perpaucis racemosis breviter pedunculatis; *involucri* cylindrici 6-serialis phyllis anguste ovatis obtusissimis araneoso-tomentosis; *corollis* exsertis; *antherarum* caudis apice villosulis; *achæniis* parvis paucicostatis fulvo-sericeis; *pappi* setis dilute stramineis achæniis longioribus.

Belgian Congo, Elisabethville; *F. A. Rogers*, 26231.

Folia pleraque 10 cm. × 5 mm., pauca inferiora ±6 × 1 cm., supra in sicco grisea. Pedunculus 15 mm. long. Capitula pansa 24 × 10 mm. Corollæ tubi pars inferior 8 mm. long., pars inflata 2 × 1·5 mm.; lobi 5 mm. long. Antherarum caudæ ægre 2 mm. long. Achænia 6 mm., pappus 10 mm. long.

The specimen has only one capitulum, and that is manifestly lateral, which must place the species among the racemose set. With it is to be joined Burtt-Davy 18049 from the neighbourhood of Elisabethville, the Museum specimen of which, perhaps a somewhat starved one, has also only one head, but this is terminal: otherwise there seems no difference between the two.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

Laurus americana Miller.

By W. Fawcett and A. B. Rendle.

This species was based by Miller (Dict. ed. 8, 1768) on a specimen from Vera Cruz received from Houston, and now in the British Museum Herbarium.

Swartz identified his *Daphne tinifolia* (Prodr. 63, 1788) with *Laurus americana* Mill., but comparison of the two specimens in Herb. Mus. Brit. indicates that they represent distinct species, both of which should be included in the genus *Daphnopsis*—namely, *Daphnopsis tinifolia* Griseb., restricted so far as at present known to Jamaica and Hispaniola, and *D. americana*, the type of which is the Mexican plant received by Miller from Houston. Houston's specimen is somewhat fragmentary, but is apparently conspecific with specimens from Vera Cruz in Herb. Kew. collected by Galeotti (no. 523) and Linden (no. 96), and included by Hemsley (Biol. Centr.-Amer., Bot., iii. 79) under *D. cestrifolia* Meisn., a Columbian species, which, however, differs in having much narrower acute leaves.

Owing to want of comparison with the type, Miller's trivial *americana* has been wrongly applied under the later genus *Daphnopsis*. First by Johnston (Proc. Boston Soc. Nat. Hist. xxxiv. 242, 1909) in his "Flora of Margarita Island," thus:—*D. americana* (Mill.) n. comb. (*Laurus americana* Mill., *Daphne tinifolia* Swartz, *Daphnopsis tinifolia* Griseb.). Juan Diego trail, Johnston, no. 257.

Later Urban (Arkiv för Botan. xvii. no. 7, 44, 1921) refers the Margarita Island plant to *D. caribæa* Griseb. (Flor. Brit. W. Ind. 278, 1860), but retains the combination *D. americana* for the West Indian species as a synonym of *Daphne tinifolia* Sw. and *Daphnopsis tinifolia* Griseb.

If a type-system means anything, it implies the association of the trivial (in this instance *americana*) with the plant to which it was originally applied (in this instance Houston's Vera Cruz specimen).

Hence we arrive at the following citations:—

1. *Daphnopsis americana* Johnston (1909), a synonym of *D. caribæa* Griseb. (1860) (*fide* Urban). Lesser Antilles.
2. *Daphnopsis americana* Urban (1921), a synonym of *D. tinifolia* Griseb. Jamaica, Hispaniola.
3. *Daphnopsis americana* nob., *Laurus americana* Mill. Mexico.

New Diospyros from Sarawak.

By H. N. Ridley.

The following species was included in a small collection of plants, used as fish-poisons in Sarawak, made by Mr. W. H. Smith of the Cooper Technical Bureau in 1924, and received at the British Museum through the Imperial Institute, for determination:—

Diospyros piscicapa Ridl., sp. nov. *Arbor* glabra, *foliis* alternis subcoriaceis oblongis nitidis obtusis, basibus subrotundis nervis

10-paribus subtus elevatis intra margines arcuantibus, laxe reticulatis conspicuis, costa superne canaliculata subtus elevata crassa, 13–18 cm. longis, 6–9 cm. latis; *petiolis* 8 mm. longis; *cymis* masculis extra-axillaribus 15 mm. longis, pedunculis 9 mm. et pedicellis 6 mm. longis crassiusculis; *floribus masculis* 3–5; *bracteis* oblongo-ovatis obtusis brevibus; *sepalis* 4 crassis coriaceis ovatis subacutis utrinque pubescentibus nigris, 6 mm. longis; *corolla* minore, tubo brevissimo, lobis 4 lanceolatis sericeo-pubescentibus; *staminibus* 8 in tubo insertis glabris, filamentis brevissimis, antheris lanceolatis nigris nitidis exappendiculatis; *floribus fœmineis* majoribus, sæpe solitariis; pedicellis validis, 1 cm. longis; *sepalis* 4 basi connatis ovatis pubescentibus 1 cm. longis; *ovario* dense hirto; *bacca* rotundata depressa dense hirta rugosa 15 mm. lata, calyce 2 cm. lato explanato pubescente.

Borneo, Ling-hi; *W. H. Smith.* Native name "Buah Tuba." "Young green fruit said to be several times stronger than *Derris* as fish poison. When ripe, is edible, and pulp is black. Green juice stains hands like acid." Sarawak; *Beccari*, 1957, Herb. Kew.

This species is not closely allied to any other, but belongs to the peduncled group *D. Horsfieldii* and its allies.

Beccari's specimens have larger and more coriaceous leaves, probably from an older branch, than those from Ling-hi. The fruits of several species of *Diospyros* are used as piscicides.

OBITUARY.

James Alfred Wheldon

(1862–1924).

Readers of the *Journal* will have learned with much regret of the death of James Alfred Wheldon, with whose contributions they have been so familiar for the past twenty-seven years. Born at Northallerton, Yorks, May 26, 1862, he died at Aintree, Liverpool, November 28, 1924, after a painful illness bravely borne for many months. The loss of his wife in 1915 had been a grievous blow to him; she was the constant helpful companion in his work. He has left two sons and a daughter.

Wheldon was educated at Cleveland College, Darlington, and at the Westminster College of Pharmacy, London; about 1884 he qualified as a pharmacist, and in 1886 set up a business in York. Four years later calamity befell him: on New Year's Eve, 1890, his premises and almost all his possessions were destroyed by fire. In 1891 he was appointed Dispenser to H.M. Prison, Liverpool, and when he retired 30 years later, after rising to the post of Senior Officer, he received the decoration of the Imperial Service Medal. It is, however, as a naturalist that he is known to the public. Devoted to nature-study from early youth, he had at the time of the fire above mentioned brought together a fine collection of living and stuffed

wild birds which, with his herbarium and books, were all lost. Nothing daunted, he now made botany his chief hobby, while maintaining a great interest in entomology, ornithology, and land-shells. Having turned his attention more particularly to mosses, he assisted in the formation of the Moss Exchange Club in 1896, an institution which, together with the publication of Mr. H. N. Dixon's *Student's Flora of British Mosses* in the same year, gave a strong impulse to bryology in this country. Of great industry and endowed with an acute mind, he was always ready to grapple with difficult problems: thus he came to specialize in the *Harpidia* and later in the Sphagnaceæ, revising our British forms in the light of the work of Continental bryologists. In 1902 he published a systematic account of "The North of England *Harpidia*" (*Naturalist*, pp. 65–92) founded on Renauld's Monograph in Husnot's *Muscologia Gallica* (1894) and on manuscript criticisms and verifications received from Renauld himself. By request of his friends, Wheldon also prepared a key to this difficult group of *Hypna*, which, however, remained unpublished until 1921–22 (*Naturalist*). In this he adopted largely the arrangement of Loeske (*Hedwigia*, 1907), dividing the group into six genera, taking also into account the views of other leading continental specialists. For the earnest student of moss-systematy there is here a mine of wealth to explore. Wheldon studied the Sphagnaceæ with equal thoroughness, and in 1917 published his "Synopsis of the European Sphagna," compiled from Warnstorf's great life-work, the *Sphagnologia Universalis* (1911). This "Synopsis" contains more than 400 varieties, and brought up to date the earlier compilation of Mr. C. E. Horrell, "The European Sphagna (after Warnstorf)," published in this *Journal* in 1900. Wheldon continued his keen study of the group till his life's end, his last paper "Additions to the Scottish Sphagna" appearing in the November number of the *Journal*.

His contributions to the *Journal of Botany* began in 1898 and are numerous, including lists of mosses and lichens of Lancashire, Cheshire, Elgin, Inverness, Banff, lichens of Arran, Perthshire, Llanberis, phanerogams of West Lancashire, and Isle of Man. Several of these opuscula were written in conjunction with Mr. Albert Wilson or with Mr. W. G. Travis. Papers containing the results of his unceasing labour, too numerous to be recorded here, were issued in the *Naturalist*, *Lancashire Naturalist*, *Transactions of the Liverpool Botanical Society*, and other publications. One of his most important achievements for the good of botanical science was his *Flora of West Lancashire* (Eastbourne: Sumfield, 1907), in which he collaborated with his old friend Mr. Albert Wilson. It was the first British local flora in which the plant-associations were treated on modern ecological lines. An important paper on the "Lichens of South Lancashire" appeared in the *Journal of the Linnean Society* (1915), embodying his acute observations on the ecology of a district subject to the vitiated atmosphere of an intensive industrial area. Ecology, indeed, became one of his favourite investigations, and he applied it with great insight to cryptogams as well as phanerogams—

as, for instance, in his "Social Groups and Adaptive Characters in the Bryophyta" (*Lancashire Naturalist*, 1911) and "The Collection, Taxonomy, and Ecology of Sphagna" (*Lancashire and Cheshire Naturalist*, 1917–18). The "Alien Plants of the Mersey Province" also attracted his attention, and a systematic account of them in the *Lancashire Naturalist* appeared during the months August 1912–July 1914—a valuable compilation unfortunately rendered awkward to consult by the excessive fragmentation it sustained during such prolonged publication. Others of his papers suffered from the same drawback.

His eminence and efficiency were warmly recognised by his fellow-workers in the north of England, and he was called upon to fill posts of responsibility—president, councillor, &c.—in many of the societies with which he was connected. His cordial friendliness and ungrudging helpfulness to all nature students endeared him to those with whom he came in contact. His work for others included the minute and microscopic examination of countless specimens sent to him by correspondents from far and near; and to all he gave the fullest critical consideration. His life was devoted to the furtherance of scientific nature study. His loss to British Botany can hardly be estimated.

In drawing up this necessarily inadequate sketch of his activities acknowledgment is due to a biographical notice of him which appeared with a portrait in the *Lancashire Naturalist*, 1911. Thanks are also due to his son, Mr. H. J. Wheldon, who supplied much information otherwise unavailable.

A. G. & A. L. S.

A portrait of Mr. Wheldon appears in the current number of the *Naturalist* (Jan. 1925).—Ed.

SHORT NOTES.

The Age-and-Area Hypothesis. The November issue of the *American Journal of Botany* contains a series of four papers, read at the Symposium of the Age-and-Area Hypothesis at a meeting of the Systematic Section of the Botanical Society of America at Cincinnati, Dec. 29th, 1923. These papers—by H. A. Gleason, E. W. Berry, M. L. Fernald, and E. W. Sinnott—embody the opinions of four leading American botanists on Dr. Willis's much-discussed hypothesis.

All four writers call attention to the involved nature of the hypothesis and to the number of reservations it includes, considering that these react very harmfully upon it. Two of them also question the statistical methods used and the accuracy of many of the figures cited.

Gleason points out that the hypothesis depends upon the fact that plants in general have had very much simpler histories than is usually supposed, and shows by numerous examples the many ways in which such histories are, in fact, almost invariably complicated. In particular, he discusses varying rates of speed in migration, retreating migration, and differences of physiological plasticity, finally dealing at some length with the distribution of the N. American Vernonias, which distinctly refute the hypothesis.

Berry begins by pointing out that Willis does not accept, nor take into account, the processes grouped under the term "adaptation." Later, he makes the profound statement that, while figures can be made to prove anything, the value of the proof lies in the judgment of the mind behind the figures. He also points out that Willis neglects the numerous factors involved in distribution. He emphasizes the importance of extinction, and then passes to some of the cases in which past and present distribution can be compared, showing, with the aid of many maps, how many plants there are which now have a smaller distribution than was formerly the case. Those chapters of Willis's book written by other authors do not, in Berry's opinion, assist the general hypothesis.

Fernald, in the largest paper of the series, reiterates Gleason's view that Age and Area can only hold in a static world, and not under the varying conditions, which, as far as we know, have prevailed. He then discusses in detail the floras of Newfoundland and Gaspé Peninsula, two regions which in great measure escaped the Pleistocene glaciation, and shows that while their statistics alone appear to support the hypothesis, a consideration of the ecological and historical factors involved gives these figures a reverse significance. He next discusses Size and Space, and shows that under no circumstances can many of the largest genera be classed as old genera. In the case of the New Zealand Veronicas he invades one of Willis's own preserves.

Sinnott confines his paper to the test of Age and Area in its historical application, and, as does Gleason, compares the generally accepted type of plant-history with that necessitated by the terms of the hypothesis. He also considers that extinction has been much more common than Willis allows, and emphasizes the distinction between dying-out from extinction and that due merely to specific changes. Finally, he discussed the case of genera which, in certain regions, have only endemic species.

The general opinion expressed throughout the papers is that, while the conception of Age and Area is a very important general phytogeographical statement, its practical value is extremely doubtful and of only very limited application.

Another important paper on Age and Area, by S. Schonland, appeared in the *Annals of Botany* for July last. The author writes from the point of view of the South African botanist. He begins with some general remarks and criticisms, in which he discusses the relationship of the hypothesis to the theory of Natural Selection. He then elaborates the different causes, enumerated by Willis, which may vary the Age-and-Area rule. The questions of endemism and discontinuous distribution, especially as illustrated in South Africa, are discussed. Finally, he deals at some length with the distribution of *Erica* and certain other genera and families of the Ericales. Schonland does not consider it likely that a general rule of Age and

Area can be drawn up for South Africa, and thinks we are safe it adhering to the theory of Natural Selection if we remember that in it is not a creative force.—R. D'O. Good.

Chara and Mosquito Larvæ. In *Parasitology* for 12th Dec., 1924 (xvi. pp. 382–7), under the title of "Tests with *Chara fœtida* and *C. hispida* on the Development of Mosquito Larvæ," Mr. Malcolm E. Macgregor gives particulars of a series of experiments carried out at the Wellcome Field Laboratory at Wisley, with a view to testing the reputed efficacy of certain species of *Chara* for destroying mosquito larvæ, and discusses the evidence previously adduced in the matter. The theory appears to have been first promulgated by Caballero in 1919, and was supported by observations made by Alluaud in Morocco, Vasconcelos in Mexico, Maynar in Spain, and, though not mentioned in the paper, by Blow in Madagascar. On the other hand, several observers in different parts of the world, having experimented in the matter, arrived at the entirely opposite conclusion. The experiments at Wisley were made both with aqueous and alcoholic extracts from the species mentioned, and with the living plants themselves, and were carried on at different temperatures. The results would appear to show that, at any rate as regards these particular species, the supposed toxic qualities did not exist. The following remarks may be quoted from the concluding portion of the paper:—

"Taking the evidence as a whole it is difficult to conclude whether *Chara* is entirely devoid of the larvicidal action imputed to it, or whether under certain conditions, and in certain localities, some species have the power of inhibiting mosquito-development, but I am convinced personally by my own experiments and observations that even some of the reputedly toxic species are often devoid of any toxicity whatever. The whole truth of the subject is obscured by the fact that the experiments of those who have reported a toxic action have not been carried out in such a way as to exclude serious errors. Because in some instances a natural water in which *Chara* is growing can be shown not to harbour the larvæ of mosquitoes, it is no evidence that *Chara* is responsible for this state of affairs."

Later on Mr. Macgregor says:—"As it is, I feel certain that *Chara* can have no generally useful application in anti-mosquito measures."—J. Groves.

Effect of X-rays on Plant-growth. M. A. Gunsett, in the course of a report presented to the Congress of the French Association for the Advancement of Science at Liège, July, August 1924, which is published in the *Journal de Radiologie et d'Electrologie* for November 1924, gives an account of the result of some experiments on the effect of irradiation with X-rays or radium on the growth of plants. Many writers have described a stimulating effect on plant-growth as the result of the application of small doses, and in 1921 Jungling suggested using the ratio between the dose of radiation and the lesion of the plant for a system of biological dosage.

In attempting to apply this method, M. Gunsett submitted soaked seeds of *Vicia Faba* to increasing doses of X-rays, and was able to observe a distinct ratio between the subsequent arrest of the development of the plant and the dose received; but, owing to the enormous individual variability of the plants, he found it was impossible to make use of the length of the plant at the time growth was arrested as an exact standard for measuring the dose. He also tried some experiments to see if the stimulating effect of radiation in weak doses really existed, and obtained such contradictory results that it was evident that any apparently stimulating effect obtained from these weak doses fell within the range of the normal variability of the plants. He therefore abandoned the experiments, finding that, owing to the extreme variability of the plants, it was impossible to obtain satisfactory results, and came to the conclusion that the results published up to that time, showing the stimulating effect of radiation, were not to be depended upon, as too few plants had been used in the experiments.

Then Schwarz, Czepa, and Schindler of Vienna took up the matter, and their work confirmed M. Gunsett's observations. They pointed out that, owing to the variability of plants, an experiment on germination which is limited to batches of two, or even ten, individuals is absolutely inconclusive. To prove the existence of a stimulus, it must be produced with *perfect regularity* upon hundreds and thousands of individuals. Only when the number of irradiated plants is multiplied can errors be eliminated, and then the stimulating action of radiation vanishes. These authors have irradiated thousands of seeds, both in the dry state and when germinating, in batches of 100 each, always controlled by an equal number of non-irradiated plants. Their method consisted in measuring the whole batch of 100 plants and taking the mean, and comparing it with the mean of the non-irradiated plants. Under these conditions the lethal effect of strong doses was always to be seen, but *never a stimulating effect from weak or medium doses*. Therefore all the results to the contrary which have been published must be attributed to the individual variability of plants or to the very large number of other factors which may influence a plant's growth.

M. Gunsett concludes as the result of his inquiry that, similarly as in plants, the stimulating effects of small doses of radiation on animals and on human tissues has not been proved, though the dangerous effect of large doses is incontestable.

A very full bibliography is given at the end of the report.

M. Rathbone.

Ekebergia pterophylla Hofmeyr, comb. nov. (*Trichilia pterophylla* C. DC., *T. alata* N. E. Br.). De Candolle first described this plant in 1894 (*Bull. Herb. Boiss.* ii. p. 581) as a *Trichilia*, and two years later (*Kew Bull.* 1896, p. 160) N. E. Brown redescribed it, also placing it in the genus *Trichilia*. Quite recently Mr. J. D. Keet of the Forest Department collected the plant in fruit in the Woodbush Forest, Pietersburg Division, Transvaal, and it can now be definitely assigned to its correct genus *Ekebergia*. The material of

the genera *Ekebergia* and *Trichilia* in the South African herbaria was subsequently examined with a view to ascertaining whether any other characters except the type of fruit could be used as diagnostic characters to distinguish species of these two genera when ripe fruits are not available. As far as the South African species of the genera are concerned, the following characters are constant:—

1. *Trichilia.*—Filaments connate only halfway; each filament bears two teeth, one on either side of the anther.

2. *Ekebergia.*—Filaments united to the summit, not toothed on either side of the anther.

It would be interesting to examine a long range of material to see whether these characters are constant in the two genera.—J. Hofmeyr, Division of Botany, Pretoria.

Ferns grown under Bottles. In further reference to the experiments described in the *Journal of Botany*, May 1924, p. 146, it may be of interest to mention that on July 1924, on removing a bottle which had remained mouth downward in the ground for two years without signs of fern-growth I found seven or more ferns, some in the prothallus stage, some fronds, struggling up between the outside of the bottle-neck and the earth, at a depth of about two inches from the surface. These have been carefully removed and replanted under a glass shade and have developed satisfactorily. The growth outside the bottle is singular, and seems to contradict the natural supposition that an inverted bottle acts merely as a miniature greenhouse. It is also remarkable that the whole of the twenty or more distinct ferns that I have obtained by inverting bottles in the flower-bed are all of the same species of *Asplenium*, though none of this species are grown, or have been growing, in the neighbourhood to my knowledge. There appears to be a disappointing tendency to "damp off" after a year or two of growth on the part of some of the ferns that have come up under bottles, but this is probably due to some neglect or ignorance of the principles of fern-cultivation, for they have always developed quite normally after being transplanted and have put forth strong and healthy-looking fronds.

C. E. Benham.

REVIEWS.

Some new Books on Taxonomy.

Syllabus des Pflanzenfamilien. By Dr. Adolf Engler. Ninth and tenth revised edition, with the assistance of Dr. Ernst Gilg. 8vo, pp. xliii, 420, text-figures 462. Berlin: Borntraeger, 1924. Price 15*s*.

In the preface to this edition of the well-known *System of the Families of Plants*, the authors state that the revision was begun in 1922, but no explanation is given of the composite style, unless the

changes introduced are to be considered sufficient to warrant this being regarded as a double edition. These changes consist partly in the promotion of certain small groups of genera of flowering plants to the status of families; this is the expression of a general tendency among modern systematists resulting from a more thorough comparative study of genera and an increasing knowledge of the vegetation of our globe. Thus the small Australian genus *Byblis*, formerly regarded as a subfamily of *Lentibulariaceæ*, now appears as the type of a distinct family of the order Rosales next to *Pittosporaceæ*. In the same order the South African *Roridula*, which had been doubtfully placed in *Ochnaceæ*, now figures as a distinct family. An example of promotion to a higher grade is the order Diapensiales, which comprises the family *Diapensiaceæ* formerly included in Ericales. As instances of families, names of which will be new to the general student of taxonomy, may be mentioned *Bretschneideraceæ* from China (near *Resedaceæ* in Rhœadales), *Didieraceæ* from Madagascar (Sapindales), *Medusagynaceæ* from the Seychelles, and *Strasburgeriaceæ* from New Caledonia (Parietales), all founded on single genera.

These are merely additions or alterations in detail, the general plan of arrangement of the flowering plants remains as in previous editions, but it is of interest to note that Cycadofilicales (*Pteridospermæ*) now head the Flowering Plants—a promotion from the Pteridophyta. It may be noted in passing that the term Reihe (Series) is still retained for the group above the family—though Order was the term indicated in the Vienna Code. The most important change in the present edition is the revision by Dr. Claussen of Marburg of the Eumycetes or Fungi, which occupy an increased space with the addition of a few more figures. A sketch of Prof. Fleischer's Natural System of the Bryales has been appended to the section on Mosses.

The authors refer in the Preface to the use of cytological characters for purposes of taxonomy; they consider that their value has been greatly overrated—like other more obvious characters they show a varying constancy in individual groups. The results of the serum diagnostic investigation of Angiosperms so far obtained do not suggest any material departure from the arrangement adopted in the *Syllabus*.

Views on botanical systematics are somewhat fluid at present—a good sign, for mobility suggests activity. But however widely the systems of the future may differ from that expressed in the *Syllabus*, the latter will remain to mark a period of activity in the science and to commemorate the large contribution of the veteran botanist, Dr. Engler, to whom we beg to tender our congratulations on his still continuing capacity for work.

Das Pflanzenreich. Regni vegetabilis conspectus. Edited by A. ENGLER. (1) IV. 105. Cruciferæ–Brassiceæ. Pars secunda. By O. E. SCHULZ. 8vo, pp. 100, tt. 26, 1923. (2) IV. 147. xvi. Euphorbiaceæ–Crotonoideæ–Acalypheæ–Acalyphinæ; and IV. 147. xvii. Euphorbiaceæ–Additamentum VII. By F. PAX and K. HOFFMANN. 8vo, pp. 231, tt. 3. 1924. Leipzig: Engelmann.

THESE two portions of the *Pflanzenreich* will be welcomed by taxonomists as continuations of families which have already in part been elaborated. The first continues the tribe *Brassiceæ* of the family Cruciferæ, and comprises the five subtribes *Cakilineæ, Zillinæ, Vellinæ, Savignyinæ,* and *Moricandiinæ.* These include genera 28 to 49 of the enumeration, all, with few exceptions, previously recognized. Two, however, have been recently described—namely, *Distomocarpus* O. E. Schulz, from Morocco, and *Pseuderucaria* O. E. Schulz, from North Africa, both formerly included under *Moricandia.* The technical descriptions of genera and species are unusually long, and the work gives the impression of careful study.

The second and third instalments, dealing with the family *Euphorbiaceæ,* form a single part. The former deals almost exclusively with the genus *Acalypha,* 390 species of which are enumerated. In addition, a new genus *Acalyphopsis* is described closely allied to *Acalypha,* containing a single species from Celebes. The latter includes additions to parts already published dealing with the same family.

Handbook of the British Flora. By GEORGE BENTHAM, C.M.G., F.R.S.; revised by Sir J. D. HOOKER, K.C.S.I., F.R.S. Seventh Edition revised by A. B. RENDLE, D.Sc., F.R.S. 8vo, pp. lxi, 606. London: L. Reeve, 1924. Price 12*s.*

AMATEUR botanists will welcome a new edition of this popular Flora, which Dr. Rendle has greatly improved by bringing the nomenclature into line with modern ideas, and by the addition of recently discovered species, as *Tillæa aquatica* or introductions, such as *Hydrilla verticillata* and *Azolla filiculoides.*

The pronunciation of the Latin names of genera and species has also been indicated, and the etymology of the names of the genera has been included. The Gymnosperms have been removed to a position more in accordance with modern ideas, and the grouping of the Ferns and Fern-allies has similarly been revised. The introductory "Outlines of Botany" has been shortened by the omission of the chapter on Vegetable Anatomy and Physiology, which was out of date and scarcely relevant to the Flora. But the limitation of species remains as conceived by Bentham, and, in spite of Dr. Rendle's improvements, this implies much that is misleading. The treatment of the primrose, the cowslip, and the oxlip as "three indigenous races" of *Primula veris* (page 299) is scarcely in accordance with modern ideas. *Populus serotina,* which is now by far the commonest poplar in the British Isles, is not mentioned. *Populus nigra* is called "the Black or Italian poplar," and this species is apparently meant to include both *P. nigra* and *P. serotina.* Field-botanists will scarcely be able to regard these two trees as one and the same.

It is as difficult to revise a Flora as it is easy for a reviewer to find faults in the revision; for, indeed, even the author of a Flora, like a lexicographer, cannot aspire to praise, but can only hope to escape reproach. In spite of its manifold defects, Bentham and Hooker's Flora has been a popular book, and this new edition, because it contains many improvements, will certainly gain popularity on its predecessors.

H. G.-C.

BOOK-NOTES, NEWS, ETC.

AT the meeting of the Linnean Society on December 18, Major T. F. Chipp showed a series of lantern-slides illustrating the fruiting of the Ground Nut (*Arachis hypogæa*) from photographs of plants grown at the Royal Botanic Gardens, Kew. The pictures, which are the first photographic record of the process, showed the young upright flower on the plant, the matured flower withered and hanging down, the gradual growth of the carpopodium and its entry into the soil, and finally the development of fruit on those carpopodia that have entered the soil. The carpopodia that were unable to enter the soil, although over a foot long, showed no signs of developing mature fruit.

Mr. E. J. Collins read a paper, illustrated by lantern-slides, entitled "The Physiological Aspect of the Incidence of late Blight (*Phytophthora infestans*) of Potatoes." An account was given of an investigation at the John Innes Horticultural Institution, 1916–1921, with a view to ascertain the cause of the seasonal incidence of late blight (*Phytophthora infestans*). The research was incidental to an attempt to produce a high-yielding variety, immune to blight.

Consistent results have been obtained each year and go to show that:—1. The early varieties and those most susceptible to blight have the highest water-content; the most resistant, which are the latest to mature, have the lowest water-content. It is generally possible to place a variety in its class for rate of growth and time of maturation by the value of the water-content of its foliage. The water-content very largely influences, if it does not determine, the rate of growth, time of maturation, and yield. High water-content induces rapid tuberisation, and this entails early maturation and susceptibility to blight.

2. The nitrogen-content, which is taken as a measure of vegetative activity and protoplasmic vitality, reaches a maximum and then falls more or less rapidly according to the growth period of the variety. Maturation is thus accompanied by a decreasing nitrogen-content of the foliage.

3. The water: nitrogen ratio increases during the season and in general is highest at the time of infection. The degree of suscepti-

bility of a variety to blight is indicated more precisely by the value of this ratio. Possibly there is a limiting value below which blight attack is not effective. Young foliage has a lower water and higher nitrogen-content than foliage of a medium age, while in old foliage the reverse conditions hold. These differences lessen with the progress of the season. In an early attack of blight the oldest foliage is first affected; a later attack will cause an epidemic. In the later phases of natural maturation the foliage becomes drier and a blight attack is not readily apparent or of marked virulence.

4. With regard to diurnal variation it was found that the water-content was higher and the nitrogen-content lower in the early morning than the previous evening.

5. Sprayed foliage showed a lower water- and a higher nitrogen-content than unsprayed foliage. The opinion is expressed that the value of spraying, apart from the action of the copper solution as a fungicide, lies in its physiological effect, since those metabolic changes accompanying old age, and heightening susceptibility, are delayed.

The conclusion is reached that high yield and high resistance to late blight, represent the expression of the two extreme values of the same physiological complex, hence it is not anticipated that a variety combining the two characteristics will be produced. On the other hand, immunity combined with high yield may be obtained by the discovery of some new form or variety which possesses a definite immunity factor segregating independently of the physiological complex which in the material at present available determines maturation, susceptibility and yield.

Mr. W. Percival Westell showed specimens of a remarkable cut-leaved variety of *Pastinaca sativa* from Norton Common, Letchworth, Herts, where the normal form is very common. The variety shown has been observed from 1915, and has been raised in later years from seed. Mr. C. E. Salmon, who has examined the plant, regards it as a form of *P. Fleischmanni* Hladnik.

At the following meeting on January 8, Mr. C. C. Lacaita gave an exposition of his papers, entitled "Some Critical Species of *Marrubium*" and "A Note on *Colchicum montanum* Linn." The name *Colchicum montanum* must be abandoned altogether. It has generally been used for the Italian *C. Bertolonii*, but *C. montanum* of Linn. Sp. Pl. is a mixture of *Merendera Bulbocodium* with *Colchicum alpinum*, while the specimen in Herb. Linn. is really *C. Bulbocodium* from the eastern Mediterranean. It was not, as supposed by J. G. Baker, sent to Linneaus by Loefling, for it is a plant that does not grow in Spain, and the sheet is marked on the back "Habitat in Morea." The spring-flowering *C. Bulbocodium*, with broader leaves and more nerves in the sepals, is a distinct species from *C. Bertolonii*. A slide of the Linnean specimen was shown on the screen.

Marrubium.—The Linnean diagnoses were written for the *Hortus Cliffortianus*, and only repeated in the *Species Plantarum*. Therefore Hort. Cliff. specimens and not those of Herb. Linn. are decisive, except in the case of *M. hispanicum*. The Adriatic plant usually called *candidissimum* is not that of Linnæus, and must bear the name of *M. incanum* Desr. True *M. candidissimum* Linn. is a species from Asia Minor. The Hort. Cliff. specimens seem identical with *M. globosum* Monbr. & Auch., but the most important Tournefort synonym is unrepresented in Herb. Tourn. *M. peregrinum* β is the common Austrian species, otherwise called *M. creticum*, but α is a mixture of broad-leaved forms of that with *M. incanum*. *M. supinum* Linn., *M. paniculatum* Desr., *M. remotum* Kit., and *M. præcox* Janka were discussed, and *M. circinnatum* Desr. was shown to be identical with, and the older name for, *M. rotundifolium* Boiss. The confusion which caused *M. hispanicum* Linn. to be broken up into the Spanish *Ballota hirsuta* Benth. and the Italian *Ballota rupestris* Vis. was explained. Specimens from the author's herbarium were exhibited.

Mr. J. C. Waller gave an account of his experiments "On Types of Electric Response in Plants," which was communicated by Prof. V. H. Blackman, F.R.S.

A meeting of the British Mycological Society was held at University College on Saturday, Jan. 24th. Miss E. M. Blackwell gave an outline of the life-history of *Phytophthora Cactorum* Schroet. The chief interest centred in the behaviour of the conidia, a germ-tube or a sporangium occurring according as to whether they germinated immediately or after a period of rest. Mr. E. S. Salmon described the epidemic appearance last year in this country of *Pseudoperonospora Humuli* Wils. on the Hop. This had first been noticed at Wye in 1920, and thought to be introduced from Japan or America, but during the wet conditions of last autumn it showed itself under conditions that proved it to be native. *Peronospora Urticæ* de Bary proves to be a *Pseudoperonospora*, and identical with the fungus on the Hop except for the smaller size of the spores. Mr. H. R. Briton-Jones followed with a discussion of the diseases known as "Bark-Canker" and "Die-back" in fruit-trees. The suggestion was made that none of the organisms usually regarded as bringing about these diseases—*Myxosporium corticolum*, *Diaporthe perniciosa*, and *Cytospora* spp. is the primary cause of the disease. They are weak parasites, and infection is only possible after the tree has become sufficiently enfeebled on account of one or more physiological factors such as excessive or insufficient soil moisture. Mr. J. Ramsbottom showed various exhibits.

Publications of the Hartley Botanical Laboratories, University of Liverpool. Greetings are extended to this new publication, the first number of which, entitled "*Studies in Advancing Sterility.* Part i. *The Amherstieæ*," by Prof. J. McLean Thompson, and bearing date of issue Dec. 1924, we have just received. The publication has a characteristic appearance, and the large page gives ample scope for the display of the numerous large and well-drawn figures with which Prof. Thompson's *Studies* are illustrated. The price of the part, which has 54 pages and includes 104 figures, is very moderate, four-

and-sixpence. It is intended to publish two parts a year, containing the results of a number of the investigations carried out by the Department of Botany of the University. The late Editor of the *Journal* would have regretted the waste of opportunity in the neglect to use the page-headings for indicating the matter of the text. Perhaps Prof. Thompson will consider this, and also in future remove the full point which he inserts between the name of a species and the authority. We wish the new Journal a long and useful career.

Museum of Natural Sciences, Barcelona. We have received several botanical publications from the Barcelona Museum. "Studies on the Morphology and Nomenclature of *Sideritis*" (Labiatæ), by Dr. P. F. Quer, Director of the Museum, is a systematic account of the Spanish species of the largest section of the genus, *Eusideritis*, for which the author proposes two subsections, *Gymnocarpæ* (including *S. incana* L.) and *Carpostegiatæ*, including the remaining species. "A List of Plants collected in and near Burgos," is by the same author. These form respectively Nos. 4 and 5 of the *Trabajos del Museo de Ciencias Naturales de Barcelona*, vol. v., Serie botanica (Feb. and May, 1924).

Also two parts of the *Memòrias del Museo de Ciencias Naturales de Barcelona. Serie Botanica*, Tomo 1. An imposing quarto publication. No. 1. "New Contribution to the Study of the Flora of Granada," by Dr. Carles Pau is a list of species with notes on localities, variation, &c. Several new species and varieties are described and are illustrated by twelve plates. (Dated September, 1922.) No. 2. "New Forms of Plants," by Dr. P. Font Quer is a description of new varieties of *Medicago arborea* L., *Hippocrepis Bourgæi* (Nyman), and the *Stapelia*-like *Caralluma europæa* N. E. Br.; also new hybrids in the genera *Teucrium, Centaurea, Helichrysum* and *Narcissus* (*N. dubius* × *N. juncifolius*); and *Teucrium oxylepis*, sp. nova. These are also figured. (Dated May 15, 1924.)

"Mushroom" Poisoning. *The Journal of the Royal Army Medical Corps* (January, 1925) reports a mild outbreak of poisoning among soldiers stationed at Tidworth due to eating *Inocybe incarnata*, which had been mistaken for mushrooms. Mr. Ramsbottom states that this is the first record of poisoning by this species.

Swiney Lectures on Geology. In connection with the British Museum (Natural History) a course of twelve lectures on "The Geological History of Plants" will be delivered by W. T. Gordon, M.A., D.Sc., F.R.S.E., in the Large Theatre, King's College, Strand, W.C. 2 (by courtesy of the Delegacy of the University of London, King's College). The Lectures will be given on Mondays and Wednesdays at 5.30 p.m., and will commence on Monday, 23rd February and end on Wednesday, 1st April, 1925. The Lectures will be illustrated. Admission free.

Appointment. It is announced that Mr. J. M. F. Drummond, Director of the Scottish Station for Research in Plant-Breeding, has been appointed to the Regius Professorship of Botany in Glasgow University as successor to Professor F. O. Bower.

GOUGH ISLAND.

By G. H. Wilkins,
Naturalist to the Shackleton-Rowett Expedition.

The route of the 'Quest' lay *via* Madeira, St. Vincent, St. Paul's Rocks, Rio de Janeiro, and South Georgia. At the islands in the temperate zone very little time was spent in making botanical collections. On St. Paul's Rocks no plant-life was found and very few sea-weeds were noticed. At South Georgia, an island about 100 miles long with a maximum breadth of twenty miles, lying in lat. 55° S., a considerable collection was made. The island is very mountainous, and from these mountains glaciers descend to the sea. There is little flat land and most of the upper slopes are barren. The south-west side is almost permanently frozen. Several expeditions have visited this island, and the flora is fairly well known. The native grass on the lowland slopes provides food for a number of reindeer that were introduced in 1911 and have now increased in numbers to nearly 300.

Elephant Island is rugged, steep-sided, mostly snow-covered and barren. The only vegetation observed on its shores and heights was various stunted lichens and mosses. Even these were comparatively few, and only one species of each was collected (*Hypnum uncinatum* Hedw. and *Usnea melaxantha* Ach.).

The Tristan da Cunha group was next visited, but the botany of this group has been so thoroughly described by Thouars, Carmichael, Hemsley and others that it was hardly likely that we could discover anything new during our short stay. A collection including sixteen species was gathered.

Gough Island lies in mid-ocean some 2500 miles W. by S. of the Cape of Good Hope, and 2000 miles N. by E. of Cape Horn. It is 220 miles S.E. by S. of the next nearest land, which is Nightingale Island of the Tristan da Cunha group. Gough Island is small, of volcanic origin, and between seven and eight miles long and three to four miles wide. It has been described as lofty and its highest point recorded as 4380 ft., but this must have been an estimate made under most unfavourable conditions, for its highest point was determined by Captain G. V. Douglas, the geologist of the 'Quest,' as being 2915 ft. Rising abruptly on every side from the sea the island appears green and rugged. It is watered by numerous rivulets ending in waterfalls, which shoot over the cliffs and lose themselves in spray before reaching the rocks below. In places these cliffs are several hundred feet high.

The island is not permanently inhabited, and landings have been described as difficult and dangerous; but on each of the four days spent there by members of the 'Quest' Expedition landings were possible. They were sometimes difficult, but never dangerous to men of experience. As a matter of fact, by taking advantage of the shelving rocks at the foot of the cliff near the Glen, it is probable

that a landing is feasible in any weather. This landing, however, necessitates a stiff but short climb to reach the beach marked on the Admiralty chart. There are several other landing-places available, and there is apparently shelter from almost any directional wind for a vessel of three to four thousand tons register.

The island has been visited, at intervals, since 1820, or perhaps even earlier, and there are records carved in slabs of stone by the various visitors. These records were found on the small grass-covered area at the foot of the Glen, and near the two huts that have been erected or renovated by parties that have lived there for months at a stretch. These people have been mostly whalers and sealers, and, in more recent years, ostensible diamond-miners.

With one of the earlier parties was a Mr. Cromer, who interested himself in the flora and fauna of the island and who brought back many interesting specimens. Among other things he reported that there were two kinds of trees on the island—one plentiful, the other scarce. Dr. Rudmose Brown, who with others of the 'Scotia' Expedition were the only authoritative scientific party to visit the island until 1922, knew that the tree referred to as plentiful was *Phylica arborea* or *nitida* (Rhamnaceæ), and was led to believe that the other tree was the tree-fern, *Lomaria Boryana* Willd., which is found growing on the island to a height of a metre or more. The naturalists of the 'Scotia' spent a few hours only on the island, but, with much more time at our disposal, we were able to travel further afield. Captain G. V. Douglas discovered a grove of trees in the ravine next to, and south of, the Glen, "growing as if planted in an orchard" and reaching a height of four to five metres, spreading to four metres or more. This tree has been identified as a form of *Sophora tetraptera* J. Mull., and is described in the list of species collected.

No permanent records of the weather-conditions are available, but they are presumably similar to those of Tristan da Cunha, although, according to Mr. Robert Glass, a native of Tristan whom I saw and who had spent thirteen months on Gough Island, there is more snow and rain at Gough Island and it is slightly colder. Conditions at Tristan da Cunha, 1908, were as follows:—Rainfall 64·8 in.; sun all day, 126 days; sun part of the day, 232 days; sun unrecorded, 7 days; temperature—lowest 37°·9 F., highest 77°·8 F. We had a considerable amount of rain every day but one during our stay on Gough Island, and for the last two days the higher slopes of the Island were partly covered with snow.

In summer travelling would be easy, as travelling in such islands goes, for with the aid of the strong tussock-grass (*Spartina arundinacea* Carmich.), tree-ferns, and the *Phylica* it is possible to climb otherwise unscalable cliffs. In winter, however, the ground is so rain-soaked that the grasses and ferns are easily uprooted from the shallow earth on the rocks, and the mosses and lichens are too wet and slippery to ensure a firm foothold. In patches the trees grow so close together and the branches are so intertwined that it is necessary to climb for distances of a hundred yards or more through the boughs without touching the ground. The branches are low, touching the

ground in places; and it is impossible for the traveller to crawl beneath them. There is very little vegetation under the trees, where they grow thickly, but surrounding them the undergrowth is so dense that a passage has to be fought with much labour, and often it is easier to roll over it than to force a way through. There appeared to be a variety of plants on the island, but my observations were limited by time and opportunity. From a distance the trees and tussock-grass were most conspicuous, while the rocks and cliffs were brilliantly green with moss, splashed here and there with the lighter colourings of lichen.

On the beach numerous fern-boles were noticed, and a luxuriant growth of dock (*Rumex frutescens* Thou. and *R. obtusifolius* Linn.). There was also a wild celery, which was found, after comparison, to differ considerably from the type-specimens from Tristan da Cunha (*Apium australe* Thouars, Fl. Trist. 43). This plant was also collected by the 'Scotia' explorers, and, after an examination of these specimens as well as those from the 'Quest,' it has been decided to make it a new species—*Apium goughense*. It is fully described below.

Clinging to the sheltered cliffs were several varieties of the beautiful maidenhair fern (*Adiantum Poiretii* Wikstr.) and the brightly-coloured mosses and lichens were as well grown everywhere as on the cliffs that faced the sea. On the flat ground bordering the beach, a thick covering of grasses grew, mostly dwarfed *Scirpus* species, but here and there bunches of *Agrostis ramulosa* Carmich. were conspicuous.

Thistles and cudweed grew rankly near the edge of the penguin rookeries, and these plants were found in less vigorous growth in most parts visited. The wild tea-plant (*Chenopodium tomentosum* Thou.) flourished luxuriantly, but the small *Hydrocotyle* (most probably *leucocephala*), dwarfed by its environment, was noticed mostly because of its comparative rarity and its distinctive leaf.

Ferns and bracken in great variety grew in different stages of luxuriance from the lower slopes to the mountain-tops, and all vegetation noticed was found (though in a more or less dwarfed form) until a height of 2000 ft. was reached. At this height the trees were scarce and in many places absent, but here the crowberry in its southern temperate form (*Empetrum nigrum* Linn. var. *rubrum*) grows abundantly. At this season of the year (1st June) it was loaded with bright red fruit. *Lycopodium* was found as high as we climbed, but in a very dwarfed condition. *Agrostis ramulosa* Carmich. and *A. media* Carmich. seemed to thrive at the higher levels. *Cotula goughensis*, described by Dr. Rudmose Brown, grows to a height of 30 cm. or more near the beach, but is dwarfed to 5 or 6 cm. on the upper slopes of the hills. At the higher altitudes, the driving sleet and snow made observation difficult.

Of the specimens collected, three were not in the collection made by the Scottish National Antarctic Expedition, but, on the other hand, they collected several species that I did not. *Sophora tetraptera*, though reported by Mr. Cromer, has not previously been collected.

List of the Species collected.

By E. G. Baker and G. H. Wilkins.

Phanerogamia.

Rhamnaceæ.

Phylica arborea Thouars, Fl. Trist. 45. The common "Island tree" grows to height of 5 to 7 metres and spreads to 4 metres. Found in most parts of the island, and grows in some places on the steep hill-sides in rows that extend up and down the slopes with the older trees at the top. At an altitude of 1500 ft. it is dwarfed. It is not found at a higher altitude than 2000 ft. on Gough Island.

Distribution. Tristan group, South Africa, St. Paul's and Amsterdam Islands, Mauritius.

Leguminosæ.

Sophora tetraptera J. Mull. forma nov. **goughensis** Bak. fil. & Wilkins. *Forma* ad var. *microphyllam* Hook. fil. accedens. *Arbuscula* 4–5 metralis. *Folia* imparipinnata, foliolis 12–14-jugis, glabris, late obovatis vel suborbicularibus, 8–11 mm. longis, 5–8 mm. latis, sessilibus, sæpissime alternis, approximatis. *Flores* ignoti. *Legumen* moniliforme, longitudinaliter alatum.

Three varieties of *Sophora tetraptera* J. Mull. have already been described: var. *grandiflora* Hook. fil., with linear-oblong leaflets in 10–25 pairs; var. *prostrata* Kirk, with prostrate stems and leaflets in 2–4 pairs; var. *microphylla* Hook. fil. (*Sophora microphylla* Ait.) with oblong or obovate leaflets in 25–42 pairs. The present form more closely approaches the last of these (the type of which is in the British Museum Herbarium), but differs in the broader leaflets, which closely approximate to one another.

Distribution of S. tetraptera. New Zealand, the West of South America, Easter Is., Juan Fernandez, Massaferua.

Umbelliferæ.

Hydrocotyle leucocephala Cham. & Schlecht. in Linnæa i. 364 (1826). This more nearly resembles the South American plant and is distinctly different from that found on Tristan.

Apium goughense Bak. fil. & Wilkins, sp. nov. *Herba* valida. *Folia* decomposita, bipinnata, petiolis crassis et latis, segmentis sæpissime cuneiformibus, margine insigniter serratis, hinc inde leviter lobatis, glabris, usque ad 40 cm. longis, petiolis 10–12 cm. longis. *Umbellæ* nunc sessiles nunc pedunculatæ, radiis 14–16, 1–3 cm. longis, radiolis tenuissimis 9–12, 5–8 mm. longis. *Fructus* ovatus, carpella 5-gona, juga primaria 5 æqualiter prominula, validiuscula, obtusa, valleculis angustis.

Hab. Gough Island, June 1922.

This plant is closely allied to *Apium australe* Thouars from Tristan da Cunha, but in the latter the plant grows well up from the ground with a distinct central stalk, the leaves growing out from the stalk in pairs. The Gough Island plant, on the other hand, has broader and thicker leaves, which grow more nearly from the base and reach 40 cm. long, while in *A. australe* the leaves are not more than

90 cm. long. The petioles of the new species are much broader and thicker, and the segments of the leaves are evenly and sharply serrated. The umbels are sessile where the stem forks, otherwise they are pedunculate; in *Apium australe* they are described as sessile. The rays are longer in the Gough Island plant; they number from 14–16 and vary from 1–3 cm. in length. The radioli number 9–12 and are 5–8 mm. long, but they are much weaker and shorter in *Apium australe.* The fruit (from a specimen collected by Dr. Rudmose Brown) differs considerably from *Apium graveolens* Linn. by being shorter and rounder. We have carefully examined specimens of *Apium australe* from Tristan da Cunha, collected by Carmichael, and we do not think it can possibly be placed as a synonym of *A. prostratum* Lab. Labillardière's type in the British Museum Herbarium seems to us a very different plant. The true *Apium prostratum* Lab. is a very close ally of *A. filiforme* Hook. and both are entirely different plants from *A. australe* Thouars.

Compositæ.

Gnaphalium pyramidale Thouars, Fl. Trist. 40. Common on the island and found mixed with the grasses and shrubs.

Cotula goughensis Rud. Brown, Bot. Scot. Nat. Antarct. Ex. plate iv. Fairly plentiful; similar habitats to the above species.

Empetraceæ.

Empetrum nigrum L. var. rubrum Hemsl. Chall. Bot. t. ii. 154. Abundant at a height of 2000 ft. In fruit at the time of our visit.

Polygonaceæ.

Rumex obtusifolius L., Sp. Pl. 335. A common and most conspicuous plant growing in water-courses and swampy places.

Rumex frutescens Thouars, *l. c.* 38. As in previous species.

Chenopodiaceæ.

Chenopodium tomentosum Thouars, *l. c.* 38. Grows to a height of 1·2 mm. when seeding and near the beach, dwarfed at higher levels.

Gramineæ.

Agrostis ramulosa Carmich. in Trans. Linn. Soc. xii. 504 (1819); Hemsl. in Challenger Rep. i. pl. xxxvi. Very common all over Gough Island, but grows in greatest abundance on the higher slopes.

Agrostis media Carmich. *l. c.*; Hemsl. *l. c.* pl. xxxvii.

Spartina arundinacea Carmich. *l. c.*; Hemsl. *l. c.* pl. xxv. Common all over the island.

Cryptogamia.

By A. Gepp.

Pteridophyta.

Hymenophyllum tunbridgense J. E. Smith in Eng. Bot. t. 162. Growing with the Hepatic. An unsatisfactory specimen: not recorded by Carmichael for the Tristan group.

ADIANTUM POIRETII Wikstr. in Vet.-Akad. Handl. 1825, 443. Grows in sheltered places on the steep-sided hills and on cliffs; most luxuriant near sea-level.

ASPIDIUM CAPENSE Willd. Sp. Pl. v. 267. Quite common.

A. MOHRIODES Bory in Mem. Soc. Linn. Par. iv. 597 (1828) with *Lycopodium insulare*.

ASPLENIUM OBTUSATUM Forst. f. Prod. 80. A common plant found at each place visited. Also on Inaccessible Island.

POLYPODIUM AQUILINUM Thouars, *l. c.* 32. *Dryopteris aquilina* C. Chr. Quite common.

LOMARIA BORYANA Willd. Sp. Pl. v. 292. Fairly common.

LYCOPODIACEÆ.

LYCOPODIUM DIAPHANUM Swartz, Synop. Fil. 179. Grows on most parts of the island, but is very dwarfed on the higher slopes. Also found on Inaccessible Island.

L. INSULARE Carm. *l. c.* 509. Grows on most parts of the island; rather more robust than the previous species, but dwarfed at higher altitudes.

HEPATICÆ.

JAMESONIELLA COLORATA Spruce in Journ. Bot. xiv. 202 (1876). On a branch of *Phylica*, mixed with lichens and *Hymenophyllum*.

MUSCI.

By H. N. DIXON.

MACROMITRIUM ANTARCTICUM C. H. Wright in Journ. Linn. Soc. (Bot.) xxxvii. 264 (1905).

THUIDIUM ALVAREZIANUM Card. in Trans. Roy. Soc. Edinb. xliii. 75 (1911).

LICHENES.

By R. PAULSON.

PARMELIA CETRATA Ach. Syn. Lich. 198.

Very noticeable on all tree-trunks, rocks, and decaying branches; is not so abundant nor so luxuriant on the *Sophora* as on the *Phylica*.

The following species were found on Nightingale Island:—

PARMELIA PERLATA Ach. var. CILIATA Schœr. Enum. 34 (1850).

P. PROBOSCIDEA Taylor in Mackay, Fl. Hib. ii. 143 (1836).

USNEA PLICATA Web. in Wigg, Prim. Fl. Hols. 91 (1780).

U. ARTICULATA Hoffm. Deutschl. Fl. ii. 133 (1795).

TELOSCHISTES FLAVICANS Norm. in Nyl. Mag. Naturvid. Christ. vii. 228 (1852).

The *Parmelia* named *P. proboscidea* has all the characteristics of that lichen—namely, isidia out of which project setæ and isidia passing into soredia, but the reaction with KHO is not +yellow then red.

All the above from Nightingale Island are on two short branches of a small shrub and they are so densely covered with fruticose species so to preclude crustose species from growing on the bark. The thallus of the *Teloschistes* is in parts grey.

FURTHER NOTES ON THE ALGÆ OF LEICESTERSHIRE*.

By FLORENCE RICH, M.A.

A PRELIMINARY note on the Algæ of Leicestershire appeared in this Journal for September 1918†. A more extended examination of samples collected from nearly all over the county, in preparation of a list of Algæ for the forthcoming new edition of the *Flora of Leicestershire*, has yielded, as might have been expected, a few varieties and forms that have not hitherto been described. The following short account is a record of these, as well as of certain other points of interest that have come out during the investigations.

Leicestershire lies about mid-way between Cambridgeshire and Yorkshire, counties of which algal lists were prepared by G. S. West in the case of the former in 1899, and by W. West jointly with G. S. West in the case of the latter in 1901. It is of interest to compare the Algæ of these three counties. The Yorkshire algal flora is a very rich one, as the large size of the county and the diversity of its topographical characters would lead one to anticipate. The collections from Cambridgeshire, on the other hand, were said by Professor West to be exceptionally poor; only by a very diligent search, in the light of much experience, was he able to obtain many of the species included in his account. No such search has been made in the case of Leicestershire—the endeavour has been to get representatives from every district of the county rather than to hunt for particular forms, and most of the collectors have been untrained people. Though many species have undoubtedly been overlooked, and the list is in no wise complete, it is certainly apparent that Leicestershire is decidedly richer than Cambridgeshire, whilst vastly poorer than Yorkshire, from an algological point of view. As an instance of this the Desmids may be cited: in Cambridgeshire only ten genera are represented, in Leicestershire fifteen (and this in spite of the absence of *Utricularia*, a favourite habitat for Desmids in Cambridge), whilst in Yorkshire twenty-three genera are represented, and some of these very richly. West remarks on the absence from Cambridgeshire of the common and widely distributed Desmids—*Cylindrocystis Brebissonii*, *Closterium striolatum*, *Tetmemorus granulatus*, *Micrasterias truncata*, *Euastrum binale*, and *Staurastrum margaritaceum*; these, however, have all been found in Leicestershire. The position of the Leicester Algal Flora, intermediate between that of the other two counties under consideration, is further brought out by the following table:—

Genus.	*Cambridgeshire.*	*Leicestershire.*	*Yorkshire.*
Œdogonium	11 species.	14 species.	27 species.
Vaucheria	3 „	7 „	7 „
Spirogyra	10 „	18 „	18 „
Closterium	22 „	32 „	48 „
Staurastrum	8 „	21 „	76 „

* From the Department of Botany, East London College, University of London,

† Vol. lvi. 264.

The three succeeding species of Algæ are worthy of note:—

Sirogonium sticticum (Engl.) Ktz. [*Choaspis stictica* (Eng. Bot.) O. Kuntze] was not found in Cambridgeshire. W. and G. S. West record it from two localities in Yorkshire and say they have never obtained this plant except where the water was running, though the habitat given by Rabenhorst* is "in stagnis." I have found it in four pieces of water in Leicestershire, none of them flowing freely; a pond near Castle Donington; the canal, Sutton Wharf; Shakerstone Canal, and a roadside pond near Seagrave.

Debarya lævis (Ktz.) West, not recorded from either Cambridgeshire or Yorkshire, was very common in a pond near Woodle Head (Rutland), forming zygospores, in May 1915.

Hydrodictyon reticulatum (L.) Lagerh., was not found in Cambridge, and is recorded from only one locality in Yorkshire. I have found it in great quantity in the large cooling reservoir at the Belgrave Pumping Station in July and October 1920, and August and October 1921, though in previous visits to this place I did not detect its presence.

The following new varieties and forms have been observed:—

1. **Œdogonium concatenatum** (Hass.) Wittr. var. **rectangulare** var. nov.

Differt a typo oosporis quadrangulari-ellipsoideis, membrana crassissima, mesosporio scrobiculis in series longitudinales ordinatis instructo, series in medio oosporæ circa 15–20. Crass. cell. veget. 32–36 μ; crass. cell. suffult. circa 50 μ; crass. oogon. 56 μ; crass. oospor. 48–56 μ; crass. cell. androsp. 27 μ.

Present in the Canal, Sutton Wharf, June 1915, and quite common in Sulby Reservoir, July 1915, was a handsome *Œdogonium* agreeing in the main with the description of *Œ. concatenatum* by Hirn †. It is dicœcious, nannandrous, with oogonia either single or two together; the oogonium sub-oviform or quadrangular-ellipsoid in shape, superior pore, oospore the same shape as the oogonium which it very nearly fills, the middle wall of the oospore scrobiculate, the supporting cell tumid, the androsporangium about 3-celled; the dwarf-males curved and resting on the supporting-cell, the antheridium 1–2-celled. The dimensions of the vegetative cells and the length of the oospore also agree with the type, but in the following respects it exhibits rather striking differences:—1. The oospores, although showing considerable variation in form, are, as a rule, much more rectangular than those figured by Hirn (t. xxxviii. figs. 230–231). They are narrower than those of *Œ. concatenatum*, though of similar length; the oospores in fig. 1 A and B are typical of these specimens. 2. The wall of the oospore is about 6 μ thick, which is much thicker than that figured by Hirn. 3. The ornamentations on the mesospore have the appearance of conical spines, a circular area of greater diameter than the round tip being observable when the latter is viewed from the surface. They are arranged in definite vertical and transverse rows.

* Flor. Europ. Algar. iii. 256.

† Monogr. u. Iconogr. d. Œdogoniaceen, 1900, 223.

These differences are sufficient to warrant the establishment of the above new variety.

It should be mentioned, in addition, that the oospore is filled with a Tangerine-orange-coloured sap, and that the filament frequently breaks just below the oogonium.

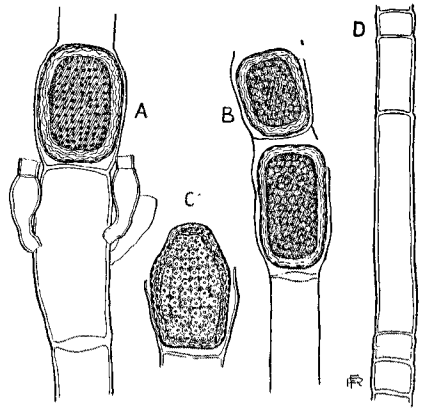


Fig. 1.—*Œdogonium concatenatum* (Hass.) Wittr. var. *rectangulare* F. Rich. A, B. Filaments showing oogonia. C. Empty oospore. D. Male filament. All figs. × 190.

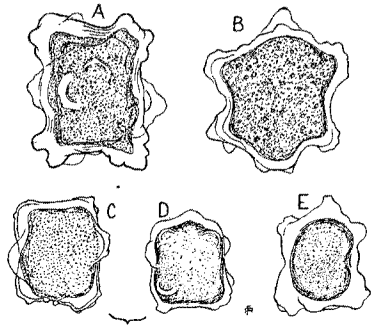


Fig. 2.—*Tetraëdron dodecaedricum* (Reinsch) Hansg. var. *ornatum* F. Rich. A, B. From pond near Swithland Wood. C–E. From Leicester Frith. C and D. Two positions of one individual. A, B, × 500; C–E, × 400.

2. **Tetraëdron dodecaedricum** (Reinsch) Hansg. var. **ornatum** var. nov.

T. magnum, irregulariter polyedricum, 10–12-angulatum, a superficie visum tetrangulare vel pentagonale, angulis inæqualiter evolutis, marginibus leviter emarginatis, angulis rotundatis obtusis, tuberculis irregularibus passim 2–5 præditis, membrana crassissima distincte lamellosa. Diam. 30–40 μ; crass. membr. 3–4 μ.

This variety was found to be rather common in a pond by the side of a footpath leading to Swithland Wood, May 1913, and a slightly less elaborate form of it was found in a pond on the left of the drive leading to Leicester Frith, May 1918. The cells are polyhedral, apparently—as judged by rolling over—10–12-angled, with four- and five-angled faces having slightly concave margins. The angles are rounded, and furnished with from 2 to 5 small protuberances. The membrane is thick throughout, especially at the angles, and stratified. The cells are asymmetrical, and vary in diameter from 30 to 40 μ. The specimens show some resemblance to the very imperfectly described *T. dodecaedricum* (Reinsch) Hansg., which is, however, considerably smaller than the form under discussion, and has smooth rounded angles without any protuberances. In some views it is also something like *T. pachydermum* (Reinsch) Hansg. For the present it may be referred to *T. dodecaedricum* as a new variety.

3. Closterium tumidulum Gay.

Zygosporis leviter tortis, in aspectu frontali quadratis, angulis paullum porrectis, marginibus leviter concavis; in aspectu laterali anguste ellipticis, polis productis membrana crassa.

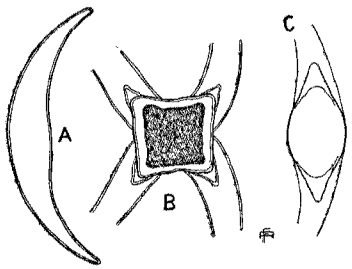


Fig. 3.—*Closterium tumidulum* Gay. B and C. Zygospore in two positions. All figs. × 360.

Cellulis diametro 6–7-plo longioribus. Lat. cell. 14–16 μ. Crass. zygosp. in media parte 31 μ; long. marginis lateralis 40 μ.

From squeezings of moss and liverwort in a boggy patch between Saltby and Sproxton, June 1919, were obtained numerous specimens of a rather strongly curved *Closterium* having square, or quadrate, zygospores. It did not agree with the description of any of the species or varieties of West's Monograph, the cells being rather small, strongly curved, the concave margin tumid in the middle, apices acutely rounded, cell-wall smooth and colourless, chloroplasts with 3–5 pyrenoids and showing 2–3 ridges, terminal vacuole with a few granules. In all these respects it recalls *Closterium tumidulum* Gay *, which has not hitherto been recorded from the British Isles.

The zygospores, which have not previously been described, are, in

* Gay, F., 'Essai d'une monographie locale des Conjugées.' Montpellier, 1884.

front view, roughly square in shape, with the corners drawn out, and the sides slightly concave (see fig. 3, B); in side-view they appear rather narrowly elliptical with the two ends produced (see fig. 3, C). The zygospores are slightly twisted.

4. Closterium Pritchardianum Arch. forma nova sigmoideum.

Forma cellulis leviter sigmoideis. Cellulis diametro 9–10-plo longioribus.

Long. cell. 303, 324, 396, 410 μ. Lat. cell. 44, 45, 43, 39 μ. Lat. apic. circa 5 μ.

Many specimens of *Closterium Pritchardianum* Arch. in an actively growing and dividing state were present in a piece of water near Holly Hayes, May 1915. Intermingled with these were some rather shorter individuals possessing the characteristic wall-markings and apices of the type, but showing a distinct, though slight, sigmoid curvature (see fig. 4, A). In general outline these were almost identical with *Closterium sigmoideum* Lagerh. & Nordst. (see Wittrock's figure *). In spite of this resemblance, however, the other characters do not warrant a separation of the form here described from *Closterium Pritchardianum*. No other sigmoid forms of *Closterium* are known except that of *Cl. eboracense* Turner, described by Moore and Carter in their "Algæ from Lakes in the North-eastern Part of North Dakota" †.

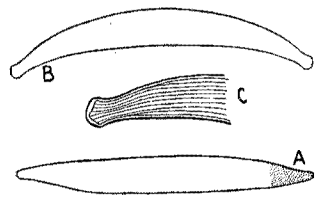


Fig. 4.—A. *Closterium Pritchardianum* Arch. forma nova *sigmoideum*. B, C. *Closterium striolatum* Ehrenb. forma. A, B, × 120.

5. Closterium striolatum Ehrenb. *Forma* apicibus leviter dilatatis, subcapitatis.

Long. cell. 307, 324, 332, 332 μ. Lat. cell. 39, 37, 40, 41 μ. Lat. apic. 11–12 μ.

This form with slightly enlarged ends was found in small quantities in a ditch near Swithland Wood, May 1913. The apices are broad and sub-capitate, the dorsal margin showing a very slight retuseness just behind the apex (see fig. 4, B, C). W. and G. W. West say ‡ of *Closterium striolatum* that "sometimes the apices are a little inflated," but they figure none showing this peculiarity.

Closterium subcapitatum W. & G. S. West §, shows somewhat similar ends, but the cell is much more strongly curved.

* Wittrock, 'Algæ aquæ dulcis exsiccatæ,' fasc. 35, no. 1138 (1903).
† 'Annals of the Missouri Botanical Garden,' x. 393 (1923).
‡ 'Desmids,' i. 124. § 'Desmids from Singapore,' 1897.

6. **Cosmarium obtusatum** Schmidle var. **Horwoodii**, var. nov.

Cosmarium mediocre, circa 1½-plo longius quam latum, profunde constrictum; *semicellulis* late truncato-pyramidatis, apicibus subretusis vel truncatis, lateribus convexis, leviter undulatis, undulationibus in quaque margine ca. 12 et intra margines seriebus concentricis undulationium 6 vel pluribus granula concentrice et radialiter ordinata æmulantibus; membrana inter granula cum punctis in lineis rectis ordinatis, sed in centro semicellulæ punctis irregulariter dispositis; semicellulis e vertice visis ellipticis, in medio ubi membrana incrassata leviter inflatis, area apicali punctata, polis undulatis; a latere visis late ellipticis, supra isthmum leviter inflatis, apicibus subtruncatis; *zygosporis* globosis processibus brevibus e basi valde dilatato, apicibus bi- vel tri-fidis munitis (ca. 20 in ambitu).

This variety, with its zygospores, was quite common in the tank of a spring in a field at Long Clawson, June 1914, and was also found (without zygospores) at Croft in May 1913 and May 1916, and in the canal at Oakthorpe, September 1915 (see fig. 5).

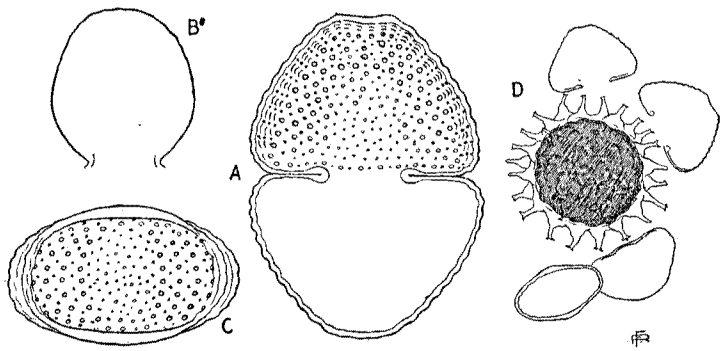


Fig. 5.—*Cosmarium obtusatum* Schmidle var. *Horwoodii* F. Rich. A. Front view; B. Side view; C. End view; D. Zygospore. A–C, × 500; D, × 230.

The cells are above medium size, about 1½ times as long as broad, deeply constricted, sinus narrowly linear with dilated apices; semicells truncate pyramidate, basal angles rounded, sides convex with about 12 undulations along each lateral margin, also with 6 or more similar series within each margin and appearing as granules; apex truncate, often slightly retuse. Cell-wall provided with large rounded granules, the latter being arranged in radiating series and causing the undulate appearance of the margin; between the granules are smaller punctæ, the punctulations arranged more or less in rows between those of the granules and alternating with them; in the middle of the semi-cell the granules are usually missing and the punctulations are arranged irregularly, but sometimes there are granules all over. Side-view of semi-cell broadly elliptical, almost circular, apex sub-truncate. Vertical view elliptic, ratio of axes 1 : 1·6, with a slight median inflation and thickening of the wall; the

granules are sometimes present in the centre, but more often replaced by irregularly arranged punctæ. Chloroplast axile, with two pyrenoids. Zygospore globose, furnished with short processes, usually 2-fid (occasionally 3-fid) at the apices and arising from broad expanded bases. Some zygospores (probably younger ones) were found with blunt spines.

The following dimensions are taken from Long Clawson specimens only, and show considerable variation:—

Length 62, 66, 67, 69, 75, 76, 78, 79, 81, 82 μ.

Breadth 52, 52, 54, 56, 56, 58, 62, 58, 62, 58 μ.

Isthmus 15–18 μ; thickness 34–38 μ.

Diameter of zygospore with spines 73–108 μ; without spines 52–83 μ.

The Croft specimens were, on the whole, a little shorter—Length 70–74 μ; breadth 54–62 μ; isthmus 15–17 μ.

This *Cosmarium* differs from *C. obtusatum* Schmidle, in being larger and relatively longer, having more undulations along the margin, and being provided with punctæ between granules on the cell-wall. It thus appears to be a variety of this species, and has been named after Mr. Horwood, formerly of the Leicester Museum, who collected many of the samples.

7. ARTHRODESMUS TRIANGULARIS Lagerh.

Zygosporis globosis, spinis gracilibus acutis ca. 9 μ longis præditis. Crass. zygosp. sine proc. 19–21 μ.

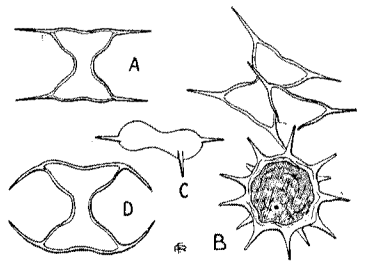


Fig. 6.—A–C. *Arthrodesmus triangularis* Lagerh. B. Zygospore. D. *Arthrodesmus triangularis* forma Boergesen, 1890.

This *Arthrodesmus* was very common amongst *Sphagnum* in the small pond some way up Beacon Hill, June 1913, and was also present in the same little pond, though in much reduced numbers in October 1913 and February 1914, after which date it seems to have disappeared.

It was rather common in Colery Reservoir, June 1914. The long spines are almost absolutely horizontal in some cases, showing a slight outward trend (away from the isthmus) in others; the isthmus is elongated and shortly cylindrical; the apex slightly elevated and convex, though retuse in the median part. The dimensions, however, are slightly less than those given by W. and G. S. West*.

* 'Desmids,' iv. 98.

Length without spines 17–20 μ. Breadth without spines 16–17 μ. Length of spines 10–13 μ. Breadth of isthmus 4–5 μ.

Zygospores of *Arthrodesmus triangularis* Lagerh. have not hitherto been described. In the Beacon Hill sample for June 1913 zygospores were present which appeared to belong to this Desmid, but as they were not very definitely associated with empty cells the determination was doubtful. But in the Colery Reservoir sample for June of the following year they were confirmed, and were found to agree with the drawing that had been made of the Beacon Hill specimens (see fig. 6, B). The zygospore is globose and furnished with rather long, simple, acute spines; diameter without spines 19–21 μ, diameter with spines 35–36 μ. It is, therefore, similar to the zygospore of *A. incus* forma *minor* G. S. West, and that of *A. incus* var. *Ralfsii* W. & G. S. West, and serves to support what Bachmann has already pointed out* that *A. incus* and *A. triangularis* grade into one another.

There was also present in the Beacon Hill pond, in February 1914, a form of *A. triangularis* with long incurved spines resembling that described by Boergesen in 1890 †.

The work of which the foregoing notes are the outcome was carried on by me at the East London College, whilst in receipt of a grant from the Council for Scientific and Industrial Research. My thanks are tendered to Professor F. E. Fritsch for his help and guidance and for the privilege of using his fine algological library.

* 'Algenflora des Süsswassers von Westgrönland,' 1921, 38.

† Desmidieæ in E. Warming, 'Symbolæ ad floram Brasiliæ centralis cognoscendam' (1890).

REPRODUCTIVE MECHANISM IN LAND FLORA.

II. Life-Cycles (*continued from* p. 20).

By A. H. Church, M.A.

The Meiotangium and its Apogamy.—In its cytological and reproductive arrangements *Fucus* stands out as the key-type of the sea, and so far the clue to the progression of all higher plant-forms of parenchymatous organization and of originally similar benthic origin. It affords a clear view of the full elaboration of what is termed in higher plant-life a sexual gamete (♂ and ♀) from a mere plankton-phase of casually pairing isogamous flagellates. The red eye-spot of the antherozoid, as a vestigial chloroplast, is sufficient evidence that this gamete was originally an autotrophic flagellate of the plankton. Taking the case of higher animals, the idea of a morphological sex-cell was founded on the fact that the latter was consecrated to its special function of karyogamy alone, and that otherwise it dies or is useless. So much so, in fact, that fusions appear as the normal function of moribund or so-called matured gametes. This conception of sex-cells as units set apart physiologically

for their special function of karyogamy is so firmly fixed in older mix theory that it is often forgotten, or, at any rate, seldom stated, that this is a function which, like everything else, must have been at some time evolved in response to some special conditions of life[1]. The story of *Fucus*, as the representative of the dominant plant-life of warmer seas, thus throws light on the method by which such a sexual process has been worked out and established by a rigorous natural selection implying the death of all non-fusing gametes—or, in other words, by the complete elimination of all attempts at apogamy (parthenogenesis). Strictly speaking, the term parthenogenesis should be restricted to the development of an embryo from an unfertilized haploid ovum; but it may be extended to cover the case of any similar development from any haploid gamete. On the other hand, apogamy may be extended to the development of any organism from what appears to be a gamete without any fusion[2]; though it was originally restricted to the production of a sporophyte of land-flora from a gametophyte without any necessary formation of reproductive organs[3]. Here, again, arises the difficulty of extending terms originally associated with higher plants and animals to the beginnings of similar phenomena. In the animal kingdom parthenogenesis is general among lower forms, and extends in experimental cultures to the horizon of the Frog. It is interesting to note that observations by Loeb, on inducing artificial parthenogenesis[4] in Echinoderm ova by means of treatment with hypertonic solutions, were extended by Overton to *Fucus*[5], with results sufficiently successful to establish the fact that even in *Fucus*-oospheres true parthenogenesis was possible, and that the young embryos thus produced were of normal morphological organization, though undoubtedly haploid. The difficulty of obtaining such a result, however, only serves to emphasize the fact that in natural environment all attempts at parthenogenesis on the part of *Fucus* are definitely excluded, and the haploid plant could have no special survival value.

In *Fucus*, that is to say, the reproductive mechanism is thus kept constant at a high level of heterogamic efficiency (comparable, in fact, with that of higher Mammalia) by a rigorous suppression of any attempt at apogamy of any kind. The cytological sequence of karyogamy[6] and meiosis is maintained at optimum relations, and the special reproductive organ as a unilocular gametangium (oogonium or antheridium) follows as the consequence of its meiotic mechanism.

[1] *Cf.* Richard Owen (1849) in Wilson's 'The Cell in Development and Inheritance' (1906) for conception of germ-cells. The culmination of the idea is noted in Weismann's 'Theory of Germ-plasm' (1883)—a point of view wholly opposed to anything in the plant-kingdom.

[2] De Bary, 1878.

[3] *Cf.* Vines (1886), 'Physiology of Plants,' p. 636; 'Vegetative Apogamy and Parthenogenesis': Bower (1923), The Ferns, Apomixis, p. 320.

[4] Loeb (1913), Chicago: 'Artificial Parthenogenesis,' p. 281.

[5] Overton (1913), 'Science,' xxxvii. p. 841: and in Loeb, *loc. cit.* p. 277.

[6] Yamanouchi (1909) Bot. Gaz. xlvii. p. 185, for freak-forms, hybrids, and result of fertilization by more than one antherozoid; again, the accidents and exceptions which prove the rule: L. Williams, 'Annals Botany,' 1899, xiii. p. 187.

As an example of the highest type of algal reproduction attained in the warmer seas, *Fucus* maintains station and proves its efficiency as a dominant plant-form by supporting an enormous wastage of gametes. Beyond the small amount of growth put into actual annual somatic increment, the entire photosynthetic activity of the organism is spent in maintaining a practically continuous output of reproductive units. The mechanism remains effective at this elementary but optimum horizon for massive benthon at vast expense, and Fucoids range as far north as the chance of warm water extends on the North Atlantic seaboard, and strays even endure as far as Arctic seas [1].

It should be sufficiently clear that to talk of alternation of generations in *Fucus* is mere academic futility. There is only one soma, or one 'generation,' so that there is nothing to alternate. To attempt to construct an idea of two generations to bolster up an academic conception of 'gametophyte' and 'sporophyte' borrowed from land-flora is nonsense. This is the sort of thing that has tended to give botanical morphology a bad name as an evolutionary science [2]. To utilize such an expression to denote a nuclear change which is obligatory in every sexually-produced organism, including Man, is wholly beside the mark. Yet such a fanciful interpretation has been tacked on to *Fucus* in much modern literature [3], and is continued apparently without any very clear idea of the strict meaning of the terminology [4].

The use of the expression alternation of generations has been only rendered possible in the past by the absurd mental processes which prompted the interpretation of the lower plants of the sea in terms and phraseology of the higher plants of the land, in defiance of all teachings of evolutionary progression, and is so far the survival of modes of thought more characteristic of the early XIXth century, if not of the XVIIIth. Strictly speaking, therefore, *Fucus* has but one generation, if this rather archaic word must be used, and is so far homologous with Man. The plant similarly works out its necessary cytological cycle, and it is equally ridiculous to talk of alternation of generations in either case. One cannot apply the term alternation to nuclei which do not alternate, but merely present periodic changes—at fixed intervals, it is true, but only after the intercalation of many nuclear units of the same class. In *Fucus* the nuclear cycle may be taken as exact and precise, while apogamy is wholly ruled out.

On the other hand, this very perfection of the *Fucus* story opens up new aspects of algal progression, and all possibilities require to be investigated—it being evident in natural evolution that every such possibility has to arise and be tried out, that at this stage of the world's history all have been tried out, and that the present survivors may be taken as indicating the only satisfactory solution of the various problems as sieved by natural selection. Hence, just as one is entitled to infer that the present state of *Fucus serratus* with

[1] Kjellman (1883), 'Algæ of the Arctic Sea: *Fucus, Pelvetia, Ascophyllum, Halidrys*,' p. 194.
[2] Tansley and others (1917), 'New Phytologist,' xvi. p. 242.
[3] Oltmanns (1922) 'Algæ,' p. 227.
[4] Tischler (1921), 'Allgemeine Pflanzenkaryologie,' p. 358.

dimorphous reproductive organs is derivative from a primary condition of hermaphroditism (*F. platycarpus*)—or from the present advanced heterogamy, that its ancestral stages were once wholly isogamous,—so the present strict elimination of apogamy is sufficient to indicate that in former stages parthenogenesis or some form of apogamy may have been usual, and haploid plants a possibility. It remains, therefore, to explore the general phenomena of apogamy and its consequences in other lines of algal progression. Curiously enough, such phenomena are remarkably general, and even within the limits of the Phæophyceæ they attain a classical interest. Thuret observed the direct fertilization of *Fucus* in 1854 [1], and these observations fell into line with similar accounts for heterogamous freshwater algæ (Pringsheim, 1855, *Vaucheria, Œdogonium*; De Bary, *Spirogyra*, 1858); but the zoospores of other Phæosporeæ, whether from unilocular or plurilocular 'sporangia,' appeared to develop directly [2]. The demonstration by Berthold (at Naples, 1881) of the fertilization of *Ectocarpus siliculosus* [3] with its remarkable corona-stage and incipient heterogamy amplifying Goebel's older observations on *E. globifer* (1878)—centred attention on the probable sexuality of the zoïds set free from the plurilocular organ, and the consequent probable 'asexual' nature of the unilocular sporangium so generally characteristic of the Phæosporeæ. Even at the present day, fertilization has been definitely observed in but a small number of forms; many plants, even of distinct phyla (Desmarestiaceæ, Sporochnaceæ) are not known to present any other reproductive organs [4]—others (*Scytosiphon lomentarius*) nothing but plurilocular constructions. Even the significance of the sexual processes received tardy recognition. As late as thirty years ago (1895) Sauvageau could suggest that all such fusions were probably pathological states [5]. Even Berthold's results were long unconfirmed. Reinhardt (1884) described the fertilization of *E. siliculosus* for the Black Sea, but Kuckuck (1891) failed to observe it at Helgoland, and Sauvageau (1896) found it come off only in early morning. Oltmanns (1899) at Naples further enlarged the details of the corona-story, but was again puzzled by the evident production without rule of 'neuter' zoïds from similar plurilocular organs, which germinated directly. These points have been largely cleared up by Miss Knight (1923), who has explained at last how it is possible to get plurilocular and unilocular sporangia on the same thallus in *Pylaiella*. The sexual fusion observed to take place freely in early spring has been also checked cytologically [6].

[1] The actual karyogamy, 1898, Farmer and Williams, Phil. Trans. cxc. p. 632; For *Spirogyra*, Haberlandt (1890); *Œdogonium*, Klebahn (1891); *Vaucheria*, Oltmanns (1895).
[2] Thuret (1851), 'Recherches sur les Zoospores des Algues: *Ectocarpus, Mesogloia, Stilophora, Laminaria, Scytosiphon, Cutleria*.'
[3] Berthold (1881), Mitt. zool. Stat. Neapel, ii. p. 401.
[4] Oltmanns (1899), 'Flora,' lxxxv. p. 86.
[5] *Cf.* also Oltmanns (1897), 'Flora,' lxxxiii. p. 388, on 'Scheincopulation'; Sauvageau (1895), Ann. Sci. Nat. viii. 2, p. 260.
[6] Knight (1823), Trans. Roy. Soc. Edin. p. 354.

From such observations on *Ectocarpus* and on *Cutleria*, there was soon no reasonable doubt that the plurilocular organs were normally sexual, and the unilocular sporangia asexual, the zoïds from the latter all germinating directly; and in some way a life-cycle of two phases prevailed, which might be comparable with an 'alternation of generations'[1]. In the absence of more detailed information as to karyogamy, in the present century interest centred in the demonstration of meiosis in the unilocular sporangium as establishing the somatic relations of the cytological cycle. This has been demonstrated in terms of synapsis and the reduced number of chromosomes for the tetrads of *Dictyota*[2] (Mottier), *Aglaozonia*[3] (Yamanouchi), *Zanardinia*[4] (Yamanouchi), *Chorda*[5] (Kylin), *Pylaiella*[6] (Knight); and there is now no reasonable doubt that the unilocular sporangium is always the meiotic organ: that karyogamy and meiosis run their obligate course in all these algæ, that haploid and diploid individuals normally occur, and in some way these stages must succeed each other in time; though there may be so far no apparent rule or reason for any strict rhythm, or for any differentiation of the two cytological types of soma.

So far, indeed, the meiotic organ, or unilocular sporangium is but the *apogamous homologue* of the unilocular gametangium of *Fucus*; and it clearly owes its unilocular organization to the fact that the first spindle is meiotic and destitute of a cell-wall, as is also the succeeding homotypic division. Further mitoses may give a varying number of ultimate nuclei which become the zoïds to be discharged into the outer medium, and on germination give haploid plants. As the subsequent fate of the free zoïds is a secondary problem, and has no necessary connection with their mode of production, a new term may be employed to cover all phases of this henceforward all-important organ as the *Meiotangium*, or structure devoted to the meiotic function preceding flagellate regression. On the other hand, the production of a haploid zoïd from a haploid plant requires no meiotic spindle, and hence shows no cytological or structural peculiarities in development; the small protoplasts regress normally, and are set free one at a time from small mother-cells as the nearest approach to the ancestral regressive flagellate from a 10–15 μ cell-unit.

The biological significance of this retention of apogamy in the life-cycle of lower forms is again obvious. Any imperfectly matured gamete, the less it is matured as a sexual cell, is the more likely to retain its vegetative capacities, and provided it contains active chloroplasts, may germinate vegetatively and so produce a new soma which is necessarily haploid. If all such gametes failed to fuse, and germinate, a saving of up to *fifty per cent.* would be effected in the wastage problem; and this in lower forms, residual in secondary stations,

[1] Reinke (1878); Falkenberg (1879), Mitt. Zool. Stat. Neapel, i. p. 420.
[2] Mottier (1900), 'Annals of Botany,' xiv. p. 163.
[3] Yamanouchi (1912), Bot. Gaz. liv. p. 470.
[4] Yamanouchi (1913), Bot. Gaz. lvi. p. 22.
[5] Kylin (1918), Svensk. Bot. Tidsk. p. 36.
[6] Knight (1923), Trans. Roy. Soc. Edin. p. 350

whether smothered by Fucoids or epiphytic on them, becomes a distinct advantage. The sexual process of karyogamy, leading on to the production of a diploid plant, must be kept in view at some time; but it is an undoubted gain to have two types of cytological soma—one is devoted to karyogamy and the other to meiosis. Both are retained, and a new phase of life-possibility is introduced, in which the two cytologically distinct somata share a physiological scheme, much as male and female individuals differentiate factors of sex in *Fucus* itself and associated Fucoids.

A range of wide possibilities is thus opened up, and apogamy of this degree undoubtedly prevails in the subsequent development of all higher types of the vegetable kingdom; all of which have evidently come the same way, and may hence be said to have originated from the subordinate vegetation of the sea, rather than from the ruling race of Fucoids. So far it is evident that a new factor has been introduced into the life-scheme of the plant, curiously remote from anything in the career of the more wasteful heterotrophic animal which gets its food ready made. Complications have been added, and any new possibilities will be run for all they are worth.

The meiotic unilocular sporangium (*meiotangium*) affords the key to the situation, as meiosis is now judged to be more significant in racial mechanism than the antecedent karyogamy which renders it possible. Meiosis must take place somewhere, and is the central fact of the life-cycle. Karyogamic fusion need not necessarily follow immediately, either in the case of the haploids zoïds thus produced or even in the case of normal gametes themselves: the latter on apogamous germination also give haploid plants. But the diploid plant must be produced some time; it is the essential benthic stage, and the odds are apparently in favour of the diploid plant with its double somatic inheritance being always the stronger and more resistant vegetative growth. Suggestions may be made as to other possibilities, and these will be judged on their merits, *e.g.*:—

(1) Why should the diploid plant be always meiotic?
(2) Why should not the haploid plant be apogamous also?
(3) Why do not the haploid derivatives of the meiotic sporangium fuse?

The first case implying 'delay' of meiosis and the production of further diploid somata does occur (*Pylaiella*, carposporophyte of Florideæ, aecidiospores of Uredineæ). In all cases it appears as adding further complexity to the life-cycle, which may acquire biological significance; but it does not affect the main cytological story of the race, and is recognized as of secondary and subsidiary importance. The case of the Florideæ is perhaps the most striking: these being admittedly a sea-phylum of subordinate value.

The second case of failure in the normal gamete to fuse, as secondary apogamy, also commonly occurs; but it can only give rise to further haploid individuals. The special case of *Cutleria* oospheres which may germinate parthenogenetically to give haploid *Aglaozonia*, affords a classical example, and is accepted as an example of racial

anomaly at the limit of dispersal range[1]: such parthenogensis is also noted in *Pylaiella*[2].

The third case is an essential one. If the diploid plant gave gametes only (as in *Fucus*), there would be no haploid plant at all, unless some were casually apogamous. There can be only two satisfactory solutions—either all must be strictly sexual or none; casual irregularity would be the indication of a decadent mechanism, unless some new factor can be added as a control. In case of total 'sterility,' which is so far the novelty, it is evident that it is this 'sterilization' of the meiotangium which does the trick; and in this way the haploid stage comes to be definitely intercalated in the life-cycle—not so much as the retention of a primitive phase, as a new departure. It is not the apogamy of the gametes of the haploid plant which is significant, these merely give the same stage over again with no new advance. It may be noted also that such sterilization to be effective must have been initiated at an early stage of the benthic horizon, when the regressive zoïds still retained functional chloroplasts, and long before they were reduced to the category of mere sex-cells, *i. e.*, at a horizon only inferred as long ago in the life-cycle of *Fucus*.

Apogamy is thus an effective cause for the initiation and establishment of two cytologically distinct somata; but it can do little more. To complete the story, it is necessary to make the sterilization of the meiotangium as absolute as is the converse in *Fucus*, and to maintain the absolute sexuality of the gametes of the secondary haploid stage. This gives the possibility of two cytological somata which will follow each other in time, and so appear to alternate; since it takes the two plants to complete the life-cycle. Any deviation from the strict rule will give mixed effects which may prove of special value in particular conditions of environment or biological procedure, appearing rather as factors of deterioration in the life-cycle of inferior and secondary types[3]. Such plants may occupy specialized positions in the general scheme of living forms; but they are admittedly off the

[1] Thuret (Cherbourg, 1850) gave parthenogenetic *Cutleria* as coming up *Cutleria*: Church (Plymouth, 1898) as constantly *Aglaozonia*: Kuckuck (Helgoland, 1899) as 50 % *Cutleria* and 50 % *Aglaozonia*: in mixture. Yamanouchi (1912), Bot. Gaz. liv. p. 465.

[2] Knight (1923), *loc. cit.* p. 355.

[3] The chances of the mechanism of this life-cycle going wrong in colder Northern seas, or in the starvation of freshwater, are so great that it is not to be wondered at that consideration of such depauperated forms has tended to obscure the view, as they were often the first to be investigated. Thus even Ferns of the land may present casual apogamy and apospory; *Cutleria*, with considerable differentiation of heterogamy and heterothallic alternation, gives very anomalous results in both categories: 'Cystocarpic' plants of Florideæ may bear tetraspores, and *Ectocarpus* may carry unilocular and plurilocular 'sporangia' on the same shoot. The accuracy of the general rule is confirmed from the surviving flora of the land—all Archegoniatæ, Angiosperms, and Fungi as Ascomycetes and Basidiomycetes,—no plant-race has really made good on the land, which had not attained the two-phase haploid and diploid cycle. The case of *Chara*, *Spirogyra*, *Vaucheria*, *Coleochæte*, with large specialized 'resting' oospores, and meiosis at germination, suggests the loss of a diploid phase; and all these types are vestigial relics with no chance of future progression.

main line of progression leading to higher flora of the land (*cf.* non-parenchymatous Florideæ of reef-pools and hyphal Uredineæ).

So far, however, there is no reason adduced for any differentiation between the two cytological types of somata: each has its special reproductive task, but need not necessarily differentiate morphologically, any more than do male and female individuals of *Fucus* and other Fucoids. The sequence at its optimum regularity works out a strictly *Homothallic Alternation*; but this does not exhaust future possibilities, and something more is still required in the progression of higher types even in the sea.

(To be continued.)

OBITUARIES.

Dr. Horace T. Brown, F.R.S. (born 1848), who died on February 6, was a chemist, and for many years associated with a brewing business at Burton-on-Trent. His valuable investigations on fermentation and the associated changes in the grain were recognized by botanists as of great importance from the point of plant-physiology. In recognition of his work, he was awarded the Royal and Copley medals of the Royal Society. He had also been a Fellow of the Linnean Society.

William Watson (born 1858) was associated with the Royal Gardens, Kew, from 1879 until his retirement under the age-limit in 1922. In 1886 he became Assistant Curator, and in 1901 succeeded Mr. George Nicholson as Curator. He had a very wide knowledge of plants, and was the author of several works on gardening. In 1904 he was elected an Associate of the Linnean Society, and in 1917 received the Victoria Medal of Honour of the Royal Horticultural Society. He died on January 30. An appreciation of his work, and a portrait, was given in the *Gardeners' Chronicle* of February 7 last.

James Kirkham Ramsbottom.—The untimely death of this promising young worker at the age of 33 occurred in New York on February 6. Owing to a breakdown in health, which made open-air work desirable, he entered the Royal Horticultural Society's Gardens at Wisley as a student in 1911, and in 1913 became special research student. By his investigation of the daffodil-disease, and his discovery that eelworm was the cause, he rendered an invaluable service to the bulb-growing industry; he also worked out the hot-water method of controlling the pest. He had recently been appointed assistant managing-editor of the *Gardeners' Chronicle*. At the time of his death he was visiting the United States, where he was to lecture on the daffodil-disease and its control. A biographical notice, with a portrait, appeared in the *Gardeners' Chronicle* (January 31) shortly before his death.

Lilian Suzette Gibbs.—The news of the death of Miss Gibbs at Santa Cruz, Teneriffe, on January 30, came as a shock to her many botanical friends, especially those with whom she had been associated in work at the Royal College of Science and the Department of Botany, British Museum. An appreciation of her work will appear in the next number of this Journal.

NOTES ON BRITISH PLANTS.

CNICUS ACAULIS × TUBEROSUS, hyb. nov. On August 12th, 1924, Mr. Eric Marsden Jones, of Potterne, Devizes, collected a thistle on Avebury Downs, Wilts, and gave it to me to confirm his opinion of it. After examination I agreed with him that it was a hybrid between *Cnicus acaulis* L. and *C. tuberosus* Roth, both of which grow there, while the hybrid is scattered about in fair quantity. I have selected *C. acaulis* L. var. *caulescens* Pers. for comparison, to get the stem-characters. In the case of *C. acaulis* × *tuberosus* the stem is *slender*, pilose with curled hairs in the lower half, and *woolly* with *floccose hairs* on the upper half, peeling off. Capitulum solitary, short and narrow; scales of the capitulum *conspicuously ciliate*, and mixed with *woolly hairs*. Leaves covered with short stout hairs on *both* surfaces, or with short raised points; lobes of the pinnæ 3–4, *long* and *narrow*, especially the *terminal* lobe. The stem of *C. acaulis* var. *caulescens* is *stout*, and pilose with curled hairs throughout. Capitula 1–7, the terminal one being long and broad, the rest smaller; scales of the capitulum *inconspicuously* ciliate, otherwise glabrous. Leaves covered with short stout hairs or short raised points on the lower surface, glabrous above; lobes of the pinnæ 3–4, short and broad. The roots of the hybrids are ±conspicuously fusiform. The extra characters are derived from *C. tuberosus* Roth.—J. FRASER.

ABNORMALITY IN FLOWER OF GORSE (*Ulex europæus*). In 1885 I noticed a curious form of the "standard" petal in several plants on Putney Heath. A small flap, about one-tenth of an inch across, protruded from the upper edge on each side and was folded back at right angles. Mr. Carruthers, of the Natural History Museum, put a note in the *Journal* (xxiii. 157, 1885), and within a very short time the peculiarity was reported from every county in England. I have often looked for it since in Switzerland and Italy and Norway, as well as at home, but after 1890 I never saw it till early this year, when I found it in Surrey. Is it possible that the flap helps the petal to retain its dew-drop at night?—D. MATHESON.

MENTHA RUBRA Sm.—A CORRECTION. In recently looking through some of the mints in my herbarium, I find that the plant recorded in this Journal (lxi. 22) as *Mentha rubra* Sm. from Llanberis is really a luxuriant state of *M. gentilis* L., which I did not sufficiently examine. Like *M. rubra*, *M. gentilis* appears to be unrecorded for Carnarvonshire, although it was noted "between Mole and Llanroost"—presumably on the Denbigh side of the Conway—so long ago as 1800 in Smith's *Flora Britannica*. Last summer I met with the same large form of *M. gentilis* in a wet spot at Criccieth.—H. W. PUGSLEY.

REVIEWS.

TEXT-BOOKS OF BOTANY.

Text-book of General Botany. By GILBERT M. SMITH, JAMES B. OVERTON, EDWARD M. GILBERT, ROLLIN H. DENNISTON, GEORGE S. BRYAN, and CHARLES E. ALLEN of the Department of Botany of the University of Wisconsin. 8vo, pp. x, 409, with 7 plates and 321 text-figures. New York: Macmillan Co., 1924. Price 16*s*.

THIS text-book represents the first year's course in botany at the University of Wisconsin. There is no indication of the share taken by the various authors whose names appear on the title-page, but there is no break in continuity and the result is a clear and well-arranged introduction to the study of the science which teachers in other colleges or universities may find useful. The illustrations, which have been specially prepared for the book, are clear and well-selected, especially those dealing with structure and general anatomy; many evidently have their origin in lecture-diagrams. The reproductions of photographs of eminent scientists who have been pioneers in the various aspects of the science—Linnæus (frontispiece), Strasburger, Pasteur, Mendel, Darwin, Asa Gray, and Sachs—are less successful, though the idea of familiarizing the student with these great men is an excellent one. An introductory chapter on the "make-up of a plant" is followed by studies of the cell, roots, stems, buds, and leaves successively. Several chapters on plant-physiology are succeeded by a brief account of the structure, division, and development of embryonic cells. Examples of the great divisions of the plant-world are then described from the simple Algæ upwards—a chapter on chromosomes and the reduction-division intervening between the accounts of the Mosses and Ferns. The detailed study of Angiosperms takes the form of an examination of a number of floral types and a general account of seeds and fruits. The four concluding chapters deal respectively with Inheritance and Variation, Evolution, the Geographical Distribution of Plants in North America, and the Economic Significance of Plants.

Plant Anatomy from the Standpoint of the Development and Functions of the Tissues, and Handbook of Micro-technic. By WILLIAM CHASE STEVENS, Professor of Botany in the University of Kansas. Fourth edition, revised. 8vo, pp. xv, 398, with 155 text-figs. London: Churchill, 1924. Price 18*s*.

PROFESSOR STEVENS's text-book envisages the plant as elucidated by help of the microscope. Starting from the cell, the general structure and differentiation of the tissues are next studied, and the various tissues are then examined in detail in relation to important physiological processes—absorption, transport and storage of material, construction of food, and, finally, reproduction. A large portion of the volume is devoted to instruction in preparation of sections, the use of the microscope, and a description of reagents and processes. There are also chapters on the microchemistry of plant-products and

the detection of adulterations in food and drugs. As compared with previous editions, emendations have been introduced where debated questions have arrived at or approached solution, such as the genesis of the plastids, the constitution of chlorophyll, the structure of the cell-wall, the ascent of water, and the operation of the stomata. Additions and modifications have also been made in the chapters dealing with technique. Teachers and students will find the book a valuable companion and guide in laboratory work.

Handbook of Practical Botany. By Dr. E. Strasburger. Translated and edited with many additional notes by W. Hillhouse. Eighth edition, revised by W. Leach, M.Sc., Lecturer in Botany in the University of Birmingham. 8vo, pp. xxviii, 533, with 164 text-figures. London: Allen and Unwin, 1925. Price 12*s.* 6*d.*

The older generation of Botanists will remember the welcome reception accorded forty years ago to the *Botanische Practicum* of the master in the technique of the study of the plant-cell and the problems it presents. The English translation by Prof. Hillhouse of Birmingham appeared in 1887, and the value of the work as supplying a felt want has been attested by the necessity for new editions at frequent intervals until 1911, when a seventh and revised edition appeared. The present edition appears after a lapse of thirteen years. But, owing to the necessity of retaining the existing formation, only such alterations as seemed absolutely necessary have been made. Figures of modern instruments have been introduced in place of those originally included, and some parts of the text have been rewritten to make them accord with more recent views. A short appendix (Appendix V.) has been added, in which a number of additional staining methods are described. The handbook still preserves the form and methods of the original, and remains a useful introduction to the practical study of plants. But the volume, judging from the copy supplied for review, is badly bound and will stand very little hard use in the laboratory.

Icones Fungorum Malayensium. Figures and Descriptions of Malayan Fungi, edited by Dr. C. Van Overeem and Prof. J. Weese. Hefts 1–4. 4to, 4 pls., coloured, with descriptive text. Nijhoff: The Hague, 1923. Subscription price 1·50 guilders each part.

Though the four parts are each dated 1923 they have only recently been received. The prospectus announces the issue of twelve parts each year. The object of the work is to introduce to the botanist and agriculturist the rich fungus flora of the Dutch East Indian Archipelago. Parts 1–4 deal with *Clavariaceæ* and are by Dr. C. van Overeem. The descriptive text is in German and occupies either a single or double sheet (2 or 4 pages). The plates, which are printed on thin card, represent the habit of the plants, natural size, in colour, and the spores and basidia, ×850. In the four parts nineteen species of *Clavaria* and closely allied genera are described and figured. Reference is given to the original place of description of the species, but there is no synonymy.

Beiträge zur Botanischen Protistologie.—I. Die Polyangiden. By E. Jahn. Pp. 107, 2 col. pls., 14 text-figs. Borntraeger: Leipzig, 1924. Price 10*s.* 6*d.*

The name Myxobacteriaceæ was given by Thaxter to a small group of bacteria, because of the very considerable amount of mucilage evolved during their development, in this character resembling the plasmodium of the Myxomycetes (Mycetozoa). Jahn, in this Monograph of Polyangidæ, points out, however, the essential difference between the two: in Mycetozoa the plasmodium is a plastic substance which moves in an amœboid manner; the Myxobacteria move also in space, but it is the bacteria that push forward as they multiply in the front line of advance. In due time, somewhat like the Acrasieæ, they build up a fruit-body or cyst which is formed of bacteria surrounded by mucilage. They are small delicate organisms that develop the cyst-stage generally in the stillness of the laboratory, either on their natural substratum of old wood, excreta, &c., or accidentally in other artificial cultures. These fruiting-bodies are small objects, the largest only 600 μ in height, and are brightly coloured, mostly orange-yellow, but often with a pinkish or reddish-brown tinge. Link, in 1809, had described a genus *Polyangium* as a Chasteromycete which Jahn recognizes as the first record of a *Myxobacterium*, and, therefore, he alters Thaxter's genus *Myxobacter* to the earlier name and also rechristens the whole group Polyangidæ. Though he has proved that "Myxobacteriaceæ" gives a wrong impression, we regret the disappearance of Thaxter's descriptive appellation and question Jahn's right to do this *. After Link the next species was observed by Berkeley in 1857, who gave us *Chrondromyces* as allied to *Aspergillus*; a third form, *Micrococcus fulvus* Cohn, was determined by Schroeter in 1886 to be of bacterial nature. Thaxter, who was the first really to follow the full development, published various species from 1892 onward. In 1901 a *Myxobacterium*, which had appeared in laboratory material of dead wood, was published in the *Journal* as *Myxococcus pyriformis* A. L. Sm.; Jahn considers it to be a synonym of *Myxococcus fulvus*. Other Myxobacteriaceæ have been noted by British workers, but the study has not been followed up. Since 1901 several botanists have found species, new or already determined, on the continent and in other countries, and now we have this full Monograph of Polyangidæ with 4 families, 11 genera, and 36 species.

Jahn has superseded Thaxter's systematic arrangement: eight of the eleven genera are largely based on Thaxter's species, one genus only being entirely new to science. Jahn writes from first-hand knowledge, but he does not always make clear the original substratum or the locality.

The opening chapter is full of instruction, taking up as it does every point of interest in history or development. The author explains the forward movement of the "rods" as due to the excretion of mucilage, and comparable to the movements of Diatoms, Desmids,

* [The name Myxobacteriaceæ must stand.—Ed.]

and Cyanophyceæ. He finds, indeed, that Polyangidæ are more nearly related to the blue-green Algæ than any other group of Schizomycetes, but considers them sufficiently distinctive to rank as a Class near to Cyanophyceæ.

Jahn's work, which is in pamphlet form, is beautifully printed and illustrated; it embodies a vast amount of observation and research, and is a welcome contribution to our knowledge of an interesting group of harmless bacteria. The absence of an index is to be regretted.

Jahn indicates in a short preface that he has cultures of the more easily grown species at the Botanisches Institut der Forstlichen Hochschule, Munden, Hannover. A. L. S.

NOTE TO AUTHORS AND PUBLISHERS. The Editor regrets that several works sent for review to the late Editor have not yet been traced. It is hoped that they will be forthcoming later, when notices will be published in due course.

BOOK-NOTES, NEWS, ETC.

Botany, an Outline of Classification. Messrs. Churchill have reprinted from *The Pharmaceutical Journal* as a small booklet (price 1*s.*) the notes on Botanical Classification prepared by their lecturer, Mr. T. E. Wallis, for use of pharmaceutical students. The twenty pages comprise a summary of the characters of the great divisions of the plant-kingdom and of the subclasses and families of flowering-plants prescribed for study. Descriptions are also given of forty-five selected plants, many of medicinal value or dangerously poisonous—a knowledge of which is required from the student.

Icones Plantarum Japonicarum. We have received from Dr. Tokutaro Ito a copy of part 6 (vol. i.) of the coloured figures and descriptions of plants indigenous to or cultivated in Japan. The plants included are *Sanicula rubriflora*, *Primula Sieboldii*, *Saxifraga sarmentosa*, and *Lychnis coronata*. The plates are beautifully executed, and include a wealth of detail in addition to a representation of the entire plant. The text comprises a full description of the plant in English and Japanese, and a map illustrating distribution is also included. Twenty-four species have so far been described in vol. i., and it is hoped that Dr. Ito will be able to continue the work.

DR. ITO also sends a description with plate of *Asarum Fudsinoi*, a new species from Southern Japan (*Science Reports of the Tohoku Imperial University*, ser. 4, Biology, vol. i. no. 1, 1924).

THE British Bryological Society held its Annual Meeting and Excursion at Llanberis, under the presidency of Mr. H. N. Dixon, from August 29 to September 5. The surroundings of Llanberis and Cwm y Glo were explored, also the precipices of Clogwyn dur Arddu, Snowdon summit, and Cwm Dyli. Drives were taken to Cwm Idwal for Glyder Fach and to Beddgelert for Moel 'r Ogof and Pont Aberglaslyn. Several interesting finds were made, the most sensational being that of *Grimmia andraeoides* Limpr., a very small dark brown moss much resembling an *Andraea*, which was found on a boulder by Llyn Clogwyn; this is a rare Continental alpine species. *Grimmia elongata* Kaulf., *Catharinea crispa* James var. *densifolia* Lindb., and *Encalypta commutata* N. & H., were added to the Welsh Flora. Among other rare mosses were noted *Grimmia conferta* Funck, *Ditrichum zonatum* Limpr. var. *scabrifolium* Dixon, *Fissidens polyphyllus* Wils., *Tortula princeps* De Not., *Leptodontium recurvifolium* Lindb., *Bryum alpinum* var. *viride* Husn., *Hypnum callichroum* Brid., and *H. dilatatum* Wils. Among the rarer hepatics were species of *Gymnomitrium* and *Marsupella*, especially *M. sphacelata* (Gies.) Lindb.; *Lophozia atlantica* (Kaal.) Schiffn., *Anthelia Juratzkana* (Limpr.) Trevis, *Herberta Hutchinsiae* (Gottsche) Evans, and *Scapania ornithopodioides* (With.) Pears.

The annual business of the Society occupied the evenings: Mr. H. N. Dixon resigned the presidency to the Rev. C. H. Binsted. Dr. Trotter offered to epitomize serial bryological papers for the Report, and the Society undertook to give a list of bryological papers published during the year. Mr. W. R. Sherrin offered to house the books and specimens belonging to the Society in the South London Botanical Institute and to act as Librarian and Curator. New editions of the two Census Catalogues, Mosses and Hepatics, are under preparation, and help will be welcomed from botanists residing in some of the less well-worked counties, where records are wanting of obviously common species. The next Meeting will be at Ross for the Wye Valley, August 14–21, with Miss E. Armitage as Local Secretary.

AT the meeting of the Royal Society on February 5, Mr. H. Hamshaw Thomas read a paper on the Caytoniales, a new group of Angiospermous plants from the Jurassic rocks of Yorkshire. The fossils described are the remains of megasporophylls with carpels, fruits, and seeds, of two distinct types, and male inflorescences bearing stamens. The megasporophylls, fruits and seeds, represent two distinct genera. The first, *Gristhorpia Nathorsti*, gen. et sp. nov., had pinnate megasporophylls 4–5 cm. long, with an axis about 1 mm. wide; the sub-opposite pinnæ terminate in small, more or less spherical carpels 2–5 mm. in diameter. The carpels have a stigma at the base near the pedicel, and young specimens look as if they were formed by the curving over of the apical part of the reduced lamina. The carpels become closed at an early stage, and contained ovules, apparently formed on the inside of the carpel wall. Generally 8–10 seeds were found, but there is evidence of the presence of very many ovules, most of which were unfertilised. Winged pollen-grains were found on some of the stigmas, which enabled the male inflorescences to be identified. The seeds had a well-developed megaspore membrane with an apical projection, above which was a micropyle lined with cutinised cells. There is evidence of the occurrence of two integuments.

The second species, *Caytonia Sewardi*, possessed megasporophylls agreeing generally with those of *Gristhorpia*, but the stigma was a small basal flange. The carpels and fruits contained two rows of ovules or seeds, with hard woody or stony testas. The testas are

regarded as having been formed from two integuments. The seeds are often found isolated, but can readily be recognised.

The remains of the male inflorescences are of a type previously known as *Antholithus* sp. and now named *Antholithus Arberi*. They were probably borne on the same plants as *Gristhorpia Nathorsti*, and had a pinnate structure, with a central axis bearing side-branches which often forked and produced groups of 3–6 anthers at their tips. The anthers were four-lobed sessile structures of a form very like that found in many modern Angiosperms, and had a longitudinal dehiscence. There are no traces of perianth-members or bracts.

Cuticle-preparations of the axes of both mega- and micro-sporophylls show that the epidermal cells of the two sides differed in their form and thickening; this is regarded as indicating derivation from an original foliar structure.

Much attention has been devoted to the identification of the leaves of the plants which produced the reproductive organs. There is a constant association of megasporophylls and fruits with leaves of the species known as *Sagenopteris Phillipsi* (Brongn.). The comparative examination of the cuticular structure of the axes of *Gristhorpia* and *Caytonia* and of the petioles of *Sagenopteris* fronds makes it seem very probable that *Sagenopteris* must be regarded as the leaf of the Caytoniales.

At the meeting of the Linnean Society on January 22, Miss M. S. Johnston showed specimens of calcareous deposits round roots of Canadian birches in Pleistocene sands. The concretion is considered to be due to the action of humic acid from the roots segregating the lime constituents in the sand.

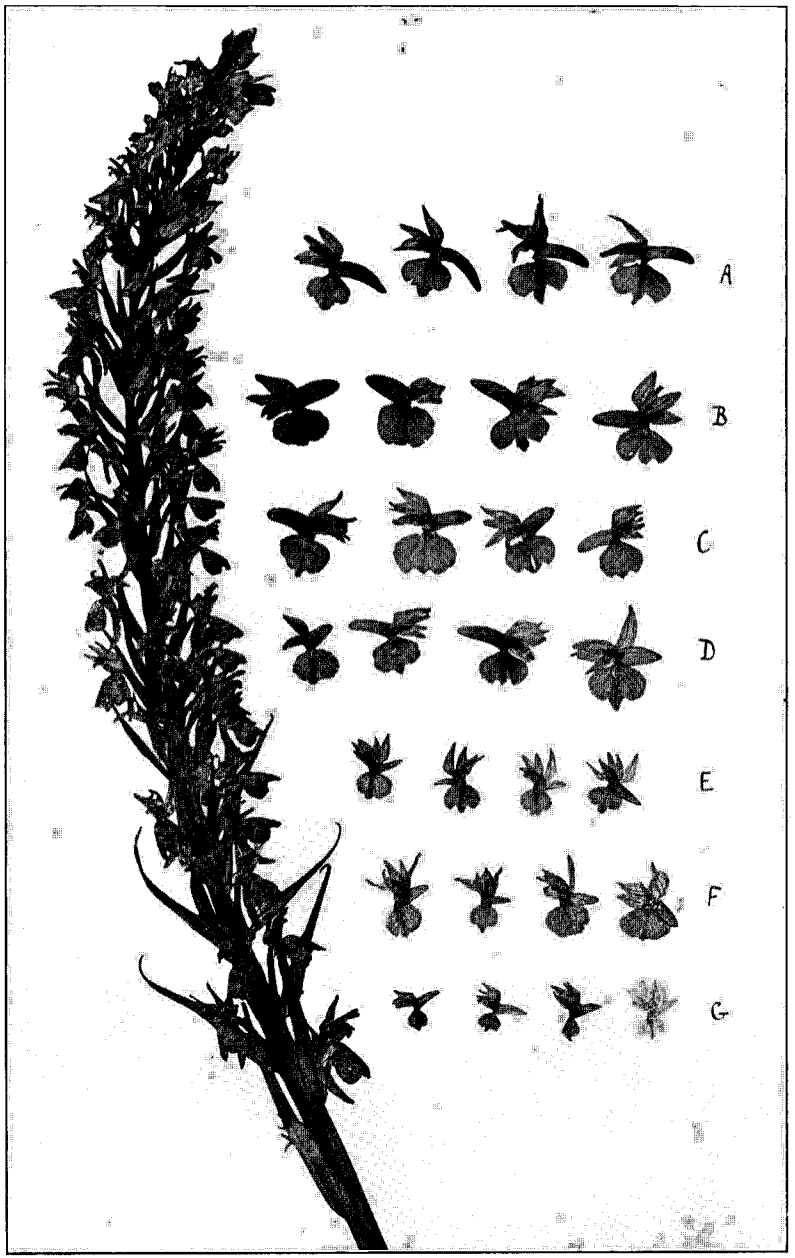
The President (Dr. A. B. Rendle) gave an account of the recent visit of the British Association to Canada, especially from a botanical point of view. The account was illustrated by a series of lantern-slides.

Mr. R. D'O. Good described the general characters of the flora of Canada, illustrated by an exhibition of the plants gathered by Dr. Rendle and himself during the trip, and showed lantern-slides of some of the more striking flowers. It is proposed to print the account in the next number of the *Journal*.

Dr. J. Munro gave an account of the Canadian forests and forestry, describing the four climatic belts between the east coast and British Columbia, with their special species and the depredations caused by insect-pests, fungi, and forest-fires, and the great losses due to wasteful exploitation.

The President announced that the two rooms adjoining the Meeting Room had been fitted for the use of Fellows for reading, writing, etc.

Dr. W. R. G. Atkins, Head of the Department of General Physiology, Marine Biological Laboratory, Plymouth, has been recommended by the Council for election into the Fellowship of the Royal Society. Dr. Atkins is the author of numerous papers dealing with the application of the methods of physical chemistry to plant-physiology.



ORCHIS SESQUIPEDALIS Willd.

E, F, *O. prætermissa* Druce; G, *O. incarnata* L.

SOME FRENCH MARSH ORCHIDS.

By the Rev. T. Stephenson, D.D., and T. A. Stephenson, D.Sc.

(Plate 572.)

1. Orchis sesquipedalis Willd. Spec. Plant. iv. 30 (1805).

That part of the description which contains the distinctive characters may be quoted: Radix *palmata*. Caulis *sesquipedalis*. Folia *lato-lanceolata*. Spica *floribus alternis remotiusculis*. Labellum *indivisum obovatum lateribus reflexum apice emarginatum, margine acute dentatum*. Cornu *fere longitudine germinis cylindraceum crassum*. Habitat Lusitania.

Some of the most important subsequent references are as follows:—Reich. Icones Fl. Germ. xiii., xiv. (1851), gives under *O. incarnata*, 4. *sub-latifoliæ*, (b) *sequipedalis*, with the sub-sections (aa) *genuina* (fig. cccc.), (bb) *algerica* (fig. ccexcvi.), (cc) *altaica* (fig. cccv.). Willkomm and Lange, Prodromus Fl. Hisp. (1861), give under *O. incarnata* (type not in Spain) (β) *sesquipedalis genuina*, (γ) *Durandii*. E. G. Camus, Monographie des Orchidées de France (1894), Mon. des Orchidées de l'Europe (1908), Iconographie des Orchidées d'Europe (1921). In the first-named *O. sesquipedalis* is given as a race of *O. incarnata*, along with *O. angustifolia* Reich. and *O. integrata* G. Camus; in the second work it is given as a subspecies of the same, along with other subspecies, such as *Munbyana* and *Durandii*, to which further reference will be made. J. Klinge, Dactylorchidis Prodromus (Act. Hort. Petrop. xvii. 1898), has described a species *O. orientalis*, composed of six subspecies, of which no. 3 is *O. africana* Klinge, which includes as varieties *O. sesquipedalis* W., *O. Munbyana* B. & R., *O. Durandii* B. & R., and *O. elata* Poir. The sixth subspecies is *O. foliosa* Nolander. Rouy, Flore de France (1921), gives *O. sesquipedalis* as a distinct species with four forms—(a) *genuinus*, (b) *foliosus*, (c) *corsicus*, and (d) *ambiguus*.

These references suffice to show that *O. sesquipedalis* has been generally connected very closely with *O. incarnata*, and is a member of a very complex group of Southern Marsh Orchids. The type-form is found plentifully in the Charente valley, and, in the light of a recent examination of very many plants *in situ*, a few notes may be useful. It is evident at once that the character "*labellum indivisum*" of Willdenow cannot stand. The form of the lip varies greatly, from sub-entire to very markedly trilobed. In view of this, all the descriptions we have seen need revising. In comparison with the more northern Marsh Orchids it is decidedly taller, many plants reaching 5 dm. The leaves are unspotted. In the very few cases where spots were found, there was probably the influence of *O. maculata*. The leaves are narrow-lanceolate, erect, not hooded, the upper small and bract-like, not often reaching the base of the spike. Thus the leaf-habit is rather like that of *O. incarnata*, but the colour is not yellowish-green, nor are the leaves so long proportionately to the width, nor are they hooded, nor are the basal leaves so long in



Orchis sesquipedalis Willd.

proportion to the whole height of the plant. In comparison with *O. prætermissa* Druce, they are narrower and not so spreading. The bracts vary a good deal, some being very large (70 mm. by 8 mm. at widest), some quite narrow, the lowest much longer than the flowers, the upper about equalling the flowers. The size of the lip is very much greater than that of *O. prætermissa*, *latifolia*, and *incarnata*. It varies from about 12 mm. to 18 mm. in width and from about 10 mm. to 14 mm. in length, as compared with 7–12 mm. by 6–8 mm. for *O. prætermissa* and *latifolia*, and an average of 7 by 7 mm. for *O. incarnata*. The size of the spur greatly exceeds that of these three species. Though occasionally quite short (8 by 4 mm.), it may reach 16 mm. in length and 6 mm. in diameter (measuring dried specimens). The average may be 12–14 mm. long by 5 mm. in diameter compared with 7–8 mm. by 2–3 mm. diameter for *O. prætermissa*, that of *O. latifolia* being usually rather more slender, and of *O. incarnata* shorter and stouter. The spike varies greatly in size, from about 8–33 cm., the flowers being sometimes lax and sometimes very dense. In general, the side-lobes of the lip tend to be strongly reflexed, so much so in some cases that when they are flattened out they split. This last character they share with *O. incarnata*; but the general appearance of the flowers suggests a bigger type of *O. prætermissa*, which they resemble also in their range of purple tints and the type of lip-markings. The plants chiefly studied were growing in hundreds in the dampest part of a marsh formed by the overflow of the "gouffre" called "Les Tards," a very

deep and powerful spring welling up from the ("Santonian") chalk. "The soil itself in which the orchids grow is alluvial deposit of the quaternary period, formed by the decomposition of the chalk of the Santonian stratum and decayed vegetable matter, with a little peat in places." In the same marsh *O. laxiflora* and *O. incarnata* are found, with a few plants which may be hybrids of *O. sesquipedalis* with these and with *O. maculata*. The last-named is found in the neighbourhood, though we did not actually see any of it near the marsh.

It is not easy to say much about the relations of *O. sesquipedalis* to the other Southern forms, as for the most part we have not seen living specimens of them. Following descriptions, *O. ambigua* Martr., described from the Tarn valley, is said to have broader (sub-oval) lower leaves, but Camus considers it to be the same as the type. *O. Durandii* B. & R., from Spain and Morocco, apparently has the side-lobes of the lip not reflexed and petals not connivent, smaller flowers, and almost sac-like spur. *O. sesquipedalis* var. *corsica* Briq. has a markedly trilobed lip, with margins not reflexed, and a shorter spur. *O. elata* Poir., from Algerian marshes, is identified with *O. Munbyana* by Briquet, but Boissier and Reuter say it is *not* the same, but has a longer spike and simple tubers.

More clearly distinct are *O. Munbyana* and *O. foliosa*. *O. Munbyana* B. & R. (*O. sesquipedalis* var. *algerica* Briq.) is a tall plant, with lower leaves broadest above the middle, and a dense cylindrical spike of rich magenta flowers, which are smaller than those of typical *O. sesquipedalis*. The lip is angular, rather than crenulate, with many fine veins and little or no lined pattern, the side-lobes are not reflexed; the mid-lobe is very obtuse blunt-triangular. The spur is of moderate size and length, slightly conical. Boissier and Reuter in their description emphasize the long bracts, "much exceeding the flowers"; but in the fine clump of this species which is growing in the rock-garden at Kew, the lower bracts only slightly exceed the flowers, and are not conspicuous. *O. foliosa* Solander was described in 1831, from Madeira. This is a very robust and leafy plant, though not specially tall, as far as we have observed. The lower leaves are very broad, up to 6·5 cm. or more, and sometimes about half as broad as they are long. The spike is very dense and broad. The flowers are even larger than in typical *O. sesquipedalis*, the lip measuring about 20 mm. in width by 17 mm. in length, more or less, being flat, with a very prominent centre-lobe, the side-lobes often rather sharply and irregularly crenulate. The spur is quite short, the colour lilac-purple, and the lip has fine veins, but very little pattern. The bracts hardly exceed the lower flowers. Some of the descriptions are rather puzzling. Solander says the stem is solid, Camus that it is fistular. Rouy gives the leaves as "spotted or not," and "Tip and spur of (α)," which is type *O. sesquipedalis*. Moreover, both Rouy and Camus give a good many French stations for the plant, whereas one would not expect to find it in France at all. One would suspect plants with spotted leaves to be hybrids, and the phrase "lip and spur of (α)" suggests some real confusion. The spur of typical

O. sesquipedalis tends to be very large indeed, up to 16 by 6 mm., whereas the spur of *O. foliosa* is relatively very small and slender (6–8 mm. long and very narrow). It seems possible that plants assigned to *O. foliosa* in France may be broad-leaved and robust forms of *O. prætermissa*. This is a point which we will now take up.

2. ORCHIS PRÆTERMISSA Druce, Rep. Bot. Exchange Club, 1913, 34, was segregated and described in 1913 (see Journ. Bot. 1923, 65). Since its segregation *O. prætermissa* has been located more or less all over the British Islands and in Holland. Col. Godfery has never seen it in South France, Switzerland, or Italy. Dr. Keller only knows it from Britain and Holland. It was therefore a matter of some interest to explore the Paris region in search of it, and it was found in three stations north of Paris in the beginning of June. In a small marsh near Isle Adam it grows along with *O. incarnata, latifolia, militaris,* and *maculata*. Of these it is most numerous. In moist meadows near Coye there are *O. prætermissa* and *O. latifolia*, growing freely and in equal numbers, no *O. maculata* being noted here. In an extensive and thickly overgrown fen near Arronville, chiefly around its borders, *O. prætermissa* grows in large numbers, as also *O. maculata*, with *O. latifolia, militaris*, and *incarnata* in less plenty. All these Marsh and Spotted orchids are precisely similar to British forms. Thus the presence of *O. prætermissa* at least so far south as Paris is established, and, in the light of this fact, some further remarks may be made. It is evident that all the species of the *sesquipedalis* group stand much nearer to *O. prætermissa* than to *O. incarnata*. It seems probable that E. G. Camus considers *O. prætermissa* as typical *O. incarnata*. For instance, in the 'Monographie des Orchidées de l'Europe,' he describes *O. incarnata* as having flowers larger than *O. latifolia* with a lip flat or almost flat. This would suit *O. prætermissa*, but *not* true *O. incarnata*. Again, he cites Arronville as a good place for *O. incarnata*. Now we found that there are great quantities of *O. prætermissa* and only one small colony of *O. incarnata*. We did not traverse the whole of the large bog; but probably we searched by far the most promising part of the ground. The figure of *O. incarnata* in the work above cited (pl. 22) has purple flowers much too large for true *O. incarnata*. In the 'Iconographie des Orchidées d'Europe,' pl. 42, fig. 1, with pale pink flowers, is a true *O. incarnata*, described as "forme à petites fleurs des marais tourbeux," whilst fig. 2 with purple flowers of a much larger size is described as "forme robuste," and is apparently *O. prætermissa*. *O. sesquipedalis* may be connected with the latter, but certainly not with the former. This, we think, gives the clue to the procedure of all those, from Reichenbach onwards, who have classed *O. sesquipedalis* as a section of *O. incarnata*. Also *O. foliosa* is better classed with *O. sesquipedalis*, where Rouy has placed it, than under *O. latifolia* with Camus. Klinge, as we have seen, separates it from *O. sesquipedalis*, and makes it a subspecies of his *O. orientalis*; but it is best treated as a distinct species.

O. incarnata, as far as we have observed it, is, in all its forms, very different from the *prætermissa-sesquipedalis-foliosa* series. Though there are many most distinct colour-varieties, the form with narrow, fleshy, rather yellowish-green leaves and small flowers of a pale pink, which may be taken as the type, may be found from the Orkneys to S.W. France. It is not certified for the Iberian peninsula. At Jarnac, on the Charente, the habit is precisely as in Britain. A very pale blue-lilac colour-form was new, and British plants have generally rather stouter spurs; otherwise no difference was noted. But parallel with this comparative uniformity of *O. incarnata* there is a continuous succession of the other type. Though *O. prætermissa* is not absent from the Orkneys and Scotland, far the commonest form in the North is the richly coloured *O. prætermissa*, var. *pulchella* Druce, which also straggles down the West side of England and Wales. In England and Wales the type-form is abundant, and, to judge from the Paris results, it is probaby common in Northern France. Further south we get the typical *O. sesquipedalis*, with *O. ambigua*. In the Iberian Peninsula perhaps these last two with *O. Durandii*. In Corsica there is *O. sesquipedalis* var. *corsica*. In North Africa *O. Durandii, O. elata, O. Munbyana*, and perhaps *O. foliosa*, and in Madeira *O. foliosa*, the most southerly of the group. No plants of type *O. prætermissa* were seen in S.W. France, and it would appear that true *O. incarnata* is not found in Spain and Portugal.

The most surprising find in the Charente district was that of *O. elodes* (*ericetorum*), of which some patches were found on sandy peat belonging to some caps of grey and yellow sandstone similar to the Fontainebleau sandstone, which in a few places cover the Jurassic limestone and Purbeck clay. This is much further south than would seem to be expected. On the other hand, this situation would seem to be rather far *north* for *O. sesquipedalis*, as also for *Ophrys scolopax* and *Serapias lingua*, which are fairly plentiful.

We owe most sincere thanks to M. J. Delamain, of Jarnac, and his son, who have fully studied the orchids of this district, the Charente region, by whose great kindness it was possible to see all the best localities in a very short space of time, as well as to Mlle. Camus, who kindly indicated the localities visited in the Paris region. All the notes about the soil are due to M. Delamain, and the text-figure is from a photograph by his son, M. Jean Delamain.

Pl. 572 is from the photograph of a sheet of pressed specimens. The spike is 33 cm. in length. The lips have a more than usually prominent middle lobe. Of the single flowers, lines A to D give various forms of *O. sesquipedalis*. E and F are forms of *O. prætermissa*—E from French flowers, F from British. G gives forms of *O. incarnata* from France, except the last flower on the right, which is var. *ochroleuca* from Germany. The text-figure gives a much looser type of spike, also with a very prominent middle lobe; but, as is evident from the lips in lines A to D, this is relatively infrequent. In general, the great difference in the size of lips and spurs in the three species is seen at a glance.

NEW OR NOTEWORTHY BRITISH GALLS.

By A. A. Dallman, F.C.S.

During the last few years a number of galls of considerable interest have come under my notice in various parts of England and Wales, while other material has been kindly contributed by various observers. Several of these cecidia are new and have not hitherto been described, and a number, though known from other parts of Europe, have not previously been recorded as British in either of our two standard works. In the following list I have also included a few types which have only recently been added to the British catalogue and which are only recorded from one or two stations, or are of interest in other respects. Quite apart from the many fascinating biological problems presented by these structures there is still very much to be learnt in regard to their distribution and ecology. All the following examples are zoocecidia (*i.e.*, galls due to animal agency), unless in any of the two or three types where the causer is at present unknown bacteria or fungi, should eventually be found responsible.

Acknowledgment is due to Professor F. V. Theobald, who has kindly reported upon various Aphid gall-formers, several of which have proved new to science. It may be well to note that the term "parasite" is used throughout this paper to designate the actual agent concerned in the formation of the gall, and thus excludes those creatures (*e.g.*, certain Chalcididæ) often tenanting some cecidia and preying upon the true tenant.

I.—*New Galls.*

The following are unrecorded by Professor C. Houard (5, 6, 7) and E. W. Swanton (8, 9).

On Corylus Avellana L. A spherical woody lateral excrescence of the stem and apparently developed from a bud. Borth y Gest, Carnarvonshire, 1919, H. N. Beggs. Only a solitary example seen. This was about the size of a golf-ball.

Glaucium flavum Crantz. Young leaves slightly crisped and distorted. Rather sparingly at one point on the Cheshire side of the Dee estuary, where the host is rather uncommon April 1921 (Dallman, 4). The parasite was subsequently determined (Theobald, 10) and described and figured under the name *Myzus glaucii* Theobald. This Aphid is so far only known from Wirral, but it should be looked for elsewhere along our coast. Prof. Theobald has described (*ibid.*) three other Aphides frequenting this plant on the English coast, but whether any are gall-formers or not remains to be seen.

Helleborus fœtidus L. Leaves and bracts somewhat distorted and margins reflexed. In considerable quantity inland of Abergele, Denbighshire, May 1921 (A. A. Dallman). The galling is due to an Aphid which proved to be a new species, and has been described (Theobald & Walton, 12) under the name *Macrosiphum hellebori*. Also found (February 1923) by Mr. C. L. Walton at Bangor, Carnarvonshire. It may be well to correct the statement (*ibid.*) where, owing to some misunderstanding, the Denbighshire insects are recorded as having occurred upon *Eranthis hyemalis*.

Hydrocotyle vulgaris L. Leaf-blade becoming somewhat puckered and slightly swollen and distorted and commonly more or less revolute. Professor Theobald reports that the Aphid proves to be a new species, which he intends describing under the genus *Myzus*. The circumstances of the discovery of the gall and parasite are rather peculiar. Dr. E. J. Haynes Thomas, of Chester, collected a quantity of *Wahlenbergia hederacea* near Hawarden, Flintshire, in the autumn of 1923, and brought home turf containing roots. This was planted in pots to see if the Bellflower could be cultivated. A small amount was also given to Dr. F. P. Dodd Thomas, who kept the pot indoors at Stoke (Staffs) during the winter. Although the Bellflower failed to show, a quantity of *Hydrocotyle* survived the winter, and Dr. F. P. Thomas noted the galling and occurrence of the parasite in July 1924. Examination of the material grown in Chester also revealed galling and Aphids about the same time, so there seems no doubt that ova of the parasite must have originated from Flintshire and remained dormant in the soil during the winter.

Mercurialis perennis L. Leaf-margin abruptly twisted and somewhat incised, and showing torsion about the midrib. Lamina more or less distorted out of the normal plane and form, and somewhat blistered above. Caused by the parasite *Myzus mercurialis* Theobald. I first observed this in Flint and Denbigh during the spring of 1921, and subsequently met with it in many places in various other counties. It appears to be not uncommon. I am indebted to Professor Theobald and Mr. A. W. Rymer Roberts for the identification (Dallman, 4).

Quercus pedunculata Ehrh. The acorns distorted; the cup twisted and inhabited by several red Dipterous larvæ. Baguley, Cheshire (Cameron, 1; Dallman, 4). Cameron was an extremely competent entomologist, and definitely states that the larvæ are of the *Cecidomyia* type. As the only acorn-gallers listed by Houard are Hymenoptera, it is desirable that a look-out should be kept for this gall with a view to more precise identification.

Vaccinium Vitis-Idæa L. Slight distortion of the lamina. Due to an Aphid which proved to be a new species, subsequently described and figured (Theobald, 11) under the name *Myzus vaccinii*. Near Penistone, W. Yorkshire, July 1923.

Viburnum Opulus L. Hard nodular developments about the nodes of the twigs and branches. Conisborough and Edlington Wood, W. Yorkshire, 1920. Also on a garden-shrub at Rock Ferry, Cheshire, 1923.

II.—*Galls new to Britain.*

The following are unrecorded for Britain by Houard (5, 6) and additional to Swanton's lists (8, 9).

On Agropyron junceum Beauv. Conspicuous stem-galls agreeing

well with Houard's description (No. 308):—Le sommet épaissi de la tige est entouré d'un bouquet de feuilles, reduites à leurs gaines hypertrophiées, emboîtées étroitement et surmountées par un limbe très court. Cavité larvaire axiale et allongée." Abundant along the coasts of Flint and Denbigh, and seen more recently on the coasts of South Lancashire and Cheshire. Houard cites *Isosoma graminicola* Giraud, a Chalcid, as the causer of the gall described above. Although I have had this under observation for some time, I have not secured examples of the imago for certain identification (Dallman, 4).

BIDENS CERNUA L., Houard 5647. "Feuilles de l'extrémité des tiges crispées, agglomérées, parfois teintées de rouge." The causer is so far unknown. Pond by Hadlow Road Station, Cheshire, A. A. Dallman, August 1919 (Dallman, 4).

CERASTIUM ARVENSE L. Gall arising at the growing-point of the shoot; numerous apical leaves more or less enlarged and grouped together forming a globular structure with condensed internodes. This appears to be due to a Homopteron (*Aphis* or *Trioza* sp.?), but the parasite requires diagnosis. Near Haxey, Lincolnshire, 1921.

CORNUS SANGUINEA L. Leaf-blade bent, distorted, and blistered. Coed-yr-Esgob, Prestatyn, Flintshire, September 1921. Due to the Aphid *Anœcia corni* Fabr. I am indebted to Mr. A. W. Rymer Roberts for the identification of the parasite. Subsequently observed about Caerwys and Ysceifiog, Flintshire, September 1924. Levitt Hagg, Warmsworth, near Doncaster, Yorkshire, October 1924 (identification confirmed by Professor F. V. Theobald). Houard records this gall (4544) for Central Europe and Portugal, and characterises it as follows:—"Limbe des feuilles jeunes, crispé, courbé par en bas, avec tendance à s'enrouler en hélice. Puceron vert sombre." If sought for in localities where the host is abundant, it will probably be found to be frequent and widely distributed.

EUONYMUS EUROPÆUS L. Leaves more or less shrivelled and swollen and sometimes involute. The parasite was an Aphid which I omitted to collect and determine. Edlington Wood, Doncaster, Yorkshire; spring 1923, A. A. Dallman. The galling agrees with that recorded by Houard—3959 and 7022—due to *Aphis euonymi* Fabr. and *A. rumicis* L.

EUPHRASIA OFFICINALIS L. Typical cases of this type of galling are easily recognised by the distinctive appearance of the host. The plant has an unusual bushy, compact, and congested habit. The upper internodes of the main stem and primary branches are shortened. There is marked cladomania and phyllomania resulting in a group of foliage with irregular folding and slight downiness. Caused by the Gall-Mite *Eriophyes euphrasiæ* Nal. In some quantity on limestone near Rhyd-y-foel, Denbighshire, September 1924, A. A. Dallman. Houard, whose diagnosis (5120) is more or less incorporated above, records this for Central and Northern Europe.

GERANIUM MOLLE L., Houard 3810. Malformation of the shoot and inflorescence. Leaf-margins involute and showing an abundant greyish-white pilosity. The peduncles are shortened and the flowers are congested, atrophied, and pilose. Caused by *Aphis geranii* Kalt.

Dyffryn Ceiriog, Denbighshire, September 1918, and Dee embankment near Connah's Quay, Flintshire, August 1920. A. A. Dallman. I am indebted to Mr. E. W. Swanton for the identification (Dallman, 3).

GERANIUM SANGUINEUM L., Houard 3801 and 3802. The apical portion of the stem is deformed and the upper internodes are abbreviated. The leaves are clustered together and tufted, with strongly incurved margins, somewhat pubescent and brightly coloured and commonly a bright red. On limestone about Prestatyn and Dyserth, Flintshire, 1908, and subsequently, A. A. Dallman. The work of a Gall-Mite. Houard associates two parasites *Eriophyes geranii* Can. and *E. dolichosoma* Can.

LIGUSTRUM VULGARE L. Flower-buds swollen and somewhat distorted, greenish. The unilarval galls remain closed, at least for some time, though in some cases the corolla-lobes of the functionless flower diverged slightly eventually. The Dipterous larvæ are apricot-coloured and complete their life-cycle in the earth. On indigenous Privet on the limestone inland of Abergele and also at Llanddulas, Denbighshire; late August and early September 1924. Subsequently observed in a hedge-row of the cultivated shrub near Storeton, Cheshire (Sept. 6, 1924), A. A. Dallman.

This approaches a cecidium which Houard records—4679—from Germany. The latter, however, is stated to contain gregarious larvæ of a very pale yellow colour which give rise to the Dipteron *Schizomyia ligustri* Rubs. I hope to be able to breed out the mature insect and so be in a position definitely to decide the precise identity of the parasite associated with the North Wales examples. As I examined a considerable number of cecidia and found them all unilarval without exception, and, having regard to the discrepancy in colour, the question of the specific identity of the Dipteron concerned must remain open at present.

POPULUS NIGRA L., Houard 538. Leaves with elongated purse-gall arising from midrib and forming a conspicuous pale projection from the upper surface. Underside opening by a long slit. The cecidia were tenanted by Homoptera which were not determined at the time, but the very distinctive galling agrees exactly with that ascribed by Houard to *Pemphigus marsupialis* Courchet. By stream behind Abergele, Denbighshire, May 1921.

RUBUS IDÆUS L., Houard 6760. Root-galls forming numerous verrucose swellings varying in size and sometimes as large as a hazel-nut. Houard suggests that these are the work of an unknown animal parasite of some kind. Only known hitherto from examples found in France in 1907. Specimens were sent me (January and November 1920) by Miss E. Bray from Hailsham, Sussex. These were on cultivated plants originally brought from Devon five years before, and the galls were first noticed at Hailsham in the autumn of 1919. They were at a depth of three to five inches in the soil. I did not succeed in rearing any insects from these, nor was I able to detect any animal parasite. Prof. Houard writes to me (Feb. 16, 1920) from Strasburg:—

"Je ne sais rien de plus concernant le producteur de la zoocécidie (St.) No. 6760. J'ai reçu en 1907 de F. Chassignol et de E. Château, instituteurs dans le département de Saône-et-Loire, de jolis échantillons qui ont été intercalés dans ma Collection cécidologique sous les numéros 355 et 356. D'autres exemplaires, qui m'ont été envoyés par P. Hariot, en 1913, existent dans ma collection sous le No. 591."

TILIA CORDATA Mill., Houard 4146. A felt-gall characterised by abnormal pilosity in the axils of the nervures and along them on the under surface of the leaf. Hairs cylindrical, at first white and eventually brownish. Due to *Eriophyes tiliæ* Pagenst. var. *liosoma* Nal. Similar galling due to the same parasite occurs on *Tilia vulgaris* Hayne, and has been recorded for Britain (Swanton, 9). Galls on the first host sent me by Dr. E. J. H. Thomas from Prestatyn, Flintshire; August 1919 (Dallman, 4).

TAMUS COMMUNIS L. Flowers of staminate plants remaining closed, and becoming enlarged and somewhat distorted and subcylindrical. Several pale jumping Dipterous larvæ in each gall. Twelve examples carefully dissected revealed the following numbers of tenants:—3, 5, 6, 6, 7, 3, 9, 10, 6, 9, 8, 6: or an average of rather more than 6 per gall. The larvæ pupate in the earth. The galls agree with those ascribed to *Schizomyia tami* Kieff. (Houard 435) and recorded from Italy, but Houard definitely states that the galls are unilarval. I am endeavouring to breed out the imago of the parasite, and so be in a position to settle the problem of its exact identity.

Although I carefully searched many pistillate plants I could not find a single instance of a galled flower, and it would seem as if the parasite restricts its attention to staminate plants only. If this is the case, the fly must possess remarkable skill in discriminating between the two types of plant and sexes of flower, especially when it is remembered that the ova are deposited while the flowers are only in the bud stage. Near Wadworth and Sprotborough, W. Yorkshire; June and July 1924.

ULEX GALLII Planch. Buds modified and forming ovoid or conical cecidia, which are green, fleshy, with a single large loculus, and about 5 mm. long and 3 mm. in diameter. The work of the Dipteron *Asphondylia ulicis* Verrall. Similar galls due to the same insect are well known on the common Gorse (*U. europæus* L.). On the former host near Prestatyn, Flintshire, Dr. E. J. H. Thomas, 1919 (Dallman, 4).

III.—*Noteworthy Galls.*

The following galls have been added to the British list during recent years, but the present records represent additional stations and extension of range:—

On CERASTIUM VULGATUM L. Capsule slightly swollen and curved, and containing several orange-coloured larvæ. Due to the Dipteron *Perrisia fructuum* Rubs. Near Llanddulas, Denbighshire, September 1921.

EUONYMUS EUROPÆUS L. Leaf-margins—especially at the basal portion of the lamina—tightly rolled, thickened and discoloured, and producing a very fine felt of minute hairs. Due to *Eriophyes convolvens* Nal. Inland of Abergele, Denbighshire, September 1919, and subsequently.

GERANIUM LUCIDUM L. Leaves much malformed, tufted, and swollen, with strongly incurved margins and some felting (especially within). Caused by Gall-Mites. Houard (3821, 3822) associates two parasites, *Eriophyes geranii* Can. and *E. dolichosoma* Can. Quarry below Cefn Church, near St. Asaph, Denbighshire, September 1922.

ONONIS REPENS L. and O. SPINOSA L. Modification of the flowers and inflorescence giving a distinctive aspect to the infected host. Houard (3499 and 3497). "Fleurs chloranthiées ou extrémité des tiges déformée. Dans la partie attaquée il y a cladomanie et phyllomanie très marquées; les feuilles sont plus petites et les bourgeons qui apparaissent à l'aisselle de ces feuilles, sont plus ou moins déformés et en général transformés en amas ovoides de feuilles brièvement pédonculées, couvertes de longs poils blancs." Due to the Gall-Mite *Eriophyes ononidis* Can. Along the coasts of Flint and Denbigh (especially on *Ononis repens* b. *horrida* Lange), 1915 and subsequently. Dee shore at Thurstaston and Heswall, Cheshire, July 1918 (Dallman, 4).

PYRUS TORMINALIS Ehrh. Pustular leaf-galls slightly elevated on both surfaces and often coalescing. Green changing to rusty-brown and opening on the underside. Due to *Eriophyes pyri* Pagenst. Wadworth Wood, near Doncaster, W. Yorkshire, 1923.

SALIX FRAGILIS L. Houard S. 1. Marked deformation of the pistillate catkins, and corresponding hypertrophy of the reproductive organs. Bracts enlarged and an abnormal development of buds—reminiscent of viviparous growth—giving rise to numerous short branches with short internodes and bearing numerous tiny leafy structures. The "Witches' Broom," so formed, varies in size. In some cases the gall is an aggregate structure, resulting from the coalescence and development of a number of adjoining catkins and attaining considerable size.

Miller Christy (2) has given a careful account of the gall and its occurrence in Britain, from which it seems to have been first observed in Essex in 1906. Writing in 1915, it was "immensely abundant" in a limited area around London and there were indications that it was spreading. He records it for Essex, Middlesex, Surrey, Buckingham, Gloucester, and Kent. Its abundance in the Thames Valley is significant, and Mr. Christy believes that its first appearance in Britain was in Epping Forest in 1906 or 1907.

There seems little doubt that this invasion of these remarkable and conspicuous cecidia may be traced to the Continent, where they are well known and abundant in places. Some uncertainty surrounds the actual agency responsible for the formation of these structures, but Nalepa, Houard, and some other authorities regard them as Mite-Galls. These cecidia have been recorded from various species of

Salix (including *S. fragilis*, *alba*, *aurita*, *Caprea*, *purpurea*, and *viminalis*) on the Continent. It would seem that in Britain *Salix fragilis* is specially preferred as host. Nalepa considers the galls as the work of *Eriophyes triradiatus* Nal., but further investigation of the "Witches' Brooms" of the various willows and associated Gall-Mites and insects is desirable.

In some quantity on *Salix fragilis* in various places along the course of the Rivers Don and Dearne in the Mexborough and Conisborough districts, West Yorkshire. First noticed on the occasion of my first visit to the neighbourhood early in 1920, but the galls had evidently been here for some time previously. They are still to be seen in some quantity.

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THE CLASSIFICATION OF DICOTYLEDONS.
II. EVOLUTIONARY PROGRESSIONS.

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

The Englerian system of classification of the Spermatophytes is now recognized by a majority of botanists as representing, on the whole, a considerable advance on previous systems, although the position assigned in it to certain families, such as the *Cucurbitaceæ*, constitutes a distinct retrogression. Apart from the division into Gymnosperms and Angiosperms, its chief merit, compared with the Candollean system, as adapted by Bentham and Hooker, consists in the union of the *Monochlamydeæ* with the *Polypetalæ* to form a single group, the *Archichlamydeæ*; and in the association, in the same orders, of nearly half the monochlamydeous families with polypetalous ones.

The disappearance of the *Monochlamydeæ* in Engler's system is, however, merely nominal: 19 out of its 36 constituent families (recognized by Bentham and Hooker) still remain together at the beginning of the *Archichlamydeæ* in Engler's latest scheme (Syllabus, ed. 9 & 10, 1924), and constitute 14 out of his first 16 orders, the two additional orders being *Garryales* and *Julianales*. The 17 other families are distributed among the orders *Centrospermæ*, *Ranales*, *Sarraceniales*, *Rosales*, *Geraniales*, *Sapindales*, and *Myrtifloræ*. In this connection it may be urged: firstly, that the process of distribution of the monochlamydeous families among the *Polypetalæ* might with advantage be carried considerably further; and, secondly, that when an achlamydeous or haplochlamydeous family is associated in the same order with a diplochlamydeous one (e. g., *Loranthaceæ* with *Olacaceæ*) that order should be placed in the *Polypetalæ*, not in the *Monochlamydeæ*. The question of what type of flower should be regarded as primitive in the Angiosperms is here involved.

Engler (Syllabus, ed. 5, p. xv; ed. 8, p. xviii) regarded the residual (*i. e.* undistributed) *Monochlamydeæ* as being at a lower evolutionary stage than the families which follow them in his system: the achlamydeous flower being, according to him (in the absence of substantial reasons for believing in the suppression of a perianth), more primitive than the haplochlamydeous, and the latter more primitive than the diplochlamydeous. Wettstein (Syst. Bot. ed. 1, ii. 196; ed. 2, 470) also considered the *Monochlamydeæ* as the most primitive of the Dicotyledons, and the haplochlamydeous flower as antecedent to the diplochlamydeous. He regarded unisexual anemophilous flowers as primitive in the Angiosperms, and (Stage 1) derived the haplochlamydeous male flower with stamens opposite the perianth-leaves from a reduced male inflorescence with a single stamen in the axil of each bract, the perianth, on this hypothesis, being derived from the bracts (*l. c.* 204; *l. c.* 480). He next postulated (Stage 2) an increase in the number of stamens, and (Stage 3) the transformation of some of them into petals. In a similar way, he derived a haplochlamydeous or achlamydeous female flower from a

female inflorescence. Finally, he supposed the hermaphrodite flower to have originated by the fortuitous appearance of an achlamydeous female flower in the centre of a male flower. In support of this hypothesis he adduced the occurrence, in several families of *Monochlamydeæ*, of pseudanthia—*i. e.*, condensed inflorescences with much simplified flowers, the central one of which is female,—and urged that a similar but more extensive reduction might have taken place in the past.

Wettstein admitted the necessity of an ecological explanation of his hypothesis. He regarded the reduction of a male inflorescence to a male flower (Stage 1) as a direct continuation of the process of reduction of the male flower seen in the Gymnosperms, and suggested that it (Stage 1) was correlated with the greater probability of pollination due to the development of the stigma. The plant at this stage was still anemophilous. He explained the increase in the number of stamens (Stage 2) mainly as a result of the carrying away of pollen by insects: such flowers as produced more stamens and had in consequence a surplus of pollen would be favoured by natural selection. The appearance of the hermaphrodite condition synchronized, according to Wettstein, with the modification of some of the stamens into petals or honey-leaves (Stage 3). A fortuitous union of male and female organs in the same flower would tend to be preserved owing to the much greater probability of pollination.

The following objections to Wettstein's hypothesis may be suggested :—1. The general tendency of diclinous anemophilous plants is towards aggregation of male flowers, so as to secure the simultaneous discharge of very large numbers of pollen-grains; whereas the reduction of a male inflorescence to a single flower would have precisely the opposite effect. 2. Bearing in mind the enormous proportion of pollen wasted in anemophily the carrying away of pollen by insects hardly seems to afford an adequate explanation of the increase in the number of stamens postulated by Wettstein. 3. No explanation is given by Wettstein of how the crowded and often complicated inflorescences of *Fagaceæ*, *Betulaceæ*, etc., were derived from the solitary male flowers of his hypothesis. 4. The hypothesis does not afford any explanation of the gradual transition from the outer to the inner perianth-leaves found in certain *Archichlamydeæ*. 5. The fortuitous appearance of a female flower in the centre of a male flower derived by reduction from a *male* inflorescence would be an extreme case of reversion. 6. This extreme reversion must have occurred *independently in each species* which passed through Wettstein's postulated stages—a circumstance which enormously enhances the improbability of his hypothesis. 7. Wettstein's hypothesis, like Engler's (*vide* Arber & Parkin in Journ. Linn. Soc., Bot. xxxviii. 39), is phyletically barren, unless the treatment of the haplochlamydeous flower in the *Euphorbiaceæ* as primitive instead of reduced be regarded as an advance, a view which few taxonomists would endorse. As the result of an investigation into the floral morphology of the *Euphorbiaceæ*, Michaelis (Goebel, Bot. Abhandl. iii. 121 : 1924) concludes that the primitive ("ideal") flower in that family was hermaphrodite, diplochlamydeous, and polystemonous. Pax (Engl. Bot. Jahrb. lix. 130 : 1924) also holds that the apetalous *Euphorbiaceæ* had heterochlamydeous ancestors.

The view that the *Ranales* are (as regards *floral* characters) the most primitive of existing Angiosperms, and that the *Monochlamydeæ* represent a congeries of reduced types of diverse affinities, has gained considerable ground in recent years. It was adopted by Bessey (Bot. Gaz. 1897, xxiv. 145–178; Ann. Miss. Bot. Gard. ii. 109: 1915) and Hallier (New Phyt. 1905, iv. 151; Arch. Néerl. sér. 3, i. 146–234 : 1912) as the basis of their systems of classification, and was incorporated in a theory of the origin of Angiosperms put forward by Arber & Parkin (Journ. Linn. Soc., Bot. xxviii. 29–80 : 1907; Parkin in Proc. Linn. Soc. 1922–23, 51–64 : 1923). The latter authors (*op. cit.* 44) pictured the primitive angiospermous flower as solitary, and having a large elongated conical torus bearing, from below upwards, numerous spirally arranged perianth-leaves, stamens, and carpels; the perianth-leaves either all similar in form, colour, etc., or somewhat differentiated, the inner ones being petaloid; the androecium comprising an indefinite number of stamens, with short filaments, long anthers, and produced connectives; the gynœcium consisting of an indefinite number of carpels forming apocarpous monocarpellary ovaries without styles, each containing several ovules, with marginal placentation; the stigmatic surface more or less confined to the apex of the carpel, and probably of a sticky nature, or the carpel wide open at the apex, as in *Reseda*; the ovules orthotropous with two integuments; the flower entomophilous; the carpel dehiscing by the ventral suture and the seeds dispersed by simply falling out or being shaken out by the wind. As regards vegetative characters, Arber and Parkin (*op. cit.* 69) considered megaphylly and a little-branched stem as primitive in the Angiosperms, microphylly and a freely-branched stem as derivative.

While the hypothesis of a primitive Ranalian stage seems to offer a satisfactory explanation of the origin of many of the Angiosperms, there is a tendency among some writers to run this hypothesis to death by attempting to derive *all* the Angiosperms (or alternatively *all* the Dicotyledons) from a Ranalian prototype. In this connection it is significant that none of the various attempts to trace the relationships of the *Amentiferæ* with other *Archichlamydeæ* has hitherto been crowned with success. Among those who have opposed the extreme application of the Ranalian hypothesis are Weiss, Wernham, and Rendle. Weiss (Rep. Brit. Ass. 1911, 556) considered that "the great variety of forms, both of vegetative and of reproductive organs, which we meet with in the Angiosperms, not only today but even in the Cretaceous period, in which they first made their appearance, warrants the belief in a polyphyletic origin of this highest order of plants." Parkin (Proc. Linn. Soc. 1922–23, 56) thought that the stereotyped nature of the embryo-sac in the Angiosperms, and the occurrence of the same type of stamen throughout the group, rendered the monophyletic standpoint well-nigh unassailable. But, as Wernham had pointed out eleven years previously (New Phyt.

1912, xi. 384), the terms "monophyletic" and "polyphyletic" are relative only: a common origin of all the Angiosperms does not preclude the possibility of their having divided into several phyla prior to the adoption of the angiospermous condition.

Wernham (*op. cit.* 387) came to the conclusion that "it is almost certain that some of the *Archichlamydeæ* at least have diverged from an ancestry other than the Ranalian." Rendle (Proc. Linn. Soc. 1922–23, 66) "protested against the attempt to derive the whole of the modern Angiosperms from the Ranalian plexus. The modern German system had done good service in indicating the affinities of certain orders of Dicotyledons, which had been separated from their allies by the French system, developed by Bentham and Hooker, on account of their apetalous character. But there were groups, such as the *Amentiferæ*, which might be regarded as descendants of older forms, contemporary with, or earlier than, the immediate ancestors of the *Ranales*. There were presumably many stages in the evolution of the modern Angiosperms, and it seemed more in accordance with facts to regard some of the modern apetalous groups as descendants from one or other of these."

Moss (*Cambridge British Flora*, ii. 2: 1914) divided the *Archichlamydeæ* into four "subclasses": 1, *Amentifloræ* (Reihen 1–12, Eng. Syll. ed. 7, 8); 2, *Petaloideæ* (Reihen 13–16); 3, *Centrospermæ* (Reihe 17); 4, *Heterochlamydeæ* (Reihen 18–30). He thought it probable that these four groups had descended from an unknown group of primitive Angiosperms, and had developed along diverging paths. Moss's subdivisions of *Archichlamydeæ* agree with Engler's except for the inclusion of the *Casuarinaceæ* in the *Amentifloræ*. Engler (Syll. ed. 8, p. xviii) and Diels (Meth. Phytogr. Syst. Pfl. 144) apparently regarded the Dicotyledons as monophyletic, with *Casuarinaceæ* as the most primitive group. Arber and Parkin, who also adhered to the monophyletic standpoint, treated the *Ranales* as the most primitive, not only of Dicotyledons, but of Angiosperms. Moss differed from both in regarding the *Archichlamydeæ* as polyphyletic.

The question whether the Dicotyledons are monophyletic or polyphyletic will not be settled in favour of the former view unless and until probable genetic relationships among the remaining Dicotyledons can be established for the various families of undistributed *Monochlamydeæ*, namely, those included in the *Amentifloræ*, *Petaloideæ*, and *Centrospermæ*. The "subclass" *Petaloideæ* appears to be an unnatural group, composed of three heterogeneous elements related respectively to 1, the *Vitaceæ*, *Umbellifloræ*, and *Rubiales* (Reihen 13, 14); 2, the *Ranales* (Reihe 15); and 3, the *Centrospermæ* (Reihe 16). No probable relationships have yet been demonstrated, however, for the *Centrospermæ* and the bulk of the *Amentifloræ*, and the hypothesis of a polyphyletic origin of the Dicotyledons seems, therefore, as stated by Rendle (*l. c.*), to be more in accordance with the known facts.

That the floral morphology of a majority of the Dicotyledons, however, may be traced back to a primitive "Ranalian" stage may be accepted as a working hypothesis for taxonomic purposes. In

general accordance with Celakovsky's Reduction Theory (Sitzungsb. Böhm. Ges. Wiss. 1894, no. iii.), Senn's Principles of Hallier's System (Beih. Bot. Centralbl. xvii. 129–156: 1904), Arber and Parkin's Ranalian Hypothesis (Journ. Linn. Soc., Bot. xxxviii. 27–80; Proc. Linn. Soc. 1922–23, 51–64), and Wernham's Tendencies to Economy and Progressive Adaptation (*Floral Evolution*, 10: 1913), the following evolutionary "progressions" may be recognized:—

Evolutionary Progressions.

I. Characters of inflorescence, flowers and seeds.

1. *Inflorescence*: flowers solitary→grouped in inflorescences.
2. *Pollination*: entomophily→anemophily; entomophily→autogamy; pollen-flowers→honey-flowers.
3. *Distribution of sexes*: monocliny→dicliny; polygamy→monœcism→diœcism.
4. *Symmetry*: actinomorphy→zygomorphy→asymmetry.
5. *Torus*: (in hypogynous flowers) long→short; hypogyny→perigyny→epigyny.
6. *Bracts, perianth-leaves (sepals and petals), and stamens*: not sharply differentiated→sharply differentiated.
7. *Flowers*: acyclic→hemicyclic→cyclic; hemicyclic→cyclic.
8. *Perianth-leaves, stamens, and carpels*: number variable→fixed; many→few; free→united (connate or adnate).
9. *Whorls and members of a whorl*: number variable→fixed; many→few.
10. *Perianth*: (when of single origin) homoiochlamydeous→heterochlamydeous; present→absent.
11. *Stamens*: filament and connective broad→filiform.
12. *Carpels*: multiovulate→uniovulate.
13. *Stigma*: sessile→borne on a style.
14. *Styles* (in syncarpous gynœcium): many→one.
15. *Placentation* (in bi-polycarpellary ovary): parietal→axile→free-central→basal.
16. *Ovules*: orthotropous→campylotropous; orthotropous→anatropous.
17. *Integuments*: two→one→none.
18. *Seeds*: albuminous→exalbuminous.
19. *Embryo*: small→large.
20. *Cotyledons*: two or more→one.

II. Vegetative and ecological characters.

21. *Habit*: trees→shrubs→herbs; erect→climbing; evergreen→deciduous.
22. *Stem*: little-branched→much-branched.
23. *Leaves*: large→small; compound→confoliolate→simple; compound→unifoliolate→simple; pinnate→palmate; pinnatifid→palmatifid.
24. *Climatic and edaphic*: megatherms→mesotherms→microtherms; hygrophytes→mesophytes→xerophytes; terrestrial→aquatic.

Remarks on the Progressions.

Comparison of the various series of progressions recognized respectively by Bessey, Senn, Arber and Parkin, Diels, and the writer shows that there is no difference of opinion in regard to a majority of the progressions, and these therefore need not be discussed. All agree, for example, that hypogyny preceded epigyny, and that the apocarpous condition was the forerunner of the syncarpous. As to certain progressions, however, authors are diametrically opposed. Bessey postulated a progression from opposite to spiral phyllotaxy, whereas Diels maintains the reverse. Assuming for the moment that the first Angiosperms exhibited only a single type of phyllotaxy, it was probably cyclic, for the following reasons:—

1. In plants growing in a closed association spiral phyllotaxy results in a somewhat better exposure of the leaves to the available light: in a cyclic arrangement the leaves are vertically superposed, and hence shade one another during the middle of the day, at every second node on erect stems, whereas in a 2/5 or 3/8 spiral they are superposed only at every fifth or eighth node respectively. The probable direction of an evolutionary progression is from the less advantageous condition to the more advantageous, *i. e.* in this case from cyclic to spiral.

2. There is evidence suggesting that the spiral phyllotaxy now characteristic of certain families was derived from an opposite arrangement, but apparently none indicating evolution in the reverse direction in other families. Thus, according to Groom (Phil. Trans. Roy. Soc. ser. B, vol. 200, pp. 57–115: 1908), the internodal curves of the *Chenopodiaceæ*, *Borraginaceæ*, and *Solanaceæ* point to the derivation of the spiral phyllotaxy of these families from an opposite arrangement. It is true that Groom assumes that the opposite arrangement in the *Clematideæ* was derived from a spiral arrangement, apparently because the other *Ranunculaceæ*, which are in a great majority, have spiral phyllotaxy. But the prevalence of a particular arrangement in a given group is not necessarily an indication that the arrangement in question is primitive. Syncarpy is much more prevalent than apocarpy in the Angiosperms, doubtless because it is a more advantageous arrangement, and, as suggested above, spiral phyllotaxy may possibly be on the whole somewhat more advantageous than cyclic.

There seems no reason, however, to suppose that the primitive Angiosperms were uniform as regards their phyllotaxy. As D. H. Scott says, "phyllotaxis, for example, may have been inherited from remote ancestors living under conditions totally different from those to which their living representatives are adjusted" (Extinct Plants, 28: 1924). Hence no *general* progression from cyclic to spiral phyllotaxy is here postulated.

1. *Inflorescence.*—There seems to be general agreement that the *solitary flower* is primitive in the Dicotyledons, and that the various types of inflorescence (flower-cluster) have been derived from it, either by aggregation of flowers, accompanied by reduction of foliage-leaves to bracts, or by branching, or in both ways. Parkin

(Journ. Linn. Soc., Bot. xlii. 559, t. 18: 1914) came to the conclusion that flowers were originally borne on the plant singly, *each terminal to a leafy shoot*, and from this arrangement derived not only all cymose and racemose inflorescences, but the solitary axillary arrangement and the "intercalary" type. The examples which he gives in *Ranunculaceæ* and *Papaveraceæ* certainly support the view that, in these families, racemose inflorescences have been derived from cymose ones, but the evidence brought forward seems insufficient to warrant the general conclusion that the racemose arrangement has been derived from the cymose in all cases. Possibly the solitary terminal and solitary axillary arrangements may be equally primitive, and the racemose arrangement may in some cases have been derived directly from the latter by the reduction of foliage-leaves to bracts. The assumption that the plumular axis was primitively terminated by a flower in all cases seems ill-founded. The possibility of the transition from fig. 1 to fig. 15 indicated in Parkin's plate implies that each axis has the potentiality of terminating either in a flower or in a vegetative bud, and hence there seems to be no reason for supposing that either of the arrangements figured is more primitive than the other. A transition in the reverse direction might equally well be assumed. The origin of the inflorescence is a problem which can be solved only by special investigation in each natural group.

2. *Pollination.*—Robertson (Bot. Gaz. 1904, xxxvii. 294) brought forward strong evidence to show that entomophily is primitive in the Angiosperms. He pointed out that the characteristic anemophilous flower has a pistil with a one-celled ovary containing a single ovule and ripening into a one-seeded indehiscent fruit, whereas the characteristic entomophilous flower has a pistil with several ovules which ripens into a several-seeded fruit. Even with a large plumose stigma anemophilous flowers have enough to do to secure sufficient pollen for a single ovule. Entomophilous flowers with a small stigma can, on the other hand, secure sufficient pollen for many ovules.

"Polyspermy is an entomophilous character. Syncarpy involves polyspermy and is also an entomophilous character, the union of oligospermous fruits producing polyspermy. It is hard to imagine conditions under which an anemophilous plant would be likely to become syncarpous. Accordingly, in the absence of other entomophilous characters, and in spite of the presence of anemophily, plants may still retain the entomophilous characters of polyspermy and syncarpy. Syncarpy is important in diagnosing advanced stages of anemophilous metamorphosis, because indications of syncarpy may be the only remaining evidence of a previous polyspermous condition." On these and other grounds Robertson regards the anemophilous *Amarantaceæ*, the *Betulaceæ*, *Fagaceæ*, *Juglandaceæ*, *Ulmaceæ*, *Juncaceæ*, *Typhaceæ*, and *Glumales* as having been derived from entomophilous prototypes.

"According to their stages of development, three sets of anemophilous plants may be recognized: (1) those closely related to entomophilous ones and evidently of recent origin; (2) plants whose development from [entomophilous ancestors] is not so evident, but

which have dehiscent polyspermous fruits, one-seeded dehiscent fruits, or one-seeded indehiscent fruits developed from pistils containing more than one ovule; (3) in large groups containing no entomophilous representatives, having one-seeded indehiscent fruits ripening from one-celled one-ovuled pistils." Undoubted instances of anemophily derived from entomophily are found in *Thalictrum*, *Fraxinus*, *Sanguisorba*, *Acer*, *Ambrosia*, *Ricinus*, *Rumex*, *Platanus*, *Amarantaceæ*, *Plantaginaceæ*, and *Juncaceæ*. "On the other hand, none of the anemophilous groups have produced forms which could reasonably be regarded as recently developed entomophilous ones."

Robertson considered that the primitive anthophilous insects probably visited flowers chiefly for nectar. As Arber and Parkin (Journ. Linn. Soc., Bot. xxxviii. 74: 1907) suggested, however, the view that pollen was the original attraction "seems more probable, and besides offers a better explanation of how entomophily arose. Otherwise how are we to account for the evolution of floral nectaries? The secretion of honey prior to insect visitation does not appear likely. Afterwards, of course, the plant would gain by substituting this cheaper food-material in the place of pollen."

3. *Distribution of Sexes.*—Bessey, Senn, Arber and Parkin, and Diels are agreed that the monoclinous flower was the precursor of the diclinous in the Angiosperms. Wettstein's hypothesis (see p. 105) has evidently failed to secure acceptance.

7. *Flowers.*—Senn, Arber and Parkin, and Diels regard the acyclic flower as primitive in the Angiosperms. Bessey is silent on this point, but places the *Ranales* at the very beginning of the Dicotyledons, with the character, "All parts of the flower mostly spirally arranged (acyclic)," so that he apparently concurs. For reasons given below, I consider the hemicyclic condition may have been primitive in certain groups. The question of the origin of the perianth is here involved.

10. *Perianth.*—Senn regarded a gradual transition from sepals to petals as a primitive character; Arber and Parkin considered that the primitive angiospermous flower had the perianth-leaves either all similar or somewhat differentiated; Bessey regarded "petaly [as] the normal perianth structure, and apetaly [as] the result of reduction (aphanisis)." Diels postulated the following progression: *Perianth* absent→homoiochlamydeous and sepaloid→homiochlamydeous and petaloid→heterochlamydeous, differentiated into calyx and corolla. Underlying each of these four views was the assumption that the perianth had the same primary origin or origins in all cases. If, as seems probable, it had two or three different primary morphological origins in the Angiosperms, it is obvious that no *one* type of perianth can be regarded as primitive for the whole Subdivision.

Three principal hypotheses of the origin of the perianth have been put forward: (1) that it has arisen from bracts in the neighbourhood of the flower; (2) that it has been formed by the transformation of stamens; (3) that it has arisen partly from bracts, and partly from stamens.

Naegeli ('Mechanisch-physiologische Theorie der Abstammungslehre,' 509: 1884) derived the calyx from bracts, and the corolla from stamens. Prantl (Engl. Jahrb. ix. 232: 1887) considered that the true perianth was of bracteal origin, though honey-leaves or petaloid members representing transformed stamens might be present in addition. Celakovsky (Sitzb. Böhm. Ges. Wiss. 1900, no. iii. 46) derived the whole perianth from the stamens.

Goebel ('Organography of Plants,' Engl. ed., ii. 549: 1905) considered that existing perianths had originated in more than one way. He regarded the simple petaloid envelope of the *Anemoneæ*, for example, as the result of the transformation of stamens, and the outer flower-envelope of *Trollius* as consisting of modified bracts. In his words, "in the plant kingdom the same result may come about in different ways."

Arber and Parkin were "inclined to postulate for the [Angiosperms] a primitive perianth, which was completely differentiated, from the sporophylls on the one hand, and from the foliage-leaves on the other, before the existing [representatives of the group] came into being." They agreed, however, that "the modern perianth may have, in certain instances, acquired additional members, either from above by the sterilisation of microsporophylls, or from below by the modification of foliar organs."

If it is admitted that existing perianths have originated in more than one way, the hypothesis of a single primitive type of perianth seems superfluous. It was postulated by Arber and Parkin in connection with their derivation of the Angiosperms from the hypothetical Homiangiosperms.

The view here adopted is that the perianth arose in at least three different ways: from bracts, from stamens, and from both together. On this hypothesis, perianths derived from bracts would be cyclic or spiral according to the phyllotaxy of the bracts, which in its turn would presumably be dependent on that of the foliage-leaves. Hence hemicyclic and acyclic flowers may be equally primitive. Thus if with Prantl we regard the perianth of *Clematideæ* as of bracteal origin, its cyclic nature is a natural consequence of the opposite phyllotaxy of the foliage-leaves, and may be regarded as primitive for the tribe.

15. *Placentation.*—It is not suggested that the progression: parietal→axile→free-central→basal is the only one which may be recognized. Free-central or basal placentation, for example, might have arisen directly through an apocarpous gynœcium with basally inverted ovules becoming syncarpous.

17. *Integuments.*—The progression postulated by Diels: "none →two→one" is somewhat surprising. Diels apparently offers no explanation of it.

20. *Cotyledons.*—The progression "two or more→one" is in accordance with the view, now generally adopted, that the immediate ancestors of the Monocotyledons were dicotyledonous (see Bancroft in New Phytol. 1914, xiii. 285–308).

11. *Vegetative and ecological Characters.*—The progressions relating to these characters are discussed in the third and concluding section of this paper, dealing with "Evolution and Geographical Distribution."

NOTES ON JAMAICA PLANTS.

By William Fawcett, B.Sc., and A. B. Rendle, F.R.S.

(Continued from Journ. Bot. 1922, p. 363.)

Combretum.

There has been some confusion as to the identity and name of the representatives of this genus in Jamaica. Grisebach (Flor. Brit. W. Ind. 275) cites *Combretum Jacquini* Griseb. as occurring in the island on the authority of Macfadyen, and quotes as a synonym *C. laxum* Jacq. Grisebach rejected Jacquin's name, owing to the assumed existence of an earlier *C. laxum* Loefling, which he cites as occurring in Trinidad. The name *C. laxum* Loefl. occurs in various systematic works and appears in the Kew Index (*C. laxum* Loefl. It. 248, 308=Loeflingii). It is, however, based on a misconception.

Loefling, It. Hisp. 248 (1758) (edited by Linnæus after Loefling's death), described a species, *Gaura fruticosa*, and in the Appendix, p. 308, redescribed the same plant as *Combretum* (a new genus).

In 1759 Linnæus (Systema, ed. 10, 999) re-named Loefling's plant *Combretum occidentale*, merely citing the two references to Loefling's book. Loefling's plant was a native of Venezuela.

In 1760 Jacquin (Enum. 19) published *Combretum laxum* from San Domingo (more fully described in his Sel. Stirp. Amer. 104, 1763), and at the same time *C. secundum*, a Continental American species.

In 1762 Linnæus (Sp. Pl. ed. 2, 496) adopted the name *C. laxum* Jacq., and included under it Loefling's plant; he suppressed his own *C. occidentale*.

In 1766 a German edition of Loefling's *Iter Hispan.* was published by A. B. Kölpin. In the preface the author states that his translation has an advantage over the original in that he has supplied the trivial names subsequently given by Linnæus, and also with the assistance of Linnæus (with whom he had spent a great part of the previous summer) has assigned to their correct taxonomic position species which had been wrongly referred in the original. Thus both *Gaura fruticosa* (p. 248) and *Combretum* (p. 308) are now referred by Kölpin to *Combretum laxum*. This presumably accounts for the erroneous citation of "*Combretum laxum* Loefl."

Jacquin distinguished two species, *C. laxum* (with a laxer panicle) from San Domingo and *C. secundum* (with a pair of dense secund spikes) from Continental America; the latter corresponds with Loefling's *Gaura fruticosa*, which Linnæus erroneously referred to *C. laxum*.

Later Aublet, Pl. Guian. i. 351, t. 137 (1775), named a plant from Guiana *C. laxum* Jacq. Aublet's specimen (in Herb. Mus. Brit.) differs from both Jacquin's species, and DeCandolle (Prodr. iii. 19, 1828) distinguished it as *C. Aubletii*.

In 1867 Eichler (Fl. Bras. xiv. pt. 2, 110) renamed Loefling's plant *C. Loeflingii*; he cites *C. laxum* Loefl. Iter, and explains that he has given it a new name owing to the use of *laxum* by Jacquin and Aublet for other species. He does not explain why he does not adopt Jacquin's name *secundum*, which he also cites as a synonym.

The names and synonymy for the three species are as follows:—

Combretum fruticosum, comb. nov.

C. occidentale L. *Syst.* ed. 10, 999 (1759).
C. secundum Jacq. *Enum.* 19 (1760) and *Sel. Stirp. Amer.* 103 (1763); L. *Sp. Pl.* ed. 2, 496.
C. laxum L. *Sp. Pl.* ed. 2, 496 (1762) (in part.) (non Jacq.); Kölpin, *Loefling's Reise*, 320, 396 (1766).
C. laxum Griseb. *Fl. Br. W. Ind.* 275 (1860) (in part.) (non Jacq.).
C. Loeflingii Eichler in *Fl. Bras.* xiv. pt. 2, 110 (1867).
Gaura fruticosa Loefl. *Iter Hisp.* 248 (1758).
Hab. Tropical America.

C. laxum Jacq. *Enum.* 19 (1760) and *Sel. Stirp. Amer.* 104 (1763).
C. Jacquini Griseb. *Fl. Br. W. Ind.* 275 (1860) (in part.), excluding reference to Jamaica.
Hab. Cuba, Hispaniola, Trop. Cont. America.

C. Aubletii DC. *Prodr.* iii. 19 (1828).
C. laxum *Aubl. Pl. Guian.* i. 351, t. 137 (1775) (non Jacq.).
Hab. Guiana.

Combretum Marchii, sp. nov. *Frutex*, ramulis junioribus, inflorescentiæ rhachi ramisque, petiolis, ferrugineo-pubescentibus. *Folia* 8–12 cm. l., 2·2–3·8 cm. lat., oblongo-lanceolata, apice obtusa et mucronata, basi obtuso angustata; petioli 4–6 mm. l. *Flores* dense spicatæ in ramis patulis paniculæ terminalis 8–15 cm. longæ; spicæ oblongæ, 2–3 cm. l. *Calyx* cupuliformis, leviter 4-dentatus, intus villosus, extus sparse puberulus, circiter 1 mm. l. *Petala* transverse elliptica, limbis ·5–·6 mm. l., ·7–1·2 mm. lat., unguibus ·2–·3 mm. l. *Stamina* circiter 3 mm. l. *Stylus* stamina æquans. *Ovarium* 1·7 mm. l., dense ferrugineo-tomentosum. Fructus ignotus.

Hab. Locality in Jamaica not stated, *March* (1863)!

Type in Herb. Kew. This species differs from *C. laxum* Jacq. in the narrower leaves with blunt mucronate apex, panicles larger and more branched, flowers only half the size, and ovary densely ferrugineous-tomentose.

The sheet in Herb. Kew (for the loan of which we are indebted to the Director) bears Grisebach's determination, "*Combretum Jacquini*," but a pencil-note on the sheet indicates the error.

Combretum Robinsonii, sp. nov. *Frutex* scandens, 30–50 ped. alt. in arboribus, 2 poll. in diam., cortice ferrugineo. *Folia* 12–20 cm. l., 9–11 cm. lat., elliptica, breviter et abrupte acuminata, basi auriculata, auriculis in petiolo brevi (·5 cm.) tomentoso imbricatis. *Calyx* cupuliformis, 4-dentatus, intus villosus. *Petala* 4, transverse elliptica, unguiculata, albo-flavescentia, calyce vix breviora. *Stamina* 8, longitudine variabili, circiter petala æquantia. *Stylus* stamina æquans apice acuto. *Fructus* oblongus, 4-alatus, 3–4 cm. l., breviter pedicellatus. *Semen* 4-sulcatum, rugosum.

Combretum A. Robinson MSS. & Ic. ined. *C. laxum* Sw. Obs. 143 (1791) (non Jacq.)?; Macf. Jam. ii. 20. *C. Jacquini* Griseb. Fl. Br. W. Ind. 275 (1860) (only with reference to Macf., Jamaica).

Red Withe.

Hab. Banks of river to windward of Lucea, and in morass near Paulo Island, Westmoreland, *Robinson*; thickets at west end of island, *Macfadyen*; banks of Black river, near Lacovia (leaves and fruit only) *Harris*!

This species differs from *C. laxum* Jacq. in the form and size of the leaves, in the relative size of the calyx, petals, and stamens, and in the fruit and seed.

The description of the flower is taken from Anthony Robinson's drawings, for the loan of which we are indebted to the Secretary, Institute of Jamaica, and the description of the whole plant from Macfadyen.

OBITUARY.

Lilian Suzette Gibbs.

By the death of Miss Gibbs we have lost a botanist of unusual gifts and attainments. Within a period of little over twenty years she acquired a good botanical training, carried out several important pieces of morphological research, and explored the montane flora in widely separated parts of the world.

After spending two years at the Swanley Horticultural College, she became a student in 1901 under Professor J. B. Farmer at the Royal College of Science, and subsequently a research student; in 1910 she was awarded the Huxley Medal and Prize for research. The floristic aspect of the science had a strong attraction for her; in her student-days she was a frequent visitor to the Botanical Department at the Natural History Museum, to get names for the plants she had collected in the European Alps. In 1905 she visited South Africa with the British Association, and her collections supplied material for a "Contribution to the Botany of Southern Rhodesia." She also published some bio-histological notes on some of the new species collected. In 1907 she spent three months collecting and observing on the Mt. Victoria range in Fiji, and the fruit of this work was a "Contribution to the Montane Flora of Fiji." Her next great expedition was in 1910, when she ascended Mt. Kinabalu in British Borneo; her collections and observations added greatly to our knowledge of the montane flora of the Malayan Archipelago, and also suggested problems in plant-distribution, a solution of which was sought in the examination of the Arfak Mountains in Dutch New Guinea; the results demonstrated the importance of New Guinea as a centre of distribution of plant-life southwards and eastwards to Australia and Polynesia. Returning by way of Queensland, a short visit was made to the Bellenden-Ker range, and later six months were spent in examining the plant-formations of the mountain summit plateaux in Tasmania.

Though Miss Gibbs welcomed the assistance of experts in different groups in the elaboration of her collections, the work was substantially her own, and help received was always carefully acknowledged. For some years she occupied a table in one of the bays in the British Museum Herbarium, which she made her floristic headquarters; but she was a frequent visitor to the Kew Herbarium, and will also be deeply regretted at the Royal College of Science, where her histological and developmental work was carried out. Her last trip was to South America, but we saw comparatively little of her after her return, and gathered that she was spending much time out of England. News of her death at Santa Cruz, Tenerife, on January 30, came as a great shock.

Miss Gibbs was a woman of considerable personality; the ability to organize and carry through successfully her various journeys of exploration is ample evidence of this. She was a keen upholder of the rights of her sex, and was one of the earliest women-Fellows of the Linnean and Microscopical Societies; she was also a F.R.G.S. She was generous in the distribution of her plants, a complete set of which is preserved at the British Museum. As a hostess she was delightful, and her botanical friends will remember with pleasure her little afternoon tea-parties. It is with deep regret that we realise that her work is finished.

A. B. Rendle.

The following bibliography has been compiled by Mr. J. Ardagh, of the Department of Botany, British Museum:—

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"Notes on the Phyto-geography and Flora of the Mountain Summit Plateaux of Tasmania." Journ. of Ecology, viii. pp. 1–17 and 89–117. 1920.

"The Genus *Calobryum*." Journ. Bot. lviii. p. 275. 1920.

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

[My friends Messrs. E. G. Baker and C. E. Salmon have suggested that abstracts of papers bearing on the British Flora would be of interest and helpful to students of our Flora. They have kindly undertaken to supply these, and the present is a first instalment.—Editor.]

Spartina Townsendii (*Journal of Ecology*, xiii. pp. 74–91, 1925).—Prof. F. W. Oliver describes the mode of establishment, economic uses, and taxonomic status of this plant. The paper is illustrated by photographs showing its rapid spread in recent years and the transformation of bare mud-flats into "*Spartina* meadows." *Spartina* was first recorded in Southampton Water in 1870, from whence it has spread west to Poole, east to Rye, and to the French side of the Channel. The seeds are carried as tidal drift, and the plants appear in the position in which the drifted seeds come to rest. They colonise chiefly the bare mud or mud carrying *Algæ* or *Zostera*, which is not subject to more than six hours' immersion per tide. The seeds germinate at once, and the young plants are from 6–8 in. high by the first summer; the second year they form dense tufts. Two types of roots are developed—long, unbranched, anchoring roots and a dense plexus of nutritive roots. The plants expand, by means of creeping stolons, several feet per year. The individuals nearest the creeks receive the first supply of drift as the water spreads out from the creeks with the rising tide. The drift is liable to be anchored and therefore more seeds become available in these regions, and in this way a more favoured outer zone comes into existence. Therefore, after the first invasion, the spread is chiefly along the margins of the mud compartments into which an estuary tends to be divided, the interior parts being relatively open. In time, however, the interior is also filled up and the only open water remaining is in arms where the depth is too great for *Spartina* to settle. Colonisation is accompanied by a rise in general level due to silting. These facts render *Spartina* particularly well fitted for the purpose of the reclamation and stabilising of muddy foreshores. The suggestion is put forward that this could be done more effectively by the scattering of seeds than by the planting of stolons.

The paper closes with a discussion of the status of *Spartina Townsendii*. It is generally regarded as either a mutant of *S. alterniflora* or as a hybrid between this species and *S. stricta*. Its extreme vegetative vigour is a point in favour of the latter supposition, but no satisfactory conclusion can be arrived at until breeding experiments and cytological investigations have been carried out.

D. Powell.

Arctic Vegetation, Past and Present (Journ. Roy. Hort. Soc. l. pp. 1–18, 1925).—Prof. A. C. Seward gives an account of his

and Mr. R. E. Holttum's visit to Greenland in the summer of 1921. A large portion of the paper deals with the fossil flora, the investigation of which was the primary object of Prof. Seward's visit.

It is important for British botanists to realize that "the state of Greenland to-day is believed to offer a fairly close parallel to that of the British Isles during the last great Glacial period. Lying on a heath-covered hill-side surrounded by a wealth of flowers, the sea in front strewn with icebergs, and behind, the ice-covered summits of the mountains, it needs but a slight mental effort to transport oneself to England as it was some thousands of years ago. The question suggests itself—may not some of the hardier members of the pre-Glacial flora of Britain have been able to survive in sheltered, ice-free localities even during the maximum phase of the Glacial period? The view that our present flora is almost entirely post-Glacial in age becomes difficult to accept when we see the 'friendly Arctic' in its summer dress."

On some of the beaches *Arenaria peploides*, *Mertensia maritima*, and *Elymus arenarius* give a familiar look to the vegetation. *Phyllodoce cærulea* is abundant; *Alchemilla glomerulans* (recently identified in Scotland) occurs in plenty. *Eriophorum Scheuchzeri* was a conspicuous feature of the landscape and *Pyrola grandiflora* one of the most attractive plants noted. Only one true annual occurs, *Koenigia islandica* (widely distributed in the Polar Regions), and there are very few endemics; altogether nearly two hundred species were collected. *Betula nana* (as in Norway and Lapland) was the most northerly tree.

C. E. S. & E. G. B.

Netherland Violets ("Het Geslacht Viola in Nederland Kruid." Nederland. Kruid. Archief 1923, pp. 138–208; 9 figs.).—A. W. Kloos, Jr., gives an account of the violets found in the Netherlands. The species are the same as those found in this country, with the exception of *Viola calcarea*. The interest of the paper to British botanists centres more on the hybrids.

V. permixta Wiesb. (*V. hirta* × *odorata*) is, of course, well known. *V. Burnati* Gremli (*V. Riviniana* × *rupestris arenaria*) is not recorded by Mrs. Gregory for this country in 'British Violets.' *V. intermedia* Rchb. (*V. Riviniana* × *silvestris*) was described by Bothke in Bast. Veilch. 15 (1881) and by Mrs. Gregory. *V. baltica* W. Becker (*V. canina* × *Riviniana*) was likewise described by Bothke. *V. caninefas* Kloos is a new hybrid and is *V. canina dunensis* × *Riviniana*. *V. batava* Kloos (*V. canina dunensis* × *Riviniana pubescens*), *V. borussica* (Borb.) W. Becker (*V. canina* × *sylvestris*), *V. najadum* Wein (*V. persicifolia* × *Riviniana*) and *V. Ritschliana* W. Becker (*V. canina* × *persicifolia*) are also dealt with.

One new variety, *V. persicifolia* Roth var. *lacteæoides* Becker & Kloos, is described (p. 192) and figured. The description is as follows:—"Planta humilis, usque ad 8–12 cm. alta; folia angustata, basi distincte cuneata, minora quam in typo; stipulæ angustatæ."

Apparently a heath form, perhaps due to the drier situation on

which the species is still able to exist in consequence of the Atlantic climate. The variety has similar flowers to the type, and under the lens shows the same peculiar fine hairiness of the leaves. Their colour is even darker green than that of the type, and they recall *V. canina* in being thicker and stiffer.

There is no mention of *V. epipsila* Ledeb.

E. G. B. & C. E. S.

REVIEWS.

The British Charophyta. By JAMES GROVES, F.L.S., and GEORGE RUSSELL BULLOCK-WEBSTER, M.A., F.L.S. Vol. II. CHAREÆ, &c. 8vo, pp. xii, 129, text-figs. 27–31, pls. 21–45, one coloured. Ray Society. London, 1924. Price 25*s.*

THIS represents the annual volume for the eightieth year of the Society (1923), and completes the account of the British Charophyta, the earlier part of which was issued in 1920. We heartily congratulate the authors on the completion of their work, and students of British botany on the acquisition of an exhaustive systematic account of one of the most beautiful and interesting groups of our flora. It was to be expected that the standard of the first volume would be maintained, and the clear full descriptions of the species and forms of lower rank, the bibliography, and information as to distribution leave nothing to be desired. The plates, as before, are largely from the pencil of Miss Mary Groves, and are beautifully executed; the large number of magnifications adds greatly to their value.

The Charophyta fall into two tribes, *Nitelleæ* with two genera, which were treated in vol. i, and *Chareæ* with three British genera, which are included in vol. ii. Of the three genera, *Nitellopsis* and *Lamprothamnium* contain each one species, while *Chara* is represented by sixteen. Brief descriptions are included of some continental species which might be looked for in Britain.

A chapter of great general interest is Mr. Groves's sketch of the Geological History of the Charophyta. Their presence has been suggested in Silurian and Devonian rocks, but the earliest remains which can with any degree of confidence be assigned to the group are from the Carboniferous (Lower Coal Measures of Nova Scotia). In the Mesozoic era they were well developed—the Middle Purbeck beds of Dorset abound in Charophyte remains—and numerous forms are recorded from Tertiary strata. It is much to be regretted that Mr. Clement Reid's death interrupted the work of himself and Mr. Groves in this productive field.

Canon Bullock-Webster adds a useful chapter on collecting and preserving specimens, and there is also a good bibliography. Inspection of the bibliography suggests that the interest of British botanists in the group has been rather in its cytological than its systematic aspect. But the completion of the monograph will be an incentive to greater general interest. Charas are not easy subjects; from their collection onwards special care is necessary, but the Groves, brothers and sister, and in later years Canon Bullock-Webster, have done yeoman service towards facilitating their study.

The Student's Handbook of British Mosses. By H. N. DIXON With Illustrations and Keys to the Genera and Species by H. G. JAMESON. Third Edition, Revised and Enlarged. 8vo, pp. xlviii & 582, 63 plates. Eastbourne: V. V. Sumfield. London: Wheldon and Wesley, Ltd. 1924. Price 24*s.*

THE third edition of this well-known handbook has met with a ready welcome, partly because it has been badly needed for some years and partly for its intrinsic excellence. The first edition appeared in 1896 and at once took the fancy of the bryological public, who were not slow to recognize the masterly arrangement and exposition of the contents and the practical utility of the *modus operandi* adopted. The main features were the easy keys, the well-considered and lucidly written descriptions of genera and species, with the salient characters emphasized by italics, the helpful critical notes, the clear and exact figures allotted to all the species, and withal the moderate price. The keys alone, based as they were on vegetative characters, proved an enormous boon to the earnest student, who, no longer confused by the unrelieved dullness of long descriptions, was henceforth able to attempt the determination of barren specimens with every prospect of success and with great saving of time and temper. The figures illustrate the distinctive characters described in the keys; they were drawn by means of the *camera lucida*, and are noteworthy because the scale of magnification of a given organ is uniform throughout the entire series; thus a leaf is always enlarged 15 times, and the areolation 180 times, and both shape and comparative size are revealed at a glance.

The second edition, published in 1904, contained 60 more pages, 80 additional species and many varieties, and 5 new plates, together with a revision of some of the genera necessitated by the advance of bryological knowledge. The present edition brings further alterations and improvements. Opportunity has been offered for a careful revision of the types of the hundred or more new species, which had been described by the late Dr. Stirton and remained as standing puzzles in bryology. The results, published in this *Journal* in 1923, are incorporated in the present work. The plates have been redrawn, and have been reproduced directly from the originals by photography; they are printed on both sides of the paper, thus saving both weight and bulk. This very practical and extraordinarily well-planned handbook with its full and accurate information is not only a boon to bryologists, but a model to workers in other fields.

A. G.

Researches on Fungi. Vol. III. By Professor A. H. REGINALD BULLER. Pp. 611, text-illustrations 227. Longmans, Green & Co. London, 1924. Price 30*s.* net.

THE original volume of these researches was published in 1909, and was mainly concerned with an account of the production, liberation, and dispersion of the spores of Hymenomycetes treated botanically and physically. Much of the matter therein described has now

found its way into botanical text-books. Since that date Professor Buller has assiduously pursued his investigations in whatever direction they have led. The further results of his researches are being published in three volumes, of which the second is the one under review. The sub-title of the volume is "The Production and Liberation of Spores in Hymenomycetes and Uredineæ." In it the author continues his account of the various subtypes of the fruit-body organisation of the Agarics. He divides these into Æqui-hymeniiferous or non-*Coprinus* type (with five subtypes) and the Inæquihymeniiferous or *Coprinus* type (with six subtypes). The *Panæolus* subtype was described in volume ii. and the *Psathyrella*, *Bolbitius*, *Armillaria*, and *Inocybe* subtypes are here considered, together with the subtypes of *Coprinus—comatus*, *atramentarius*, *lagopus*, and *micaceus*,—leaving the *plicatilis* and *curtus* subtypes to be considered in the final volume. The permutations and combinations which go to the defining of these sections, though quite clearly stated, are not such as can be summarised in a short space. We should be surprised, however, if all the non-*Coprinus* forms could be relegated to five of such divisions, whereas *Coprinus* itself requires six. The author has, however, made a special study of the genus *Coprinus*: his analyses of the gill-structure of the different species is particularly illuminating. Here the basidia are usually dimorphic, but occasionally are trimorphic or tetramorphic. Throughout the first eleven chapters there are many interesting facts brought to light. The ozonium of *Psathyrella disseminata* is clearly described and its biology discussed, but the author is mistaken in believing that it has not hitherto been noted, as Coemans mentions it in 1862, and Hennings and Mez also describe it. Part I. of the volume is completed by two chapters which seem to be somewhat out of place in the work. The first of these is on bioluminescence in *Panus stypticus*. This is a common fungus in Europe and North America. The form in North America has frequently been reported as luminous, whereas in this country no one has seen it behave so. There thus appear to be two physiological forms, and to these the author gives the names *Panus stypticus luminescens* occurring in North America and *Panus stypticus non-luminescens* occurring in England. From the work of Molisch, Ludwig, and Gueguén it seems that, similarly, there are luminous and non-luminous strains of *Xylaria Hypoxylon* occurring on the continent. The author gives a summary of known facts about luminescence and describes an apparatus which, by controlling the supply of oxygen, makes it possible to switch the light on and off at will. In *Panus stypticus* the light can be turned off completely in three seconds and on again in one second.

The following chapter on Agarics which are parasitic on other Agarics also seems a departure from the main theme, and is little more than a summary of known facts. The suggestion that the chlamydospores of *Nyctalis asterophora* will be found to contain at least one pair of nuclei was shown to be the case by Maire in 1902; they are binucleate.

In Part II. spore-production and discharge in the Uredineæ is considered. Here, on the germination of the teleutospore, the basidiospores are arranged on their sterigmata and are discharged in exactly the same manner as in the Hymenomycetes, but they are usually somewhat larger, are shot off a greater distance, and have a somewhat larger water-drop excreted at the spore-hilum. The basidiospore in certain species at least is shot violently into the air. An interesting calculation is given of the number of spores present on three Barberry leaves heavily infected with *Puccinia graminis*—4,700,000, 5,400,000, and 8,000,000. Finally, there is a general summary of sixteen pages and a very full index. The volume is lavishly illustrated, and about ninety per cent. of the illustrations are published for the first time.

Mycologists are under a great debt of gratitude to Professor Buller for his illuminating researches on the structure of the hymenium and spore-discharge. For ourselves, we wish that a more condensed account of the essential matter had been presented. Already over a thousand pages have been occupied, and many on subjects which seem irrelevant to the main theme, and this apparently with the object of increasing popular interest. However, few general readers can be expected to take any interest in the mass of detail here presented, in spite of a certain amount of fine writing. Knowing the tremendous enthusiasm of the author, the painstaking observations, and the enormous labour expended over a long number of years, we regret that by his very "doctrine of thorough" he has probably failed to produce a classic.

J. R.

LINNEAN SOCIETY.

At the meeting of the Linnean Society on February 19, Miss A. Lorrain Smith exhibited a series of drawings of Lichens and Fungi by John Templeton, which she had received as a gift from an American surgeon of world-wide reputation, Dr. Howard Kelly, who has been for years a patron of Mycology and Lichenology. John Templeton (1766–1825) was well known to the botanists of his day, more especially in Ireland. Robert Brown dedicated to him the Australian leguminous genus *Templetonia*.

Dr. J. Burtt-Davy read a paper entitled "The Tropical Element in the Arborescent Flora of the Transvaal." The geographical distribution of 647 species of trees and allied shrubby plants of the Transvaal was discussed. About 30 per cent. of these were found to be endemic to the Transvaal and 70 per cent. were "wides." The percentage of endemics is only about two-thirds that of the endemics of all Transvaal phanerogams, suggesting that they represent types of vegetation older than many of the herbaceous types. Fully 90 per cent. of the wides are tropical or subtropical; the temperate element is very small. There is evidence in a limited area of the evolution of a recent warm-temperate flora (through recent elevation of the land-surface) replacing an older tropical and subtropical flora. Islands and reefs of older floras are left stranded where climatic conditions

permit them to persist; these are not homogeneous, but represent different migration periods.

Prof. R. R. Gates exhibited a specimen of a "Virescent *Delphinium*," which appeared in a London garden. In this specimen, which is nearest to *D. elatum*, the numerous flowers showed little variation. The sepals were large and baggy, the spur of the posterior sepal being very short, forked at the tip, and very late in developing. The petals were very much reduced and without spurs or nectaries. The androecium was unaltered and the pollen normal. The carpels were long, curved, and without stigmatic surfaces.

This was compared with other specimens of virescence, in *Œnothera*, *Torenia*, etc., in which the inheritance has been studied. It was pointed out that virescence is frequently inherited as a Mendelian recessive, but often with complications, and the whole phenomenon deserves further genetic study.

At the meeting on March 5 Mr. C. C. Lacaita explained the scope of a short paper on "Two rare Spanish Species of *Echium*," exhibiting a photograph of the two, mounted on the same sheet, from the Boissier Herbarium, Geneva.

Mr. E. Marsden Jones read a paper on "The Pollination of *Primula vulgaris*," giving details of his observations in a wood at Potterne in Wiltshire. Four visits were paid to the wood between April 22 and May 17, and several hours were spent in observing the insects visiting this flower. Temperature and weather conditions were noted. Fifteen species were seen visiting the flowers, and a representative of each species was caught and set. The specimens were shown, and comprised:—*Bombus pratorum*, *B. hortorum* var. *harrisellus*, *B. agrorum*, *Anthophora filipes*, *Andrena* sp., *Bombylius major* ♂ & ♀, *B. discolor* ♂ & ♀, *Rhingia campestris*, *Agriotes pallidulus*, *Meligethes lumbaris*, *Meligethes* sp., *Tachyporus pusillus*, *T. solutus*, *Eusphalerum primulæ*, *Forficula auricularia*.

Of these *Bombylius major*, *B. discolor*, *Rhingia campestris*, *Bombus pratorum*, *B. hortorum* var. *harrisellus*, and *Anthophora filipes* have a proboscis long enough to pollinate satisfactorily and appear to be adequate to effect pollination. The first four were frequent, the *Bombylius* especially, visiting consistently and almost exclusively the primrose.

One of the author's visits was made at night and was entirely negative. It was hoped that moths might have been seen, but none were on the wing. The only insects observed were *Forficula auricularia* and *Eusphalerum primulæ*. A further visit was paid to the wood when *Primula vulgaris* was out of flower, and an average-sized plant selected and examined critically. It had a percentage of 65 per cent. good capsules, 18 per cent. smaller capsules, and only 17 per cent. failed to set seed; some of the latter were of very late flowers.

Against this good record of seed-production two plants under control, a long- and a short-styled form, failed to produce a single capsule. It therefore appears obvious that insect-agency is necessary to secure pollination, and the author concludes that the insects he observed in the wood in Wiltshire are adequate for the purpose.

NEW BRITISH BRYOPHYTES.

I. Mosses.

By H. N. Dixon, M.A., F.L.S., and W. E. Nicholson, F.L.S.

Grimmia andreæoides Limpr. in Rabenh. Krypt. Fl. von Deutschland, etc. iv. 776 (1889). The discovery of this moss on the side of Snowdon in 1924, during the visit of the British Bryological Society to Llanberis, adds a very interesting species to our moss-flora. So far as we are aware, the species has hitherto been found only in a very restricted area in the Central European Alps of Tirol, Salzburg, and Carinthia; the Grisons, the Bernese Oberland, and the Jura, in Switzerland; and the mountains of Savoy in France; and in most of those localities, at least, confined to a single station, at altitudes varying from 1500 to 2700 metres.

The name is highly appropriate, as the plant has almost exactly the appearance of an *Andreæa*; it is, in fact, exceedingly difficult to distinguish from *A. petrophila*, a moss moreover which is very likely to occur as its associate. The leaves in the *Andreæa* are perhaps always a little more rigidly erect or suberect, and a little narrower in the points, when dry; and of course, when, as usual, perichætia are present, the *Andreæa* is easily recognizable. Under the microscope the nerve at once denotes the *Grimmia*.

Grimmia andreæoides, which has only been found sterile, grows in low dense tufts, a quarter to half an inch high. The leaves are very minute, less than ·5 mm. in length, erect and appressed, with scarcely any twisting when dry, the lower broadly ovate and very obtuse, the upper longer, ovate-lanceolate, obtuse, or bluntly pointed, concave, but not carinate, with plane margins, which are often finely crenulate near the apex; nerve rather weak, ending below the point. In the original, and in most of the gatherings, the leaves are hairless; but in specimens gathered by the authors at Franz-Josef-Höhe in Carinthia the leaves have occasionally—but rarely—a minute hyaline apiculus formed of two or three colourless cells. This we have not seen with certainty on the Welsh plant. The upper cells are about 10 μ in diameter, mamillose on the surface, and also very minutely papillose; the walls thick, not sinuose; the basal cells very shortly rectangular in mid-leaf, subquadrate towards margins. Only sterile female plants have been detected.

Loeske, in his "Grimmiaceæ," retains it as a species, while agreeing with Limpricht's remark that it is nearly allied to *G. torquata*. Culmann considers it a reduced form of *Barbula rigidula*. The distinct presence of a minute hair-point in many leaves in the Carinthian plant, as well as the alpine distribution, precludes the latter view quite decidedly, while the markedly mamillose cells are rather against a close connection with the former.

Extremely slender shoots with microscopic leaves are frequently present, but it is doubtful if this can be considered a specific character; we have found them occasionally in dense xerophytic forms of *G. funalis* also. Stalked gemmæ have also been described, but their presence has not been clearly established.

The species was gathered by Miss Scott, and afterwards by Mr. J. L. O'Loughlin, in depressions on boulders in and close to Llyn Clogwyn du'r Arddu, at about 2000 ft. altitude, on Sept. 1st, 1924. Subsequently Mr. D. A. Jones made a careful search and found it in numerous spots around and above the lake, always on volcanic ash rocks. This agrees with Limpricht's and Loeske's description of it as a calciphilous moss.

Owing to its small size and the close resemblance to an *Andreæa*, it is probable that this little moss has been overlooked, and may prove to be more widely distributed than has been supposed.

WEBERA CALCAREA Warnst. Dioicous; male flower large, terminal, discoid with widely spreading perigonial bracts. Plants rather loosely tufted, often in wide patches, dull green, not glossy. Stems bright red, slender. Leaves rather distant, spreading, narrowly linear-lanceolate from a narrow slightly decurrent base, margin plane, denticulate in the upper third, yellowish or reddish at the base; nerve rather thin, but wide, yellow or reddish yellow below, vanishing below the apex; cells elongate, 6 to 12 times as long as broad in the middle of the leaf, 16 to 18 μ wide, narrower towards the margin, where they form an indistinct border; fertile plant generally more slender than the sterile one. Seta rather stout, reddish below, paler above. Capsule small, ovate with a short neck, cernuous, greenish yellow when ripe, pale yellow when deoperculate, not contracted below the mouth; operculum apiculate; cells of the exothecium polygonal, walls yellowish with 3 or 4 rows of smaller rectangular cells about the mouth; annulus none, immersed stomata in the neck of the capsule. Teeth of the outer peristome reddish brown, narrowly bordered, faintly papillose on the outer surface; inner peristome yellow, processes gaping, cilia nodulose and papillose. Spores 18 μ, yellow, almost smooth, ripe in March.

Hab. Chalk banks and roadside ditches on the downs near Lewes. A few immature capsules have been found in January 1925, and they agree, so far as can be seen, with the above description of the capsule which is taken from Limpricht. The small immersed stomata in the neck of the capsule are very inconspicuous, and the covering cells are hardly, if at all, differentiated.

W. calcarea is no doubt very close to *W. albicans*, from which it is not separated by any important structural differences. It may possibly be regarded as a small narrow-leaved form of this from a calcareous habitat. It is, however, very different in general appearance from the typical form of *W. albicans*, and lacks the very characteristic pale glaucous-green colouring of that species.

Baumgartner (in E. Bauer, "Musci europæi exsiccati," Schedæ und Bemerkungen zur 21–27 Serien) considers *W. calcarea* near to *W. carnea* rather than to *W. albicans*, and suggests that it is a southern race of *W. carnea*. The plants we collected near Taormina in Sicily in 1914 scarcely bear out this view; the size and colour, in both sterile and fruiting plants, are far more suggestive of an affinity with *W. albicans*. The same is the case with some of the earlier sterile plants from Lewes. Later gatherings, however, in abundant, rather immature fruit, are far more suggestive of *W. carnea*; the short rigid stems, dull, not bright green leaves, deep purple, short setæ, and small capsules being highly reminiscent of that species; while the extremely narrow and narrow-pointed leaves, and very narrow cells, differ as widely from these organs in *W. carnea* as do the sterile plants from *W. albicans*.

W. calcarea would appear to be a highly variable plant (Baumgartner suggests that it is a plastic evolute species), so much so that it seems hardly possible to determine whether it be a derivative from *W. albicans* or *W. carnea*. A possible alternative is that both these species, when occurring in similar calcareous habitats, may develop parallel forms, both of which are represented in the Sussex plants *.

II. Hepatics.

By W. E. Nicholson.

FOSSOMBRONIA LOITLESBERGERI Schiffn. During a recent visit to West Cornwall in November 1924, in company with Mr. H. H. Knight, when botanizing on wet ground on the Lizard Down where *Erica vagans* grows so freely, we came upon a robust species of *Fossombronia* which appeared to belong to the *F. cæspitiformis* group, but as it was without any capsules it was impossible to determine it. I therefore brought some of the material home and cultivated it in my greenhouse, where during January it produced several capsules, the spores of which did not agree with those of any of our recognized British species, but appeared to agree well with the description of those of the above species, and in this determination Mr. S. M. Macvicar concurs. The following diagnosis is largely borrowed from the original one by Dr. Schiffner ("Ueber Lebermoose aus Dalmatien und Istrien," Hedwigia, xlviii. 195):—

Fossombronia Loitlesbergeri. Monoicous. Laxly or densely cæspitose, creeping, similar in size and habit to *F. cæspitiformis*. Stems to 10 mm. long and to 4 mm. broad with the leaves, densely covered with vinous rhizoids on the underside. Leaves dense, crispate, almost double as wide as long on robust plants, lobes subobtuse, entire, cells subquadrate or hexagonal 40–45 μ, cuticle smooth. Pseudoperianth wide, more or less deeply cleft on one side with lamellæ here and there on the outside, margin undulate, sublobate dentate. Capsule longly pedicellate (seta 5–6 mm.) globose, capsule-wall composed of a double layer of cells, outer layer of smaller cells without thickenings, inner layer of larger cells (to 60 μ) with lateral thickenings, which are here and there semi-circular. Spores 50–60 μ, yellowish brown, on the inner surface densely papillose, on the outer surface with numerous prominent lamellæ (almost as in *F. Wondraczekii*, but the lamellæ fewer and more distant, though more numerous than in *F. pusilla*), spaces between the lamellæ laxly and minutely papillose, lamellæ appearing on the margin as about 25 spines, 6–7 μ high. Elaters to 180 μ long and 10 μ wide, slightly contorted, bispiral, spirals loosely twisted, brown. Antheridia on the antical surface of the stem near the insertion of the leaves, often close to the archegonia, solitary, covered with scale-like bracts, ovate, shortly pedicellate.

* Since the above was in type, the Rev. W. R. Megam has sent a plant from chloritic limestone, Colin Glen, Belfast, found by himself and Capt. Chase, which agrees with the Sussex *W. calcarea*.

The plant was growing on very wet ground in company with *Riccia Beyrichiana*, *Foss. Husnoti* var. *anglica*, and *Gongylanthus ericetorum*, which is also new to the British flora. It was growing in large compact tufts, almost the size of the palm of one's hand, of a rather dark green colour, and from its general appearance suggested a species of the *F. cæspitiformis* group rather than that of *F. pusilla* and *F. Wondraczekii*, to which it is more closely related. Dr. Schiffner compares it particularly with *F. Wondraczekii*, but it seems to me to be rather closer to *F. pusilla* on account of the structure of the inner layer of the capsule-wall, which closely resembles that of *F. pusilla*, while differing materially from that of *F. Wondraczekii*. It is, however, quite distinct from both these species in the size and sculpture of the spores. Once known, it is fairly distinguishable in the sterile state on account of its large size and the larger, more obtusely lobed leaves, which are less crispate than those of *F. cæspitiformis*.

The species was originally discovered in the island of Arbe, off the Dalmatian coast, and, so far as I am aware, it has not been hitherto found elsewhere.

GONGYLANTHUS ERICETORUM (Raddi) Nees. Growing with the *Fossombronia*, as in the island of Arbe, was also this species, of which the following is a diagnosis :—

Dioicous. In yellowish-green tufts, dark olive-green in the older parts. Stem 1–2 cm. long, closely creeping, simple or more rarely bifurcate, closely affixed to the substratum by long, pale or brownish, fasciculate rhizoids, tufts depressed, sometimes of considerable size. Leaves closely approximate, opposite, often connate at the antical base, transversely inserted, spreading or subvertical, oval obtuse, rounded at the apex, entire except on the postical base, where occasionally the ends of the cells project downwards, forming obtuse teeth, about 1·5 mm. long and 1 mm. broad, margin generally plane, but here and there recurved. Leaf-cells rather large, hexagonal, about 3 μ in the middle of the leaf, smaller on the margin, thin-walled, scarcely thickened at the angles, marginal cells towards the postical base hyaline, elongated, to three times as long as broad, oil-bodies distinct in the younger cells, but soon disappearing, cuticle finely papillose. Under-leaves none. Perigynium subterranean, forming a long cylindrical tube to 7 mm. long. Capsule cylindrical, smooth, black. Spores almost smooth. Antheridia solitary in the axils of 4 to 5 pairs of scarcely altered leaves, or the male inflorescence is in the form of terminal spikes, when the bracts are more concave and more imbricated, and often have two antheridia in their axils.

Gongylanthus ericetorum cannot well be confused with any known British hepatic. It sometimes has a superficial resemblance to certain forms of *Alicularia scalaris*, from which it is readily distinguished by the opposite leaves and the absence of under-leaves. In a sterile condition it very closely resembles, and is scarcely distinguishable from *Southbya stillicidiorum*, which has not been found in Britain, but this is a plant confined to dripping places on limestone rocks in the south of Europe, where I have found it both in Crete and Sicily, while the *Gongylanthus* is confined to a siliceous habitat.

Southbya nigrella, which has recently been found in Britain and has somewhat similar opposite leaves, is readily distinguishable by the blackish colouring of the underside of the leaves and the appendage which they bear. No trace of any inflorescence has been found on the Cornish material, but the siliceous soil (serpentine rock) on which it was found and the mosses and hepatics growing with it such as *Riccia Beyrichiana*, *Fossombronia Loitlesbergeri*, *F. Husnoti* var. *anglica*, *Scapania compacta*, and *Funaria ericetorum* leave no doubt as to its identity. *Gongylanthus ericetorum* is a plant of general distribution in the Mediterranean regions and the South-west coasts of Europe. It is also found in Madeira and the Canaries, and I have recently received it from the Middle Atlas in Morocco.

CEPHALOZIA COMPACTA Warnstorf. In July 1924 I collected a series of forms of *Cephalozia connivens* (Dicks.) Spr., which was abundant on the moors round Goathland in Yorkshire. On examining these plants on my return I found some which I could not distinguish from *C. compacta*, and which agreed well with the specimens of this species in Dr. Schiffner's Hep. Eur. Exs., particularly No. 522. This species is distinguished from *C. connivens* by the author by the toothed involucral bracts, by the perianths being less longly ciliate than they are in that species, and by the rather smaller leaf-cells. Mueller gives a further character as distinguishing *C. compacta* in the smaller size and greater number of the cortical cells of the stem; but this character is not very satisfactory, as *C. connivens* exhibits a considerable range of variation in this respect.

C. compacta is not infrequently compared with *C. Loitlesbergeri* Schiffn., but I do not think that there is much chance of confusion here. I have found *C. Loitlesbergeri* in a number of localities in Scotland and I have had it sent to me from others, but I have never found any difficulty in identifying it. The long deeply-cleft involucral bracts are very distinctive, as are the colour and shape of leaves; indeed, in a sterile condition the plant is more likely to be confused with *C. macrostachya* than with *C. connivens*, and altogether it appears to me to be a well-characterized and constant species. *C. compacta*, on the other hand, though fairly distinct in extreme forms, is often very difficult to distinguish from *C. connivens*, and when a large amount of material is examined numerous intermediate forms are found. Dr. Mueller, in the supplement to the second volume of 'Die Lebermoose,' p. 774, dwells on this fact, and says that *C. compacta* can only be a so-called "small species," adding that C. Jensen, Loeske, and Schiffner share this view. I should be inclined to go one step further and regard *C. compacta* as a variety only of *C. connivens*, characterized by the toothed involucral bracts, though even here a considerable range of intermediate forms occur.

LOPHOCOLEA HETEROPHYLLA (Schrad.) Dum. with gemmæ. *L. heterophylla* is hardly a new British hepatic, but in a gemmiferous state it does not appear to have been recorded anywhere with any certainty. A short time ago I found in the moist sandy hedge-bank of a lane near Wivelsfield, Sussex, several tufts of this plant, in which a number of the leaves were eroded by gemmæ, and since this time

I have found the plant with gemmæ either on the leaves or on the perianths near Lewes and Hastings, and quite recently near the Lizard, Cornwall, while Mr. H. H. Knight has sent me a plant with very numerous gemmæ from the Keuper sandstone of Gloucestershire. At first it might be thought that one had to do with *L. minor* Nees, which is largely distinguished from *L. heterophylla* by the constant presence of gemmæ, but this plant is much smaller with more uniform leaves of a yellower colour, and it is also dioicous and confined to a calcareous habitat, while the plants which I examined were quite ordinary forms of *L. heterophylla* with the paroicous inflorescence and other characters of this species, and differed only from the type in the presence of gemmæ.

The gemmæ appear to be more often produced when the plant is growing on rock or other inorganic substratum, though I have occasionally seen them on plants growing on wood. M. Douin, in an interesting paper ('Revue Bryologique,' 1908, pp. 14–23) entitled "*Lophocolea minor* Nees, Est-il une bonne espèce?," discusses the relationship between *L. heterophylla* and *L. minor*, and he is inclined to regard the latter as a variety only of the former, such variety embracing practically all gemmiferous forms. The evidence of the British plants, however, rather goes to prove that gemmiferous forms of *L. heterophylla* occur, which show no tendency towards *L. minor* in any other respect.

LICHENOLOGICAL NOTES.—I.

By W. Watson, D.Sc.

The following notes on the occurrence of new, rare, or critical species of lichens in the British Isles are supplementary to those given in this Journal during 1917. In many cases the plant has been sent to me for determination or verification by other collectors, and in such cases the name of the collector is given in the text. The bracketed numbers refer to the botanical vice-counties of Great Britain.

Stanocybe bryophila, sp. nov. Thallus obsoletus aut evanescens aut nullus proprius. Apoth. pedunculatum, 1–1·5 mm. longum, nigrum aut cinereum, sæpe subcæsium, nitidiusculum præsertim ad marginem disci. Capitulum clavato-truncatum cum margine inflexo. Ascus cylindratus circa 0·35 mm. longus, 0·025 mm. latus, attenuatus ad basim, cœrulescens cum iodo. Sporæ 8næ, nigro-fuscæ, oblique uniseriatæ 0·035–40 mm. longæ, 0·012–15 mm. latæ, 3-septatæ, cellulis apicalibus minoribus et pallidioribus. Paraphyses decolores, haud discretæ, tenuissimæ sat implicatæ, sæpe vix evolutæ, cœrulescens cum iodo.

Hab. Cwm-y-glo, near Llanberis, V.C. 49. August 1924.

This little plant occurs on the stems of hepatics. It was actually dissected off three different hepatics belonging to the three genera *Cephalozia*, *Scapania*, and *Frullania*. Another capitulum was perhaps on the thallus of *Stereocaulon compressus*, which was intermixed with the hepatics.

Thallus obsolete, little evident, or none proper. Apothecia stalked, 1–1·5 mm. long, dark or greyish, often with a bluish tinge, somewhat shining, especially at margin of disc; capitulum clavate-truncate, with the margin of the disc inflexed. Ascus cylindrical, about 350 × 25 μ, narrowed at base, bluish with iodine. Spores 8næ, dark brown, obliquely 1-seriate, 35–40 μ, 3-septate with paler and smaller end-cells. Paraphyses not very evident, sometimes showing as slender, more or less entangled hyaline filaments, bluish with iodine.

S. byssacea (Fr.) Nyl. Not uncommon on alders in N. Wales. Llanbedr, V.C. 48 (*D. A. Jones*). Tyn-y-groes (48).

Calicium quercinum Pers. Dolgelly, V.C. 48 (*D. A. Jones*).

Calicium pusillum Flk. On a stump, Combe St. Nicholas (5), in small quantity. The apothecia are not pruinose, and the spores are smaller than in specimens of *C. curtum* from the same district.

Trachylia tigillaris (Pers.) Fr. On an old gate-stump, Triscombe, Quantocks, V.C. 5.

Mycoporum miserrimum Nyl. Minehead (5). Somerton and Cleeve wood (6). Cheltenham (33, *H. H. Knight*).

Pyrenula nitida form *geographica*. A form with the black lines intersecting and limiting the thallus very noticeable. The common form of *P. nitida* is usually without these lines or they are little developed. The form *geographica* is rarer, but is probably widely distributed, especially on dying or dead trees. My best example was collected from a dead ash at Penzance.

Clathroporina calcarea, sp. nov. Thallus sat tenuis aut mediocris, albescens aut albido-rufescens, interdum luteo-rufescens, passim sordide, effusus aut subdeterminatus, pulverulentus, iodo non reagens. Gonodia chroolepoidea, 0·006–10 mm. Perithecium minutum, subglobosum, immersum ad basim, pallido-flavum aut demum cinerascens aut fuscescens, ostiolo depresso. Paraphyses numerosæ, simplices, discretæ, 0·18 mm. longæ, tenuissimæ, hyalinæ, inseptatæ, haud apicibus clavatæ. Ascus sat rufescens. Sporæ hyalinæ, 6–8næ, 0·054–75 mm. longæ, 0·010–15 mm. latæ, murales, cellulis numerosis, in ordinibus transversalibus 15 aut pluribus. Epithecium et hypothecium hyalina. Gelatina hymenia decoloris aut primum pallido-cœrulescens demum fulvo-rufescens cum iodo.

Hab. Collected by Mr. Knight on oolitic walls and on other calcareous rocks at Winchcombe, V.C. 33, and in Dovedale, V.C. 57.

Thallus thin or thickish, whitish, usually with a reddish tinge, sometimes orange-red, variegated with minute darker areas, effuse or subdeterminate, pulverulent, I−, with *Trentepohlia* gonidia, 6–10 μ broad. Perithecia minute, almost globose, immersed at the base, pale yellow or becoming greyer and darker when old, with ostioles usually depressed; wall yellow with rectangular cells in rows. Paraphyses numerous, unbranched, discrete, 180 μ long, slender, hyaline, unseptate, not clavate at apices. Asci reddish. Spores colourless, 6–8næ, 54–75 × 10–15 μ, when young 1–8-septate, becoming 15- or more-septate and muriform, each tier of cells having one to three longitudinal septa. Epithecium and hypothecium colourless. Hymenial gelatine uncoloured or at first slightly greenish blue then tawny reddish with iodine.

Clathroporina is a genus segregated from *Porina* on account of its muriform spores. It has not hitherto been recorded from the British Isles, unless *Porina interseptula* (Nyl.) A. L. Sm., which is recorded from Wastdale (70), is placed under it. Most species of *Clathroporina* occur on trees. Zahlbruckner (Catal. Lich. Univer.) lists two species, *C. Elliotii* and *C. translucens* from rocks; the former was described in this Journal (1896, p. 293) under the name *Thelenella Elliotii* Wain. The description of its paraphyses as "ramoso-connexæ" suggests that it is a *Polyblastiopsis* rather than a *Clathroporina*.

Microthelia dispora A. L. Sm. A plant collected by Mr. Knight at Cheltenham (33) on calcareous rocks agrees, both internally and externally, with the description of *M. dispora*, except that the ascus contains eight spores. If the two-spored ascus is constant in the type-specimen, the Cheltenham plant will come under it as form *octospora*.

REPRODUCTIVE MECHANISM IN LAND FLORA.

II. Life-Cycles (*continued from* p. 85).

By A. H. Church, M.A.

Heterothallic Alternation.—As an initial proviso it may be well to point out that any marked and simultaneous periodicity in organism is at once suggestive of a response to some time-factor already in operation in nature—of the order, that is to say, of the day, a function of the earth; the daily, fortnightly, or monthly period of the tide, as a function of the moon; and the annual periodicity of the earth's rotation round the sun, giving changes of temperature and insolation which are responsible for climatic seasons. In other words, any periodicity extending beyond the range of a month is probably seasonal, and may be taken as the response to the annual periods of seasons.

That the successive cytological phases of a differentiated life-cycle may be sooner or later brought into direct relation with the yearly period of the seasons, and so synchronized, seems well-warranted as a working-hypothesis; and it is even justifiable to conclude that the only effective cause of the ultimate differentiation of alternating generations beyond indefinite succession of cytological phases must be such seasonal response, and the possibilities opened up by the effects of such changes require to be investigated.

In the sea, seasonal changes follow temperature effects more obviously in the temperate regions; but anywhere beyond the tropics the annual period of light-supply is more significant; since it is by light that autotrophic plants live. Comparison with a very similar state of affairs in the flora of the land, similarly dependent on seasonal sunlight and temperature, naturally follows. For example, in the case of Land Flora, seasonal periodicity of water-supply and insolation work out the case of (1) the evergreen trees of tropical

rain-forest, with little definite seasonal response, grading into (2) the deciduous trees of tropical dry-season woodland, also (3) the herbaceous perennial with seasonal effects still more clearly impressed, and culminating in the extreme case of (4) the Annual. This last, however, in further progression may grade into (5) the Ephemeral, in the limit practically losing its connection with the longer annual period. So in the sea, one may distinguish the essentially tropical alga, with little or no seasonal expression, grading into the same type becoming markedly seasonal; the common case of the annual, and even the possibility of the ephemeral. Of the first type, *Fucus* may be taken as an example; even in British seas the new shoots begin to mature their gametes before the older conceptacles are depleted; while *Ascophyllum* and *Himanthalia* (the latter an expression of the *Sargassum*-series) are more definitely reproductive in the summer months only. *Dictyota*, as an annual, is again a relic of a tropical family extending north with apparently little adaptation to seasonal change. On the other hand, *Cutleria* is markedly seasonal, with an annual 'gametophyte' (haploid); and the same idea is more exaggerated in the larger more or less perennial Laminarians. *Chorda* is apparently annual in both phases, while smaller Ectocarpi grow as they can, and approximate the conditions of the ephemeral. In the limiting cases, again, the changes of the seasons show little effect; in the intermediates their influence is well-marked. It is interesting to compare the main types of the Phæophyceæ in this respect, since in the sea these alone present the parenchymatous type of organization also characteristic of the somata of higher land-plants.

Ectocarpi are small weeds of the tide-range and pools, of generalized filamentous organization, producing simple isogamous gametes, and hence pass as comparatively primitive Phæophyceæ. But the cell-soma is highly specialized along its own lines of development, giving large cells (up to 60 μ diam.) with complex vacuolar system and arrangement of chloroplasts—the family being no more elementary as a whole than the isolated and highly elaborated Sphacelarias [1]. Following the classical observations of Berthold (1881) and Oltmanns (1899) at Naples on *Ectocarpus siliculosus*, an equally illuminating paper on *Pylaiella litoralis* [2] by Miss Knight (1923) brings out the essential facts in the life-history of an *Ectocarpus*, which are probably common to a wide range of lesser forms, including the somatically distinct Sphacelarias. Haploid and diploid phases grow side by side, and present much the same general appearance. Meiosis takes place normally in the unilocular sporangium, and haploid zoïds germinate to sexual plants which preponderate in the spring. Karyogamy gives a diploid zygote, and diploid plants which reproduce preponderantly throughout the summer. Zoïds and gametes are much alike. Haploid gametes are also freely parthenogenetic to haploid plants, and there is little definite periodicity in the life-

[1] Bot. Mem. x. p. 25.
[2] Knight (1923), Trans. Roy. Soc. Edin. liii. p. 343.

cycle. Both phases present irregularities. The special feature, so far unique as to be the first to be cytologically recorded, is the occurrence of a diploid zoïd [1], emitted from the diploid plants, which thus reproduces the same phase. Hence plurilocular sporangia emitting diploid zoïds without meiosis, and apparently much the same as plurilocular gametangia, grow on the same plants as normal unilocular sporangia giving haploid zoïds; and during the optimum growing season such multiplication by diploid zoïds prevails. That is to say, the diploid plant is vegetatively dominant and preponderant; it may omit or 'delay' meiosis, giving rise to zoïds which reproduce it rapidly and effectively with minimum wastage. In the case of *Ectocarpus* the cytological generations may be thus confused in the actual individuals of the seasonal growths; and although the cytological sequence has to be effective, it plays no essential part in the organization of the soma.

On the other hand, *Dictyota* with its closely similar haploid and diploid somata, in which alternation is apparently effective and strict, does not present any seasonal periodicity at all. Both cytological forms grow side by side in British Seas, and both grow in the optimum summer-season. The diploid phase is apparently no better than the haploid, and this case, the first to be described in cytological detail (since 1900), has tended to obscure the interpretation of others [2]. *Dictyota* and its allies are distinctly tropical types of warmer seas, of which *Dictyota dichotoma* is the most northern stray, extending beyond British seas, where *Padina* and *Taonia* are mere relics. There remains one feature of *Dictyota* still imperfectly described; the last residual plant, both up the tide-range and on the verge of geographical distribution, is the peculiar growth-form var. *intricata*, apparently wholly asexual and presumably always diploid, yet reproducing itself (possibly by monospores which omit meiosis). Hence, if anything, the balance falls on the side of the diploid plant as being the vegetatively stronger and more enduring.

Comparing these forms, it may be noted that *Fucus* is perennial, reproducing in the second year from germination, and hence takes two years to work through the life-cycle; but the output of meiotangia and gametes is continuous; beyond slowing down in cold weather, it

[1] A diploid zoïd is almost a contradiction in terms, since all regressive zoïds should be haploid and of the order of gametes. Such zoïds are a novelty; they do not come under the heading of either parthenogenesis or apogamy; there is no change of generation, and such units are clearly the forerunners of gemmæ, 'sporophytic budding,' such stages as the diploid carpospores of the Florideæ, and the diploid æcidiospores of the Uredineæ, for which a similar postponement of meiosis is generally postulated. They may be regarded as the attempt of a diploid protoplast to regress to the flagellated phase, not knowing that it is diploid and thus incapable of fusion. The case is complementary to the tetrasporangium and tetraspores of Florideæ found on cystocarpic plants, with the omission of meiosis. The special point of interest, perhaps, is that such a unit should have met the demand for rapid propagation, even in Algæ with flagellated regressive zoïds.

[2] *E.g.*, it has been made responsible for theories of 'Homologous Alternation of Generations' in Land Flora.

primarily independent of seasonal changes, in the manner of an arboreal form of tropical rain-forest. *Ectocarpus* completes its cycle in one season, or even less; many individuals may succeed in the course of the summer (at least three crops), and the plant approximates the growth of an ephemeral. *Dictyota* is more or less annual, taking two years to complete its cycle. Each phase grows to the adult condition in the favourable summer-season, and the embryos germinate. Hence there is no special somatic distinction in the plants, which grow side by side. These types are thus *homothallic*, since seasonal response affects both cytological phases in much the same manner, and there is no seasonal differentiation; though the cytological sequence works out in terms of succession of actual somata, perfectly in *Dictyota*, imperfectly in *Ectocarpus*—but there is so far no appreciably new factor added.

A new departure is observed, however, when the two cytological phases respond unequally to seasonal change—*e.g.*, when one grows in the favourable period and the other follows on into the unfavourable. It is at once obvious that if this is practicable, there will be a net gain of a season, or a possibility of an advantage of some fifty per cent. of total time in the progression of the race; this being, again, a significant factor in evolution. The classical older example is that of *Cutleria*, a highly-specialized haploid soma of warmer seas, reproducing sexually only in the warmer waters of the Mediterranean, becoming irregular and even wholly parthenogenetic in British seas, yet associated with a diploid perennating phase of distinct organization (*Aglaozonia*), which endures the winters of the north (as also deeper water in the south), and gives the summer *Cutleria*-thallus in the spring [1]. Here the diploid form is again the more enduring, though less specialized as a photosynthetic soma; and the *Cutleria-Aglaozonia* story presents one phase of the possibility of a seasonal and rhythmic alternation. Though it cannot be said to be, on the whole, very successful, it is one method tried out, and the life-cycle is now completed within the year.

It is only within the last ten years that the optimum case has been outlined for the Laminariaceæ [2], though much of the details require to be cleared up and amplified. An alternative seasonal response involving the two cytological phases, by which the diploid plant becomes the soma of the photosynthetic summer season and the haploid form perennates over the darker winter-months, combines the advantage of any increased vitality of the diploid soma with the optimum growth-period with marked results. To this is added in the Laminariaceæ that the massive diploid soma to obtain its light supply withstands the greatest violence of surface-water, while the haploid form is apparently relegated to deeper and quieter levels as a

[1] Church (1898), Ann. of Bot. xii. p. 75.

[2] Sauvageau (1915) for *Saccorhiza*, (1916) *Laminaria flexicaulis*, *L. saccharina*, *Alaria*; Kylin (1916) *L. flexicaulis*; Yendo (1919) *Alaria*; Kuckuck (1917), Berichte, xxxv. p. 578; Oltmanns (1922). Algæ, p. 123; L. Williams (1921), Annals Bot. xxxv. p. 603, *Laminaria, Chorda.*

greatly deteriorated somatic scheme[1]. It is clear that, given two such cytological phases with no definite controlling factor, two possibilities of special adaptation arise; and one is entitled to conclude that the arrangement giving the best results is the more satisfactory solution, and the one which will be ultimately sieved by natural selection as the working scheme for higher organism. In the sea this marked dominance of the diploid phase is exhibited by the great group of the Laminariaceæ, essentially characteristic of colder water; all being of sub-Arctic or sub-Antarctic distribution, living exposed to the extremes of long summer days and a dark winter. With the diploid phase massive and perennial to the limit of the greatest algal growths of the sea, the haploid sexual plant is apparently restricted to minute size and more or less filamentous organization, growing over the darker months to liberate gametes at the end of the winter period of the sea (March). The cytological cycle may be completed within the year (*Chorda*), or is only delayed by the longer growth to maturity of the more massive Laminarias, rhythmically following the seasonal periodicity of colder seas much in the manner of the modern tree-flora of the northern forests. The more marked the seasonal effects, and the more definite the agreement on the time-schedule, the more extreme is the divergence between the two generations which thus alternate as distinct growth-forms. The case of the Laminarian runs so closely parallel with that of the Pteridophyta of the land, that, when first suggested, it seemed difficult to believe that plants could exist in the sea with such massive 'sporophytes,' and diminutive retrograde 'gametophytes,' wholly unlike the diploid phase and retaining archaic features of somatic organization long superseded in the massive and parenchymatous soma of the latter.

Again, in dealing with the life-cycles of modern algæ, few things are more commonly ignored than the biological value of the plants forming the community. The flora of the tide-range and coastal fringe presents a facies as varied as that of a terrestrial woodland. One would not usually look for primitive plants among the epiphytes and lianas of a tropical rain-forest, or again among the ground-flora of a northern deciduous woodland. Yet scattered among the mingled inhabitants of either station some form may retain a primitive factor of older vegetation, however specialized it may be in other respects. Thus rarities and casual plants of English coasts may, it is true, present appearance of primitiveness; but at this distant time all are but the scattered and isolated fag-ends of phyla of most remote and wholly unknown antiquity and distribution throughout the ages. Even *Dictyota* and *Cutleria* are comparatively rare in British seas; however interesting the stages of their life-cycles, neither even reaches

[1] The haploid stage is so far only described from cultures, and these notoriously give depauperated and pathological states (cf. *Cutleria*). Kuckuck (1917, Berichte, *loc. cit.* p. 573) figures the haploid plant reduced to the limit of one vegetative cell and one oogonium emitting one oosphere; Pascher has even germinated the zygote to a diploid plant also limited to one vegetative cell and one sporangium, as the *reductio ad absurdum* of the massive Laminarian soma. (Berichte, 1918, p. 250.)

the category of sub-dominants. Plants of sun-heated tide-pools (*Dictyosiphon*), casuals and even rarities (*Dictyosiphon, Tilopteris*), epiphytic growths (as *Ectocarpus* and *Pylaiella*) may again present interesting and suggestive phases; but all are the merest minor strays struggling to maintain station under pressure of extreme wastage and in competition with more dominant types. Of these dominant forms there are but two surviving classes—the Fucoids and the Laminarians,—the former ranging from the Tropics to Temperate Seas, the latter essentially Sub-Arctic and Sub-Antarctic in colder water with extreme seasonal aspects. Yet these two dominants between them combine the two extreme cases of the benthic life-cycle scheme—*Fucus* with only a diploid soma rigidly sexual, but *Laminaria* presenting the extreme case of heterothallic alternation of haploid and diploid somata found in the sea, and so far as is known equally invariable. *Chorda* affords an interesting link with the types of minor and more specialized Phæosporeæ, and *Cutleria* is really most interesting as it constitutes the heterothallic homologue of the southern and still homothallic *Zanardinia*. Views of the origin of the more fundamental phenomena of plant-life are to be estimated and corrected from the story of the dominant forms of the present world, hence assumed to be the successful survivors, and not from minor forms and struggling strays, often the merest vestigial relics of lost races, whose secondary specializations may mask their original habit, as new methods of propagation become more effective than any strict adherence to the theoretical life-cycle.

It is interesting thus to correlate extreme heterothallic alternation with the marked seasonal periodicity of the northern seas, involving essentially a light-factor rather than one of temperature alone; since it implies that other cases of heterothallic alternation may be of similar causation and response; and so long as two phases of haploid and diploid sequence are alone concerned there is little reason to object[1]. But this need not be taken to imply that two-phase land-

[1] The case of the Florideæ is left on one side, since these are never truly parenchymatous algæ, and are hence of admittedly inferior somatic organization, as their necessities for economy in the wastage of reproduction are the greater. All have long passed on to fertilization *in situ*, with post-sexual nutrition of the zygote replacing the pre-sexual food-storage of the oosphere. The mechanism of post-sexual nutrition, which tends to sink the carpogonium deeper into the somatic tissue, in order that it may drain a wider tract of food-supply, also implies a diminished light-supply. Hence a vicious circle is established; the carposporophyte is more and more dependent on parental supplies, until it deteriorates to a mere vestige in which even meiosis is forgotten, in spite of the concentration of food in the carposporangia. Such delay of meiosis leads to the differentiation of a second diploid plant—the tetrasporophyte,—which runs parallel with the haploid plant in its relation to seasonal growth, and remains so far 'homothallic.' (A suggestion of heterothally is claimed for *Galaxaura*; Howe, 1918, Brooklyn Bot. Gard. p. 192.) The Life-Cycle of the Florideæ thus normally presents two cytological phases, but three somatic types, and with the addition of sexual dicœcism four 'persons.' Such delay of meiosis in what should be the alternating diploid phase illumines the parallel phenomena observed in the deteriorated transmigrant holoparasitic Fungi of the land (Uredineæ); as the alternative substitution of meiosis in the first division of the zygote-nucleus (*Nemalion, Scinaia*) suggests analogies with such deteriorated algæ of fresh water as *Chara, Coleochæte, Spirogyra, Vaucheria*, which present no diploid phase.

flora has originated entirely from Subarctic or Temperate algæ. With the equipment gained in such an environment, a race is none the worse in competing with the types of older and simpler life-cycle; the whole story is based on means of economizing the wastage of zoïds and the wastage of time. But there can be little doubt that it is owing to the experience thus impressed by marked seasonal environment that the two generations diverge, each taking its own path; and that the choice that makes the diploid plant the type for the optimum growing-season is the one on which the higher flora of the land is based. It need not have been a Laminarian, but it was similarly a heterothallic type with a diminished haploid phase and a well-differentiated parenchymatous diploid soma [1].

(To be continued.)

WHAT IS ORCHIS CANDIDISSIMA KROCKER?

By G. CLARIDGE DRUCE, LL.D.

IN the 'Index Kewensis' the Orchis thus named by Krocker (*Flora Silesiaca*, iii. 16, 1814) is referred with a query to *Habenaria bifolia*. This may be due to Krocker—who does not appear to recognise its true relation with *maculata*, but contrasts it with *O. bifolia* and *O. odoratissima* [now *Habenaria*]; while he places *O. angustifolia*, *O. incarnata*, and *O. cruenta* (to the last of which he attributes a solid stem) between it and *O. maculata*. Under *O. maculata* he has a var. "floribus albis"; while judging from his synonyms and descriptions his *maculata* may include both *maculata* and *Fuchsii*. Neither Richter (Pl. Europeæ) nor Camus ('Iconographie des Orchidées') include *O. candidissima*.

Recently, Colonel Godfery, with a kindness I fully appreciate, wrote to me saying that a correspondent of his—Herr Ruppert—tells him that *Orchis O'Kellyi* abounds on the Saar on calcareous soil, with unspotted leaves and pure white flowers. He says "c'est la même plante comme *O. maculatus* L. candidissimus, foliis immaculatis = *O. candidissimus* Krocker." It seems evident that Herr Ruppert has either never read or fails to grasp what are the characters of *O. O'Kellyi*—or that he fails to understand Krocker's diagnosis, since the descriptions of the two plants are contradictory. Fortunately, Krocker also gives a coloured figure of his plant (*Flora Silesiaca*, tab. ii.), which shows that it has a spotted leaf and the flower with a broad almost undivided labellum, with a faintly lobed basal margin in which the two side-lobes are much larger than the very small short

[1] Laminarias, it is true, keep below the general tide-range and below the Fucoids in British seas, but they alone give vast submarine forest-associations in rough water where no Fucoid can live. The British shores, just at the overlap of these two algological regions are particularly well-suited for observation of both. Laminarians are at an optimum in the north (Orkney, Færoe) and are comparatively feeble in the English Channel, though strays occur as far south as the Mediterranean. Farther south the Fucoids are extended by species of *Cystoseira*, while *Sargassum* does not get as far north as the English Channel.

middle one. His description runs "petalis omnibus candidissimis, tribus superioribus erectis, distantibus, duobus deflexis, minoribus, conniventibus, labello lato, subcordato, crenato, sublobato," and he goes on to say "Labellum . . . subtri- aut 5-lobum cuneatum. Cornu coloratum, rectum, dependens, germini æquale." He also says of the leaves, "læte viridia vel obsoletissime maculata." Let us see how it agrees with *O. O'Kellyi* (Irish Nat. ccxi. 1909, as a new var., B.E.C. Rep. iv. 108, 1913, as a species), which has the following main characters: "Spike cylindric, of pure white flowers, smaller than in *Fuchsii* or *maculata*: the three segments of the labellum narrow, oblong, subacute, the middle segment longer and as broad as the lateral: leaves unspotted." We may add that the spur is not coloured, but there is often a faint blush at the base of the petals, and even pink-flowered plants have been found. As will be seen in reading these two descriptions, they have nothing in common except flowers white. Therefore, the contention that the Silesian *candidissima* is the same as the Irish *O. O'Kellyi* is incorrect. Whether Herr Ruppert has the true *O. O'Kellyi* on the Saar has yet to be ascertained; as it was on calcareous ground it quite well may be. That is another question and one I do not controvert, nor until I have seen a specimen can I speak with certainty. What, however, I do emphatically disclaim is the identity of Krocker's plant and *O. O'Kellyi*.

The question as to what is *candissima* has still to be answered. Although the flowers are small it is equivalent to, or may be placed with, *O. maculata* subvar. *leucantha* Druce (in B.E.C. Rep. v. 53, 1917); although our British white-flowered *maculata* (unlike *O. O'Kellyi*) has not always smaller flowers, there seems scarcely room enough for two white-flowered varieties of *maculata*.

But *candidissima* competes with *elodes* Griseb. The figure and details given by Camus (Icon. pl. xliv. figs. 15, 16) for this plant are specifically the same as those given by Krocker in the *Flora Silesiaca*. I am still unable to separate as distinct species from *O. maculata* (of the Spec. Plant.) either *O. ericetorum* Linton, *præcox* Webster, *elodes* Griseb., or the much earlier *candidissima* Krocker, and all these being later names than *maculata* may be treated as synonymous or slight variants, to which specific rank need not be given.

As there seems to be much misunderstanding among continental botanists, perhaps from only hearing of the characters at second-hand, it may be well to give short descriptions, mainly of the flowers, from the more detailed diagnoses of the plants in B. E. C. Rep. 99–104, 1914.

O. MACULATA L. The usually coloured labellum trilobed, the lateral segments larger than the middle one and as long or longer; leaves usually spotted.

O. FUCHSII Druce. The usually coloured labellum trilobed, the middle segment as large or nearly as large as, and longer than, the laterals; leaves usually strongly spotted.

O. O'KELLYI Druce. The white labellum of three small subequal divisions, the middle one longer than the laterals; leaves unspotted.

CAREX REMOTA × DIVULSA.

By C. E. Salmon, F.L.S.

In Proc. Linn. Soc. 1924, p. 66, mention is made that this hybrid was exhibited from a locality in Sussex, and a few details were given respecting its characteristics. In view of its apparent scarcity, perhaps a more ample note may not be out of place.

When botanizing with Col. Wolley-Dod in June last, a few miles south of Mayfield, we came across a fine stretch of *Carex remota* lining the roadside; an immense tussock of a clearly distinct sedge grew in its midst. Suspecting hybridity, a search was made for some other species and after a short hunt *C. divulsa* was seen in small quantity, but no other Carices could be found in the vicinity. A close examination of the tussock-plant showed that whilst *C. remota* was clearly the dominant partner, yet evidences of the *C. divulsa* parent seemed fairly clear. Its stems were more rigid and the leaves stiffer than in *C. remota*, the culms of which are rather weak and the leaves more or less flaccid; the stems were strongly scabrid near the summit, not smooth or slightly rough as in *remota*. These three points indicated *divulsa*.

The ligule appeared practically that of *remota*, and the general arrangement of spikelets recalled that species save that the lowest only possessed a long bract—and that shorter and not so patent. The second spikelet had, occasionally, a short bract; the remainder were without bracts.

The spikelets were all simple, the lower female at the base, male above; the uppermost usually wholly male with a few female intermingled. The glumes were generally longer in proportion to the perigynium than in *remota*, and, whilst the perigynium itself was much of the same shape as in that species (being but very slightly smaller and narrower), the serrulations extended lower from the apex (*i. e.* about halfway down), thus being much more serrulate than in *C. divulsa*. Whilst the supposed parents were forming healthy fruit at the same time, no good nuts seemed to be on their way in the plant described, and the conclusion seemed warranted that it was barren.

At first sight, our plant has a superficial resemblance to *C. remota* × *vulpina* (*axillaris*), but the latter has a more acute-angled stem, lower spikelets compound, longer-beaked fruit, etc. *C. remota* × *paniculata* (*Boenninghauseniana*) is also quite distinct, with its channelled leaves, compound lower spikelets, brownish glumes, etc.

The present hybrid seems very uncommon; no mention is made of it in Lang (Caric. Germ. et Scand.), Hoppe (Caric. Germ.), Husnot (Cyper. Fr. Suisse et Belg.), Rouy (Fl. Fr.), or other works examined; it is doubtfully recorded by Aschers. & Graeb. (Flor. Mitteleur.).

Kükenthal (in Engler, 'Pflanzenreich,' iv. 20, 1909, 247) definitely reports it as follows:—"*C. divulsa* × *remota* Kük. et L. Gross in Mitth. Bad. bot. Ver. (1906) 74.—*C. Emmæ* L. Gross, *l. c.*—Planta in via silvatica prope arcem Bodenburg ad lacum bodamicum inter *C. remota* et *C. divulsa* detecta, culmo pergracili et spiculis inferioribus compositis a præcedente distat.—Huc forsan pertinet *C. virens* × *remota* Focke, Pflzmischl. (1881), 405." This hybrid seems to be on the *divulsa* side, whilst the Sussex plant is apparently nearer *remota*.

Specimens of the latter have been distributed through the two Exchange Clubs, and examples sent to the British Museum Herbarium and to Kew.

POTAMOGETONS AT HIGH ALTITUDES.

By H. Stuart Thompson.

A year ago I sent Mr. Arthur Bennett a small scrap of a *Potamogeton* gathered Aug. 19, 1907, from a shallow tarn near Entre-deux-Eaux in the Tarentaise, Savoie, at nearly 8000 ft., or, say, 2400 mm. Although without flower or fruit, Mr. Bennett was able to determine it as *P. heterophyllus* Schreb.; and he remarked that he had not seen a *Potamogeton* from Europe from such an altitude.

Referring to the original note-book taken on that occasion, I observe that a *Chara* was growing in the same small lake. It is a long but interesting walk from the little village of Val d'Isère over the Col de Fresse and the savage Col de la Leisse, 9121 ft., down the Vallon de la Leisse—which John Ball describes as "one of the wildest in the Alps,"—past Entre-deux-Eaux to Termignon in the Maurienne Valley above Modane, and thence up the main road to Lanslebourg, at the foot of the Mont Cenis Pass. But the district is so approachable from the railway at Modane that I would recommend to field-botanists who are good walkers both the expedition from Bonneval over the famous Col d'Iseran to Val d'Isère and the longer walk over the Col de la Leisse to Termignon. But for the latter a guide is desirable as far as the higher pass, which is in the midst of extremely wild and little-frequented country. From Entre-deux-Eaux the traveller could cross the Col de la Vanoise (8290 ft.) to Pralognan, or merely make a détour to the top, examine the interesting flora of the desolate plateau, as the writer did, and retrace his steps before continuing towards the Maurienne Valley. I never saw so many or such unsophisticated marmots, nor got so near to white partridges and a chamois as in the neighbourhood of the Col de la Leisse; but I was alone that morning, and had lost an hour through neglecting the warning to start with a guide.

From the Lac de Tigues (2088 m.), on the north side of the snowy Grande Motte, whose icefields are held up by rocky buttresses skirting the Leisse Valley, *Potamogeton marinus* L. was recorded by M. Le Père Gave in his *Exc. Bot. dans les Hautes Vallées de la Tarentaise*, Chambéry, 1895, and he reminds one that this is the Pondweed which grows in the big lake at Mont Cenis (1913 m.). The last species, under the name of *P. filiformis* Pers., was recorded in 1921 from "Schwarzsee (lac inférieur) 2540 m. (Thellung, teste E. Baumann)," in *Observations sur la Végétation et sur la Flore des environs de Zermatt*, by Drs. J. Braun-Blanquet and A. Thellung, in *Bull. de*

la Murith. fasc. xli., Sion, 1921. This is probably the highest station in the Alps for any Pondweed; when at the Schwarzsee Hotel in 1902 I did not see it.

The very interesting paper last mentioned records many new maximum altitudes for the Valais, and not a few are claimed for the whole chain of the Alps. Reasons are also given, on p. 1, for the finding of so many hybrid plants on the mountains above Zermatt. The second reason suggested is the presence of xerothermic plants at considerable altitudes. "Ceci permet à des espèces croissant ailleurs à des étages altitudinaux différents de se rencontrer et de vivre côte à côte." The fourth reason is the considerable extent of new terrain (moraines, alluvions, terraines abandonnés par les glaciers) particularly favourable to the formation of hybrids.

The following Potamogetons from heights of or above 2000 m. in the Valais, Switzerland, were recorded by Jaccard in his *Catalogue de la Flore Valaisanne*, Zürich, 1895, viz.:—*P. natans* L., 375–2200 m., Étang d'Esserze, Alpes d'Hérens, 2200 m.?; *P. rufescens* Schrad. (*P. alpinus* Balb.), 1300–2000 m.; *P. prælongus* Wulf, very rare, observed in one station only in the Valais, viz., Bettensee, between Riederalp and the Eggischhorn, 2050 m., by E. S. Marshall, 1885 (A. Bennett in litt. ad Alph. de Cand. 1888). Keller and Schinz give only four stations for that species in Switzerland. Of *P. marinus* L., Jaccard says, Alpine lakes, very rare or little observed, 1450–2130 m.

From Britain I have *P. heterophyllus* Schreb., from Loch Brotachan, S. Aberdeen, 2300 ft., Marshall, 1892; and from Walton-Peat-moor, Somerset, perhaps 20 ft. above sea-level.

A SKETCH OF THE CANADIAN FLORA.

By R. D'O. Good, B.A., F.L.S.

One of the most valuable aids in the study of the flora of any country is some knowledge of the more recent geological history of that particular region. In most parts of the world such knowledge is very scanty and uncertain, but in the case of Canada the facts are better known than in almost any other country. This is because the recent geological history of Canada is, in the main, the story of the great Pleistocene glaciation, a time which has left behind it widespread and unmistakable traces.

During their maximum development the Pleistocene ice-sheets extended far down into the United States, so that the whole of what is now Canada was, in all probability, completely ice-covered. It has been suggested that small parts of the Atlantic seaboard, especially the Gaspé region of South Quebec, escaped the general glaciation and formed backwaters in which certain plant species were able to survive the intense climatic changes. Even if this is true, it can have but little bearing upon the present vegetation of Canada as a whole, and the existing flora must be regarded as an immigrant one which has

developed within very recent times. It is extremely interesting to try to give some actual possible dates, and an indication is given by a study of the Niagara River. The wonderful natural features of the Gorge and the Falls have been produced as a direct consequence of the melting of the great Pleistocene ice-fields, and, in the opinion of many geologists, originated not more than 30,000 years ago. Some such date as this may well mark the time when the retreating ice passed the latitude of the Niagara district. It must be remembered that, although the ice probably retreated and advanced several times over much the same ground, it is only since its last retreat that the present flora has been able to develop.

Since the constitution of any flora depends very much upon the type and variety of habitat presented, it becomes necessary to give a short outline of the main topographical features of Canada before considering the vegetation itself. Across the country near the Southern border five distinct regions are met in passing from east to west. First comes a wide belt of almost bare, heavily glaciated rock of great age—the Archæan shield. Second, towards the interior, is a series of plateaux or steppes rising towards the west and covered with a rich deep soil. Third, a complex and vast mountain-region composed of Mesozoic rocks uplifted chiefly in the late Mesozoic and late Tertiary periods. Fourth, a small arid zone in the drier valleys between the main mountain masses, where the rainfall is very scanty. Lastly, the Pacific littoral region with a well-marked oceanic climate. These regions do not extend for equal distances northward, and the steppe and arid regions in particular soon disappear. Farther north the eastern rocky region is much wider and extends almost to the Pacific coast.

In corresponding fashion the vegetation of Canada is divisible into five types. The eastern rocky region is the region of the sub-arctic and temperate coniferous forest, with an increasing preponderance of hardwoods southward. The steppe region is the northern part of the great North American plain and prairie country. It is almost devoid of trees except along some of the river-valleys, and is characterised by the great development of Composites and Scrophulariaceous plants. The mountain region bears coniferous forest at the lower levels and an arctic-alpine vegetation above. The arid region has the vegetation characteristic of semi-desert. The Pacific littoral is again a region of coniferous forest, but has not the same elements as the eastern forest, and has fewer hardwoods. As stated above, the eastern and western forest-regions are in touch with one another in the north, and form a continuous belt right across the continent. Further north still beyond the limit of the trees the vegetation even at the lower levels is uniformly arctic in character.

By far the most extensive of the above regions is that of the eastern forests—the seat of the timber industries of the country. This vegetation in its most southern part undergoes an interesting modification. A little way north of Toronto there is a very marked climatic change, and conditions are very different on the two sides of this boundary. The country to the south is the most temperate and

amenable part of Canada, as is shown by the fact that it is the centre of the fruit-growing districts. As a result of this climatic change, a number of comparatively southern plant-types have the northern limits of their distribution at about the level of Toronto. The vegetation of Southern Ontario in the region of the great lakes differs very much from that farther north, and is particularly conspicuous by the presence of a number of such southern forms.

Viewing the flora of Canada as a whole, it will be seen that it is composed of several well-marked floral elements, derived from various sources. The endemic proportion is not very large or conspicuous, but is chiefly developed in the prairie and mountain region.

The first of these elements and the one most conspicuous in Eastern Canada is that composed of the introduced plants. With the ever-increasing human tide a great number of species have been brought from Europe, and many of these have established themselves completely. The genus *Verbascum* is represented in North America only by two such species: the chicory is much more common than it is in Europe: melilots and yellow toadflax are abundant. Clovers, plantains, burdocks, and others are less striking, but no less plentiful. The *Labiatæ* illustrate the introduced elements especially well—about one-third of all the species found in Canada are adventive.

Another important element is the general northern temperate element. This is composed either of species which are themselves widely distributed or which belong to genera which are widespread and not characteristic of any particular part of the northern hemisphere. The exact limitation of such an element is very difficult, but the members of such genera as *Epilobium*, *Ranunculus*, *Rosa*, *Rubus*, *Veronica*, and *Scutellaria* may be cited as examples.

There is also a well-marked American, and especially North American, element. A certain number of families entirely or almost unrepresented in the Old World temperate are noticeable in Canada, the best examples being furnished by the *Asclepiadaceæ*, *Polemoniaceæ*, *Hydrophyllaceæ*, *Araliaceæ*, and *Ampelidaceæ*. Besides these a number of individual genera of more widely distributed families are peculiarly American. Especially is this so in the case of the Composites which form such a very marked feature of the Canadian vegetation, particularly in the prairies. Nearly all the species belong to subfamilies and genera which are little developed in the Old World. The greater portion of the flora of Southern Ontario, which has already been mentioned, is composed of more temperate genera and species, many of which have American affinities.

The fourth element is the arctic-alpine, chiefly represented in the mountain region, but also present in the eastern sub-arctic forest zone. The high-level vegetation of the Rockies is simply a narrow southern extension of the great circumpolar flora, and in many ways resembles the flora of the European mountains. It is, however, not so richly developed, and many typical Old World alpine genera are absent or but poorly represented. On the other hand, there are a number of plants of American affinity which really form an alpine portion of the

American element. One of the most striking features of the Canadian flora is the great number of Ericaceous plants (although the sub-family of the true heaths and heather is only doubtfully represented by a single species in New England). The other very numerous examples of the family belong to both the last two elements. There is a group of arctic circumpolar genera, and there is also a smaller group of distinctly American relationship.

The next element to be noticed is perhaps the most interesting of all, namely, the American-East Asian element. In Canada it is confined more particularly to the south-eastern part of the country and almost entirely to the eastern side of the Rockies, and consists of species and genera having a discontinuous distribution, being found elsewhere only in Eastern Asia. This element contains some eighty or so genera, many of which are monotypic, while others possess two species, one in each of the two regions. Several notable arborescent Leguminous plants belong to this category, while among others *Liriodendron*, *Hamamelis*, *Diervilla*, *Hydrastis*, *Caulophyllum*, *Diphylleia*, *Podophyllum*, and *Negundo* may be mentioned. *Epigæa* and *Chiogenes* are cases in point among the *Ericaceæ*. This very remarkable relationship was first pointed out and discussed by Asa Gray. It is notable that many of the plants represent genera which, from fossil evidence, appear to have been common in Europe during early Tertiary times, and there seems little reasonable doubt that this element of the Canadian flora is one of the relics of the preglacial circumpolar northern temperate vegetation. With the oncoming of glacial conditions this vegetation was forced southwards, and in the case of Europe was exterminated in the Alpine and Mediterranean region. In Eastern Asia conditions were much less severe, while in North America there was no obstacle to migration far south and subsequent return with better conditions. The final result was to leave those plants in the two widely separated places where they are found to-day.

Finally, in the Pacific region of the country, and particularly in the semi-desert zones among the mountains, there is a small but significant element of Mexican affinities. *Opuntias* and several Composite genera are examples. This portion of the general flora is of very great interest, because it indicates that the climatic conditions on the west coast after the retreat of the ice were such as to permit the northward migration of certain plant-types of the Central American flora.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

NEW SPECIES FROM TROPICAL AFRICA. BY S. MOORE.

Empogona Taylorii, sp. nov. (Rubiaceæ). Verisimiliter *frutex* ramosus; *ramulis* patenti-adscendentibus crebro foliosis griseo-pubescentibus postea glabrescentibus corticeque cinereo obductis; *foliis* pro genere majusculis brevipetiolatis oblongo-ovatis apice basique obtusis firme membranaceis supra costa media exempta mox glabris nitidulisque subtus subtiliter velutinis; *stipulis* a basi lata rigide subulatis acutis; *fasciculis* axillaribus pauciforis; *pedicellis* floribus

circa æquilongis pubescentibus bracteolis exiguis 1 vel 2 lanceolatis onustis; *ovario* subhemispherico dense pubescente; *calyce* ultra medium diviso lobis rotundatis obtusis puberulis; *corollæ* tubo subcylindrico extus glabro intus ore densissime villoso lobis tubum excedentibus oblongis obtusis basi pubescentibus; *staminibus* ori insertis antheris sessilibus linearibus in appendiculam acutam induratam excurrentibus; *stylo* exserto ramis 2 lineari-oblongis acutiusculis.

Hab. Tanganyika Territory, Giryama; *Rev. W. E. Taylor.*

Folia pleraque 5-6 × 2·5–3 cm.; costæ laterales utrinque 8–10 pag. sup. uti reticulum optime eminentes; petioli circa 3 mm. long., pubescentes. Stipulæ 3 mm. long. Pedicelli +7 mm. long.; bracteolæ circa 1·5 mm. Ovarium 1·5 mm., calyx 1·25 mm. long., hujus lobi 1 mm. long. Corollæ tubus 4–4·5 mm.; lobi 5 mm. long. Filamenta vix 1 mm. antheræ 5 mm. long. Stylus 5 mm. long., ramis 2 mm.

Differs from *E. Kirkii* Hook. f. chiefly in the foliage and the longer pedicels to the flowers.

The collector notes the plant as being "used in infusion as a cattle medicine to increase the supply of milk."

Tricalysia Davyi, sp. nov. (Rubiaceæ). *Frutex* glaber; *ramis* subteretibus foliosis cortice pallido obductis; *foliis* subsessilibus oblongo-obovatis obtusis vel obtusissimis nonnunquam breviter cuspidatis basi longe cuneatim angustatis tenuiter coriaceis costis lat. utrinque 3–4 uti costa centralis pag. inf. eminentibus; *stipulis* brevibus basi latis sursum rigide subulatis; *fasciculis* densifloris; *calyculo* cyathiforme calyce multo breviore extus microscopice puberulo intus pilis appressis albidis dense vestito; *ovario* subgloboso quam calycis limbus truncatus extus microscopice puberulus paullo breviore; *corollæ* tubo calyce plane longiore superne gradatim ampliato extus glabro intus ore piloso-pubescente exempto glabro lobis 6 tubo longioribus oblongis obtuse acutis apicem versus margine sparsim ciliolatis ceterum glabris; *antheris* breviter exsertis apiculatis; *stylo* superne incrassato pilosoque; *ovulis* quove in loculo 5.

Hab. Belgian Congo, near Élisabethville; *J. Burtt-Davy*, 17,953.

Folia plerumque 6–9 × 3–4 cm., pallide nitida; petioli robusti, 4 mm. long. Calyculus 2 mm. alt. Ovarium 1·25 mm. long. Calycis limbus in sicco striatus, 2 mm. long. Corollæ tubus 5·5 mm. long., basi 2·5 mm. ipso sub limbo 4 mm. lat. Antheræ 5 mm. long. Stylus 10 mm. long.

Not identified from any of Dr. de Wildeman's described species, this evidently comes near *T. nyassæ* Hiern, from which it can be distinguished at once by the smaller flowers and the calyculus densely hairy inside.

Otiophora cæspitosa, sp. nov. (Rubiaceæ). *Frutex* dense cæspitosus ½-orgyalis vel paullo altior; *caulibus* erectis tetragonis ramulis pluribus foliiferis abbreviatis exceptis simplicibus in sicco brunneis secus lineas duas minute pubescentibus ceterum glabris; *foliis* ob ramulos abbreviatos pseudoverticillatos sessilibus linearibus acutis supra glabris subtus minutissime albo-furfuraceis in sicco viridibus; *stipulis* diutule persistentibus setaceis glabris; *spicis* foliis longioribus inferne interruptis plurifloris; *ovario* oblongo-ovoideo costato

parvissime brevissimeque hispidulo; *calycis* segmentis parvulis setaceis acutis ciliatis addito uno multo majori lineari-oblongo acuto minute furfuraceo; *corollæ* tubo lineari lobis oblongis obtusis tubo paullo brevioribus; *staminibus* longe exsertis; *coccis* oblongis fere omnino glabris.

Hab. N.E. Rhodesia, Luwingu, 4500 ft.; *Mrs. Jelf*, 5.

Folia pauca, inferiora 2·5–3 × 3·5–4 mm., pleraque 1·5–2·5 cm. × 1·2 mm. Stipulæ 3 mm. long. Spicæ 4–7 cm. long. Ovarium 1 mm. long. Calycis segmenta parva circa 1 mm. long. segmentum magnum 4·5 × 1 mm. Corolla punicea; tubus 6–7 × ·5 mm.; lobi 6 mm. long. Stylus 9·5 mm. long.; hujus rami circa 2 mm. Cocci 4 mm. long.

Judging from the description this must resemble *O. pycnostachys* K. Schum., except that the leaves do not dry black. The laxly-flowered spikes and the nearly glabrous ovary and cocci are chief among the differences.

Embelia (§ *Choripetalum*) **Batesii** (Myrsinaceæ), sp. nov. Planta scandens, glabra; *ramulis* foliosis subteretibus fistulosis longitrorsum striatis lenticellisque prominentibus donatis; *foliis* petiolatis obovatis vel obovato-oblongis apice rotundatissimis nonnunquam retusis basi sæpe obliquis cuneatisque vel rotundatis pergamaceis; *racemis* ex axillis foliorum delapsorum ortis simplicibus abbreviatis basi squamellis parvis onustis pauciforis; *floribus* pedicellatis in axilla bracteæ lanceolatæ pedicellum circiter adæquantis; *calycis* tetrameri ultra medium divisi segmentis rotundatis; *corollæ* lobis ovato-oblongis obtusis intus tela arcta rubiginosa præditis; *staminibus* petala bene excedentibus trienteque inf. iisdem adnatis antheris ovoideis obtusis; *ovario* anguste ovoideo ut stylus se ipsum excedens minute puberulo.

Hab. Yaunde, Bitye; *Bates*, 1284.

Folia 6 × 4 cm. attingentia, sæpissime 3–5 × 2–3·5 cm., opaca, in sicco griseo-viridia; costæ laterales utrinque circa 8 aliis ord. inf. intermixtis necnon ab his sæpe difficile secernendæ; petioli 5–8 mm. long. Racemi 7–10 mm. long., raro ad 14 mm. provenientes; horum squamellæ basales ovatæ, acutæ, circa ·75 mm. long. Pedicelli circa 1·5 mm. long., uti rhachis minute puberuli. Calyx ·75 mm. long. Corolla 2·5 mm., filamenta libera 3·5 mm., antheræ 1 mm., ovarium 1 mm., stylus ægre 1 mm. long.

Easily distinguished by the foliage and short inflorescences. Tessman, no. 135 from Spanish Guinea (in hb. Kew) is probably conspecific.

Jatropha (§ *Tuberosæ*) **Monroi**, sp. nov. (Euphorbiaceæ). *Herba* parva fere glabra semispithamea vel minus; *caule* simplici vel ipsa a basi perpauciramoso crassiusculo aliquanto compresso minutissime papilloso; *foliis* brevipetiolatis 5-palmatisectis segmentis oblongis mucronatis margine indurato-dentatis vel denticulatis rarissime breviter lobulatis glabris levissime crassiusculis in sicco viridibus; *stipulis* setaceo-subulatis diutule persistentibus; *cymis* paucifloris foliis brevioribus; *bracteis* lanceolatis ciliatis quam pedicelli brevioribus; *florum* ♂ calycis campanulati circa usque medium divisi lobis oblongis obtusis glabris; *petalis* oblongis obtusssimis quam

calyx plusquam duplo longioribus; *staminibus* 8 filamentis liberis; *florum* ♀ sepalis fere usque basin liberis ovato-oblongis acutis; *petalis* spathulatis calycem facile superantibus; *ovario* ovoideo; *stylis* 3 ramis breviter 2-ramosis.

Rhodesia, Victoria; *Monro*, 2187.

Folia 2·5 cm. long.; segmentorum par proximale 7–12 mm. long. cetera 1·5–2·5 cm. × 3–5 mm. Stipulæ circa 3 mm. long. Cymæ 1·5–2 × 1·2–1·5 cm.; harum bracteæ ±3 mm. long. Pedicelli summum 4 mm. long. Calyx ♂ 3 mm., ♀ 4 mm. long. Petala ♂ 4·5 mm., ♀ 7 mm. long. Filamenta 1·5 mm. long., antheræ paullulum breviores. Ovarium compressum, 2·5 × 2 mm.; styli 1·5 mm. long., horum rami 1·5 mm. long.

Affinity with *J. natalensis*, *erythropoda*, and *campestris*.

NOTES ON BRITISH PLANTS.

1. Ledum palustre L. By Arthur Bennett, A.L.S.

In the Secretary's Rep. Bot. Ex. Club, 1923, 148 (1924), Dr. Druce, in a notice of the late Mr. Barclay of Perth, mentions being taken to the Bridge of Allan to see the *Ledum*. He remarks: "It was in such poor condition and barren. How any one could have imagined it native there it is hard to say. It grew under the shade of planted spruce and larch, and it was in such small quantity and bad condition that I could not say whether it was *palustre* or *latifolium*."

The plant growing there and on Flanders Moss, and Blair-Drummond Moss, is *palustre*, as it has 10 stamens, and these longer than the corolla, while *L. latifolium* Ait. has 5 stamens and the corolla subequal. As I sent a note to the *Journal of Botany* (1894, 274–5) respecting the plant, it may be well to give its history in Scotland. About 1847, Dr. Paterson, of the Bridge of Allan, taking a geological walk with Principal Forbes, of St. Andrews, discovered it in the Moss of Lecropt (now drained) and sent specimens to Edinburgh and Dublin (Dr. P. in litt. 1887) (see 1). Then it was found in Blair-Drummond Moss and Flanders Moss by Mr. Shearer (2), and also in both Mosses by Mr. Geddes. Mr. Shearer remarks: "I am told it is found all through Flanders Moss." In 1889 Flanders Moss contained nearly 10,000 acres, but since that date much of it has been reclaimed. In 1889 it was shown to Mr. Ramsay in Lecropt Moss by Mr. Geddes, "where there are a great many plants." In Sept. 1887, Mr. Geddes, on behalf of his daughter, Miss Geddes, sent specimens to Sir Joseph Hooker: these, Mr. Brown, of the Kew Herbarium, showed me, and in a later letter said, "I need hardly say that the plant is genuine *Ledum palustre*." On Oct. 4, 1887, Miss Geddes sent me a specimen with an interesting letter respecting its occurrence. Mr. Shearer, remarking on the plant remaining so long unknown, says: "I can only attribute this to its flowering at an earlier period of the year than Botanists visit the Mosses, and when out of bloom it bears so much resemblance to the Bog Myrtle (*Myrica Gale*)." In the spring of 1879 Mr. Shearer went to the Moss (Lecropt) and saw it growing amongst the heather in considerable quantity. After this (p. 254), "But since then the locality had been visited by the Botanical class from Edinburgh University who had ruthlessly rooted it up" (2).

In 1912, Dr. Moss of Cambridge (Oct. 8) wrote: "Is the plant *latifolium* or *palustre*? However, the figure in Fl. Lond. t. 212 is *palustre*." Again, Dec. 12, 1912, Dr. Moss wrote: "The specimen in Herb. University, Edinburgh, by Dr. Paterson, is like the plant I saw growing there last September, a broad-leaved form or variety. Two forms must have grown there." If so, this would be the var. *dilatatum* Wahl. Fl. Lapp. 103 (1812), where he says, "foliis oblongo-ovalibus," that is, *L. palustre* var. *latifolium* Eichwald, Nat. Skizz. Lithauen &c. 143 (1830). Both *latifolium* and *palustre* occur in Lithuania.

As to the mention of the trees by Dr. Druce, these were freshly planted after the Moss was drained, but, even if not so, *Ledum* occurs in plenty in Finnish Lapland under trees (3).

Ledum palustre occurs in every province of Sweden from Scania to Swedish Lapland, in Norway up to Finmarken, and in every province of Finland.

References.

(1) Trans. Bot. Soc. Edinburgh, vi. 137 (1860), xiii. p. xxiii (1877).
(2) Trans. Nat. H. Soc. Glasgow, iii. (New Series), 251 (1892).
(3) Wainio, Fl. Lap. Finland. 7 &c. (1891) in Act. Soc. Fauna et Flora Fennica, viii. no. 4.

2. Potamogeton Drucei Fryer. By Arthur Bennett.

The above name must give way to one long referred to other species, but about which no definite decision could be given. It is *P. petiolatus* Wolfgang (ex Besser) in Roem. & Schult. Syst. Veg. Mant. 3, 352 (1827).

My specimen is from "Wilna (Lithuania) leg. Wolfgang ex Dr. Reichardt Herb. Mus. Vind.," given me by the late Dr. Tiselius. In the *Mantissa* it is given as "Wolfg. MSS. No. 4, Besser in litt.," and placed under *polygonifolius*, and recorded from "Borysthene in Gubernio Chersonensi (Russ. austr.)," Andrzeiowsky; also "Russ. media, Lithuania et Volhynia," Eichwald*. The Lithuanian specimen agrees with Dr. Druce's from the Loddon, Berks.

I have it also from "Grève du Rhone au dessus de Lyon (France), Sept. 1897," Dr. Ant. Magnin; and Denmark, from the late Herr Hagoe—"In aqua rapide fluente, 1·25 m. alt., in amne Gudenå, ad Kongensbro, Jyllandia, solo arenoso limoso, 18.8.99."

Dr. Hagström, Crit. Res. Pot. (1916) 149, considers it must be regarded as the hybrid *P. alpinus* Balb. × *P. natans* L. He only gives the "Berks, England," station. But the same hybrid is recorded in Neumann, Sveriges Flora, 798 (1901), and Kupffer, Korresp.-bl. Nat. Ver. Riga, 11, 169 (1906).

In cultivation by the late Mr. Fryer it produced good fruit, and up to the present I have been unable to match it with any known species. I do not think we are able to say whether it is a hybrid, or a species, with any certainty; though I rather think it may prove the former.

* Nat. Skizze von Lithauen &c. 1830.

PROTECTION OF OUR NATIVE PLANTS.

THE following appeared in the London *Times* of April 14:—

"WILD FLOWER SANCTUARIES.

"At a recent meeting of the Bristol Naturalists' Society, held at the University, the following resolution was carried unanimously:—'That in view of the importance of preserving to the country the heritage of its wild flowers, and particularly the rarer and choicer species, an appeal should be made to the public through the local Press to abstaining from uprooting and excessive picking now that the spring and summer are approaching. The Bristol Naturalists' Society desire to encourage the corporation and the trustees of the National Trust (Leigh Woods) and any other public bodies in any efforts they make towards to this end, and would welcome the making of "sanctuaries for wild flowers" in appropriate places.'—IDA M. ROPER, Hon. Secretary, the Bristol Naturalists' Society."

A few days previously we received from a contributor a cutting from the *Surrey Mirror* reporting that, at the Godstone Petty Sessions, two women were summoned "for up-rooting a number of wild plants in such quantities as to disfigure the countryside, at White Hill, Caterham Valley.—The proceedings were taken under the Wild Plants Protection Order, a by-law of the Surrey County Council.—P.C. Andrews said he was on duty in the Square, Caterham Valley, when he saw the two defendants carrying baskets containing primroses. He asked them where they obtained them, and they told him 'White Hill.' Asked if they had permission to pick them, defendants said they were growing wild on a bank at the side of the road. He took the baskets to the police station, and counted fourteen dozen primroses, which had been dug up by the roots. On the following day he went to White Hill, and found that the bank at the side of the road was full of holes, where primroses might have grown, and the soil in the baskets corresponded to the soil at White Hill.—Both defendants told the Bench they did not think they were doing any harm. They were not trespassing.—The Chairman said they were not summoned for trespassing, but for damaging the beauty of the countryside. The whole object of the by-law was to protect the beauty of the countryside and the wild plants. It was desirable in order to preserve the amenities of the countryside that these plants should not be destroyed. There would be a fine of 5*s.* each."

Comment is unnecessary, except, perhaps, to question whether, in the second instance, the punishment fitted the crime.

Before the war we had in connection with the Selborne Society a "Wild Plant Protection Society"—the late Prof. Boulger was one of the enthusiasts,—and a Bill had been prepared for presentation to Parliament to promote the objects of this Society. But it is notoriously difficult to inculcate virtue, whether temperance or consideration for one's fellow-man on the public highways, by law, though adequate punishment for excesses may act as some deterrent. We have, therefore, been interested to receive from the "Wild Flower

Preservation Society of America" (Washington, D.C.) a budget of literature, indicating the efforts made in the States to check the wanton destruction of natural vegetation. These include an appeal in the form of a large-type handbill, several single-page cartoons—illustrating vandalism on the part of the motorist and charabanc traveller, who return to town embowered with branches of the Dog-wood,—and specific appeals in the form of circulars. One of these is beautifully illustrated with photographs of plants in their habitats, indicating which may be picked freely, which only sparingly, and which should be protected. There is also a single sheet with lists of wild flowers classified from the same points of view. A circular entitled "Our Christmas Greens" emphasises the destruction incident on the supply of Christmas decorations, and urges moderation in their use until such time as the cultivation of some of them at least can be undertaken on a commercial basis.

From Vancouver Prof. John Davidson sends a copy of his presidential address to the Vancouver Natural History Society, entitled "The Handwriting on the Wall" or "Wake Up! Vancouver: an Address on the Conservation of Plant-Life." The trouble here is more than a question of amenities; apparently the water-supply of the town is threatened by the forest devastation by lumbermen which has taken place in the Capilano Valley; but the wholesale slaughter of young Douglas Firs for Christmas trees, in the vicinity of the town, is also subject of comment, and reference is made to the necessity of conservation of the Cascara tree, the source of a valuable drug.

OBITUARY.

ARTHUR WARWICK SUTTON, F.L.S., V.M.H.

MR. A. W. SUTTON, who died on April 15 after a long illness, was born at Reading in 1854, and was the grandson of John Sutton the founder, in 1806, of the well-known firm of Seedsmen. From 1913 until 1921, when he retired from ill-health, Mr. Sutton was senior partner in the firm. Mr. Sutton was interested in the botanical origin of food-crops, and contributed papers to the *Journal of the Linnean Society* on "*Brassica* Crosses" (vol. xxxviii. 1908), "Wild Forms and Species of Tuber-bearing Solanums" (*ibid.*), and "Results obtained by crossing a Wild Pea from Palestine with Commercial Types" (vol. xlii. 1914). He was elected a Fellow of the Society in 1886 and served on the Council, 1918–20. He was for many years a member of the Council of the Royal Horticultural Society, and was one of the original recipients of the Society's Victoria Medal of Honour established in 1897. Mr. Sutton had travelled extensively in Palestine and the Sinai peninsula.

REVIEWS.

Plant Forms and their Evolution in South Africa. By J. W. Bews, M.A., D.Sc., Professor of Botany in the Natal University College. 8vo, pp. 199 with map (frontispiece) and 31 text-illustrations. Longmans and Co. London, 1925. Price 12*s.* 6*d.* net.

In this book Prof. Bews describes the results of fourteen years' study of South African vegetation. A number of facts are recorded, and the author attempts to trace the evolutionary history of the vegetation. The volume is a useful contribution to our knowledge of plant-geography, and suggests the method by which careful study of plant-forms and their distribution may throw light on larger problems of plant-migration and phylogeny.

Incidentally, the book is part of the important work of the survey of that part of the Empire to which the South African botanists have set their hand, and Professor Bews indicates not merely what has already been done, but suggests lines for further investigation.

The plan of the work is as follows:—An introductory chapter on physical features and climate is followed by a short general account of plant-forms and their evolution. The origin and migrations of the flora are then discussed; the tropical-subtropical element is the most important—it originated in the vast reservoir of plant-life in the tropics to the north and the sea-shore, coast-belt, and river-valley supply paths of migration. The origin of the temperate or mountain element extending from the mountains of Abyssinia through the mountains of East Africa to the Cape is still matter for discussion. Is it due to a northern invasion, or is it the remnant of a larger Antarctic flora? Successive chapters deal with the various types of the tropical and subtropical trees and shrubs, the tree-veld and xerophytic scrub types, subordinate woodland types—lianes, epiphytes, parasites and undergrowth, grasses and sedges, marsh-, water-, and strand-plants, karroo and karroid types, and the temperate or mountain and south-western flora. The final chapter supplies a general summary and discussion.

Prof. Bews adopts the view that primitive types of growth-form should be sought in certain types of plant-habitat, namely, moist tropical forest, stream-banks and swamps, sea-shore habitats, and possibly mountain habitats. Grassland, scrub, and desert types of habitat are more recent, and the growth-forms of their plants are therefore in general derivative. Collateral evidence from phylogeny is found in Engler's system of classification, the six most primitive orders of which are associated with the above-mentioned primitive habitats; the Ranales also mainly belong to the same series. The grasses established a new type of habitat displacing the gymnosperms on the drier land-surfaces; this does not support a geophytic origin of the Monocotyledons, as the development of the geophytic Liliaceous types could hardly have taken place before the origin of the grasses.

The text-figures, from drawings by Miss S. Gower, illustrate some of the characteristic plants referred to in the text. A bibliography supplies references to works on South African vegetation in particular, and generally on phylogeny and ecology.

My Garden Book. By John Weathers. 8vo, pp. xvi, 774, with 24 coloured plates and 392 text-figures. Longmans and Co., London, 1924. 36*s.* net.

Mr. Weathers's ponderous and important-looking volume recalls the family Bible; it is, in fact, a bible prepared for the daily use of all who own a garden, big or little. The author, who needs no introduction to the gardening world, has endeavoured to convey to his readers the results of knowledge and experience gained during forty years of work in practical, scientific, commercial, and journalistic horticulture. We propose to notice the book from the point of view of the botanist who loves and works his garden. And at the outset we would commend Mr. Weathers's appeal to give space and opportunity to the plants sufficient to allow of full and proper development, and to depend on good cultivation rather than artificial antidotes to disease and insect-plagues.

The first section of the book, about one-fourth of the whole, entitled "gardens and garden-making," deals with the selection of a site, the laying-out of a garden, the various appliances, implements and operations, and the elementary botanical principles underlying the science of horticulture. Mr. Weathers is a sufficiently good botanist to be a safe guide on scientific matters, but we think he exaggerates the "poisonous" effect of carbon dioxide in his advice to banish plants and flowers from a sleeping-room. The greater part of the volume is concerned with the practical sections, namely, the hardy flower garden, glasshouse gardening, the fruit garden, and the vegetable garden. The first of these occupies 330 pages, under the headings:—the mixed herbaceous border, hardy herbaceous perennials, hardy and half-hardy annuals and perennials, hardy bulbous plants, climbing and trailing plants, the rock garden, water and bog gardening, hardy ferns, ornamental and flowering-trees and shrubs, and roses. Under each heading some general instructions are given, but the greater portion of the text is arranged under the various genera following in alphabetical order, and contains an account of the genus including the different species, with directions for culture and propagation. The derivation of the generic name is given and the family to which it belongs is indicated.

At the end of the volume is a calendar of work in the various sections of the garden, and a list of jobs for wet weather. There is also a full index.

The text-illustrations are helpful, and an attractive feature is supplied by the excellent coloured plates reproduced from drawings by Mr. G. S. Elgood, Miss Beatrice Parsons, Miss E. Warrington, and Miss Winifred Walker.

The book is well and clearly written, and should prove a valuable guide and work of reference both for the amateur and professional gardener.

British Museum (Natural History): New Publications.

Guide to the Fossil Plants in the Department of Geology and Palæontology. 8vo, pp. 72, with six plates, one folding table, and 40 text-figs. London: Trustees of British Museum, 1925. Price 1*s.*

The original manuscript of this Guide was prepared by Mr. H. Hamshaw Thomas, M.A., of the Cambridge Botany School, more than ten years ago. War intervened, and before publication could be resumed advances in knowledge and the re-arrangement of the specimens necessitated a re-handling of the text. This has been done by Mr. W. N. Edwards, the palæobotanist on the Staff of the Department.

Though technically a guide to the exhibited series of specimens, this little book, like other British Museum Guides, forms a handy introduction to the study of the subject treated.

The back of the outer cover bears a plan of the Department, and the text is preceded by a folding table—a geological time-chart for fossil plants. Then follows a brief description of the Floras of the Past arranged in ascending order from the Lower Palæozoic, with its doubtful alga-like remains, to the Pleistocene.

The plates are photographic reproductions of exhibited specimens. The text-figures include drawings of specimens, restorations, and diagrams. New drawings have been prepared by Mrs. W. N. Edwards, and illustrations are included, by permission, from well-known text-books by Dr. D. H. Scott and Prof. A. C. Seward. The uniform use of the small initial for the trivial name has an unfamiliar appearance to the botanical eye.

British Flowering Plants. Post Cards. Series Nos. 5 and 6. Price 1*s.* each series. On sale at the Museum.

These comprise coloured photographic prints, similar to those of the previous series, of Wood Anemone, Wood Violet, White Bryony, Primrose, Small Bindweed and Traveller's Joy, Rock Rose, Musk Mallow, Harebell, White Dead-nettle. A descriptive leaflet is included with each series.

The New Edition of the *Monograph of the Mycetozoa* by Miss G. Lister is now ready. Price £1 11*s.* 6*d.*

We hope to publish a notice of the book in our next number.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on March 19, Mrs. Muriel Roach read a paper on "A Study of the Physiology of certain Soil Algæ in Pure Culture," the paper being illustrated by specimens of the cultures and by lantern-slide diagrams. Pure cultures of soil algæ were demonstrated which showed strikingly that although a very few species carried on the kind of nutrition generally associated with green plants, viz., the synthesis of organic substance from carbon-dioxide and water through the agency of sunlight, yet the great majority of those studied grew very much better when supplied with some soluble organic compound as an additional source of carbon. Each species could use different compounds in very varying degree and had its own order of preference for them, glucose being especially favourable to many.

A single species, *Scenedesmus costulatus* Chod., var., was selected for a more detailed investigation of the effect of different organic substances on its growth in liquid media. A standard solution of mineral salts was used either alone or supplemented by 1 per cent. (calculated to give equal numbers of carbon atoms) of the following naturally occurring compounds:—Glucose, fructose, galactose, sucrose, maltose, glycerine, and mannite. Daily measurements were made of the bulk of algal protoplasm per c.mm. of medium and the values obtained were found in many cases to lie, within the limits of experimental error, upon an exponential curve.

The alga was shown to be able to grow in complete darkness, given a suitable supply of food, at about half the rate that it grew in the same medium in the light, an important fact in considering its natural habitat. Parallel cultures inoculated with equal quantities of a uniform suspension of cells and kept under the same conditions of temperature and light increased in bulk at the same rate and in the same manner.

The logarithmic values of the bulk for the first nine or ten days, in those media completely favourable to the growth of the organism, were shown to lie within the limits of experimental error on a straight line. In the less suitable media the observed points showed a greater variance from the straight line, the extreme case being reached with mannite, where the curve indicates a gradual breeding out of a strain able to grow in presence of the compound.

At the meeting on April 2, Mr. W. R. B. Oliver's paper entitled "Biogeographical Relations of the New Zealand Region" was summarized by Dr. A. W. Hill, F.R.S.

The geographical features which make New Zealand of interest to the plant and animal geographer are the extensive land-areas lying in the Pacific Ocean far distant from the nearest continent, the diversity of their physical characters, and the depth of the surrounding ocean. The outstanding characteristic of the flora of the New Zealand region is its marked dissimilarity to that of Australia, and the presence of an element common to two or more of the southern land-masses.

A large proportion of the plants at present living in New Zealand are such as require continuous land-connection for their dispersal. Their presence demands that at some period in the past New Zealand was joined to the other land-masses of the globe. Most of these are related to species now found in lands to the north, and an explanation of the origin of these must be consistent with the fact of the fundamental differences between the floras of the south temperate land-masses.

Perhaps no point concerning the origin and distribution of the New Zealand flora has given rise to more controversy than the so-called "Antarctic" element. This appears to be a mixture of several

elements. Eliminating the genera and species of plants common to New Zealand and South America which may be explained by migration from the north overland and from the west overseas, there remains a residue which seems to demand a more direct land route between New Zealand and South America.

Photographs of some of the noteworthy plants were shown on the screen.

Mr. W. C. F. Newton gave an account of his researches on "The Cytology of the Genus *Tulipa*," illustrated by an extensive series of lantern-slides. Previous work on *Tulipa* has shown the existence of peculiarities in the development of the embryo-sac. By means of these the § Eriostemones may be distinguished from the rest of the genus. Certain species and groups of species are distinguished by the form of the chromosomes. The basic number of chromosomes is twelve, but as a result of fragmentation one species has sixteen. Alteration in the relative size of the chromosomes may occur independently of changes produced by fragmentation. Tetraploid and hexaploid varieties and species occur. There is some correlation between chromosome number and nuclear size, but as between species no correlation between nuclear size and the size of the plant. A comparison of the cytological conditions in the genera of the tribe *Tulipeæ* shows that *Calochortus* is very widely separated from the rest of the tribe. The reduction division (*T. australis*, *T. Hageri*, *T. primulina*) is according to the parasynaptic scheme, and the exceptional clearness of the prophase permits the accurate analysis of the crosses, rings, and double rings of diakinesis. These are formed by the alternative opening of one or other of the two splits at right angles that divide each tetrad into four chromatids. In *Fritillaria Meleagris* the change of direction of split only occurs at the point of attachment, giving rise to diaschistic V's and crosses in which the shape of the tetrad depends on the point of attachment of the chromosomes of which it is composed. The different kinds of tetrad found in *Tulipeæ* have their exact parallels in the Acrididæ as described by McClung and others, thus helping to emphasise the essential similarity of the meiotic phase in plants and animals.

List of Papers bearing upon the Botany of the British Isles issued during 1923. We have received the Report of the Conference of Delegates of Corresponding Societies for 1924, issued by the British Association for the Advancement of Science. It comprises the address of the President on "The Conservation of Sites of Scientific Interest," and a list of papers, prepared by Mr. T. Sheppard, of the Hull Museum, bearing upon the Zoology, Botany, and Prehistoric Archæology of the British Isles, issued during 1923. The list of papers on Botany fills nearly thirteen pages.

The *Transactions of the Perthshire Society of Natural Science*, vol. viii, pt. 1, contains a notice, by George F. Bates, with portrait, of William Barclay, President of the Society, 1907–18. Also two papers of botanical interest, "Some Recent Additions to the Discomycetes of Perthshire," by James Menzies, and "A Preliminary List of Perthshire Diatoms," by G. F. Bates.

NOTES ON THE FLORA OF THE VARNA DISTRICT, EASTERN BULGARIA.—II.

By W. B. Turrill, M.Sc.

During 1924, Mr. B. Gilliat-Smith, British Vice-Consul at Varna, continued to study the flora in Eastern Bulgaria, and to send valuable collections to Kew. The total number of specimens received from him during the last two years is 1028, and these are now available for reference in the Kew Herbarium. A number of species received last year are worthy of special record, either because they are new to the flora of Bulgaria or to the Varna district, or for their taxonomic and phytogeographic interest. These are enumerated below, together with some taxonomic notes and the descriptions of two new species.

Ranunculus millefoliatus Vahl, Symb. ii. 63, t. 37 (1791), var. brevirostris Boiss. Flor. Or. i. 35 (1867), *sensu* Hayek in Fedde, Repert. Beih. xxx. i. 333 (1924). Hills south of Varna, April–May, nos. 421, 442, 486.

The species was originally described from North Africa. There is a specimen from Vahl at Kew, and this has narrow leaf-segments, ending in acuminate tips, and curved carpels. Similar plants are represented from Sicily, but I have seen no specimens from the Balkan Peninsula which exactly agree with the original. The majority of the specimens of this species, *sensu lato*, from Italy, Herzegovina, Dalmatia, Greece, Macedonia, Serbia, Bulgaria, and the Orient have relatively shorter and broader leaf-segments, which are more blunt at the ends. One specimen from North Africa shows similar characters, and some Sicilian specimens are intermediate. Specimens with longer segments to the leaves and straight beaks to the ripe carpels have been received from Dalmatia, Bosnia, Italy, and the Alpes Maritimes, and are separable as *R. Canuti* Coss. I have been unable fully to understand *R. garganicus* Ten., and most diverse opinions have been expressed about it by authors. The common Balkan Peninsula plant would appear to be the var. *brevirostris* Boiss. sensu Hayek, *l. c.*, though Boissier did not divide up his material as apparently Hayek has done.

Dentaria bulbifera L. Sp. Pl. 653 (1753). Hills south of Varna, April, no. 427, with the leaves markedly hairy on the nerves of the lower surface, and perhaps belonging to or approaching the var. *pilosa* O. E. Schulz in Engl. Bot. Jahrb. xxxii. 365 (1903), but the specimen is insufficient to decide. No. 507, from moist places on the hills south of Varna, May, has only a few scattered hairs on the under surface of the leaves.

Viscaria atropurpurea Giseb. Spic. Flor. Rumel. i. 166 (1843). Hills north of Varna, in flower, May, no. 513.

Ailanthus altissima Swingle in Journ. Wash. Acad. Sci. vi. 605 (1916). Cultivated and naturalized specimens, nos. 307, 679, 680. This has escaped from cultivation and now covers a considerable area in the Varna district, where it is spreading spontaneously.

The leaves emit a strong odour when bruised. This has not been observed by me in the many cultivated specimens at Kew, but is mentioned by Bailey *Manual of Cultivated Plants*, 448 (1924).

VICIA TETRASPERMA Moench, Meth. 148 (1794). Hills south of Varna, May, nos. 575, 597.

DAUCUS BESSARABICUS DC. Prodr. iv. 210 (1830). *Astrodaucus littoralis* Drude in Engl. & Prantl, Pflanzenfam. iii. viii. 156 (1898). Sea-shore, north of Varna, in flower and fruit, June and July, nos. 738, 775.

HERACLEUM TERNATUM Vel. in Sitz. Böhm. Ges. Wiss. 46 (1890) & Flor. Bulg. 209 (1891). Hills north of Varna, in fruit, Aug.–Sept., nos. 919, 938, 956.

PASTINACA TERETIUSCULA Boiss. Flor. Or. ii. 1060 (1872). Very common north of Varna; a foul-smelling plant, in flower and fruit, Aug.–Sept., nos. 896, 932.

PHYSOCAULIS NODOSUS Koch, Syn. Flor. Germ. ed. ii. 348 (1843). Hills south of Varna, in flower and young fruit, May, no. 521.

ASPERULA MONTANA W. & K. ex Willd. Enum. Hort. Berol. 151 (1809)? Turrill in Kew Bull. 1924, 340. Hills south of Varna, June–Sept., nos. 764, 772, 974.

CARDUUS LEIOPHYLLUS Petr. Addit. Flor. Nyss. 105 (1885). Hills near Varna, in flower, July and October, nos. 825, 993; also June 1923, no. 220.

CENTAUREA sp. aff. C. KERNERIANUM Jka. and C. RAZGRADENSIS Vel. Hills south of Varna, Oct., no. 1021. In Bulgaria there are a large number of Centaureas related to *C. pseudophrygia* C. A. Mey. and *C. stenolepis* Kern. There is little doubt that hybridization and subsequent segregation occur in the genus to a considerable extent. I have found it impossible to be certain of identifications in the genus from the published descriptions only.

CICHORIUM INTYBUS L. Sp. Pl. 813 (1753), var. GLABRATUM Gren. & Godr. Flor. Fr. 286 (1850). *C. glabratum* Presl, Flor. Sic. i. p. xxxii (1826). Near Varna, Aug., nos. 871, 888. This is apparently the common variety in the central parts of the Balkan Peninsula.

DORONICUM HUNGARICUM Rchb. f. Ic. Flor. Germ. xvi. 34, t. 956 (1854). Hills south of Varna, in flower, May, no. 554.

INULA BIFRONS L. var. PUBESCENS Rochel (?). Ab planta vulgari caulibus superne præcipue patule setoso-pilosis, involucri squamis haud vel vix glandulosis differt.

Herba perennis, caulibus ramosis basi sublignosis patule setoso-pilosis præcipue superne. *Folia* basalia late oblanceolata, apice rotundata, inferne angustata sed petiolo vix instructa, usque ad 1·8 dm. long. et 6·5 cm. lat., margine integra, in pagina utraque scabridulis et pilis dispersis prædita; caulina ovata vel oblonga, apice rotundata vel in supremis rotundato-apiculata, ad ramorum apices gradatim minora, sessilia, plus minusve amplexicaulia, inferiora ad 2 cm. decurrentia, margine integra vel leviter crenato-serrulata. *Capitula* numerosissima in ramorum apicibus aggregata, breviter

pedunculata vel sessilia, 0·8–1·5 cm. diam. *Involucri squamæ* exteriores subfoliaceæ, apice paulum recurvatæ; interiores lineares, apice acutæ 8 mm. long., 0·75 mm. lat., margine superne ciliata, inferne serrulatæ, dorso breviter hispidulæ, haud vel vix glandulosæ. *Flores* exteriores ♀, uniseriati, vix ligulati, erecti, flores tubulosos interiores fere æquantes, corolla 6·5 mm. long., parte ligulata 1·5 mm. long. apice truncato-tridentata; interiores ☿, tubulosi, corolla 4 mm. long., acheniis immaturis cylindricis 2 mm. long. longitudinaliter costatis apicem versus hispidis, pappi setis 6 mm. long.

BULGARIA: hills north of Varna, Nov. 18, *Gilliat-Smith*, 1028.

To this variety are also to be referred a specimen from the same locality, collected on Oct. 24, *Gilliat-Smith*, 1015, and a specimen at Kew from the Dobruja: Babadagh, Wald bei Slava, Aug. 1872, *Montenis*, 414.

This variety has possibly a wider distribution in S.E. Europe than is at present known. The species as a whole occurs in S. France, Italy, Transsilvania, Slavonia, and in the Balkan Peninsula in N. & W. Bulgaria, Rodope Massif, the Dobruja, Serbia and Herzegovina. Velenovsky, in Fl. Bulg. 281 (1891), records it from near Varna, Orhanie, Vraca, Konjovo, Dermendere, Sliven and Kipilovo, and in the Suppl. 160 (1898) from Kalofer, Sadovo, Stanimaka, Philippopolis, and Loveč. He says, it has several varieties, but the variations mentioned by him do not include the characteristics of our plants. Beck, in Denkschr. Math.-Naturw. Cl. K. Akad. Wiss. Wien, xliv. 882 (1881), refers as follows to a variety which is probably the same as ours: "*Inula bifrons* var. *pubescens* Rochel (ubi?) est forma caule sub capitulis pilosiore." Again, Vandas, Reliq. Formánek. 309 (1909), quotes the species as collected by Formánek at Kale, Dlegovo Uvojke in mt. Rodope, Bulgaria, and says: "a planta italica et gallica caulibus, pedicellis involucrisque dense pubescenti-hispidis differt (f. *pubescens*)."

Jurinea Gilliatii Turrill, sp. nov., a descriptione *J. Ledebourii* Bunge foliis supra leviter arachnoideo-tomentosis, omnibus integris, involucri squamis extimis foliis subsimilibus, interioribus leviter minuteque glandulosis differt.

Herba perennis, e rhizomate lignoso caulibus 4 orientibus. *Caules* herbacei erecti, usque ad 1·8 dm. alt. indumento albo adpresse arachnoideo-tomentoso, teretes, monocephali. *Folia* omnia integra supra viridia, leviter arachnoideo-tomentosa, subtus dense albo-tomentosa, indistincte uninervia, anguste oblonga vel oblanceolata, apice brevissime apiculata; basilaria in petiolum gradatim angustata, 2·5–5 cm. long. 0·8–1 cm. lat.; caulina gradatim minora, remotiora, basi subamplexicaulia. *Capitula* hemisphærica vel fere sphærica, 2–2·5 cm. diam., multiflora. *Involucri squamæ* paucæ; exteriores 2–4 foliis summis subsimiles sed minores, vix vel irregulariter recurvatæ; interiores erectæ, lanceolatæ, apice attenuato-acuminatæ, 1·1 cm. long., 2 mm. lat., superne leviter minuteque glandulosæ, margine grosse ciliata. *Flosculi* atro-purpurei, involucro multo longiores. *Corolla* 1·5 cm. long., lobis linearibus 4 mm. long. 0·5 mm. lat. *Achenia* immatura obconica, dense imbricate squamuloso-echinata;

pappi setæ valde inequales, distinctissime barbellatæ, exteriores patulæ ab vix 1 mm. long., interiores ad 8 mm. long., suberectæ.

Bulgaria: hills south of Varna, in flower and young fruit, July 3, 1924, *Gilliat-Smith*, 759.

This species has been described as new with some hesitation. The two specimens on the one sheet are very distinct from anything I have seen at Kew or the Natural History Museum. The nearest specimen I have seen to it is one collected in Serbia by Adamović "in rupestribus m. Basara, Jun. 1897," and named *J. mollis* (L.) Rchb., but our plant is at once distinguished by the fewer phyllaries. I have serious doubts regarding the specific distinctness of *J. mollis* (L.) Rchb. and *J. arachnoidea* Bunge. The characters mentioned by Bunge, Velenovsky, and other authors seem all of a fluctuating character, and it may be that our plant too will ultimately be connected up by intermediates with *J. mollis* sensu latissimo.

Another difficulty is the *J. Ledebourii* Bunge in Flora, xxiv. 1, 157 (1841). The original description is very unsatisfactory and is simply copied by Ledebour, Flor. Ross. ii. 766 (1846). The records of this species (by Janka) from Transsilvania are wrong, according to Simonkai, Enum. Fl. Transsilv. 344 (1886), and refer to *J. transsilvanica* (Spreng.) Simonk. It is interesting to note that Nyman, Consp. 415 (1879), quotes the species from Bulgaria, while reducing it to *J. arachnoidea* Bunge. Velenovsky, in Flor. Bulg. 302 (1891), reduces *J. Ledebourii* to *J. arachnoidea*, without comment. I have seen no authenticated specimen of Bunge's *J. Ledebourii*, and from the description alone I cannot be sure what it is. *J. albicaulis* Bunge in Flora, xxiv. 156 (1841), has pinnatipartite leaves, though a var. is quoted (an spec. propria?) with entire leaves. However, the glabrous fruits would take our plant out of this species. *J. kilæa* Aznavour in Bull. Soc. Bot. Fr. xliv. 172 (1897) is probably closely related to *J. albicaulis* Bunge, as suggested by Velenovsky in Flor. Bulg. Suppl. 168 (1898). It has, *e descriptione*, smooth shiny achenes, longitudinally more or less distinctly striated and minutely denticulate at the apex. *Jurinea Hartmanii* Beauverd in Bull. Soc. Bot. Genev. ser. 2, vi. 153 (1914), differs from our plant, *inter alia*, by having a large number of phyllaries, the outer strongly recurved, and smooth achenes. *Jurinea subhastata* Panč. Flor. Princip. Serb. addit. 169 (1884) is described as having decurrent leaves and the lower phyllaries reflexed from their middles.

Jasione Heldreichii Boiss. & Orph. Diagn. ser. ii. vi. 120 (1859). In open fields, above the wooded hills, south of Varna, in flower, July, no. 803; hills north of Varna, in flower, July, nos. 803 *a* and 849; above Gebedže (Kebedže), in fruit, Sept., no. 954.

Two or three forms or varieties are represented, including, perhaps, from the description, var. *microcephala* Vel. Flor. Bulg. 374 (1891). Abundant seed has been received, and it is hoped that cultivation will decide some of the questions which are insoluble from the study of herbarium material only.

Heliotropium hirsutissimum Grauer, Pl. Min. Cogn. Dec. 1 (1784); Sprague in Journ. Bot. lx. 268 (1922). *H. villosum* Willd. Sp. Pl. i. 741 (1797). Coastal district, north of Varna, Aug., no. 904 *b* and *c*.

Onosma viride Javorka in Annal. Mus. Nat. Hung. iv. 433 (1906). On banks north of Varna, May, no. 115; hills north of Varna, June, no. 642; near Varna, July, no. 846.

The specimens are not quite typical, but verge towards *O. echioides* L. *sensu* Javorka (*O. Javorkæ* Simonk.). Similar specimens, partly intermediate, have been recorded from the Balkan Peninsula by Javorka himself.

Scrophularia grandidentata Ten. Flor. Napol. iv. 88 (1830), & v. 41 (1835–36). Hills south of Varna, in flower, July, no. 805.

Verbascum pulchrum Vel. in Sitzb. Böhm. Ges. Wiss. 1887, 154, non vidi, & in Flor. Bulg. 409 (1891). I have seen no authenticated specimens of this, nor yet plants agreeing completely with the description in Velenovsky's 'Flora Bulgarica.' Gilliat-Smith has, however, sent three specimens (nos. 755, 773, 982), which may represent different hybrids with *V. pulchrum* for one of the parents of each.

Veronica orchidea Crantz, Stirp. Austr. Fasc. iv. 333 (1769). Varna district, June to November, nos. 255, 256, 354, 728, 729, 748, 828, 1001, 1023.

The series of specimens show a range of variation in a number of characters. Thus the density of the indumentum varies, as does also the degree of crenation of the margins and the size of the sepals. No. 1023 is a monstrous form with much branched inflorescences but no perfect flowers. Velenovsky, 'Flora Bulgarica,' Suppl. 214 (1898), notes the occurrence of a form with glabrous leaves.

Veronica euxina Turrill, sp. nov., ab *V. spicata* L., sensu stricto, caulibus foliisque dense glanduloso-pubescentibus foliis inferioribus latioribus omnibus sessilibus vel fere sessilibus, capsulis glabris differt.

Caules erecti vel ascendentes usque ad 3·6 dm. alt., ima basi 3 mm. diam., omnino dense glanduloso-pubescentes, subteretes. *Folia* inferiora late elliptica vel ovato-elliptica, apice obtusa vel subrotundata, basi angustata sæpe semiamplexicaulia, 4·5–5·5 cm. long., 2·5–2·8 cm. lat., margine crenata, pagina utraque dense glanduloso-pubescentia, costa nervisque in siccitate supra subimpressis infra prominentibus, nervis lateralibus utrinque circiter 6, in folia superiora minora angustiora acuta gradatim transientia. *Inflorescentia* spicis densis multifloris solitariis vel usque ad 5 aggregatis instructa, usque ad 1·2 dm. long.; bracteæ angustissime ellipticæ, apice acutæ, 1·5 mm. long., 0·5 mm. lat., margine longe ciliatæ, haud glandulosæ; flores pedicellis 0·5 mm. long. suffulti. *Sepala* 4, glabra, margine conspicue albo-ciliata excepta, haud glandulosa, 2 adaxialia ovata, 1·5 mm. long., 2 abaxialia lineari-elliptica, 2 mm. long. *Petala* 4, 3·5 mm. long., abaxiale lineare, adaxiale ovatum, lateralia lineari-oblonga. *Filamenta* 2·5 mm. long.; antheræ vix 1 mm. long. *Ovarium* compresso-subsphæricum, glabrum; stylus 4 mm. long., glaber. *Capsula* compresso-subsphærica, apice leviter truncata, haud emarginata, 3 mm. long., 4 mm. diam., glabra, stylo sæpe persistente. *Semina* plana vel subplana, ambitu oblonga vel subrotundata, circiter 0·75 mm. long., luteo-brunnea.

BULGARIA: hills south of Varna, in flower June *Gilliat-Smith*, 671, 730, 752, 879.

The above description has been drawn up from no. 752, which may be considered the nomenclatural type, except that the mature capsules and seeds have been described from no. 879. In addition to the above specimens, there is one preserved at Kew from the Dobruja, Tultscha, near Malkodz, June 20, 1872, *Sintenis*, 227, which is probably to be included within the species, although the leaves are, on the whole, narrower.

If *Veronica spicata* is accepted in the wide sense to include *V. hybrida*, *V. crassifolia*, and *V. orchidea* then our plant will also have to take subspecific or varietal rank, but from the evidence at present available it seems distinct morphologically and to have a sufficiently definite geographical distribution to entitle it to be considered a species. Only extensive field-work and breeding experiments can define the correct limits of the assemblages centering round *V. spicata*.

V. TEUCRIUM L. Sp. Pl. ed. 2, 16 (1762), subsp. THRACICA Vel. Flor. Bulg. Suppl. 214 (1898). Watzl, in Abhandl. K. K. Zool. Bot. Ges. Wien, v. Heft 5, p. 40 (1910), places this as a variety under subsp. *crinita* of *V. Teucrium*. Near Varna, May to October, a series of flowering and fruiting specimens, nos. 72, 355, 374, 933, 1019.

This subspecies or variety extends through the central parts of the Balkan Peninsula from Varna to Bosnia. Very fine plants of it flowered at Kew last year, grown from seeds collected by me in Eastern Serbia, near Sičevo, east of Niš, *Turrill*, seed-number 29. Gilliat-Smith's later specimens show that the plant sometimes behaves as a die-back chamæphyte, for in the autumn young lateral branches grow out from below the old infructescences. The leaves on these branches are often smaller than those on other parts of the plant and have a somewhat different shape.

GLOBULARIA WILLKOMMII Nym. Syll. 140 (1854–55). Hills to the south of Varna, in flower, May, no. 445.

STACHYS THIRKEI C. Koch in Linnæa, xxi. 685 (1848). Hills south of Varna, June, no. 689; thermal springs of Lidja, west of Burgas, June, no. 721; coast north of Varna, June, no. 745.

The additional material of this interesting species indicates a certain range of fluctuation or variation in the expression of some of the characters. Thus, it is doubtful if Boissier's var. *condensata* is more than an extreme fluctuation, while the shape of the lamina of the cauline leaves may be modified, within limits, by environmental factors.

SCLERANTHUS DICHOTOMUS Schur in Verh. Siebenb. Ver. Naturw. ii. 10 (1851), non vidi, var. PONTICUS Hayek in Fedde, Repert. Beih. xxx. i. 179 (1924). *S. perennis* L. var. *ponticus* Vel. Flor. Bulg. Suppl. 110 (1898). Near Varna, in flower and fruit, June, no. 171; hills south of Varna, in flower, May, no. 592; fields on the heights, south of Varna, in flower and fruit, June, no. 723.

S. dichotomus Schur is sometimes separated with difficulty from the *S. perennis* of Central and Northern Europe. It has, however, spreading perianth-lobes in the fruit, and usually longer leaves. The var. *ponticus* is distinguished by its larger flowers. Probably a large proportion of the material recorded from the Balkan Peninsula as *S. perennis* is *S. dichotomus* var. *ponticus*. Thus the specimens from Greek Macedonia referred by me to *S. perennis* in previous publications, I now place under *S. dichotomus* var. *ponticus*. There are, however, in the Kew Herbarium some specimens collected by Adamović from near Salonika and on Mt. Hortiach which appear to be intermediate between *S. perennis* and *S. dichotomus* var. *ponticus*.

KOCHIA PROSTRATA Schrad. var. CANESCENS Moq. Chenopod. Monogr. Enum. 93 (1840). Near Varna, in flower, Aug., no. 898 (also nos. 326, 874).

I have used the above varietal name because the leaves are decidedly "incano-sericea." The indumentum of the stem seems to vary with age.

STERNBERGIA COLCHICIFLORA W. & K. Pl. Rar. Hung. ii. 172, t. 159 (1805). Hills south of Varna, in leaf and fruit, March, no. 381; in flower, Sept., no. 927.

COLCHICUM TURCICUM Janka in Oesterr. Bot. Zeitschr. xxiii. 242 (1873) and Termész. Füzet. x. (1886) p. 76 of "separate" at Kew. The specimens quoted in Journ. Bot. lxii. 241 (1924) are not quite typical, in that the leaf-margins are not "patenter vel retrorsum nonleato-ciliati." It is necessary to have available much more material and to make extensive field-observations before deciding whether the Varna plants represent a mere fluctuation, a local microspecies, or are intermediates between *C. turcicum* and some other species, perhaps *C. autumnale*.

SCILLA BITHYNICA Boiss. Diagn. ser. 1, vii. 111 (1846); Stoyanoff & Stefanoff in Oesterr. Bot. Zeitschr. lxx. 296 (1921). *S. Radkæ* Davidoff in Mag. Bot. Lap. iv. 27 (1905). Under Djanavar Tepe, the wooded height overlooking Lake Devna, in a shady damp place opposite a Turkish fountain, in flower, April, no. 413, and in fruit, May, no. 495. Masses of blossoms of this species are brought into Varna for sale by the gypsies (no. 412). The flowering period is three weeks to a month later than that of *S. bifolia* L.

AN ACCOUNT OF THE INTRODUCTION OF AMERICAN SEEDS INTO GREAT BRITAIN.

By PETER COLLINSON.

[WE have in the library of the Department of Botany a small quarto note-book, bound in vellum, which bears the above title. It is an autograph MS. of Peter Collinson (1694–1768), describing the means that he adopted to introduce seeds of American plants into Great Britain. His biographer, John Fothergill, remarks that at the time when their acquaintance commenced, in 1740, Collinson "was then considered amongst the number of those who were best

acquainted with botany and natural history in England; his collection in most branches of natural history was very large, and the specimens well-chosen; his botanic garden contained many curious plants, not at that time to be met with in any other; and the number of such kept increasing to the last period of his life." The book belonged at a later date to C. S. Collinson, perhaps a descendant. It may be of interest to reprint the account, which was written less than two years before Collinson's death.—A. B. R.]

"As the Nobility & Gentry for some years past have introduced a vast variety of North American Trees Shrubs and Flowers into their Plantations

"The Present, as well as the next Generation may be pleased to know at what time & by whom such abundance of the vegetable productions of our Colonies were naturalized to our Climate.

"In the very early Part of my Life I had a love for Gardening—this increased with my years, My Publick Station in Business brought mee acquainted with Persons that were natives of Carolina, Virginia, Maryland, Pensilvania and New England.

"My Love for New & Rare plants putt mee often on soliciting their assistance for seeds or plants from those Countries.

"I used much importunity to very little purpose—for the turn of the people was entirely the other way. What was common with them (but Rare with us) they did not think worth sending.

"Thus I labour'd in vain or to little purpose, for some years, & obtained but very few Seeds or Plants, Neither Money or Friendship would Tempt them.

"Notwithstanding these Discouragements, as I continued engaged in Trade with these people, new correspondents offered, & I continued to renew my Requests to them; they made fair promises but very few performances, & those of little consequence, thus this Difficult affair stood for some years longer—at last some more artful Man than the Rest contrived to get rid of my importunities By recommending a Person whose Business it should be to gather Seeds & send over plants.

"Accordingly John Bartram was recommended as a very proper Person for that purpose, being a native of Pensilvania with a numerous Family—the profits ariseing from Gathering Seeds would enable him to support it.

"At first it was not thought that sending over Seeds would prove a Trade but the demand increaseing the price was settled at five Guineas a Box. Besides my Self, the next Person that gave J. Bartram encouragement was Lord Petre at Thorndon Essex who continued to employe him from 1736 to 1740. Then his orders increased from the Dukes of Richmond, Norfolk, and Bedford.

"Afterwards the Taste for planting increased, the annual orders for Boxes of seeds as by the following Lists will more evidently appear.

"The Transacting this Business of procureing Foreign Seeds brought on mee every year no little Trouble, to carry on such a Correspondence attended with so much Loss of Time—viz. in

keeping Accounts, writeing Letters with Orders, Receiving and Paying the Collectors Money, Difficulties and attendance at the Custom House to procure the Delivery of the Seeds, & then dispersing the Boxes to their proper owners &c. &c.

"Yet all this trouble with some unavoidable Expence attending it did not discourage mee for I willingly undertook it without the least grain of profit to my self in hopes to improve, or at least adorn my Country—Besides to oblige so many Great and Worthy People, many my Friends & acquaintance but more were Strangers, who all applyed to mee & asked it as a favour I would take their Orders for Seeds—I could not refuse their Requests because I had Public Good at Heart.

"It hath pleased God to prolong my Life to just 72 to see the Reward of all my Labours crowned with Success in the numerous Plantations spread over this Delightful Island which gives infinite pleasure to

"Peter Collinson, { F.R.S. S.A.S. A.R. { Berol. Suec. } Soc.
"Decem. 16, 1766.

"After the Subscribers Names a List of Seeds contained in Each Box is aded.

"Unsought & unasked I was Honoured with Diplomas for a Momber of the Royal Societies of Sweeden and Berlin.

"I forgot to mention that after I had supplied the several persons in the following List with Seeds—the next was pray S[r] how and in what manner must I sow them,—pray be so good, S[r], as to give mee some directions, for my Gardener is a very Ignorant Fellow.

"This created more Trouble & Loss of Time, yet to encourage Planting, I never refused any One, & they were not a few.

"N.B.—My Son and I, havving some Dispute about my age—I had recourse to the Register and find next month I am 72."

The first entry is as follows:—

"In the years 1736, 1737, 1738 & 1739 Seeds were annually sent over By Jn° Bartram from Pensilvania To Lord Petre for which he had frequent Presents. But the Collecting Them did not become a Settled Trade & Business untill the year 1740."

Then follow the entries for successive years continuously from 1740 until 1767. In 1740 the Duke of Norfolk and Lord Petre are the only entries, each having two boxes of seeds; but the entries increased as time went on, and in 1754 there are 15, including Doc[r] Mitchell, 5 large boxes for Nobility and Gentry of Scotland. Later occasional entries appear for France and Germany. The list of different kinds of seeds at the end of the book contains 105 numbers.

ALABASTRA DIVERSA.—Part XXXV.*

By Spencer Le M. Moore, B.Sc., F.L.S.

(Continued from Journ. Bot. 1921, p. 249.)

1. Some New or Little-known Acanthaceæ from Eastern Asia.

Strobilanthes (*Eustrobilanthes, Bracteatæ*) **prahuensis** Clarke MS. in herb. Kew. Verisimiliter *frutex*; *ramis* longitrorsum prominenter sulcatis in nodis aliquantulum tumidis glanduloso-pubescentibus cito glabrescentibus; *foliis* majusculis longipetiolatis late ovatis acuminatis apice obtusis basi in petiolum breviter excurrentibus margine crenatis membranaceis pag. sup. pilis strigillosis appressis subsparsim obsitis pag. inf. pilis laudatis præsertim secus nervos onustis costis lat. utrinque circa 12 infimis leviter intermediis aperto superioribus admodum arcuatis reticulo laxo facile viso; *floribus* in cymas ramosas axillares vel terminales e strobilis capitulatis pedunculatis constitutas ordinatis; *bracteis* late orbiculatis arcte imbricatis glabris; *bracteolis* calycem breviter superantibus oblongis truncatis apice aliquanto induratis decoloratisque; *calycis* alte partiti segmentis linearibus apice leviter clavellatis necnon decoloratis glabris; *corollæ* (maturæ haud scrutatæ) tubo inferne gracili superne dilatato glabro limbi lobis late oblongis obtusis posticis paullulum altius connatis; *staminibus* 4 antheris æquimagnis; *capsula* compressa ovata ipso sub apice (ubi hispidula) attenuata ceterum glabra; *seminibus* quove in loculo 1 maxime compressis suborbicularibus glabris.

Java; *Horsfield*, Acanth. 56 in herbb. Mus. Brit. & Kew.

Folia usque 20×13·5 cm., in sicco fusco-griseoviridia, subtus paullo pallidiora; petioli dense glanduloso-pubescentes 4·5 cm. long. Exstant folia floralia pauca multo minora. Inflorescentiæ pleræque 5-12 cm. long.; harum rami sparsim pilosi vel glabri, ultimi 4–12 mm. long. Strobili circa 1·5 cm. long. et lat. Bracteæ vivæ verisimiliter albæ exsiccatæ luteo-brunneæ, circa 12×13 mm. Bracteolæ 4·5–5 mm., calyx 4 mm., corolla valde cruda 4 mm. long. Capsula 3·5×2·5 mm. Semina 1·85×1·5 mm.

Easily known by the ample foliage and the inflorescence. Success did not attend the effort to find a mature corolla.

Strobilanthes (*Eustrobilanthes, Nudatæ*) **axilliflorus** Clarke MS. in herb. Kew. *Herba* fere omnino glabra; caule ascendente aliquanto anfractuoso in nodis leviter tumido; *foliorum* paribus valde inæqualibus paris folio minore breviter majore longius petiolato ellipticis acuminatis apice obtusis basi in petiolum latum angustatis margine sat argute serratis membranaceis pag. sup. cystolithis linearibus minutis obsitis; *cymis* perpaucifloris axillaribus abbreviatis; *bracteis* fugaceis; *calycis* alte 5-partiti segmentis inter se parum inæqualibus lineari-lanceolatis acutis dorso carinulatis glabris; *corollæ* tubo intus piloso inferne angusto cylindrico incurvo superne inflato-glabro lobis

* Types in the British Museum Herbarium, unless otherwise stated.

rotundatis; *staminibus* 4 antheris inter se similibus; *ovario* anguste ovoideo puberulo; *stylo* piloso.

Java; *Horsfield*, Acanth. 46 in herbb. Mus. Brit. & Kew.

Folia majora 7–9×3–4 cm.; costæ lat. utrinque 5, teneræ; reticulum maxime laxum; petioli circa 1·5 cm. long. Folia minora 2·5×1 cm., margine undulata. Inflorescentiæ axis summum 3 mm. long., cicatricibus bractearum delapsarum notatus. Calyx 7–9 mm. long. Corollæ tubi pars angusta 5×2 mm. pars dilatata 10×7 mm.; limbus circa 1·5 cm. lat. Staminum anticorum filamenta 4·5 mm. posticorum 1·5 mm. long. Discus prominens. Ovarium 3 mm., stylus 11 mm., stigma 2 mm. long.

Near *S. filiformis* Bl. The large coarsely-toothed leaves and axillary inflorescences are points of difference recognised on sight.

Acanthopale debilis Clarke. Western China; *Wilson*, 4301.

A. acrocephalus Clarke. Western China; *Wilson*, 4302.

Gutzlaffia. Hance in 1849 (Hook. Kew Journ. i. 142) established this genus on a Hong Kong plant (*G. aprica*), which Anderson who followed him reduced to *Strobilanthes* (*Endopogon*). C. B. Clarke found the plant to differ from *Strobilanthes* (*Endopogon*) in having spiny instead of ribbed pollen: he therefore saw that Hance's name must be restored to its quondam validity. Meanwhile, Lindau, five-and-forty years after the date of Hance's work, had proposed (Engl. Bot. Jahrb. xviii. 50) the genus *Pseudosiphonium* for species hitherto placed in *Strobilanthes* (*Endopogon*), which he found to have spiny pollen; but on the score of priority this name must give way to Hance's. *Gutzlaffia* thus holds to *Endopogon* the same relation as *Acanthopale* to *Strobilanthes*, and as *Ipomœa* to *Merremia*. Besides *G. aprica*, species of the genus are:—

G. exareolata Lace (*Strobilanthes exareolatus* Clarke).

G. glandulosa Lace. Burma.

G. Henryi Clarke MS. (*Strobilanthes Henryi* Hemsl.) Western China; *Wilson*, 4299.

G. pedunculata Craib. Siam.

G. Dielsiana, comb. nov. (*St. Dielsianus* W. W. Sm.).

Gutzlaffia Forrestii, sp. nov. *Suffrutex*; *ramis* tetragonis gracilibus pubescentibus; *foliis* petiolatis ovatis obtuse acutis basi rotundatis vel acutis margine crenatis supra scabriusculis subtus in nervis pubescentibus; *spicis* angustis pluriflоris foliis subæquilongis glanduloso-pubescentibus; *bracteis* perpaucis inferioribus foliis similibus nisi multo minoribus superioribus oblongo-lanceolatis obtusis; *bracteolis* calyce paullo brevioribus anguste oblongis obtusis glanduloso-pubescentibus; *calycis* alte partiti segmentis lineari-oblongis obtusis inter se paullo inæqualibus glanduloso-pubescentibus; *corollæ* tubo calycem facile excedente inferne cylindrico superne dilatato incurvoque extus puberulo limbi lobis suborbicularibus tubo brevioribus; *staminibus* breviter exsertis; *staminodiis* 2 imminutis; *ovario* obovoideo-oblongo albo-pubescente; *stylo* exserto apice incurvo pilosulo.

West China, margin of thickets on the Tong Shan in the Yangtze bend at 9000 ft. *Forrest*, 10966.

Folia pleraque 5–9×2–5 cm., in sicco supra olivacea subtus palli-

diora; petioli 5–20 mm. long. Inflorescentia circa 8 cm. long. Bracteæ inf. 7–10 × 5–7 mm., sup. circa 7 mm. long. Bracteolæ 6 mm., calyx 7 mm. long. Corolla ex schedis cl. detectoris dilute cyanea; tubus 10 mm. long., inferne 1·5 mm. sub limbo 5 mm. lat.; lobi usque 5 × 5 mm. Filamenta 7 mm. long.; antheræ ovato-oblongæ, 2 mm. long. Staminodia vix 2 mm. long. Ovarium paullo post floritionem 5 mm. long. Stylus 18 mm. long.

Affinity with *G. exareolata* Lace, but different, *inter alia*, in the shape and toothing of the leaves and the much smaller flowers. To it apparently belongs *Forrest*, 11512 (Tali range, alt. 10,000 ft.), with smaller more hairy leaves and more hairy bracteoles and calyx-segments.

Dicliptera (*Sphenostegiæ*) **Horsfieldii** Clarke MS. in herb. Kew. *Herba* ramosa, ascendens; *ramis* distanter foliosis tetragonis nodulosis minute puberulis; *foliis* ovatis obtusis basi in petiolum cuneatim angustatis rarius rotundatis membranaceis in sicco brunneo-viridibus pag. inf. griseo-viridibus supra costa media minute pubescente excepta fere glabris subtus cystolithis sat prominentibus inspersis; *spiculis* 1-floris in axillis congestis; *bracteis* exterioribus lineari-subulatis mox patentibus vel reflexis interioribus imparibus spathulato-obovatis apice breviter firmeque spinulosis basi leviter angustatis margine patule piloso-ciliato excluso glabris; *bracteolis* calycisque segmentis lineari-lanceolatis breviter acuminatis ciliolatis illis quam hæ paullulum longioribus; *corollæ* exsertæ extus minute puberulæ tubo infundibulari limbo breviore labio antico ovato-oblongo 3-denticulato; *staminibus* breviter exsertis; *antherarum* loculis superpositis.

Java; *Horsfield*, Acanth. 12 in herbb. Mus. Brit. & Kew.

Folia pleraque 4–4·5 × 3–3·5 cm.; petioli 1–2 cm. long. Inflorescentiæ paucifloræ, circa 1 × 1·5 cm. Bracteæ ext. 4 mm. long., int. 7–9 × 3·5–5 mm. Bracteolæ 3 mm. long. Calyx 2·5 mm. long. Corolla 12 mm. long.; tubo 5 mm. limbo 7 mm. long. Antherarum loculi late oblongi, basi mutici, vix 1 mm. long. Ovarium 1 mm., stylus glaber, 8·5 mm. long.

A very distinct species.

Dicliptera (§ *Sphenostegiæ*) **Zollingerii**, sp. nov. *Herba* ramosa; *ramis* quadrangularibus microscopice puberulis; *foliis* ellipticis obtusis basi in petiolum sæpe ea circa semiæquantem extenuatis membranaceis utrinque costa media puberula exclusa glabris; *spiculis* 1-floris laxe paniculatis nunc breviter nunc longe pedunculatis bracteis (paris inter se subæqualibus) ellipticis brevissime acuminatis basi cuneatis glabris; *bracteolis* anguste lineari-lanceolatis longe acuminatis; *calycis* segmentis bracteolis brevioribus lineari-lanceolatis acuminatis ciliatis; *corollæ* tubo cylindrico glabro quam labia breviore labio antico 3-dentato postico amplo ovato apice minute 2-denticulato; *staminibus* exsertis antherarum loculis optime discretis.

Java; *Zollinger*, 3189.

Folia 2·5–6 × 1–fere 2 cm.; petioli teneri, summum 2 cm. long. Spicularum pedunculus longior 1-2 vel etiam sed raro usque 3·5 cm. long.; brevis 1–3 mm. long.; inflorescentiæ bracteæ filiformes, 2–3 mm. long. Spicularum bracteæ circa 8 × 4·5 mm. Bracteolæ 3·5 mm., calyx vix 3 mm. long. Corollæ tubus 5 × 1 mm., labium anticum 4–3 mm., posticum 6·5 × 4 mm. Ovarium glabrum 1 mm., stylus 11 mm. long.

In habitat very much like *D. effusa* Balf. fil. from Socotra.

Hypoëstes (*Apolyton*) **mollior** Clarke MS. in herb. Kew. Verisimiliter *herba*, crebro ramosa; *ramis* prolixis subdistanter foliosis puberulis mox glabrescentibus; *foliis* (altero paris sæpe minori) petiolatis ovatis obtusis basi rotundatis margine repandis membranaceis præsertim in costa centrali pubescentibus dein pilis paucis appressis exemptis glabris; *spiculis* bifloris in axilis solitariis vel 2–3-nis subsessilibus pedunculatisve pedunculis subtiliter fulvo-pubescentibus; *bracteis* ext. inter se liberis oblanceolatis obtusis margine ciliatis dorsoque pilis albis sparsissime obsitis bracteis int. lineari-lanceolatis acuminatis quam exteriores paullo brevioribus; *bracteolis* calycis segmentis similibus eaque circa semiæquantibus; *calycis* segmentis inter se liberis anguste lineari-lanceolatis acuminatis ciliatis; *corollæ* tubo cylindrico quam limbus plane longiore labio antico ovato obtusissimo postico oblongo æquilongo; *filamentis* complanatis glabris; *ovario* superne pubescente; *stylo* breviter exserto puberulo.

Java; *Horsfield*, Acanth. 44 in herbb. Mus. Brit. & Kew.

Folia 2–4·5 × 1·5–3 cm. in sicco griseolo-viridia; petioli 5–10 mm. long., pubescentes. Spicularum pedunculus 1–7 mm. long. Bracteæ ext. 12 mm. long., int. 10 mm. Bracteolæ 4 mm., calyx 7 mm. long. Corollæ tubus 12 mm., labia 8 mm. long. Ovarium oblongum, supre 2 mm. long. Stylus 16 mm. long.

Hypoëstes (*Hemicylindrus*) **psilostachys** Clarke MS. in herb. Kew. *Herba* fere glabra; *foliis* petiolatis (altero paris minori) ovatis acutis breviterve acuminatis basi obtusis vel truncato-rotundatis margine repandis membranaceis costis puberulis exceptis glabris; *spiculis* 2- (casu 3-) floris verisimiliter uno solum maturante in ramos paucos paniculatos unilateraliter florigeros ordinatis; *foliis floralibus* (ad basin spicularum) subulatis minutis; *bracteis* ext. dimidio inf. connatis oblongo-lanceolatis acuminatis carinatis ciliatis bracteis int. ext. similibus nisi paullo minoribus; *bracteolis* lineari-lanceolatis acuminatis calyce brevioribus; *calyce* oblongo-infundibulari triente sup. in lobos lanceolatos acutos ciliatos diviso; *corollæ* bracteas facile superantis tubo cylindrico extus puberulo labio antico obovato quam tubus dimidio longiore postico oblongo sat abbreviato; *filamentis* complanatis puberulis; *stylo* glabro.

Java; *Horsfield*, Acanth. 2 in herbb. Mus. Brit. & Kew (in part.).

Folia majora usque 7–10 × 3–5 cm., minora summum 5 × 3 cm., supra in sicco fusca subtus grisea; petioli 3–10 mm. long. Paniculorum rami plerique 3–6 cm. long., glabri. Folia floralia circa 2 mm. long. Bracteæ ext. 11 mm., int. 10 mm., bracteolæ vix 2 mm. long. Calyx 3 mm. long. Corollæ tubus 10 mm., labium anticum 15 mm., posticum 8 mm. long. Filamenta 11 mm. ultra tubum exserta; anthera anguste oblonga, 2 mm. long. Stylus 22 mm. long.

Allied to *H. laxiflora* Nees.

Hypoëstes (*Hemicylindrus*) **discreta**, sp. nov. Verisimiliter *herba* ramosa glabra ultra bispithamea; *ramis* subteretibus ad nodos tumi-

dulis rarifoliis; *foliis* ovatis acutis basi rotundatis breviterve angustatis integris membranaceis; *spiculis* pedunculatis 1-floris in paniculam laxas folia facile excedentes digestis; *foliis floralibus* minutis subulatis; *bracteis* ext. dimidio inf connatis ovato-oblongis sursum satis longe acuminatis dorso carinulatis bracteis int. lineari-lanceolatis acuminatis quam bracteæ ext. paullo brevioribus; *calycis* segmentis lineari-lanceolatis breviter acuminatis ciliatis; *corollæ* tubo cylindrico quam limbus breviore labio antico ovato 3-lobo postico oblongo longiore; *filamentis* maxime complanatis.

Sumbawa Island; *Zollinger*, 3349.

Folia usque 6 × 2·5 cm., sæpius vero 2·5–3 cm. long., in sicco supra fusca subtus brunneo- vel griseo-viridia; petioli 5–10 mm. long. Paniculæ usque 13 × 12 cm. Folia floralia 1 mm. long. Spicularum pedunculi graciles, 5–15 mm. long. Bracteæ ext. 6 mm. long.; int. 5·5 mm. long. Calycis segmenta 3 mm. long. Corollæ tubus 6 mm. long.; labium anticum 13 mm., posticum circa 9 mm. long. Filamenta 1 mm. lat., ad 10 mm. ex tubo corollæ eminentia; antheræ vix 3 mm. long. Ovarium 2 mm., stylus 14 mm. long.

On a first view this might easily be mistaken for *H. Cumingiana* Benth. & Hook. f. but the spicules and flowers are seen to be very different on examination.

2. Notes from Beddome's Herbarium (South India).

Two species of *Vernonia*, hitherto unidentified, are characterised under the manuscript names given by the collector.

Vernonia (§ *Xipholepis*) **membranacea** Bedd. MS. in herb. Mus. Brit. *Fruticosa*?; *caule* tetragono longitrorsum paucistriato brunneo-pubescente; *foliis* ellipticis breviter acuminatis mucronatis basi in petiolum pubescentem gradatim attenuatis margine crenato-dentatis dentibus induratis membranaceis supra scabriusculis subtus in nervis puberulis; *capitulis* submediocribus circa 16-flosculosis corymbosis, corymbo amplo polycephalo sublaxo minute pubescente folia circiter æquante; *involucri* campanulati puberuli phyllis circa 6-serialibus extimis deminutis bracteasque sparsas pedunculorum propriorum referentibus exterioribus oblongo-lanceolatis appendice nigra filiforme sursum recurva onustis intermediis quam exteriora longioribus intimis acutis omnibus linea media viridi exclusa pallidis; *corollis* exsertis glandulis minutis lucentibus sparsissime inspersis tubo anguste infundibulari lobis oblongo-lanceolatis acutis tubo brevioribus; *achæniis* cylindricis apice truncatis basi callosis sparsim albo-papillosis; *pappi* setis scabriusculis sordide albis ext. paucis quam interiores multo brevioribus.

Nilgiris, Sispara ghat; *Hb. Beddome*, 4200.

Folia in sicco supra olivacea subtus griseo-viridia, usque ad 15 × 6·5 cm. sæpius vero ± 10 × 3·5 cm., summa gradatim minora; petioli ± 1 cm. long. Corymbus circa 12 × 12 cm. Pedunculi proprii tenues, ± 2 cm. long.; horum bracteæ sparsæ, filiformes, 2–4 mm. long. Capitula pansa 1 × 1 cm. Involucri phylla ext. 1·5–2·5 mm., intermedia 3–4 mm., intima 5 mm. long. Corollæ tubus 7 mm., lobi

4 mm. long. Achænia angusta, 2 mm. long. Pappi setæ ext. 1·5 mm. int. 6 mm. long.

Looks a good deal like *V. Dalzelliana* Drumm. & Hutchins., which has larger heads and involucral leaves without the appendage. The affinity is with *V. teres* Wall.

No. 4201 (from Tinnevelly, Attramallay) with somewhat narrower less markedly toothed leaves is conspecific.

Vernonia (§ *Xipholepis*) **recurva** Bedd. MS. in herb. Mus. Brit. *Frutex*? vel *suffrutex*?; caule ascendente tetragono dense brunneo-puboscente tandem glabrescente; *foliis* brevipetiolatis ovatis vel ovato-oblongis acutis breviterve acuminatis mucronulatis basi aliquanto obliquis obtusisque nisi rotundatis margine crenulato-serrulatis membranaceis pag. sup. scabriusculis pag. inf. in nervis minute pubescentibus; *capitulis* submediocribus circa 40-flosculosis in corymbum oligocephalum laxum brunneo-pubescentem folia sæpius excedentem ordinatis; *involucri* campanulati araneosi phyllis circa 6-serialibus oblongo-lanceolatis in appendicem filiformem rigidiusculam reflexam nigram protractis; *corollis* (maturis haud visis) extus minute puberulis; *achæniis* clavato-turbinatis apice truncatis inferne angustatis basi callosis 10-costatis puberulis; *pappi* setis 2-seriabilis scabriusculis stramineis.

Anamallay hills; *Hb. Beddome*, 4208.

Folia pleraque 6–8·5 × 2·5–4 cm., summa vero imminuta, in sicco griseo-viridia; petioli pubescentes ± 5 mm. long. Pedunculi proprii 1–2·5 cm. long. Capitula hucusque haud pansa 12 × 13 mm. Involucri phylla exteriora (appendice exempta) 2 mm. intermedia 3–4·5 mm., intima 6 mm. long., appendices 3–3·5 mm. long., flosculorum vero intimorum abbreviatæ. Achænia usque 2·5 mm. long., superne 1 mm. inferne ·5 mm. lat. Pappi setæ ext. circa 1 mm., int. 5 mm. long.

This is close to *V. peninsularis* Clarke which has glabrous (or almost glabrous) strongly toothed leaves, involucral leaves with shorter patent appendages and different achenes.

No. 4207 (Anamallay hills, 6000 ft.) has somewhat different leaves, but seems to be conspecific. The specimen is in fruit.

Ficus Beddomei King (*Beddome*, 7503, Tinnevelly hills). King (Monogr. 26 and Hook. Fl. Brit. Ind. 503) gives about ½ in. for the length of the stipules (as a fact, the Kew specimen has them only ¼ in. long), while those of the Museum specimen are but little short of 2½ in. Several years after the publication of *F. Beddomei* Bourdillon described a Travancore fig (a specimen is in herb. Kew) under the name *F. Rama-Varmæ*, which he afterwards recognised (ex litt. in herb. Kew) as conspecific with *F. Beddomei*. The chief point of interest here is that *F. Rama-Varmæ* has the long stipules of Beddome's Museum specimen.

F. travancorica King (*Beddome*, 7509, N. Travancore). King gives about 1 in. for the length of the stipules. The Museum specimen has them full grown and not less than 4 in. long.

Ficus (§ *Sycidium*) **smaragdina**, sp. nov. *Frutex*?; *ramulis* gracilibus (circa 3 mm. diam.) scabriusculis cortice brunneo sulcato obductis; *foliis* longipetiolatis obovatis cuspidato-acuminatis apice

obtusis basi rotundatis brevissimeque peltatis margine undulatis trinervibus (nervis inter se inæquilongis 2–4 cm. ex basi progredientibus) firme membranaceis supra glabris subtus scabriusculis in sicco luteo viridibus costis lat. utrinque 8–9 aperte arcuatis pagina utravis eminentibus perpaucis interjectis minoris valoris reticulo laxo; *stipulis* lanceolatis acutis dorso scabriusculis; *receptaculis* (adhuc crudis) parvis axillaribus solitariis (anne semper?) pedunculo tenui scabriusculo impositis turbinatis tesselatis osteolo prominente; *floribus* ♀ sessilibus; *calycis* alte partiti segmentis plerumque 2 oblongis bifidis vel bipartitis ovarium breviter superantibus; *ovario* sessili globoso; *stylo* laterali ovarium excedente puberulo. Reliqua desunt.

Tenasserim; *Hb. Beddome*, 7489.

Folia 16–17 × 8–8·5 cm.; acumen circa 7 mm. long.; petioli graciles, basi apiceque paullulum dilatati, 5–8 cm. long. Stipulæ 6–8 mm. long. Receptacula 5 × 3 mm., horum pedunculus 7–8 mm. long. Calyx 1 mm. long. vel paullulum magis, hujus segmenta sæpe inæquilonga. Ovarium ·5–·75 mm. long. Stylus 1·25 mm. long.

The affinity seems to be with *F. quercifolia* Roxb. and *F. heterophylla* Linn. f., but with several differences in foliage and receptacles. In the absence of ♂ and gall flowers, it is on account of this apparent affinity that the § *Sycidium* is presumed to be the proper place for the species.

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

Some New South African Plants.

By R. D'O. Good, B.A., F.L.S.

The following new species are described from material presented by Dr. C. E. Moss, of the University of the Witwatersrand, Johannesburg, to the Herbarium of the British Museum, where the type-specimens are to be seen.

Campanulaceæ (*Lobelioideæ*).

Mezleria quadrisepala, sp. nov.

Herba parva glabra adpressa; *foliis* minutis alternatis vel suboppositis subsessilibus integris anguste spathulatis obtusis utrinque glabris; *floribus* pedunculatis solitariis in axillis foliorum; *pedunculo* basi petiolo coalato; *calyce* 4-mero, lobis triangularibus acutis, lobo abaxiale egente; *corollæ* lobis patentibus reflexis linearibus acutis, 3-adaxialibus basi glandula lunata præditis; *filamentis* brevibus, antheris imparibus curvatis; *capsula* in sectione transversale elliptica; *seminibus* numerosis subtriangularibus brunneo-nigris.

Hab. "Dry bed of Reit Vlei, near Tygenberg, Cape Province. Feb. 1924." C. E. Moss, 8798.

A tiny appressed herb with branches 3 to 5 cm. long. Leaves up to 2 by 4 mm. Peduncles varying in length, but usually about the same length as the leaves. Flowers 3 mm. across, crowded towards the younger parts of the branches.

This plant is in habit and structure very closely related to *Mezleria depressa* Presl, but as its name indicates differs from that plant (and, as far as I am aware, from all other *Lobelieæ*) in having only four calyx-lobes. More remarkable still, the four lobes are not in contact to form a complete ring, but there is a very conspicuous gap where the fifth lobe should be.

Apart from this one character there seem no others which distinguish the plant from *M. depressa*, and the most simple interpretation seems to be that *M. quadrisepala* is a new species which has arisen by a single mutation from *M. depressa*.

Labiatæ (*Ocimoideæ*).

Orthosiphon tubiformis, sp. nov.

Herba erecta pilosa perennis; *foliis* decussatis breviter petiolatis ellipticis acutis ovatis dentatis ad basin cuneatis utrinque aspere et dense hispidis infra nervis dense prominentissimeque reticulatis; *cymis* 1- vel 2-floris; *bracteis* parvis ovatis acutis hispidis; *floribus* longipedicellatis; *calycis* tubo anguste campanulato extus et intus breviter piloso, dentibus imparibus, supero ovato acuto, reliquis setaceis, inferioribus longioribus; *corolla* extus pilosa, tubo longissimo, labiis parvis, labio supero erecto trilobo lobo medio truncato lobis lateralibus rotundatis, labio infero carinato; *staminibus* exsertis, filamentis basi libris.

Hab. "Lydenburg division, Transvaal, 3500 ft. Dec. 1919." Rogers, 25014.

Internodes 2–2·5 cm. long, petioles 2–3 mm. long, leaves up to 2 by 1·25 cm. Flowering calyx-tube 1 cm. long, pedicel about the same length. Lower teeth 5 mm. long. Corolla-tube 3 cm. long, upper lip 7 mm., lower lip 5 mm. long. Calyx 10-nerved, upper lip purple.

Near *O. Liebrechtsianus* Briq., but a larger plant with much longer corollas and harshly hispid leaves.

Orthosiphon messinensis, sp. nov.

Suffrutex erectus, ramulis senioribus exceptis, dense et minute stellate pubescens; *ramulis* junioribus brevibus dense foliosis; *foliis* subsessilibus anguste ellipticis subacutis integris crassis supra viridibus infra pallidioribus utrinque minute stellate pubescentibus; *cymis* sessilibus unifloris; *bracteis* ovatis acutis caducis; *floribus* brevipedicellatis; *calyce* campanulato stellate pubescente dente infero rotundato ovato, dentibus reliquis setaceis inferioribus longioribus; *corollæ* tubo hypocrateriforme labio supero minute 4-lobo lobis rotundatis, labio infero magno rotundato leviter carinato ad basin valde constricto; *staminibus* exsertis.

Hab. "Messina, Transvaal. Nov. 1917." Moss and Rogers, 153.

Leaves up to 1·5 by ·7 cm. Pedicels 2–3 mm. Calyx in flower 1·5 mm. long, corolla-tube 8 mm. long, 4 mm. broad at the mouth, lower lip 3–4 mm. long.

This species is very near *O. subvelutinus* Guerke, but differs in the flat leaves, the stellate pubescence, and the size and shape of the lower lip of the corolla.

Orthosiphon Mossianus, sp. nov.

Suffrutex leviter pilosus; *ramulis* 4-striatis; *foliis* decussatis petiolatis anguste linearibus lanceolatis acutis dentatis basi cuneatis supra leviter pilosis infra nervis pilosis; *inflorescentia* ramosa racemosa; *cymis* 3-floris sessilibus; *bracteis* minutis; *floribus* pedicellatis; *calycis* tubo campanulato extus piloso accrescente, dente supero rotundato latissimo, dentibus reliquis setaceis inferioribus longioribus; *corollæ* tubo extus piloso inferne angusto superne expanso, labio supero parvo erecto 4-lobo lobis lateralibus minutis, labio infero rotundato concavo ad basin constricto; *staminibus* exsertis.

Hab. "Messina, Transvaal. Nov. 1917." Moss and Rogers, 193.

Pedicels 2–3 mm. Leaves up to 5 by 1 cm., calyx-tube in flower 3–4 mm. Corolla-tube about 1 cm. long, 3–4 mm. wide at the mouth, lower lip 2 mm. across.

Near *O. iodocalyx* Briq., but differs in the narrower dentate pilose leaves and the broadly rounded upper calyx-lobe.

Some Overlooked Species of *Oxalis*.

By A. W. Exell, B.A., F.L.S.

Mr. T. A. Sprague has kindly drawn my attention to four species of *Oxalis*, described by G. Don, Gen. Syst. i. (1831), which are not recorded in the Kew Index, and have apparently been overlooked. They are:—

1. *O. leptophylla* G. Don, Gen. Syst. i. 756. no. 40. Herb. Lambert, Chili.
2. *O. minima* Ruiz & Pav., ex G. Don, *loc. cit.* 760. no. 114. Peru.
3. *O. villosa* G. Don, *loc. cit.* 762. no. 141. Mexico.
4. *O. biloba* G. Don, *loc. cit.* 760. no. 109. Peru.

The types of the first three have been identified in the British Museum Herbarium, and the short descriptions given by G. Don are here amplified and some changes of nomenclature necessitated by the discovery of these names are indicated.

1. O. leptophylla G. Don. *Suffrutex* erectus, pubescens; *foliis* trifoliolatis, petiolatis, petiolo terete pubescente, foliolis lateralibus subsessilibus lanceolatis apice emarginato, foliolo terminale petiolato lanceolato apice obtuso, lamina utrinque subtilissime griseo-pubescente, costa media supra insculpta infra prominente; *pedunculis* axillaribus pubescentibus uni- vel bifloris; *pedicellis* pubescentibus quam petala brevioribus.

Petiole 10 mm. long; *lateral leaflets* 8–10 mm. × 3–3·5 mm.; *petiolule of terminal leaflet* 3 mm. long; *terminal leaflet* 15–17 mm. × 4–5 mm.; *peduncle* 12–16 mm. long; *pedicels* 2–3 mm. long; *calyx* 4–5 mm. long; *corolla* (dried) 7 mm. long.

O. radicans Ruiz & Pav. MSS. in Herb. Lambert in Herb. Mus. Brit. Chili.

The species is easily recognizable by the sessile, emarginate, lateral leaflets and the obtuse terminal leaflet on a slender petiolule.

2. O. minima Ruiz & Pav., ex G. Don. *Herba* parva acaulis bulbosa; *bulbis* squamosis, squamis marginatis; *foliis* trifoliolatis longipetiolatis, petiolo glabro, foliolis sessilibus obcordulatis utrinque microscopice pubescentibus; *pedunculis* unifloris, quam petioli brevioribus, superne leviter incrassatis, bracteis ovatis calyci approximatis; *sepalis* ovatis, glabris; *petalis* verosimiliter purpureis calyce ter longioribus.

Bulb about 9 × 7 mm.; *petiole* 2·5–4 cm. long; *leaflets* 4–6 mm. long × 6–10 mm. broad; *peduncle* 15–20 mm. long; *sepals* 3–4 × 1·5–2 mm.; *corolla* 11 mm. long.

This species is near to *O. eriolepis* Wedd., but may be easily distinguished by the position of the bracts close beneath the calyx and by the stouter peduncles.

This anticipates the name *O. minima* De Wild. in Fedde Report, xi. (1913) 542.

3. O. villosa G. Don. This remarkable North American species, with simple leaves, usually apiculate at the emarginate apex, was re-described by Asa Gray under the name *O. dichondræfolia* (Plantæ Wrightianæ, part i. (1852) 27). A co-type of this (Wright, no. 74) is in the British Museum Herbarium, and there is no doubt that it is conspecific with *O. villosa* G. Don.

The name *O. villosa* was first used by Bieberstein (Fl. Taur. Cauc. i. (1808) 355). His species was kept up by De Candolle (Prodr. i. (1824) 692), but G. Don, Gen. Syst. i. (1831) 757. no. 68, considered it to be a variety of *O. corniculata* L., and this appears to be the opinion of most subsequent writers. Thus, according to the present rules of nomenclature, *O. dichondræfolia* A. Gray must become *O. villosa* G. Don.

Two later writers have described plants under the name *O. villosa*: (1) A. Progel, Mart. Fl. Bras. xii. ii. (1872–75) 495, a Brazilian species, related to *O. corniculata* L., of which I have seen no specimen; (2) J. G. Baker, Journ. Linn. Soc., Bot. xx. (1883) 112, a species from Madagascar, which may be re-named:—

Oxalis Bakeriana, comb. nov. *O. villosa* Baker, *loc. cit.*, nec *O. villosa* Bieb., nec *O. villosa* G. Don, nec *O. villosa* Progel, Baron, no. 1801, Herb. Kew et Herb. Mus. Brit. Central Madagascar.

Illigera vespertilio Bak. fil., comb. nov.

Dioscorea vespertilio Bentham is diagnosed in the Niger Flora, 538 (1848) as follows:—"Glaberrima, foliis trisectis segmentis petiolulatis obovali-oblongis obtusissimis subcoriaceis nitidis, fructus alis 2 latissime expansis transverse ovato-oblongis rigide membranaceis, tertia angustissima v. costæformi.—Sierra Leone, *Don*; a single specimen, in leaf, with a few loose fruits."

The type, which is in the British Museum Herbarium, is undoubtedly *Illigera pentaphylla* Welw. in Trans. Linn. Soc. xxvii. 26 (1869). The genus *Illigera* was included by Bentham & Hooker in Combretaceæ, but is referred in Engler's recent *System* to Hernandiaceæ. The species must bear the name *Illigera vespertilio*.—E. G. Baker.

ABSTRACTS OF PAPERS ON BRITISH PLANTS.

FESTUCA OVINA L. AND ITS SEGREGATES (Journ. Linn. Soc. (Bot.) xlvii. pp. 29–39, 1925). The present article is upon the same lines as Mr. W. O. Howarth's former paper on *F. rubra* (op. cit. xlvi. 1924), and all the British material available has been sorted out in the light of Hackel's *Monograph Festuc.* (1882), the specimens have been carefully examined, and detailed descriptions (amended from the original, where thought necessary) given of all the British forms.

These fall under Hackel's subsp. *eu-ovina* and are his vars. *capillata*, *vulgaris*, *supina*, *duriuscula*, and *glauca*. The corresponding names adopted by Mr. Howarth (and he states that the plants are sufficiently distinct to be recognized as true species) are:—1, *F. capillata* Lam.; 2, *F. ovina* L. sens. strict.; 3, *F. supina* Schur; 4, *F. longifolia* Thuill. emend. Howarth; 5, *F. glauca* Lam. For sp. 4, the name *duriuscula* cannot be retained, as the author has shown (*op. cit.* xlvi. 325) that Linnæus's *duriuscula* is a form of *rubra*, and not *ovina*. One cannot, however, commend the clumsy name adopted in its place under a system of nomenclature that has been commented upon in Rep. B. E. C. 1922, 641.

A good key is given of the five species, and various varieties and forms are described under them.

As regards distribution, so far as the author's investigations have gone, *F. capillata* and *F. ovina* are widely spread in this country; *F. supina*, noted only from one Scottish county (v.c. 92); *F. longifolia*, rare and only in Wales and the southern half of England; *F. glauca*, type not known in Britain, except cultivated, and its var. *cæsia* (Sm.) only in v.c.s 6, 26, 34, and 56. It is exceedingly doubtful whether *longifolia*, *glauca* (and var. *cæsia*), are indigenous; the two former are cultivated.

Valuable comparative distinctions between forms of *F. ovina* and those of *F. rubra* are given with text-figures of ligules and sections of radical leaves; the author lays great stress upon the latter as affording important specific characters.

C. E. S. & E. G. B.

FLORA OF PEEBLESSHIRE. (History of Peeblesshire, vol. i. chap. x., Botany.) Mr. F. R. S. Balfour, F.L.S., gives an interesting account of the flora of Peeblesshire, including the ferns, mosses, hepaticæ, and fungi.

The geological formation of the county is uniformly upper and lower silurian. In the north of the county, where Peeblesshire and Midlothian meet, there are some old red sandstone and limestone formations, and their influence may be noticed in the occurrence of a few of the rarer species.

It will come as a surprise to many to learn that the county lacks about one hundred and twelve native plants common to almost every part of the British Isles. Among the conspicuous absentees are:—the yellow water-lily, cowslip, bog-myrtle, and bullrush. The most conspicuous wild flower in the county is perhaps the foxglove, and the higher hills are well furnished with the usual Scottish upland plants:—common heather, bell-heather, common blueberry, cowberry, and the black crowberry.

Among the rarer plants we note: the maiden pink (*Dianthus deltoides* L.) found in 1917, by Lady Glenconner, in the park at Glen, which in previous years had been mown; the handsome vetch (*Vicia Orobus* DC.), first found by Robert Morgan near West Linton many years ago; the very rare *Saxifraga Hirculus* L., discovered by Dr. Hunter nearly a hundred years ago, and seen later in one locality on the north-west boundary of the county; and the rare umbellifer, *Meum athamanticum* Jacq., found above Newlands. *Scrophularia alata* Gilib. has recently been added to the county flora by Mr. Templeman, who found it at Spitalhaugh.

Among the rarer ferns, we note the filmy fern (*Hymenophyllum unilaterale* Willd.) and the very rare forked spleenwort (*Asplenium septentrionale* Hoffm.).

The alien flora of Tweedside has been exhaustively dealt with by Miss I. M. Hayward and Dr. G. Claridge Druce in their joint work published in 1919. They record the astonishing number of 348 species of adventitious plants, all of which owe their origin to seeds which found their way from the effluence of the woollen mills.

There is also an interesting account of the trees of the county, and it will be seen that many of the commoner trees, both wild and cultivated, attain to large dimensions in this cold region, but there are many species reaching great perfection in south Britain which hardly survive in Peeblesshire, *e. g.*, the London plane (*Platanus acerifolia* Ait.) or the tulip-tree (*Liriodendron tulipifera* L.).

It would have been helpful to plant-geographers if the "additions to the previously recorded species" had been definitely enumerated. The following would appear to come under this category—possibly, others also:—*Teesdalia nudicaulis*, *Genista anglica*, *Sedum villosum*, *Saxifraga oppositifolia*, *Lobelia Dortmanna*, *Vaccinium uliginosum*, *V. Oxycoccos*, *Habenaria viridis*, *Cystopteris fragilis*, *Asplenium septentrionale*, and *Phegopteris polypodioides*.

Carex paradoxa is a remarkable addition to the flora of Scotland. Hitherto it has not been reported further north than Yorkshire. *Alchemilla alpestris* seems a queer "weed in the garden at Dawyck and, undoubtedly, elsewhere." No localities are given for *Asperula taurina* and *Poa alpina*. Is it possible that these are too frequent in the county to need detailed stations? The record "*Myrica Gale*. Introduced?" seems strange when the plant occurs as a native in all the bordering counties.

An index would have been a very useful addition to this little Flora. E. G. B. & C. E. S.

NEW COUNTY RECORDS (*The Vasculum*, Jan. 1925).—J. W. H. Harrison reports the following species additional to v.c. 68, Northumberland north (Cheviotland):—*Ranunculus Baudotii*, *Vicia tetrasperma*, *Epilobium roseum*, and *Typha angustifolia*.

E. G. B. & C. E. S.

NOTES ON BRITISH PLANTS.

Ledum palustre in Britain.

Mr. Bennett's note on this species in last month's *Journal of Botany* prompts me to offer a word on a bush of *Ledum* growing wild in the middle of Soyland Moor. The spot is precisely on the line dividing Lancashire and Yorkshire. Soyland Moor is at the summit of Blackstone Edge, ten miles from Oldham, and between Rochdale and Halifax. This moor is a level plateau lying about 1600 feet above sea-level. The soil is peat of remarkable purity, and the flora consists of *Empetrum* and *Eriophorum* with a very little *Vaccinium Myrtillus*. Personally, I have never seen *Calluna*, *Erica*, *Vaccinium Vitis-idæa*, or *Rubus Chamæmorus* on this moor, although on certain parts of the Pennine plateaus, within a few miles of Soyland, all are in places abundant.

The history of the *Ledum* is rather obscure. It was first noticed by Mr. Fred Taylor, of Oldham, in or about 1917, being then obviously many years old, but not in flower. Specimens were collected, which seem to have passed from hand to hand until they reached the Botanical Department of Manchester University. Mr. Taylor was told that the shrub was the "Labrador Tea Plant," and this name is now current amongst the field-naturalists of Oldham and Rochdale.

Up to 1909 I was very familiar with the Blackstone Edge moors, and had even on Soyland Moor made many rough surveys of the plant association. This bush of *Ledum* may have been in existence then, and would easily pass unnoticed; indeed, to-day, although a yard in diameter, the bush is difficult to find, and is often missed by experienced botanists already acquainted with the station.

Mr. Taylor tells me that the plant has flowered only once. Unfortunately, he either has no notes, or has lost the records if any were made. Certainly the bush flowered most copiously one year. Specimens were collected and pressed, and a good photograph was taken. Unfortunately, neither photographs nor specimens are forthcoming at the moment; but Mr. Bennett's note is leading to some action so far as the searching of records is concerned.

From 1909 to 1919 I was away from Lancashire, but late in the summer of 1919 I accompanied Mr. Taylor to Blackstone Edge, and then I heard of this bush of "Labrador Tea." The plant was hard to locate. It is in the middle of a flat swampy waste of cotton-grass, perhaps half-a-mile from the road, with neither rocks nor other prominent bushes for landmarks. The bush was then not in flower.

I suspected that it was *Ledum palustre*, and, if so, a most likely native of such great moors as these. At that time I had no idea that *palustre* had ever been reported for these islands; but it seems a likely native. I sent foliage-specimens to Mr. James Groves, who seemed to agree with me that the plant was really *palustre* and not *latifolium*, but he looked forward to having better material. Since 1919 the bush has never flowered. Quite by chance Mr. Taylor mentioned to me last night that he had made a special visit to the *Ledum* a day or two ago, finding no sign of flower-buds; and the plant seemed to be sinking deeper into the marsh. It was still about a yard in diameter, but he thought not a foot high—which was the height I remember on our visit last year.

Early in 1924 I encountered Mr. Bennett's article (Journ. Bot. 1894). At once I secured leafy sprays of the shrub, but could make nothing of them. I sent specimens to Kew, and the reply was: "Probably *latifolium*, but it is not possible to be certain from the material sent." Apparently, from my reading of Mr. Bennett's present note, it does not much matter whether this Blackstone Edge plant is *palustre* or *latifolium*; I did not know previously that *latifolium* occurred in Europe.

To those who know these moors, any human origin for this plant, either direct or indirect, is incredible. The nearest house is a full mile away—the lonely "White House Inn." One has to go farther still for the first farm-land, and there is no farming or sheep-grazing—no fences, bushes, no grass, hardly any stone. Once (actually on Soyland Moor) we walked in a straight line looking for forms of life. Excluding algæ, we saw nothing alive but *Empetrum* and *Eriophorum* for a space of 22 minutes' hard walking—not an insect or a bird, no distant trees, not even a wall as evidence of human life—and we could see for miles. But this, of course, was a selected stretch of monotony, just to see what could be done. In early summer these moors may be alive with nesting birds. Such well-known migrants as Dunlin and Golden Plover breed here, and there are several large colonies of Black-headed Gulls. Personally, I suspect the agency of birds as explanation for this Soyland shrub of *Ledum*. I might add that we all think here that this lonely bush should be molested as little as possible. During the year when it flowered so copiously no doubt seeds were produced, but we have not yet seen new plants. Our local naturalists quite rightly dislike the idea of specimens of foliage being gathered.

Fredk. J. Stubbs.

Monœcious Form of *Mercurialis perennis* L.

At the Quell, Blackdown, Sussex (near Haslemere, Surrey), on March 14th last, I gathered two specimens (probably growing from the same root) of *Mercurialis perennis* which, though chiefly female, bore each a few male flowers. Similar monœcious specimens were recorded by the late James Saunders, of Luton (Journ. Bot. 1883, 181), and by Colonel Woolley-Dod (*op. cit.* 1895, 185), in each case without the station being mentioned. Mr. Saunders's locality does not now appear to be traceable. Colonel Woolley-Dod tells me that the plants he recorded were from near Kidnal (Malpas), Cheshire; specimens were distributed (from Edge Woods, Cheshire) through the Botanical Exchange Club (see Report for 1899, 612). He also writes (May 6) that he has this year found a few plants in a wood near Mayfield, Sussex, and that "So far as I could see they all grew from the same root, but I could not make quite certain of this. The cluster of plants contained male, female, and mixed sex specimens more or less indiscriminately mixed. One or two pieces came up by the roots, and I am growing them in my garden to see if the form is permanent. Two of the specimens might be called female plants with one or two male flowers; the third is male with a female flower or two."

The late Rev. W. R. Linton (*Flora of Derbyshire*, 257) records this monœcious form from Shirley, Cabley, and near Roston, and there are also specimens in the British Museum Herbarium, collected by him at Marston Montgomery, in the same county. The British Museum also has two specimens collected by the Rev. Hugh Davies (1739–1821) probably in Anglesea. Davies, in his *Welsh Botanology* (Part i. Syst. Cat. Pl. Anglesey, 1813, 95), wrote: "I have seen this species quite monœcious in considerable plenty, with the seeds perfected." Mr. Saunders, in the note referred to above, also recorded a form with hermaphrodite flowers, but I am informed that neither of this nor of the monœcious form, are true specimens in his herbarium.

I. A. Williams.

Parnassia palustris in Inland Cheshire.—*Parnassia palustris* L. is a rare plant in inland Cheshire, and has not so far been recorded for the Nantwich Hundred, while in the adjoining Broxton Hundred it has become extinct through improved drainage (De Tabley, Fl. Chesh. 143). I came across six plants spread over a large area in meadows by the Weaver, three miles south of Nantwich. Although fifty yards from the river, these plants would be covered by three feet of water during an average winter flood. Since the discovery the meadow has been subjected to further drainage, so the plant may become extinct here as in the Broxton Hundred. Search for it on the numerous "mosses" of the district was unsuccessful.

N. Woodhead.

OBITUARY.

James Saunders, 1839–1925.

James Saunders, A.L.S., was born in Salisbury, March 30, 1839. He took up first the profession of teaching, but at the age of twenty he moved to Luton, and entered business as a straw hat and bonnet manufacturer; he retained an interest in this industry to within a few years of his death. From a youth he was devoted to natural history, and gradually acquired a good knowledge of English wild flowers, as well as of the mosses, liverworts, and Characeæ of the district in which he lived. He was much interested in geology, and soon after his arrival in Luton had special opportunities for studying the relations of various strata from the extension of the Great Northern and Midland Railways into Bedfordshire. The collection of fossils he made from the fresh cuttings are now preserved in the Geological Museum in Jermyn Street. Later, in association with Mr. John Hopkinson, he prepared the account of the geology of Bedfordshire for the volume of the Victoria History dealing with the county; this was published in 1904. About the year 1891, Mr. Saunders was introduced to the study of the Mycetozoa; he began at once to search for specimens, and to make a study of the habitats and distribution of the different species in Bedfordshire, Huntingdonshire, and Buckinghamshire. He was working as a pioneer in these counties, and the valuable results he obtained he published in a series of articles contributed to the *Journal of Botany* and other magazines. He carried on a correspondence on

the subject of Mycetozoa for many years with the late Arthur Lister, F.R.S., or with his daughter, with whom his specimens and field-notes were freely shared. His industry and accuracy enabled him to obtain a grasp of every subject he investigated; he was eager to impart to others the pleasure he gained from the study of Nature. Often, after a week of hard work at business, he would spend part of his Sunday holiday in giving an address either in Luton or to some village audience, his text being supplied by a flower or other natural object. For thirteen years Mr. Saunders served on the Libraries Committee of the Luton Town Council, where his cultivated mind and wide knowledge made him a valued member. For his distinguished service to botanical science he was elected an Associate of the Linnean Society in February 1900. He died at Luton, April 17, 1925, at the age of eighty-six, deeply respected by all who knew him.

G. Lister.

The following bibliography has been prepared by Mr. Alfred Kench, of the Department of Botany, British Museum:—

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Flora of South Bedfordshire. *Journal of Botany*, 1883. Notes on the Flora of the County occur in the same *Journal* in 1884, 1886, 1889, 1890, and 1897.

Buckinghamshire Plants. *Journ. Bot.* 1884, 1889, and 1890.

Drosera anglica in Hants. *Ibid.* 1890 and 1899.

South Wiltshire Mosses. *Ibid.* 1892.

Notes on North Norfolk Plants. *Ibid.* 1899.

The Mycetozoa of S. Beds and N. Herts. *Ibid.* 1893.

Mycetozoa of the S. Midlands. *Ibid.* 1900 and 1906.

Mycetozoa of Bedfordshire. *Ibid.* 1919.

Further Notes on the Mycetozoa, with a List of Species from Herts, Beds, and Bucks. *Trans. & Proc. Herts Nat. Hist. Soc.* 1895.

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The Distribution of the Mycetozoa in the S. Midlands. *Ibid.* 1911.

Lichens, Fungi, and Mycetozoa of St. Albans and Neighbourhood. *Ibid.*

Notes on the Mycetozoa, with a List of Species from Herts and Beds. *Proc. Herts Nat. Hist. Soc.* 1893.

Alteration in Flora of Totternhoe caused by draining. *Ibid.* 1908.

Notes on the Characeæ, with a List of Species from the South Midlands. *Trans. Herts Nat. Hist. Soc.* 1896.

Notes on some Plants collected in Hertfordshire by Miss Maria Ransom, 1838–40. *Ibid.*

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Botanical Notes from South Beds. *Midland Naturalist*, 1880–1889, 1891, 1892.
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Pinguicula vulgaris in S. Beds. *Ibid.* 1887.
Mycetozoa of Hertfordshire. *The Victoria History of the County of Hertford*, i. 1902.
Cryptogams of Bedfordshire. *The Victoria History of the County of Bedford*, i. 1904.
The Lichens of Bedfordshire. (Revised by E. M. Holmes). *Ibid.*
Mycetozoa or Myxomycetes of Bedfordshire. *Ibid.*
Mycetozoa of Buckinghamshire. *The Victoria History of the County of Buckingham*, i. 1905.

Mr. Saunders also communicated notes to *Science Gossip*, *Nature Notes*, and the *Selborne Magazine*.

John Durbin Gray, M.A.

John Durbin Gray was a botanist who collected a very good British herbarium, which was deposited in the Cambridge University Museum in 1909, the result of many years' labour. He was M.A. of Clare Coll., Cambridge, ordained deacon in 1872, and, after holding curacies, became Vicar of Nayland, Suffolk, in 1879, where he remained till 1909, when he resigned and went to live at St. Leonards, where he remained till his death on March 27, 1925. He made, too, a large and important collection of stone implements, Palæolithic and Neolithic, which was also given to the Cambridge University Museum. He died on the 27th March last in his 80th year, and was buried at Nayland.

E. F. Linton.

SHORT NOTES.

Endemic Plants. In a paper on the distribution of plants, published in the *Annals of Botany*, vol. xxvii. 3 (1923), I pointed out that the name *endemic* had been used to cover two distinct classes of plants, and that this had led to some confusion. The word is commonly used to describe any species or genus confined to a limited area. Such plants are either evolved from allied species in the locality in which they occur and which have failed to spread further—for these I retain the name *endemic*, which signifies those who live with their own people; or they are species which are the survivals of a lost flora—for these I propose the name *Epibiotics*, which signifies survivors.

There is little difficulty in separating these two classes of plants, as an endemic will be found to have closely-allied species in or close to its area, whence it has been evolved, while the epibiotic has no relations existing or within its area.

The various narrowly-localised species of *Saxifraga*, *Ranunculus*, *Anemone*, etc. in Europe would be classed as endemics; while such plants as *Aphyllanthes monspeliensis*, *Borderea* (the Pyrenean Dioscoreacea), the Gesneraceæ of the Pyrenees and Balkans—relics of a long-lost flora—would be classed as epibiotics.

The case of the plants of Christmas Island is rather peculiar, as there is rarely more than one species of each genus, but we know that Christmas Island was never attached to the mainland, but that the endemic species were brought by sea, wind, and birds from Java, and were later so modified as to form distinct species. These are true endemics.

In many large genera we find both forms, e. g. *Anemone baldensis* is of so limited an area that it may be classed as an endemic living, so to say, among other Anemones, but *Anemone sumatrana* of Sumatra and the Malay Peninsula, the survivor of a formerly extensive but now almost entirely lost flora, is an epibiotic.—H. N. Ridley.

Chara macropogon Braun in South Africa. In vol. lvii. of this *Journal* (1919), p. 126, in a note on the genus *Lychnothamnus*, I referred to a Charophyte which had for some years past been cultivated in a jar in the Department of Botany of the British Museum, having come up from dried mud which had been sent over many years before from Port Elizabeth, Cape Colony, for the purpose of investigating the Entomostraca. I referred the plant at the time to *Chara macropogon* of Braun (which that author had subsequently placed in the genus *Lychnothamnus*), but in the absence of mature fruit felt there was just an element of doubt as to its identity.

Miss Edith Stephens, of Cape Town University, who has for the last few years been actively engaged in the investigation of the rich Charophyte flora of South Africa, has been successful in finding the plant *in situ* in several localities in the same district, and the excellent specimens in ripe fruit which she has sent me have enabled me not only to verify the determination, but to confirm the opinion that the species must be reinstated in the genus *Chara*.—James Groves.

Barbarea Barbareæ. The earliest binary combination for *Barbarea plantaginea* DC. (Syst. ii. 208: 1821) is *Sisymbrium Barbareæ* L. (Sp. Pl. ed. 2, 921: 1763). Hence, under International Rules, Art. 48, the species should be called Barbarea Barbareæ (L.), comb. nov. As the trivial name *Barbareæ* does not merely repeat the generic name *Barbarea*, the combination is not a tautonym. It falls into the same category, more or less, as *Bambusa bambos*, *Sesbania sesban*, and *Silaum Silaus*, which are regarded as valid by Druce, Merrill, Fawcett & Rendle, and Schinz & Thellung. The next binominal in chronological order is *Erysimum orientale* Mill. Gard. Dict. ed. 8, no. 4 (1768), which, like *Sisymbrium Barbareæ*, was based on *Sisymbrium orientale, Barbareæ facie, Plantaginis folio* Tourn. In the Index Kewensis *E. orientale* Mill. was erroneously reduced to *Conringia orientalis*, doubtless owing to confusion with *E. orientale* Crantz Class. Crucif. 116 (1769); Ait. Hort. Kew. ed. 2, iv. 117 (1812). The synonymy of *B. Barbareæ* is as follows:—

Barbarea Barbareæ (L.), comb. nov.—*Sisymbrium Barbareæ* L. Sp. Pl. ed. 2, 921 (1763). *Erysimum orientale* Mill. Gard. Dict.

ed. 8, no. 4 (1768). *Barbarea plantaginea* DC. Syst. ii. 208 (1821); Deless. Ic. ii. 7, t. 19 (1823); Boiss. Fl. Or. i. 183 (1867), Post Fl. Syria, 64 (1896); Bornm. in Beih. Bot. Centralbl. xix. II. 204 (1906). *Erysimum Barbarea* var. γ L. Sp. Pl. ed. 1, 660 (1753). *Sisymbrium orientale, Barbareæ facie, Plantaginis folio* Tourn. Cor. 16 (1719).—T. A. SPRAGUE.

REVIEWS.

A Monograph of the Mycetozoa. A Descriptive Catalogue of the Species in the Herbarium of the British Museum. By ARTHUR LISTER, F.R.S. Third edition, revised by GULIELMA LISTER, F.L.S. 8vo, pp. xxxii, 296, with frontispiece, 222 plates (part coloured), and 56 woodcuts in text. Trustees of British Museum. London, 1925. Price £1 11*s.* 6*d.* net.

STUDENTS of the Mycetozoa have been looking for a new edition of this classical work; the second edition, of 1911, was exhausted, and interest in the study of the group has greatly increased in the intervening years.

The new edition embodies the latest observations and the most up-to-date classification and nomenclature. During the past fourteen years our knowledge has increased to the extent of 3 new genera, 46 new species, and over 50 new varieties; of the new species eleven were first discovered in Great Britain, thirteen in America, and eleven in Switzerland.

The introduction has been in part re-written, and now contains a more detailed account of the life-history of the higher Mycetozoa; and paragraphs have been added dealing with spore-formation, distribution and characteristics, the more usual habitats, and hints on collecting and mounting.

A useful bibliography subjoined to the introduction refers the student to works of fuller detail on points that may interest him. The glossary has been made more complete, and the inclusion of the etymology of names in the descriptive text is a useful addition.

Among the changes introduced in the new edition we note that some varieties have been raised to specific rank, e. g. *Physarum sessile, rigidum* and *montanum, Diderma deplanatum, Comatricha tenerrima*; others, that were thought to be distinct species, appear in the light of present-day knowledge to have been previously described under other names, e. g. *Physarum columbinum, confertum, Famintzini*, and *Didymium vaccinum*; while others have been recognized as mere varieties of existing species, e. g. *Badhamia orbiculata, Physarum Bethelii*, and *Diachea splendens*. Much new light has been thrown on *Lamproderma atrosporum* and *Columbinum* and their bewildering varieties.

The general production of the book reflects credit on all concerned, and we have few criticisms to offer. Typographical errors are surprisingly few, but there seems to be some confusion as to whether *Physarum leucophæum* is a subspecies (*cf.* pl. 38) or a variety (*cf.* p. 47) of *Physarum nutans*. The plates in colour do not appear

quite so true to life as those of the previous edition; and room might perhaps have been found in the glossary for haploid, pabulum, and chromosomes.

One great value of this work is that it embraces the whole world, and is exhaustive of the present state of our knowledge; this is feasible, owing to the relative smallness of the group.

In view of the large number of plates, 128 of which are in colour, the price of the book is extremely moderate.

P. J. ALEXANDER, C.J.

Resumptio Genetica. Edited by J. P. LOTSY and H. N. KOOIMAN. 8vo. Vol. i. pt. 1, pp. 1–16, pt. 2, pp. (17)–(32), 17–112. Nijhoff, The Hague, 1924–25. Price per vol. fl. 24.

THIS is a third publication, designed to assist students of genetics, issued by Messrs. M. Nijhoff, under the editorship of Dr. Lotsy. *Genetica* publishes original articles; *Bibliographia Genetica* is designed to cover in about ten volumes, in a series of articles, the complete genetic literature appearing between 1900 and 1923; and the latest publication, *Resumptio Genetica*, will record at regular intervals reviews of current literature on genetics and also complete lists of the genetic literature of the world. The editors have the assistance of numerous subeditors in different countries—Miss D. de Winton, of the John Innes Horticultural Institution, is serving for England—and abstracts have been supplied by numerous correspondents.

The abstracts are arranged under headings, indicated at the top of each page, alphabetically under the author's name. The headings comprise general works, anthropology, medicine, zoology, breeding of animals, botany, and agriculture; botany occupies pp. 9–15 in pt. 1 and pp. 74–108 in pt. 2. A departure from the normal arrangement places Pringsheim's "Physiologischen Studien an Moosen" (on sterile and fertile forms of *Leptobryum piriforme*) at the end of the abstracts dealing with animals, instead of in its proper position among the botanical abstracts—evidently an editorial slip.

The abstracts are in English, French, or German—in a few cases they have been supplied by the authors. They vary in length from a few lines to nearly three pages.

The second part (pp. (17)–(32)) contains a "Bibliography"—a list of titles of new works arranged under headings similar to those adopted in the abstracts.

Alpine Flora for Tourists and Amateur Botanists. By Dr. JULIUS HOFFMANN. Translated by E. S. BARTON (Mrs. A. GEPP). New edition, 8vo, pp. xiv, 121. With 283 coloured figures in 43 plates. Longmans: London, 1925. Price 12*s.* 6*d.*

THIS is one of the handiest and most widely used of the books dealing with the alpine flora which are arranged for the convenience of amateurs. Like all such handbooks it has the failing that only a relatively small proportion of the plants which are found can be named with its help. But it is an excellent introduction to the serious Floras, and may also be used in conjunction with them, for

the plates are really helpful. Most of the latter are reproductions of original water-colour drawings by Hermann Friese, and, although a good deal is got into each plate, each plant is fairly distinctive. In the new edition one of the original plates has been omitted and four new ones have been added with corresponding text; these deal with rushes, sedges, grasses (one plate), ferns and lycopods (one plate), mosses and liverworts (one plate), and lichens (one plate). The descriptions of the plants have apparently been carefully composed and are very clearly printed; the geographical distribution and time of flowering are also indicated.

BOOK-NOTES, NEWS, ETC.

At the meeting of the Linnean Society on April 23rd, Mr. R. J. Chittenden exhibited a collection of Primula hybrids. Specimens of first crosses between *P. Juliæ* and *P. acaulis*, *P. elatior*, and *P. officinalis* were shown. The F_1 between *P. acaulis* and *P. Juliæ* has a pink corolla, while those between *P. Juliæ* and *P. elatior* and between *P. Juliæ* and *P. officinalis* have the corolla yellow. This—with F_2 and backcross data—shows that a dominant colour-inhibitor is present in *P. elatior* and *P. officinalis* and absent from *P. acaulis*. These facts suggest that the garden *Polyanthus* may have arisen from *P. acaulis* and *P. officinalis* or *P. elatior* hybrids by recombinations of their various factors.

Miss Pellew drew attention to the fact that although the three species of *Primula* native in Great Britain differ from *P. Juliæ* in a very marked degree, they cross easily with *P. Juliæ* and give hybrids that are fertile and have given large F_2 families. In these families plants occur resembling the parent species and many forms showing recombinations of parental characters.

Mr. John Parkin read a communication on "A Unique Feature in the Petal of *Ranunculus*, and its bearing on the Phylogeny and Taxonomy of the Genus."

Möbius, forty years ago, explained the high polish exhibited by the petals of yellow buttercups as follows:—The upper epidermis of the petal, unlike that of most other flowers, has a perfectly smooth external surface, and its cells instead of containing the yellow pigment in the solid form as in other parts of the petal, hold it in solution as a kind of oil. Below the epidermis is a layer of cells densely packed with minute starch grains. The whole structure he likens to a mirror. The epidermis with its clear yellow liquid acts as the glass, and the starch-layer as the reflector.

In an investigation of the distribution of the glass and starch-layer in the genus, Mr. Parkin has studied about a quarter of the species. On account of its seemingly uniqueness among flowers, he suggested that it is of primary importance in the taxonomy of the genus: species with glossy petals appear to form a natural group, and all seem to have yellow flowers, though there are a few yellow forms with mat petals. *Ranunculus gramineus*, with mat petals, has a starch-layer nearly as pronounced as in glossy species. Here the epidermis is papillate and the pigment in a granular state. A few white-flowered species, e. g. *R. amplexicaulis*, also possess petals with some starch-containing cells below the upper epidermis; the outer epidermal walls are very rounded, and this prevents any lustre.

It was suggested that the high polish of the petal of the yellow Buttercup has been of advantage in attracting insect-visitors to the flower; and thus been responsible, to some extent at any rate, in making this section of the genus, in contrast to the white group, cosmopolitan and by far the more numerous in species and individuals.

Mr. Kenneth Rees read a paper on "Previous Investigations into the Distribution and Ecology of Marine Algæ in Wales."

The coast of Wales, more particularly that of Anglesea, Carnarvonshire, Pembrokeshire, The Gower, and Aberystwyth, has been visited by British and Enropean botanists from time to time since the 17th century; at present there are recorded for its coast 30 Cyanophyceæ, 48 Chlorophyceæ, 85 Phæophyceæ, and 138 Rhodophyceæ.

At the meeting on May 7th, Miss Alice Jane Davey, M.Sc.(Lond.), and Mrs. Emma Nora Barlow were elected Fellows; and Nathaniel Lord Britton, Ph.D., Director of the New York Botanic Garden, Prof. Carl Schroeter, of Zürich, and Alexander Zahlbruckner, Director of the Department of Botany of the Natural History Museum, Vienna, were elected Foreign Members.

Dr. Bateson gave an account, illustrated by lantern-slides, of the investigations conducted by Miss I. Andersson at the John Innes Horticultural Institution into the genetics of Ferns.

Experiments on genetics of variegation and leaf-structure were described in four distinct ferns. Spores being sown on Knop-agar, the several kinds of prothallia could be counted and observed continuously. Segregation in respect of green or pale plastids may occur (1) at reduction; (2) during the prothallial growth; or (3) in somatic tissue of the sporophytes; or in any of these stages successively. Starting from the variegated fern the course was in each genus distinct:—

Lastrea: prothallia all green (probably some spores non-viable), giving ferns all variegated.

Adiantum: from any one sporangium prothallia mixed; either white, or green, all subsequently acquiring white stripes, and producing ferns either entirely white, or green with white stripes.

Scolopendrium: any one sporangium gives exclusively prothallia either all greens, giving all green ferns which breed true; or all pale, which gives variegated ferns only.

Polystichum: behaviour too complex for summary. Segregation may occur at any stage. It may be completed at reduction, or postponed to the haploid stage, or to the diploid.

In *P. angulare* the forms known as *truncatum* and *compactum* are probably Mendelian recessives.

Mr. Spencer Moore gave an account, illustrated with lantern-slides, of some new species of Compositæ from Angola Land, and referred to the great increase in the number of known species that had taken place within the last few decades. His memoir contains

descriptions of plants sent to the British Museum by various correspondents, notably Mr. Gossweiler (Angola) and Mr. Kässner (N. Rhodesia and Belgian Congo). A second species of the hitherto monotypic genus *Gossweilera* is described and two remarkable species of *Elephantopus*. New species of *Veronia*, *Erlangea*, *Helichrysum*, *Inula*, *Sphacophyllum*, *Geigeria*, and other genera are included.

As showing the great increase in the size of some of these genera during recent years, it was mentioned that *Erlangea*, with only 2 species in the *Flora of Tropical Africa*, now includes 50; *Vernonia* with 78 has now about 300; tropical Helichrysums, formerly 23 in number, are now five times as numerous, while *Geigeria*, of which only 10 species were noted in the *Genera Plantarum*, now comprises 40.

University of California. Publications in Botany, 1924.

(1) *Hemizonia congesta*, a genetic, ecologic, and taxonomic study of the hayfield tarweeds. By E. B. Babcock and H. M. Hall (vol. xiii. no. 2). A detailed study of this endemic Composite. It contains many natural forms, some of which have previously been classed as distinct species, but these are closely united by intergradations and hybrids. Six subspecies are recognised which are roughly correlated with geographic distribution. Artificial hybrids are easily produced which may duplicate supposed natural hybrids. Individual plants are self-sterile. Certain morphological and physiological characters are inherited according to Mendelian principles; other hereditary variations have apparently arisen through mutations.

(2) *Phycological Contributions*, vii. By W. A. Setchell and N. L. Gardner (vol. xiii. no. 1). A description of new species of Melanophyceæ from the Pacific Coast of North America.

(6) *Plantæ Mexicanæ Perpusianæ*, xii. By T. S. Brandegee (vol. x. no. 8). A description of new species of Flowering Plants from the collection of Dr. Purpus in the States of Vera Cruz and Chiapas in 1923.

THE *Journal of the Dept. of Agriculture, Union of South Africa*, January 1925, contains good illustrations of the Water Hyacinth (*Eichornia speciosa*) (by Miss K. A. Lansdell), a native of Tropical America, which has become an extensive pest in the rivers of the Southern United States. As it has already appeared in two rivers in South Africa, it is scheduled as weed no. 10 in Miss Lansdell's official list of Weeds of South Africa.

Flowering Plants of South Africa. Among the ten figures in the January number (vol. v. no. 7) are two species each of *Aloe* and *Gladiolus*, and species of *Cotyledon*, *Crassula*, *Synnotia*, *Lachenalia*, and *Lissochilus*. The last plate is of *Leucadendron humifusum*, which was first collected by Drege between 1826 and 1829, but was then completely lost sight of until it was recently found by Mr. T. P. Stokoe on the Hottentot Holland Mountains.

DR. J. BURTT DAVY has been appointed Lecturer in Tropical Forest Botany at the Imperial Forestry Institute, Oxford University.

LICHENS OF MOUNT EVEREST.

By Robert Paulson, F.L.S.

IT is due to the courage and enthusiasm of Dr. T. Howard Somervelle, a distinguished member of the Mount Everest expedition (April–June 1924), that a collection of lichens was brought home from localities of high altitudes situated in the vicinity of the route. There was no organised scheme for collecting cryptogamic plants.

Details respecting the height at which lichens were collected, the substrata upon which they grew, and the more favourable position of certain rocks for vegetative growth were described by the collector in a letter to Dr. Leslie W. Trotter, who has readily consented to the publication of the following paragraphs:—

"Knowing that you probably have many specimens up to 14,000 ft., I collected only those above that level. I tried to get a complete collection of all that were there. Over 17,000 ft. there are very few lichens.

"On most parts of the Himalayas the snow-line is lower than on the Everest region, and even there, in the valleys, I found no lichens or mosses above 18,500 ft., and this was on a mica-schist and pegmatite and quartzite mixture entirely free from snow, due to its position, and hence encouraging flora.

"I tried to collect enough stones to give some idea of habitat. The ones without stones are chiefly mosses from 16,000–17,500 ft., and probably they do not grow above this level. The soil is formed by the detritus of quartzite and pegmatite for the most part."

At definite points along the route, which, in its upper course, followed the eastern branch of the Rongbuk glacier, were a series of camps known as the Base Camp, 16,500 ft., No. 1 Camp at the junction of the main Rongbuk and east Rongbuk glaciers, 18,000 ft., No. 2 Camp halfway up the eastern glacier, 19,800 ft., and No. 3 Camp by the snow-field at the head of the glacier close under the North Peak, 21,000 ft.

"Most of the lichens came from fairly near the Base Camp. It was easy to go walks from these two camps collecting lichens."

Saxicolous specimens of the collection are either upon small pieces of rock, or they consist of scrapings of thallus from rock-surfaces. The latter present difficulties respecting identification, owing to the method, the only practical one, by which they were secured. That portion of the thallus to which the apothecia are attached is frequently very small, and hence it exhibits no part of the contour or of the hypothallus that may have been present.

The healthy conditions of some species, even of those collected at the greatest altitudes, is evident, not only by the presence of fertile apothecia, but also by the active state of sporulation that was present in the gonidia at the time they were collected.

The present collection increases by ten the number of species that were known as forming part of the lichen-flora of that section of

the Alpine-Himalayan system that forms the northern boundary of India, and which extends from west to east for a distance of 250 miles between long. 87°–89° 30′ East.

It is now possible to correlate the Everest lichens with those, as far as they are known, collected by Sir Joseph Hooker (1849) on the heights around Mt. Kinchinjinga and among the mountains of north-east Sikkim during his expedition into that region of the Himalayas. As no special description or complete enumeration of his collection of lichens from Sikkim has been published, the writer has prepared, after a careful search through the Himalayan Journals * and the sheets of the Hooker Herbarium now in the lichen collection at Kew, a list that can be, in any case, approximate only.

Other lists of lichens collected in Sikkim † have also been consulted, but, as the altitudes at which the specimens were obtained fall below the 15,000 ft. contour-line, these lichens do not come within the limits of Drude's Northern Glacial Zone, which has been chosen for the purposes of this paper.

The Everest and Sikkim collections, having been gathered at corresponding altitudes above the 15,000 ft. level, bear a considerable resemblance to each other from the fact that they contain several species that are common to the Arctic lichen-flora.

The first of these collections represents twelve and the second nine genera, while the species, in the same order, are thirty-one and twenty-one.

The species that are common to both collections are *Letharia flexuosa*, *Placodium elegans*, *Candelariella vitellina*, *Rinodina oreina*, *Lecanora rubina*, *Acarospora chlorophana*, and *Gyrophora cylindrica* var. *tornata*.

The first of the above is endemic to the Alpine-Himalayan system and has been known as a lichen from Sikkim only, since its discovery by Hooker (1849). There is now, however, a record from Mount Everest, and *Letharia flexuosa* was collected ‡ in the Choni valley, Pei-ma Shan, 13,500 ft., 28° 19′ N. lat., 98° 59′ E. long., three years ago (1922) by Professor J. W. Gregory during his expedition to the Alps of Chinese Tibet.

1. Cetraria nivalis Ach. Alt. 16,000–17,500 ft., over earth and moss. The specimens are small (3–4 cm. high). The lichen is outwardly similar to *C. nivalis* var. *Tilesii* Nyl., but, as the medulla is invariably pure white and the spermogones are not strongly developed, it is here included under the species only.

2. Letharia flexuosa (Nyl.), comb. nov. Alt. 16,500–17,500 ft., on decaying vegetation fifteen miles north of Base Camp, over *Androsace sessiliflora*. Neither the Everest nor the Sikkim specimens are fertile. The same remark applies to those coming from Chinese Tibet, although they are more luxuriant in development.

* Hooker, J. D., 'Himalayan Journals,' i. 352, ii. 165–179 (1854).

† Müller Argau, "Lichenes Sikkimenses," Bull. Herb. Boissier, iii. 194–5 (1895); Churchill Babington, "Lichenes Himalayenses," Kew Journ. Bot. iv. 243–252 (1852).

‡ Paulson, Robert, "Lichens of Chinese Tibet," *ined.*

3. Placodium elegans DC. Alt. 15,000–18,000 ft., on rock.

4. P. murorum DC. f. Arnoldi A. L. Sm. Alt. 16,500 ft., on rock.

5. **Placodium frigidum**, sp. nov. Alt. 15,000–17,000 ft., on earth.

Thallus effusus, tenuissimus, granulatus, albido-cinereus, K + coccineus. *Apothecia* numerosa, sessilia, conferta, diam. ad 0·75 mm.; discus flavo-vitellinus, planiusculus, demum leviter convexus, margine flavo, K+ dilute roseolus. *Paraphyses*, apice leviter capitato-incrassatæ, indistincte septatæ, rarius ramosæ; epithecium flavescente, granulosum. *Asci* inflato-clavati, 25–30 μ alt. *Sporæ* octonæ, nunc simplices, nunc uniseptatæ, loculis approximatis, non polari-dyblastæ, 12–14 × 6–8 μ. I thecium intense cærulescit.

Habitat. On sandy earth, at 15,000–17,000 ft.

The thallus reaction with K, its granular appearance, and the variable spores indicate a close affinity with *Placodium nivale*. The epithecium is of a yellow-brown colour, but this rapidly disappears on the addition of K to a section in water. The thalline margin is not distinct, but gonidia in groups are closely clustered around the base of the apothecium. The reaction of the thallus, K+, the size of the spores, and the habitat are sufficient to separate this lichen from *P. nivale*, and the thallus reaction, K+, separates it from *P. albolutescens*, which is thallus K−.

6. Candelariella vitellina Müll. Arg. Alt. 16,000–17,000 ft., on rock.

It has been noted that, when growing on maritime rocks, both the thallus and apothecia at times give an abnormally brownish-red reaction with K, and it has been suggested that the reaction probably was due to the lichens being suffused with salt water *. Everest specimens give a similar reaction. May the colour-reaction in the latter case not be due to minute quantities of the acid parietin being carried in the form of dust-particles from the damaged thalli of *Placodium elegans*, which is little short of ubiquitous where rocks and Arctic conditions prevail?

7. Physcia pulverulenta Nyl. Alt. 16,500 ft., over earth.

8. P. melops Duf. ex Nyl. Alt. 16,500 ft., on detritus of rocks.

Thallus bluish-grey, laciniæ strongly convex, discolor beneath, K+ yellow. Rhizinæ dark-coloured, robust (70–80 μ), little-branched K−. Spores 8 in ascus, biseriate, brown, rounded at the apex (18–22 × 8–10 μ). There is a false appearance of the spore being three-septate. The loculi are large and flattened on the side away from the septum

9. Rinodina arenaria Th. Fr. Alt. 16,000–17,500 ft., over sand.

10. R. turfacea Ach. and var. roscida Sommerf. Alt. 16,000–17,500 ft., over earth.

11. R. mniaræa Nyl. 16,000–17,500 ft., over moss.

12. R. oreina (Ach.) Vain. 16,000–17,500 ft., on rock. Squamules slightly more turgid than those of specimens seen in British herbaria.

* Crombie, J. M., 'Monograph of British Lichens,' i. 369 (1894).

13. LECANORA (SQUAMARIA) RUBINA (Vill.) Vain. Alt 16,000–17,000 ft., on rock.

14. L. POLYTROPA Schær. var. SUBGLOBOSA Crombie. Alt. 16,000–18,000 ft., on rock.

15. **Lecanora Somervellii**, sp. nov. *Thallus* epilithicus, citrinus, squamulosus, disperso-cervatus e squamulis turgidis adnatis leviter lobatis, subtus albus. K distincte lutescit. *Apothecia* parva, ·5–·8 mm. lat., immersa, concavo-planiuscula, demum leviter convexa margo thallinus primum bene prominulus, persistens, thallo et disco concolor. *Paraphyses* filiformes subconglutinatæ, septatæ, leviter ramosæ, apice epithecio granuloso flavo-fuscescente tectæ. *Asci* clavati, apice rotundato, 20–30 × 18 μ. *Sporæ* octonæ, hyalinæ, 8–12 × 5–6 μ. Hymenium I cærulescit dein sordidescit.

Habitat. On rock at 17,000 ft.

Scattered portions of thallus, consisting of a few crowded squamules, on which are apothecia, occur on other portions of the rock. These suggest *L. polytropa* f. *illusoria* Ach., but the immersed citrine-yellow apothecia with thick persistent thalline margin and the moniliform paraphyses point rather to close affinity with the *Aspicilia* group of *Lecanora*.

16. L. (ASPICILIA) CINEREA Sommerf. Alt. 16,500–17,500 ft., on rock.

17. L. (ASPICILIA) CINEREORUFESCENS Nyl. Alt. 16,500–17,500 ft., on rock.

18. L. LESLEYANA Darbish. Alt. 16,500–17,500 ft., on rock. This lichen, traces of which are evident on other portions of rock, is not fertile. It is placed under the above name for the reason that the margin of the thallus breaks up into a fringe of long thin branches that retain the areolate characteristic so well shown in *L. Lesleyana*, and, further, because the central portion of the thallus is lightly verrucose-areolate and rose-tinted in colour.

I have not been able to see Darbishire's type *, but the specimen from Everest agrees, in form and colour of the thallus, with fertile specimens recently collected (1924) in Spitsbergen.

19. L. (ASPICILIA) sp. Alt. 17,000–18,000 ft., on a fine sandstone. Thallus crustose, thin, subareolate, dispersed, pale ochraceous with a dirty white hypothallus. K—, CaCl—. Apothecia densely crowded, moderate, immersed, thalline margin turgid, regular, later inflexed and very irregular; disc dull yellowish flesh-coloured, paraphyses slender, agglutinate, light brown at the apices, not distinctly moniliform. Hymenial gelatine I+ blue, then bright wine-red. Spores not developed: asci are filled with disorganised contents.

20. ACAROSPORA CHLOROPHANA (Wnbg.) Mass. Alt. 17,000–18,000 ft., on rock.

21. A. VERONENSIS Mass. Alt. 16,000–18,000 ft., on rock.

22. A. SMARAGDULA (Wnbg.) Havaas (?), 16,000–18,000 ft., on rock. Nothing but the smallest of scraps on two stones.

23. LECANIA ERYSIBE Mudd.

* Darbishire, Otto V., "Report of the Second Norwegian Expedition in the 'Fram,' 1898–1902," Kristiania, 1909.

24. GYROPHORA CYLINDRICA Ach. var. TORNATA Nyl. (fertile). Alt. 16,000–18,000 ft., on rock. Agrees with Nylander's specimen (no. 18 exsicc.). The specimen in Herb. Arnold is similar, except that it is not fertile.

25. STEREOCAULON ALPINUM Laur. A specimen in the Kew Herbarium, collected on the Everest Expedition, 1922.

26. LECIDEA DECIPIENS Ach. Alt. 16,000–17,000 ft., over earth.

27. L. ASSIMILIS Th. Fr. Alt. 16,900 ft. The apothecia are occasionally clustered in groups of 3–9 resembling those of *L. sylvicola* Flot. Otherwise in size of spores, 11–15 × 5–7 μ, and the reaction, thallus K—, CaCl— it is true to the species.

28. L. ARCTICA Sommerf. Alt. 16,500 ft.

29. L. AURICULATA Th. Fr. Alt. 17,500 ft., on rock.

30. L. ASSIMILATA Nyl. Alt. 17,000 ft., over moss.

31. RHIZOCARPON ALBOATRUM Th. Fr. var. EPIPOLIA A. L. Sm. Alt. 16,500–17,500 ft., on rock. A very small patch along a crack in the stone.

I take this opportunity of thanking Miss A. Lorrain Smith for the helpful assistance she has always given me when discussing points that have arisen respecting the determination of critical species.

REPRODUCTIVE MECHANISM IN LAND FLORA.

II. LIFE-CYCLES (*continued from* p. 138).

BY A. H. CHURCH, M.A.

The Initial Equipment of Land Flora. The general facts in the evolutionary progression of the life-cycle in the benthic phase of the flora should be now sufficiently clear. Instead of a medley of forms presenting aimless and casual variants of somatic and reproductive processes, as different types of unknown origin and relationship or morphological value, it is possible to place in sequence a series of stages for which causal factors and biological significance are equally well accounted:—

(1) The optimum primary condition for benthic algæ is that of a wholly self-contained *diploid* organism, producing gametes, and also intercalating a meiotic change; the gamete being at first isogamous and alike, while crossing is effected by such regressive flagellates in the open medium of the sea.

(2) The progression of heterogamy which ensues gives differentiation in the 'sexes,' as conventional ♂ and ♀ gametes, produced by the same wholly 'hermaprodite' organism. Good examples still persist in *Fucus platycarpus* and *Pelvetia* of the tide-range, *Dystoseira*, and most Sargassums.

(3) To this stage may be added the specialization of *Sexual diœcism*, as production of the two forms of gametes is restricted to

distinct individuals; this being the general case of many Fucoids (*F. serratus*), as also of the vast majority of higher animal races—meiosis and karyogamy being obligate, and parthenogenesis restricted to very minor errors of the mechanism.

(4) An alternative scheme is seen in the wholesale adoption of apogamy in what should have been the gametes of the diploid plant, leading to a second and distinct physiological expression of *Cytological diœcism* in the form of diploid and haploid individuals, now restricted respectively, one to the provision of meiosis, the other of karyogamy—a phenomenon of division of labour fully as significant as that of 'sex.'

(5) When such cytological diœcism is combined with sexual diœcism, three types of plant result, still homothallic—as the haploid male, haploid female, and diploid asexual stages. To this horizon of reproductive attainment belong *Dictyota* and *Zanardinia*.

(6) Beyond this phase, the effect of annual periodicity in extra-tropical waters becomes associated with a third break along lines of physiological division of labour as *Heterothallic diœcism*, and diploid somata diverge from the haploid in external morphology. In this category come *Cutleria* and *Chorda*, as it finds its culmination in the dominant Laminarians of colder seas. In the best examples the physiological mechanism of both karyogamy and meiosis remains normally precise and obligatory.

This marks the general limit of attainment in the reproductive organization of marine vegetation, and the two great dominant lines of modern algal progression follow the type of the Fucoid (3) or that of the Laminarian (6). At the same time, at any stage, rigorous accuracy may fail, the physiological mechanism become irregular or may go wrong, with no new advance in precision; though the possibility is not invalidated that casual and temporary gain may result in the favour of minor and struggling races, to whom any easing off of the strain of the wastage-factor may make all the difference in immediate survival-value. Good examples are afforded by the failure of karyogamy in the case of *Cutleria* in northern waters (male plants even being rare in the English Channel); while in *Ectocarpus* and *Pylaiella*, not only does syngamy fail without rule, but the diploid plant may 'delay meiosis,' also without rule. Decadent variants of the life-cycle scheme are less important in the sea—as, again, they are particularly characteristic of extremely modified heterotrophic derivatives on the land, as Fungi. The special case of the Floridean cycle of three phases clearly follows the deterioration of the carposporophyte as a free autotrophic individual.

In all these cases, again, it is important to note that meiosis ensues normally at the 'second intent,' and that this position in the life-cycle is quite as constant in the case of the higher plant as in that of the higher animal. On the other hand, any further delay, as to the 3rd or 4th intent, as seen in the secondary diploid plants of *Ectocarpus*, in the tetrasporic plant of the Florideæ, or in teleutospores of Uredineæ, emphasises the subsidiary nature of the phenomena and the deterioration of the mechanism of the life-cycle, though the actual causal factor may be still obscure. In other cases, in which meiosis now appears precociously in the germination of the zygote (*Nemalion*, *Chara*, etc.) there is little suggestion that one has to do with a more 'primitive' case, or even an independent type of life-cycle.

It should be now sufficiently clear that all up-grade flora of the land takes off from the limiting specialized case (6) of the sea, as presenting the full and precise version of the heterothallic alternation, to which the rare occurrence of apospory, apogamy, parthenogenesis, and sporophytic budding may still continue as *accidentia* of the normal physiological mechanism. Not only so, but the oldest successful phyla (*Pteridophyta*) present a life-cycle closely paralleling the Laminarian scheme—with massive diploid 'sporophyte' photosynthetic in optimum light-exposure, and a much deteriorated and haploid 'gametophyte' enduring environment of unfavourable light-supply, and somatically suggestive of an older phase of somatic organization, yet persisting as the indispensable vehicle of syngamic fusion. Having traced the legitimate progression of such a series in the sea, it is no longer necessary to suppose that all such identical stages have worked out *de novo* at some subsequent date in the course of attainment of the dominion of the land-surface. The general facts indicate that an equipment attained in the sea has proved sufficient to meet the newer problems; and, as a matter of common observation, no plant without the two cytological generations has made good in subaerial enviroment—this applying not only to Bryophyta, Pteridophyta, and Phanerogams, but also to such extreme cases as the larger Fungus groups (Ascomycetes, Basidiomycetes, Uredineæ, Lichens).

The reason for this dominance of the familiar two-phase scheme among land-flora is, again, sufficiently clear and suggestive. The seasonal significance of heterothally in the sea implies an adaptation to two complementary sets of environmental factors—one favourable, and the other less so,—the former expressed in abundant light-supply and higher temperature-relations, the latter in terms of darkness and cold. A plant with equipment capable of enduring such rhythmic sequence in the annual succession, and becoming synchronized in two cytological phases, has a double chance of survival when it is required to meet the new problems of another change of surroundings also involving complementary changes of climate. Transference to subaerial conditions, in which the water-problem becomes the ever-insistent factor in racial progress, also implies a complementary set of environmental factors, which may be equally seasonal and rhythmic when expressed in the annual succession of wet and dry periods—the latter giving the maximum insolation and the former with possibly reduced light and temperature. In such case the older education of the sea stands in good stead as the new factors agree in their rhythmic periods of more favourable and less favourable environment, and it is evident that in the long run the plant that has successfully negotiated the older seasonal conditions may adapt the same mechanism to the needs of the new. Speaking generally, this is what happened, and the special cases of early Land Flora illustrate the success of the

process; though it is by no means a simple problem, as new factors of the land are constantly superimposed on the inherited equipment of the sea. Once withdrawn from the sea, and the original causal complex to which it owed its origin, the system of Heterothallic Alternation remains invariable, to all intents, as the fundamental framework of the life-cycle of subaerial vegetation [1].

Already in the sea two possibilities have been noted, according to which either the haploid or the diploid phase may assume the lead in the optimum growth-period; though the balance of success appears to fall on the side of the diploid soma. Curiously enough, the general facts of the early progression of Bryophyta and Pteridophyta present much the same complementary conditions, with the balance in favour of the latter, as this scheme is also characteristic and now dominant for all higher Land Flora.

Thus, in the case of the Bryophyta, the haploid plant with leafy branched stem (Musci) appears photosynthetically dominant, though vegetative in cool moist environment, while the hemiparasitic diploid phase endures greater desiccation and reproduces by air-borne spores; the haploid plant appears more specialized vegetatively, though the sporophyte is more enduring and is the phase more strictly adapted to the new subaerial conditions. The gametophyte with its older aquatic zoïdogamy necessarily demands conditions of external water-supply at some time of the year; while the hemiparasitic habit of the attached diploid phase apparently implies decadence, as the combined organization ultimately fails in further progression for want of an efficient absorbing root-system. Modern Moss-sporophytes probably afford little idea of the original diploid phase (which may have been more in the manner of *Rhynia* and *Hornea*). At any rate, the foliaceous and branching haploid Moss-soma (cf. *Sphagnum*) suggests a plant-body far in advance morphologically of even these sporophytes, and it is open to suggestion that the ancestral Moss had been derived from an algal series, in which, as in *Cutleria*, the diploid plant was the enduring form, though already somatically deteriorated, or retaining evidence of a more elementary thalloid horizon.

On the other hand, the case of the Pteridophyte presents little difficulty; here the mutual relationship of the two generations is from the first perfectly definite, and the divergence between the two phases is already too great to be lightly glossed over. No theory of the origin of such a state of affairs, whether by 'antithetic' or 'homologous' methods has proved anything beyond the merest academical speculation [2]. The antithetic side of the question has proved extremely popular, but remains wholly unconvincing [3]; being originally stated in complete ignorance of later cytological knowledge, it is now evident that there was no rational basis of approach, and the logical con-

[1] As first taught by Sachs, Text Book, Eng. Edit. 2, p. 229, in contradistinction to antitheticists, as Celakowsky.

[2] *Cf.* Bower (1890), 'Annals of Botany' iv. 347.

[3] Bower (1908), 'Origin of a Land Flora': 245, Origin of the Sporophyte; 271, from relatively simple post-sexual cell-divisions; 288, Theory of the Moss, following Hofmeister, Leitgeb, and Goebel.

clusions of this line of thought, admirably worked out by Professor Bower, in the classical pages of his 'Origin of a Land Flora' (1908), merely end in the morasses of 'the Selago-stage' and 'Sporangiophoric Pteridophyta.' Instead of the sporophyte being an intercalated diploid post-sexual phase, as expressed in the conventional text-book scheme of 'progressive sterilization of archesporial tissue,' from *Riccia* to the Moss, and from the Moss somehow to the Fern or *Lycopodium Selago*; it is evident that the diploid plant has been always the predominant member of the partnership, as it is the original benthic plant-form at the horizon of *Fucus* [1]. In fact, if anything is interpolated, it is the haploid 'gametophyte.' The date of such interpolation is, however, not in the early elaboration of land-flora, but far back in the benthic phase of the sea, when the first algæ were still more or less isogamous, and the gametes all contained functional chloroplasts.

Hence, on transfer to land, the two phases had been long stereotyped, to remain unalterable. There is no question of beginning the whole story of a life-cycle over again; the older life-cycle of the sea proved amply satisfactory in meeting the newer problems of subaerial life. The mere fact that the diploid sporophytes of land-flora still produce asexual tetrads, in general size, as well as in details of construction, identical with those of *Dictyota* and many Florideæ [2], is alone sufficient to show the remote origin of the phenomena of asexual spore-formation.

Similarly, the general advance in higher Land Flora, does but continue and emphasize the divergence already initiated in the sea. The diploid phase becomes increasingly dominant and preponderant, as the land-plant *par excellence*; the haploid plant reduces to still further deteriorated an expression, in the limit to be indicated by merely a few nuclei in a cœnocytic and holoparasitic organism, wholly immersed within the tissues of the diploid parent. The full story of the reproduction of the land-plant (Angiosperm) appears at first sight so complex, and so widely aberrant, as compared with that of the land-animal comonly accepted as the moral standard since coming within our own human cognizance, that the inevitability of the different lines of progression often escapes notice.

With these observations the general theory of plant-reproduction, and its relation to the animal side of the story, now begins to appear in a more satisfactory light. The primary phenomena of karyogamy and meiosis are functions of the older Plankton-phase, and are so far maintained with little change in all progressive and higher organism.

[1] *Fucus* is both sexual and meiotic; it is the meiotic side which puts it in line with higher plants, not the sexual. The popular bias for regarding the sexual phase as of extreme importance, and the reason for the interpolation of the sporophyte of land-flora being to compensate rare acts of fertilization, is now seen to be a part of the extreme veneration for anything sexual, as a relic of the attitude of the early XIXth century.

[2] Though the three cases differ widely in metabolic mechanism of pigments and polysaccharide reserves, all appear biologically equivalent, and hence in all probability of contemporaneous origin.

Their biological value to the race is accepted without question. The initiation of the Benthic phase, attempting solution of the problems of reproduction by the regression of gamete-flagellates of the older plankton-model, introduces a source of error in soma-building, in that apogamy may be general in such autotrophic units, and may be even commonly successful, provided that the zoïds retain functional chloroplasts. Hence, in the limit, the alga affords two cases of development from the diploid zygote: one wholly 'sexual,' in which photosynthetic chloroplasts are gradually eliminated (at first in the antherozoid), as physiological 'sex-cells' are differentiated from the more somatic units; the other case follows the results of complete apogamy. On this broad distinction are based two lines of benthic progression in plants of the sea, typified now by Fucoids, and by such a form as *Dictyota*; giving rise in the former to wholly diploid plants, in the latter to diploid plants and also haploid. The former, again remains the dominant phase of the sea itself, and is paralleled by the case of the 'animal,' to which, however, no other choice was available, once heterotrophy prevailed and the gametes had lost all trace of active chloroplasts. Hence the error of parthenogenesis only supervenes in lower animals, in which the ovum is already provided with abundant food-material, and is even then gradually suppressed in favour of strict sexuality.

While the benthic problem was how to make the best use of older plankton functions and habits, so the initial problem of land-flora is to make the best of the benthic mechanism, and prove by experience which is the more effective of the two algal schemes. As a matter of fact, the Fucoid story has proved useless in such transmigration. No plant has made good on the land which had not already attained even an advanced stage of heterothally, to be henceforward stereotyped as the essential mechanism of all progressive plant-life—at first sight so curiously unlike the animal side of the progression that throughout the latter half of the XIXth century it remained the outstanding mystery of morphological botany.

IMPERIAL BOTANICAL CONFERENCE.

The report of the proceedings* of the Conference, held last July, has been issued with commendable promptitude by the Executive Committee, the Hon. Secretary Mr. F. T. Brooks having acted as Editor. The book, which is published by the Cambridge University Press, reflects credit on all concerned in its production. Sir David Prain's Presidential Address forms an appropriate introduction, as it explains very clearly the origin of the Conference and its relation to the abandoned International Congress, which had been projected for 1915 in London. The greater part of the volume is occupied with reports of the discussions under their respective headings, namely, Plant

* Imperial Botanical Conference. London, July 7–16, 1924. President Sir David Prain, C.M.G., C.I.E., F.R.S. Report of proceedings, edited by F. T. Brooks, Hon. Secretary, 8vo, pp. xv, 390. Frontisp., 2 plates, and 7 text-figs. Cambridge University Press. Price 15*s*.

Physiology, Genetics, Plant Pathology and Mycology, Systematic Botany and Ecology, Rules of Nomenclature, and Education and Research.

In Plant Physiology the discussions were confined to two specific problems, the Physiology of Crop Yield and the Biological Problems of the Cold Storage of Apples. In Genetics the economic possibilities of plant-breeding and the value of selection work in the improvement of crop-plants were discussed. The section on Plant Pathology and Mycology deals with the Relation of Plant Pathology to Genetics and of Forest Pathology to Sylviculture, and several obscure, but widespread plant-diseases—Mosaic and Streak Disease of Sugar-Cane, Bud-rot of Coco-nut and other Palms, and Brown-bast disease of Rubber-trees; also with Fungal attacks on Timber. The strong economic trend of the discussions is noticeable.

In the section on Systematic Botany and Ecology two closely related subjects were discussed, namely, the Botanical Survey of the Empire, and the correlation of taxonomic work at home and overseas. While acknowledging the work that has already been done—as, for instance, in India or South Africa,—it was evident that very much remains to be done, and that some areas are almost untouched. The solution of the problems would seem to lie in the direction of a closer co-operation between the home institutions and those overseas; the rendering of both more efficient to cope with the size of the task; and the economic organization in the different parts of the Empire of available sources of help. At the close of the Conference it was resolved that a Committee be appointed to consider the various proposals and to take such steps as they may think fit. The ecological subsection gave a summary of present knowledge and of outstanding problems, and discussed specially training for various aspects of field-work. The outcome was a series of resolutions and the appointment of a temporary Committee to arrange for the appointment of a permanent Committee to carry out the substance of the resolutions.

The section on Nomenclature devoted the three hours at its disposal to the discussion of certain resolutions which had been prepared by an *ad hoc* Sub-committee appointed by the Executive Committee. Resolutions were carried modifying some of the Rules of the Vienna and Brussels Codes, and at the closing meeting of the Conference the Executive Committee was asked to bring these resolutions as recommendations before the next International Congress. The Sub-committee was asked to remain in being to receive and collate additional proposals for changes in the International Rules.

The section on Education and Research discussed specially the possibility of promoting an interchange of staff and post-graduate students between the Overseas and Home Universities and Research Institutions, and the desirability of providing further facilities for botanical research in the Dominions, Colonies, and Protectorates; a resolution embodying the former proposition was carried at the concluding meeting.

The Report also contains an account of one of the three evening lectures, that by Prof. A. C. Seward on Ancient Plants within the

Empire—a *résumé* of its palæobotanical resources and an indication of the work already accomplished and of that which remains to be done. Abstracts are also given of various papers read during the Conference.

The resolutions, seventeen in number, passed at the closing meeting are set out in full. It was decided that the present Executive Committee should remain in being to consider matters arising out of the Conference, and to take action with regard to resolutions. The last resolution, proposed and seconded by two overseas botanists, expressed the desire for the formation of an Imperial Botanical Association for the furtherance of botanical work throughout the Empire.

Prof. J. R. Schramm, who was present as a guest, announced that American botanists were arranging to hold an International Botanical Conference in the United States in 1926, and extended a cordial invitation to members of the Imperial Botanical Conference to attend it.

The list of members includes 64 overseas botanists and delegates and 232 home botanists; the ten foreign visitors included nine from the United States of America, and one from Czecho-Slovakia.

A pleasant feature of the Report is the frontispiece, an excellent portrait of the President, Sir David Prain. A. B. R.

GIOVANNI BATTISTA DE TONI, F.M.L.S., Hon.F.R.M.S. (1864–1924.)

By Dr. Achille Forti (Verona).

The lamented death of G. B. De Toni, Professor of Botany at the University of Modena, on the 31st of last July, was a source of deep regret to the scientific world. He had earned world-wide fame by his great work, the 'Sylloge Algarum,' published in five large volumes between 1889 and 1907, to which last year he added a sixth volume incorporating later additions to the Florideæ. Another great service which he rendered to algology was his prolonged editorship from 1889 onwards of an international journal of algology, 'La Nuova Notarisia.' This journal was the off-shoot of the earlier 'La Notarisia,' which De Toni had jointly edited with David Levi Morenos (1886–89). Recently, the jubilee fascicle (1886–1925) projected by De Toni has appeared—a volume of 400 pages containing contributions from his widely scattered correspondents and friends in many countries and in many tongues, all uniting to bear testimony to their esteemed leader in algology as well as to celebrate his unbroken record as editor for forty years.

His activity as an algologist was enthusiastic and successful from the first. The "Flora Algologica della Venezia" was published, in collaboration with David Levi, in five parts in the *Atti R. Istituto Veneto* between 1885 and 1898, forming the continuation of a catalogue of the complete flora of the region, begun in 1869 by Visiani and Saccardo. During this period he published new types, such as *Hansgirgia*, *Boodlea* (with G. Murray), &c.; and contributed to our knowledge of the most diverse groups of world-wide origin.

In later years he devoted himself more particularly to the elucidation of certain phenological and biological details of marine algæ, especially in the Mediterranean, a side of Nature Study which had always attracted him.

Algology, however, was by no means his only occupation, nor perhaps was it even the pleasantest or most desirable of his studies; yet the exhausting and patent taxonomic researches while editing his indispensable but ponderous volumes certainly occupied most of his working hours. In reckoning up his labours in those strenuous years, we find him editing (1888–89) for his master, Prof. P. A. Saccardo, several sections of vols. vii. & viii. of the 'Sylloge Fungorum'; of these the Uredineæ, Ustilagineæ, and Saccharomycetes were entirely his own compilation, the Gasteromycetes, Phycomycetes, and Schizomycetes were done in collaboration.

It was the exhaustive literary researches undertaken for the production of these standard mycological volumes that prepared the way for the parallel algological work, the 'Sylloge Algarum.'

Here, too, should be mentioned the rare and appreciated exsiccatæ entitled "Phycotheca italica" (De Toni and Levi, 1886–88) containing 150 algæ; also the notes on the rearrangement of Giovanni Zanardini's great herbarium of algæ ("L'Algarium Zanardini," De Toni and Levi: Venezia, 1888), as well as numerous contributions to exotic floras—for example, Tierra del Fuego (1889), Japan (1895), Tripoli (1914–16), and Oceania (1923): the two latter with his pupil Achille Forti.

His career as a teacher necessitated an exploration of more general botanical science and led to his systematic researches on phytography, for instance, in finding distinctive characters for the Italian species of *Geranium*, with special consideration of the carpologic characters and seed-integuments; anatomy, physiology, and microchemical technique, comprising papers on such varied subjects as the rôle and localization of alkaloids; the function of anthocyan; the variable structure of several cell-membranes; the anomalous dispersion of chlorophyll; the influence of several poisonous substances on germination; the development, respiration, and death of many organisms, especially plants.

A multitude of other valuable papers followed, embracing such extremely varied subjects as practical questions of agronomy, cultivation of silkworms, little-known textile plants, merceology, docimastic bacteriology, and other recondite studies possible only to a scientist well-versed in chemistry, physics, etc. In his later years De Toni with his students became absorbed in the great problems of genetics biometry and heredity of acquired characters, as also in the teratology of *Antirrhinum* and the heterocarpy of *Calendula*, the outcome of long and close investigation, and ably discussed.

The above sketch of De Toni's activities must be further supplemented by an account of the profound historical researches which engaged his keenest interest during the last decades of his life. He devoted himself to seeking out and deciphering precious and rare manuscripts that treated of scientific subjects. He thus was able to make known the acquirements of the old Masters of the Renaissance

and the stage of knowledge attained by them in the widest sense of the term, but particularly as regards plants. From his youth he had been attracted by the remarkable discoveries of Leonardo da Vinci (1452–1519), and sought to interpret and reveal the enigma of his marvellous ideas on the symmetry and growth of organs, on transpiration, negative geotropism, etc. The correspondence and the numerous writings of Ulisse Aldrovandi (1522–1609) also engaged his attention, and are treated in the XXII. "Spigolature" [gleanings], which not only show Aldrovandi's relations with the most renowned botanists of the time—above all, with early collectors of plants,—but also tell of his travels and researches in phytography, which have an important bearing on the origin of herbaria in Italy, and also picture his amicable intercourse with Luca di Ghino Ghini of Faenza (1490–1556), Francesco Petrollini of Viterbo (fl. 1553), a medical man who initiated Aldrovandi in the study of plants, Bartolomeo Maranta (1500–1571), Pietro Antonio Michiel (1510–1576), Charles De l'Écluses [Clusius] (1516–1609), Francesco Calzolari (1522–1609), etc., and, further, give Aldrovandi's description of plants, medicinal products, etc. De Toni also carried on the 'Illustrazione' of Aldrovandi's great herbarium—sixteen volumes now preserved in the University of Bologna,—the publication of which was begun by Oreste Mattirolo in 1899.

Another series of his historical researches were concerned with the biobibliography of old naturalists, such as Bonaventura Corti (1729–1813) (discovery of the circulation of protoplasm), Domenico Cirillo (1739–1799), and Giovanni Battista Amici (1786–1863) (studies on pollination and description of the embryo); and also the very modern views of Francesco Griselini (1717–1783) on the necessity of marine biological researches, including the relation of vegetable life with fisheries and allied industries. These and other contributions to the history of science are, as may be gathered, of surpassing interest and importance. It is interesting to recall a small but valuable note on homonymous genera published with P. Voglino in the *Journal of Botany*, 1887, pp. 26–27.

Many sympathetic notices and biographies published in *Notarisia* and elsewhere were elicited by the deaths of algological and other scientific friends; among these may be recalled those of Meneghini, Castracane, Piccone, J. G. Agardh, E. S. Gepp-Barton, etc.

The bibliography reaches the enormous total of nearly 400 titles, some of them bulky works containing thousands of pages, the mere writing of which might be reckoned an astounding task to be accomplished in the life-time of a man of 60 years.

[It is hoped that Dr. Forti will pardon the freedom with which his interesting MS. has been rendered into English. Due care has been taken to avoid mistakes; but so vast and wide-scattered is the output of De Toni's papers that, inadvertently or through misconception, errors may have crept in. It is to me a real privilege to be associated with Dr. Forti in this expression of esteem and regard for a great man, whose friendship I prized exceedingly.—A. Gepp.]

NOTES FROM THE BRITISH MUSEUM HERBARIUM.

New South African Rubiaceæ.

By S. Greves, M.Sc.

Anthospermum arenicolum, sp. nov. *Herba* prostrata; *ramis* incurvatis indistincte quadrangulatis gracillimis valde pilosis; *ramulis* quadrangulatis gracillimis cortice brunneo obtectis pilosis; *foliis* pro verticillo paucis lanceolatis apice obtusis basi late cuneatis margine revolutis pilosis, internodiis subæquilongis; *stipulis* triangularibus acutis minutis pilosis; *floribus* unisexualibus paucis in axillis sessilibus tetrameris; *calyce* piloso; *corollæ* lobis intus striatis extus pilosis; *fructibus* oblongis pilis longis obtectis.

Hab. Witpoortze Kloof, near Johannesberg; *C. E. Moss*, 9806.

A prostrate plant of graceful habit. Branchlets 4–8 cm. long. Leaves ·6–1·2 cm. long, ·2–·6 cm. broad. Calyx 1 mm. long; corolla-tube 1·5 mm. long, lobes 3 mm. long.

Allied to *A. hispidulum* E. Mey. ex Harv. & Sond. in the size and characters of its flowers, but differs in its slender and graceful habit, its soft hairiness, and in the size and shape of its leaves, which are not longer than the internodes.

Anthospermum ambiguum, sp. nov. *Herba* erecta; *ramis* teretibus pubescentibus; *ramulis* patentibus gracilibus teretibus cortice brunneo obtectis pubescentibus; *foliis* pro verticillo paucis spathulatis apice obtusis margine revolutis supra scabriusculis levissime incrassatis, internodiis subæquilongis vel paullo brevioribus; *stipulis* triangularibus acutis pubescentibus; *floribus* unisexualibus paucis in axillis sessilibus tetrameris vel pentameris; *stylis* elongatis glabris; *fructibus* oblongis pilis brevibus hispidis albis arcte obtectis.

Hab. Port St. John's, Pondoland, dune grassland; *C. E. Moss*, 2456.

Branchlets 5–9 cm. long. Leaves 5 cm. long; stipules 1·5 mm. long. Flowers about 4 mm. long.

Differs from *A. hispidulum* E. Mey. ex Harv. & Sond. in its erect habit, and in having leaves not longer than the internodes, both tetramerous and pentamerous flowers, glabrous stigmas, and no distinct calyx-teeth on the fruit; from *A. Burkei* Sond. it differs in having both tetramerous and pentamerous flowers, spathulate leaves with blunt apices, and no calyx-teeth on the fruit.

Otiophora cupheoides N. E. Br., collected by F. A. Rogers between Pilgrim's Rest and Sable, Lydenburg Div. (no. 23687), has not previously been reported from South Africa.

Passiflora samoensis Exell, sp. nov. (Samoa).

Herba scandens, ramis triquetris glabris; *foliis* petiolatis, petiolo gracile glabro quam pedunculus circa duplo longiore, basin versus 2–3 glandulis sessilibus instructis, trilobis, lobis lateralibus adscendentibus apice obtusis, lobo centrali fere æquimagnis, basi subito angustatis,

trinerviis utrinque glabris; *floribus* apetalis solitariis axillaribus pedunculatis, pedunculo glabro bracteato, bracteis filiformibus deciduis; *sepalis* 5, basi connatis, oblongis petaloideis; *corona* duplice, exteriore fimbriata, interiore membranacea margine crenulata e tubo supra medium exserta; *staminibus* 5, filamentis alte connatis, antheris versatilibus; *ovario* ovoideo stipitato, stylis 3 liberis; *fructibus* subglobosis siccis rugosis.

Hab. Three miles south of Apia, Samoa, May 1924; *Dr. P. Buxton* and *G. H. E. Hopkins*, 640 G.

The following is conspecific:—Samoa. *Rev. S. J. Whitmee*, 1876–77, Herb. Mus. Brit. and Herb. Kew.

Leaves 7–13 × 7–11 cm.; *petioles* up to 6·5 cm. long; *peduncles* 3–4 cm. long; *sepals* 3 × 7 cm.; *corona* 1 cm. long; *stamens* with filament-tube 20 mm. long, free filaments 9 mm. long, anthers 5 mm. long; *ovary* 4 mm. long and about 3 mm. in diam. with gynophore up to 2·5 cm. long.

A rather uncommon plant, growing in the uncleared forest, not in the cultivated coastal area, up to at least 2000 ft. Mr. Hopkins writes that, to the best of his memory, the flowers were reddish-buff in colour and that the fruits were green but probably unripe.

According to Masters's classification (Mart. Fl. Bras. xiii. pars. 1, 545) this species belongs to Subgenus II. *Plectostemma* Mast., Section I. *Cieca* DC. It is probably related to *P. suberosa* L., but is distinguished by the glands being near the base of the petiole and by the much larger fruits with longer and stouter stalks.—A. W. Exell.

Globba Burbidgei Ridl., sp. nov. (Borneo).

Herba gracilis 45 cm. alta, vaginis basalibus purpureo-punctatis superioribus hirtis; *foliis* lanceolatis vel oblongo-lanceolatis longe acuminatis, basibus rotundatis vel obtusis, utrinque hirtis subtus purpureis, 7–15 cm. long. 3 cm. lat., vaginis hirtis, ligulis brevibus hirtis; *panicula* gracili 3–6 cm. long, pedunculo 4–9 cm. long., glabra, *bractea* media angusta lanceolata acuminata, ramis 1·5 cm. long., *bracteis* oblongo-ovatis rotundatis persistentibus 4 mm. long.; *floribus* paucis congestis parvis; *calycis* tubo infundibuliformi, dente superiore longo, alteris multo brevioribus, 4 mm. long.; *corollæ* lobis oblongo-ovatis rotundatis, staminodiis subsessilibus; *labello* breviusculo, parte libera brevi, trifida, lobis linearibus-oblongis obtusis brevibus, macula brunnea in medio super lobos; *stamine* 15 mm. long., anthera oblonga ad basin bicalcarata, calcaribus basibus latis lanceolatis longe acuminatis subulatis, ferme anthera æquilongis; *capsula* globosa 6 mm. diam.

Hab. Borneo, north and east coasts. Lundu; *Mjoberg*, 233 (Herb. Mus. Brit., comm. *E. Merrill*). Sandakan Baths; *Burbidge*; British North Borneo, east coast; *Creagh*; (Herb. Kew).

Allied to *G. pumila* Ridl. of Puak, Sarawak, but is larger and laxer, and the leaves are only sparsely hairy, not densely velvety as in that species. The flowers are probably white.—H. N. Ridley.

Lucuma bullata S. Moore, sp. nov. (Brazil).

Verisimiliter *arbor*; *ramulis* validis cortice cinereo obductis foliorum delapsorum cicatricibus prominenter signatis 7–12 mm. diam.; *foliis* magnis petiolatis ad apicem ramuli confertis oblongo-obovatis apice rotundatis basi obtusis integris rigide coriaceis supra ferrugineis cito glabrescentibus et nitidis et ob costas costulasque nonnon reticulum valde impressum prominenter bullatis subtus presertim in costis ferrugineo-tomentosis; *floribus* 4-meris in fasciculos sessiles paucifloros arcte approximatos caulemque nudum obtegentes ordinatis; *pedicellis* calyce brevioribus ferrugineo-tomentosis; *calycis* segmentis ovatis apice rotundatis exterioribus dorso ferrugineo-tomentosis interioribus paullo minoribus dorso appresse sericeis marginibus glabris; *corollæ* usque ⅓ divisæ (pansæ haud visæ) lobis rotundatis sparsim ciliatis; *staminibus* basin versus corollæ tubo insertis antheris extrorsis; *staminodiis* oblongis obtusis quam corollæ lobi brevioribus; *ovario* villosissimo 4-loculari; *stylo* crasso ovarium multo superante.

Hab. Brazil, Rio de Janeiro; *Bowie & Cunningham*, 314.

Folia usque 25–27 cm. long., 9–11 cm. lat. (exstant minora circa 20 × 7 cm.), supra in sicco saturate olivaceo-nigra; costis lat. utrinque circa 16 uti costulæ et reticulum pag. inf. optime eminentibus; petioli validi, basi tumidi, ferrugineo-tomentosi, 1–2 cm. long. Pedicelli 5 mm. long. Calycis segmenta ext. 5 mm. long. Corolla nondum pansa 3 mm., hujus lobi 1 mm. long. Staminodia ·75 mm. long. Filamenta ægre 1 mm. long.; antheræ sagittulatæ, apiculatæ, fere 1·5 mm. long. Ovarium globosum, 1 mm. diam. Stylus 2 mm. long.

Near *L. torta* A. DC., differing chiefly in the large bullate leaves, the dense fascicles of flowers, and the stamens inserted near the bottom of the corolla-tube.—S. Moore.

ABSTRACTS OF PAPERS ON BRITISH PLANTS.

Aspidium Braunii.—*The Garden* for April 4, p. 184, contains a note by C. Schneider on *Aspidium Braunii*. British botanists were reminded that this species—or variety—occurred in England in Journ. Bot. 1907, 451, but we do not recollect that a figure has appeared in British handbooks. C. Schneider gives a photograph of the plant, and remarks that its light green deciduous fronds, thin and soft, are characteristic; they are not evergreen, but die in late autumn or in winter. Those of *A. lobatum* are leathery, and of *A. aculeatum* distinctly harder than those of the plant in question. *A. Braunii* is not, he states, at all variable; the scales of the rachis are of a light brownish colour, and the number of the pinnæ of the fronds (which usually reach a length of about two feet—sometimes almost three) do not exceed, as a rule, fifteen on each side.

C. E. S. & E. G. B.

COLLECTING AND CURATING OF FRUITS AND SEEDS ('Essex Naturalist,' xxi. part 1, pp. 43–48; part 2, pp. 49–59).—Mr. T. A. Dymes describes methods of collecting and curating of fruits and seeds for the study of local dispersal. He says that seed-dispersal must be divided into: (*a*) the first-instance dispersal, or the liberation of the seed from the parent-plant; and (*b*) its subsequent history; both of which should be reflected in the arrangement of the collection.

The writer arranges his own collection in four parts:—

(1) The fruiting sprays that can be put into the herbarium without damaging them, such as immature but well-advanced indehiscent fruits, as well as pods and capsules that are not quite ripe.

(2) Spent dehiscent fruits which cannot be put into the herbarium because they would be crushed.

(3) The seeds themselves.

(4) Such things as spent fruiting axes, too long to go into any box that can be carried about conveniently, and minute gauzy seeds that are too small to be seen individually with the naked eye. In conjunction with the first two sections it helps more especially, though not exclusively, to illustrate the first-instance dispersal, while the seeds themselves recall the subsequent history.

In continuation, he takes each section in turn and gives many valuable hints and instructions for the preservation and arrangement of the specimens. E. G. B.

LATHRÆA SQUAMARIA ('Lancashire and Cheshire Naturalist,' February 1925, pp. 53–63).—Messrs. Isaac Hartley and H. Ellis summarize the results of their work on this plant.

The authors consider that they are justified in saying that the following points have been established:—

That the plant is a true parasite.

That although its vegetative system is never exposed to sunlight, and is devoid of chlorophyll, yet it produces starch in abundance.

That the discs or suckers and haustoria are capable of living and functioning for several years in succession.

That suckers and haustoria are capable of being produced anywhere along the roots, and occur quite as numerous, if not more so, laterally than at the extremities.

That no stomata exist.

That the underground portions may continue to live and function for upwards of twenty years.

Some of the problems connected with the plant are dealt with by the authors as follows:—

(1) Is the plant carnivorous? So far we have found no evidence to show that it is, nor are we in a position to say it is not, though our opinion inclines that way.

(2) How does secondary thickening take place? There is a considerable increase in the xylem elements, but little or no increase in the thickness of the stem as a whole. There is no evidence of a cambium.

(3) Is there a resting-stage similar to that which occurs in our deciduous trees and shrubs during the winter? We are of the opinion there is not. Growth is probably continuous, though more active in summer than in winter. E. G. B.

DEVELOPMENT OF BLUE PIGMENT IN MERCURIALIS.—Dr. P. Haas and Mr. T. G. Hill (*Biochemical Journal*, xix. pp. 233–239, 1925) have investigated the origin of the bluish hue which appears in the green shoots of *Mercurialis perennis* and *annua* on drying. That the production of the blue colour is not due to enzyme-action is concluded from the facts that the plant does not contain a direct-acting oxidase, and that the blue pigment can be produced by drying the tissues after immersion in boiling water or suspension in steam, or by leaving the tissues to soak for some time in absolute alcohol.

The authors conclude that it is due to a chromogen which gives rise to a blue pigment on drying, and describe their methods for the isolation of the pigment. The chromogen is most abundant in the youngest and vigorously growing parts.

Under certain conditions a blue colour is produced, which differs from that produced on desiccation in being fugitive and in producing a permanent yellow substance on further oxidation. The authors consider that only one chromogen is present which forms either the fugitive blue or the permanent blue according to conditions. A. B. R.

LINNEAN SOCIETY ANNIVERSARY MEETING.

AT the Anniversary Meeting, held on May 26, Mr. A. D. Cotton, Mr. H. N. Dixon, and Prof. J. Percival were elected to the Council in place of Dr. A. W. Hill, Mr. T. A. Sprague, and Prof. F. E. Weiss. The Officers for the previous year were re-elected, Dr. A. B. Rendle as President and Mr. J. Ramsbottom as Botanical Secretary.

In his address the President referred to the losses sustained by death during the past year. Among the Fellows were Dr. W. B. Hemsley, Mr. James Britten, Miss L. S. Gibbs, Sir Harry Veitch, Mr. A. W. Sutton, and Mr. Charles Bailey, and among the Associates Mr. A. J. Wheldon, Mr. James Saunders, Mr. R. I. Lynch, and Mr. W. Watson, all of whom had done good service in various fields. The Society had also to regret the loss of a distinguished foreign member, Prof. De Toni, the eminent algologist.

In referring to the appointment of Lt.-Col. Gage as Librarian and Assistant-Secretary, the importance was emphasized of rendering the Library as efficient as possible; Fellows could render help by presenting copies of their own works or papers. The long-delayed Catalogue of the Library was approaching completion, and should be available to Fellows early next session.

With a view to rendering the General Meetings more helpful, it was suggested that abstracts of papers might be printed in the circular announcing the meetings at which they would be read. This would enable Fellows to come better prepared for the discussion.

Reference was also made to recent improvements in the domestic arrangements, including the provision of rooms for reading and writing and conversation.

The result of the readjustment of the admission-fee for Fellowship and its repeal in the case of candidates under thirty-six years of age had been encouraging. Forty-seven Fellows had been elected during the past six months, including many younger workers, both on the zoological and botanical sides.

It was also very desirable to increase, if possible, the Goodenough Fund—an investment, the interest of which can be used by the Council to remit subscriptions. It was to be regretted that eminent Fellows after many years' association with the Society were not infrequently unable to continue their subscriptions, and their resignations had to be accepted.

In conclusion, the President referred to the various societies which had arisen in recent years to claim the special interest of groups of workers, and suggested the possibility of some definite association, which would be for their mutual benefit, between the Linnean and these younger Societies.

The Trail Medal and Award was given to Professor Robert Chambers of Cornell Medical School, New York, in recognition of his work on the intimate structure of protoplasm and his remarkable success in demonstrating the details of nuclear structure. The President commented on the fact that, although his work had been done for the most part in the United States of America, Professor Chambers was of British parentage and a graduate of a Canadian University.

The Linnean Medal was awarded to Professor F. W. Oliver, one of the Society's most eminent Fellows, who had made valuable contributions to various aspects of botanical science, including the discovery of the seed-character in the Pteridosperms and pioneer work in the study of plant ecology. Reference was also made to his work as a teacher at University College. Thirty-two years previously the medal had been awarded to his father, Prof. Daniel Oliver.

The following letter which is being circulated among the Fellows of the Linnean Society should interest an even wider circle of naturalists :—

DEAR SIR OR MADAM,

It has been suggested that the approach of his eightieth birthday is a suitable opportunity for an appreciation of the services to the Society of our General Secretary, Dr. Benjamin Daydon Jackson.

Dr. Jackson has served the Society for forty-five years, as Botanical Secretary from 1880 to 1902 and as General Secretary from 1902 until the present time.

It is unnecessary to remind our Fellows of Dr. Jackson's devotion to the work and interests of our Society; many of us gratefully remember help in various ways received from him in his capacity as Secretary.

Dr. Jackson has also achieved a wide reputation as the exponent

of the Library and collections of Linnæus of which our Society is the custodian; and workers at home and abroad gratefully acknowledge his assistance in matters connected with Linnæus and his work. His bibliographical work, including the early volumes of the *Index Kewensis* are a permanent monument of his industry and powers of research.

It is proposed to ask Dr. Jackson to allow his portrait to be painted and to be hung in the rooms of the Society.

A committee of present and former Officers has been formed to carry out the proposal. Sir David Prain has kindly consented to act as Treasurer.

Subscriptions (which should not exceed Two Guineas) from Fellows and other friends should be sent to Mr. J. Ramsbottom at the British Museum (Natural History), Cromwell Road, London, S.W. 7.

A. B. RENDLE, *President*.		T. R. R. STEBBING, *Secretary*	1903–1907.
S. H. VINES, „	1900–1904.	OTTO STAPF, „	1908–1916.
D. H. SCOTT, „	1908–1912.	G. C. BOURNE, „	1912–1915.
E. B. POULTON, „	1912–1916.	E. S. GOODRICH, „	1915–1923.
D. PRAIN, „	1916–1919.	W. T. CALMAN, *Zoological Secretary*.	
A. S. WOODWARD, „	1919–1923.	J. RAMSBOTTOM, *Botanical Secretary*.	
H. W. MONCKTON, *Treasurer*.			

THE SOUTH-EASTERN UNION OF SCIENTIFIC SOCIETIES.

THE Thirtieth Annual Congress of the above was held at Folkestone from June 3rd to 6th under the Presidency of Sir John Russell, D.Sc., F.R.S., Director of the Rothamsted Experimental Station, Harpenden. The subject of the President's address was "The Place of Science in Rural Life"; and reference was made to the growth and development of the Rothamsted Station from the small beginnings initiated by Sir John Lawes and Dr. Gilbert in the middle of last century, and to the improvement of cereal and other crops, and, more recently, to our still rapidly increasing knowledge of the organic population of the soil, which had resulted from the work of the Station. The last subject was admirably developed by Mr. D. Ward Cutler, a member of the Rothamsted staff, in a lecture on the following evening.

The Botanical Section was well represented. The President for the year, Mr. A. G. Tansley, F.R.S., gave an address on the "Vegetation of the Southern English Chalk," describing the various plant-associations and their development. This was appropriately followed by an excursion in the afternoon, led by Mr. Tansley, to the ridge and chalk slopes above the Alkham Valley. Miss Lilian Lyle gave an interesting account of the Folkestone seaweeds and their growth, describing, with the aid of an excellent series of lantern-slides, the zonation and the characteristics of the genera and species found at the various levels. A good afternoon's work at the seaweeds was also done among the rocks between the tides under Miss Lyle's leadership;

and a useful exhibition of the local seaweeds arranged by Miss Lyle and the Rev. S. O. Ridley was shown in the meeting-room.

On the Saturday afternoon the botanists visited Dungeness, with Mr. G. C. Walton, F.L.S., as their guide. The excursion was a most enjoyable one; purple fox-glove and great masses of prostrate yellow broom made grand colour-splashes on the shingle in the bright sunshine. Lists of the characteristic plants were drawn up, including various water- and marsh-plants from the margins of the fresh-water pools.

Mr. Robert Paulson, F.L.S., was elected President of the Section for the next Congress, which will be held at Colchester.

A feature of the Congress was the Museum which had been specially arranged in the Woodward Hall, and included interesting exhibits of the local natural history.

The Congress was eminently successful; the weather was glorious and the local arrangements admirable. The botanists were specially indebted to Mr. George C. Walton, President of the Folkestone Natural History Society, and Mr. John W. Walton; the latter was also the editor of the survey of the Natural History and Archæology of the district, to which Mr. G. C. Walton supplied a report of the flowering plants and ferns of the neighbourhood. This useful little handbook had been prepared with a view to the visit of the Congress, and the arrangement of the chapters was based on a scheme drawn up in 1920 by the Regional Survey Committee of the Union.

BOTANICAL NOMENCLATURE IN AUSTRALIA.

[Mr. J. M. Black, Secretary of the Committee on Australian Botanical Nomenclature, has communicated two circulars, dated 28th Feb. and 15th April, 1925, respectively, which are summarized below for the information of British botanists. As it is desirable for the sake of precision to associate every generic name, whether conserved or not, with a *standard-species* (*vide* Rep. Imp. Bot. Conf. 1924, 304–305 (1925); Kew Bull. 1925, 49–58), I have ventured to suggest a standard-species for each of the proposed *nomina conservanda*—T. A. Sprague.]

A Committee on Australian Botanical Nomenclature was appointed by the Australasian Association for the Advancement of Science in 1924. It includes the senior botanical officer of each University and of each Government Botanical Department in Australia, with Mr. J. M. Black as Secretary and Mr. J. H. Maiden as a co-opted member. The list of Members is as follows:—New South Wales: Prof. A. A. Lawson, Dr. G. P. Darnell-Smith, Mr. Edwin Cheel, Mr. J. H. Maiden. Victoria: Prof. A. J. Ewart, Mr. W. Laidlaw, Mr. J. W. Audas. Queensland: Prof. E. J. Goddard, Mr. C. T. White. South Australia: Prof. T. G. B. Osborn, Mr. J. M. Black. Western Australia: Mr. W. M. Carne. Tasmania: Mr. L. Rodway, Mr. R. A. Black.

The Committee has had under consideration the question of what names, if any, of Australian genera should be recommended to the next International Botanical Congress for addition to the list of *Nomina conservanda*. A detailed memorandum dealing with ten suggested *nomina conservanda*, all being names employed in Bentham's 'Flora Australiensis,' was prepared by Mr. J. M. Black, and each name was subsequently submitted to the vote.

The decisions of the Committee have been embodied in the following Resolutions:—

(1) That the Ithaca Congress be asked to place on the list of *nomina conservanda* the following generic names:—*Muehlenbeckia* Meisn., *Denhamia* Meisn., *Oreomyrrhis* Endl., *Leucopogon* R. Br., *Angianthus* Wendl., *Olearia* Moench; and to place on the list of *nomina rejicienda* the names *Calacinum* Rafin., *Karkinetron* Rafin., *Sarcogonum* G. Don, *Leucocarpum* A. Rich., *Caldasia* Lag., *Perojoa* Cav., *Siloxerus* Labill., and *Shawia* Forst. & Forst. f.

(2) That no action be taken as regards the names *Themeda* Forsk., *Stemona* Lour., *Lomandra* Labill., and *Lindernia* All., which are already, by right of priority, the valid names for those genera, unless a proposal is made at the Congress to displace them, in which case the Committee is in favour of their conservation.

(3) That the priority of *Bassia* All. be maintained, and that a friendly suggestion be made to the British botanists working on the flora of Further India and the Malay Peninsula, and to American botanists working on the flora of the Philippine Islands, that they cease the use of *Bassia* Koenig, as it is contrary to botanical principles that two entirely different genera should bear the same name. [The case of *Bassia* Koenig was briefly discussed in Journ. Bot. 1924, 80, when it was mentioned that the name *Madhuca* Gmel. had been adopted for the genus under International Rules by MacBride (1918) and Merrill (1923). *Madhuca* has since been accepted by H. J. Lam in his account of the *Sapotaceæ* of the Dutch East Indies and surrounding countries (Bull. Jard. Bot. Buitenz. sér. 3, vii. 152, 1925). In these circumstances it is now improbable that any attempt will be made to displace *Bassia* All. by placing *Bassia* Koenig on the list of *nomina conservanda*.—T. A. S.]

The cases stated by Mr. Black for the conservation of the six names mentioned in the first part of Resolution 1 may be summarized as follows:—The number prefixed to the generic name in each case is the running-number employed in Dalla Torre and Harms, Gen. Siphonogarum.

Polygonaceæ

2208. Muehlenbeckia Meisn. Gen. 316; Comm. 227 (1840). Name adopted in Benth. Fl. Austr. (1870), and in all previous and subsequent Australian and New Zealand floras; also in Benth. & Hook. f. Gen. Pl., and Engl. & Prantl, Nat. Pflanzenf.

Suggested standard-species: *M. australis* (Forst.) Meisn. About 20 species in Australia, New Zealand, Pacific Islands, and extra-tropical South America.

The prior names—*Calacinum* Rafin. Fl. Tellur. ii. 33 (1836), *Karkinetron* Rafin. *l. c.* iii. 11 (1836), and *Sarcogonum* G. Don in Sweet, Hort. Brit. ed. 3, 577 (1839)—have not been used in any flora or other botanical work since their original publication.

CELASTRACEÆ.

4623. DENHAMIA Meisn. Gen. 18; Comm. 16 (1837). Name adopted in Benth. Fl. Austr. (1863); Benth. & Hook. f. Gen. Pl.; Engl. & Prantl, Nat. Pflanzenf.; F. M. Bailey, Queensl. Fl. (1889); and Ewart & Davies, Fl. N. Terr. (1917).

Suggested standard-species: *D. obscura* (A. Rich.) Meisn. A purely Australian genus of three species. The existence of *Leucocarpus* D. Don (1830) (*Scrophulariaceæ*) makes it highly undesirable to revive *Leucocarpum* (*Leucocarpon*) A. Rich. Sert. Astrolab. 46, t. 18 (1834), which is a prior name for *Denhamia* Meisn. F. v. Mueller (Fragm. vi. 203, 1868) adopted *Leucocarpon* A. Rich., but all other Australian botanists have preferred *Denhamia*.

UMBELLIFERÆ.

5957. OREOMYRRHIS Endl. Gen. 787 (1839). Name adopted in Benth. Fl. Austr. (1866), Hemsl. Biol. Centr.-Amer., Bot. (1880), Reiche, Fl. Chile (1902), and, as far as is known, in all floras except Tate's cited below; also in Benth. & Hook. f. Gen. Pl., and Engl. & Prantl, Nat. Pflanzenf.

Suggested standard-species: *O. andicola* (H. B. K.) Endl. Seven species, one purely Australian, one belonging to Australia, New Zealand, and South America, one from Formosa, and four belonging to South America and Mexico.

The prior name, *Caldasia* Lag. Amen. ii. 98, was accepted in DC. Prodr. iv. 229 (1830), but does not appear to have been adopted in any flora except Tate, Fl. Extratrop. S. Austr. It is antedated by *Caldasia* Humb. ex Willd. (1807), a mere synonym of *Bonplandia* Cav. (1800) (*Polemoniaceæ*) and by *Caldasia* Mutis, which is a *nomen rejiciendum* in respect of the conserved generic name *Helosis* Rich. (1822) (*Balanophoraceæ*).

EPACRIDACEÆ.

6262, partim. *Leucopogon* R. Br. Prodr. 541 (1810). Name adopted in Benth. Fl. Austr. (1869), Benth. & Hook. f. Gen. Pl., Moore & Betche, Handb. Fl. N. S. Wales (1893), Rodway, Tasm. Fl. (1903), Cheeseman, N.Z. Fl. (1906), Ewart & Davies, Fl. N. Terr. (1917), Ostenfeld, Contrib. W. Austr. Bot. (1921), Cens. Pl. Vict. (1923), and all botanical publications which do not unite *Leucopogon* with *Styphelia*.

Suggested standard-species: *L. lanceolatus* (Sm.) R. Br. Over 120 species in Australia, and a few outside it in the islands to the north, and in New Zealand.

The prior name *Perojoa* Cav. Ic. iv. 29, t. 349 (1797), was based on, and has been applied only to, a single species, *P. microphylla* Cav. (*Leucopogon microphyllus* R. Br.), and has not been used since in any work dealing with Australian botany. As many botanists prefer to treat *Leucopogon* as a distinct genus, instead of merging it in *Styphelia*, it is important that the name *Leucopogon* should be conserved. Otherwise great disturbance in nomenclature might be caused by the revival of *Perojoa*.

COMPOSITÆ.

8916. OLEARIA Moench, Meth. Suppl. 254 (1802). Name adopted in Benth. Fl. Austr. (1866); Benth. & Hook. f. Gen. Pl.; Engl. & Prantl, Nat. Pflanzenf., and by nearly all subsequent botanical authorities. F. v. Mueller merged *Olearia* in *Aster*, a course in which he was followed by Moore and Betche, Handb. Fl. N.S. Wales; and Tate, Fl. Extratrop. S. Austr. Most botanists, however, regard *Olearia* as generically distinct from *Aster*.

Suggested standard-species: *O. tomentosa* (Wendl.) DC. A genus of 60–70 species, chiefly belonging to Australia, with a few in New Zealand.

The prior name, *Shawia* Forst. & Forst. f. Char. Gen. 95, t. 48 (1776), has not been used since in any botanical work, except by Schultz Bipontinus, who, in *Pollichia*, xviii.–xix. 172–175 (1861), transferred all the then-known species of *Eurybia* (now included in *Olearia*) to *Shawia*, and by Britten, who, in Illustr. Cook's Voy. (1901), mentioned one species as *Shawia arguta*.

9028. ANGIANTHUS Wendl. Coll. ii. 31, t. 48 (1809). Name adopted in Benth. Fl. Austr. (1866), and in all Australian floras published since that date.

Suggested standard-species: *A. tomentosus* Wendl. A purely Australian genus, comprising (as defined by Bentham) about 27 species, mostly West Australian.

The prior name *Siloxerus* Labill. Nov. Holl. Pl. ii. 57, t. 209 (1806), was based on *S. humifusus* Labill. Bentham accepted the name *S. humifusus* in Huegel, Enum. Pl. (1837). Since then, however, the name *Siloxerus* does not appear to have been used until it was revived by Ostenfeld, Contrib. W. Austr. Bot. ii. 134 (1921) (Dansk. Vidensk. Selsk. Biol. Meddel. iii. 2), who published four new combinations under *Siloxerus*.

SHORT NOTE.

FERNS GROWN UNDER BOTTLES. As the result of further experiment in growing ferns under bottles in the manner described in the *Journal of Botany*, May 1924, p. 146, I have found that the top surface of the soil is apparently the source of the supply of spores. Trials with soil six or more inches from the surface have yielded no results, while the actual top soil, especially from spots favourable to wind-drift from the south-west (such as the foot of a wall facing in that direction), gives abundant fern-growth when treated in the method described by stirring in a pail of water and planting the floating scum.

Possibly this fact, though it is not in itself surprising, may give a clue to the whole problem. It does not appear that the inverted bottle favours fertilisation merely by acting as a miniature greenhouse, because this would not account for the finding of fern-fronds outside the bottle, between the glass and the earth, with no trace of prothallus within the bottle. On the other hand, it is not difficult to see that spores under a bottle or in the crack between the earth and the bottle-surface would be protected from further wind-drift. Continual displacements of a spore by wind would afford little opportunity for growth, which would be continually arrested by the removal of the spore to some other spot, no doubt rapidly impairing and destroying its vitality. If protected from these continual wind-disturbances it is given a fair chance to germinate, the spores would not be so likely to occur a few inches below the surface of stationary soil, because being simply wind-borne there would be little reason for their penetrating far underground.—CHARLES E. BENHAM.

REVIEWS.

Ergebnisse der Internationalen Pflanzen-geographischen Exkursion durch die Schweizeralpen 1923. Edited by E. RUBEL. 8vo, pp. 361. Rascher: Zurich, 1924.

THIS is a symposium of the third International Plantgeographical Excursion, a short preface by E. Rubel preceding the following twelve sections:—

(1) C. Schröter (Zurich) gives (pp. 7–27) programmes and diaries of the first, second, and third excursions.

(2) L. Diels (Berlin) contributes (pp. 28–30) a few remarks on algal and other colonising lithophytic associations, indicating a wide field for study.

(3) G. E. Du Rietz (Upsala) has made (pp. 31–139) a comparative study of the vegetation of the Swiss Alps and Scandinavia. He gives descriptions (often with tabulated lists) of numerous Swiss associations named and classified into formations and subformations based, not on climate and soil as with the English ecologists, but on the nature of the vegetation, *e. g.* A. Lignosa (woody-plant formations)—i. Magnolignosa (woodlands)—*a.* deciduimagnolignosa (deciduous woodland)—and so on. His subdivision into "associations" is rather fine—some would appear to be what English workers call subassociations, facies, or even mere societies; but possibly detailed analysis is a useful preliminary to later synthesis. Following these descriptions is a comparison with Scandinavian associations, altitudinal zonations and other ecological questions being discussed.

(4) K. Linkola (Åbo, Finland) discusses (pp. 140–224) the types of woodland occurring in the Swiss Alps. He distinguishes (i.) "Heidewalde" (xerophilous woodland): *Empetrum-Vaccinium* type; *Vaccinium* type; (*Erica carnea* type). (ii.) "Frischenwalde" (mesophilous woodland): *Myrtillus* type; *Oxalis-Myrtillus* type. (iii.) "Hainwalde" (meso-hygrophilous and hygrophilous woodland): *Vaccinium-Papilionaceæ* type; *Brachypodium-Chamæbuxus* type; *Oxalis-Maianthemum* type; *Oxalis* type; (*Impatiens-Asperula* type).

A detailed list of each type is given, transitional and indeterminate types are dealt with, the "spectra"—by Raunkiaer's method—of the types are given, and other details are discussed. He explains how to distinguish the types, and the value of the method, and a long bibliography is added.

(5) J. Pavillard (Montpellier) and A. P. Allorge (Paris) give (pp. 225–237) botanical and other impressions of the excursion.

(6) Podpera (Brunn) contributes (pp. 238–260) a systematic list of the Bryophytes which he collected.

(7) R. L. Praeger (Dublin) compares (pp. 261–274) the vegetation of Switzerland and Ireland.

(8) C. Regel (Kovao) compares (pp. 275–284) the Alpine vegetation with the northern (sub-Arctic).

(9) E. J. Salisbury (London) remarks (pp. 285–288) on cases where British species possess a different habitat in Switzerland, *e. g.* are calcicole, and not calcifuge as with us.

(10) F. Schustler (Prague) offers (pp. 289–299) considerations of how far the vegetations of the various "tree-limits" are equivalent. Since different species represent the tree-limit in different mountain-ranges, the vegetations of the tree-limits are only comparable when the same species of tree defines the limit. In other cases the tree-limits may represent different altitudinal zones (hohen-Stüfen), and these are classified.

(11) W. Szafer (Cracow) writes (pp. 300–310) on the sociological aspect of "Schneetälchen" associations, with a comparison between those of Switzerland and the Tatra.

(12) F. Vierhapper (Vienna) compares (pp. 311–361) the vegetation of the Swiss Alps with that of the Eastern Alps, and also gives critical floristic notes on several species met with on the excursion. A. J. WILMOTT.

Handbuch der Pflanzenanatomie. Edited by K. LUISBAUER. Abt. II. Teil 2: *Bryophyten. Anatomie der Lebermoose* by TH. HERZOG. 8vo, pp. 112, text-figs. 93. Borntraeger: Berlin, 1925. Price G.M. 8.70.

THIS account, with its abundance of figures, is likely to prove of great assistance to students of the Hepaticæ. In the first part the author describes the various forms of hepatic tissue and their cell-elements—epidermis, parenchyma, conducting and stiffening bundles and cells, slime-cells, oil-cells, idioblasts of unknown function, absorbing hairs, bristles, scales, and rhizoids; also the gemmæ and the formation of the calyptra. Passing on to a consideration of the various types of gametophyte-plant he describes the simpler forms of thallus exhibited by *Aneura*, *Pellia*, *Metzgeria*, *Symphyogyna*, and the more specialized types found in the Marchantiaceæ, with an elaborated layer of air-chambers, and in *Riccia*, and then discusses the forms of leafy stem found in the Jungermanniaceæ, with the various leaf-characters such as lobes, marginal spines and hairs, wall-thickenings, papillæ, water-sacs. Coming to the sporophyte he treats of the foot, seta, sporogonium, the various forms of capsule-wall in

Marchantiales, Jungermanniales, Anthocerotales, the elaters, and the spores. All the data that could reasonably be demanded are given, and most are figured; and several of the figures are new. A bibliography is appended. A. G.

Bakterien-Cyclogenie. By Professor GÜNTHER ENDERLEIN. 8vo, pp. 390, 330 text-figures. De Gruyter: Berlin and Leipzig, 1925. Price 20 Marks.

IT is unusual to have to turn to an author's glossary in order to find out the meaning of his title. The subtitle "Prolegomena zu Untersuchungen über Bau, geschlechtliche und ungeschlechtliche Fortpflanzung und Entwicklung der Bakterien," however, gives a clue to the fact that, in spite of the author's definition of "Cyclogenie" requiring five further references to his glossary, the word corresponds to what most botanists mean by life-cycle.

Professor Enderlein is a well-known zoologist, being Kustos in the zoological museum of the Berlin University. His contributions to science are listed in an appendix to the volume under review and comprise 285 titles, chiefly entomological. The first paper on bacteriology is dated 1915. It appears that his interest in this subject was reawakened during two years' spare-time volunteer service in a military hospital. A new system of classification was sketched in 1917 and over twenty new genera proposed: the basis of the classification and the details of its application are the theme of the monograph which, according to the preface, was completed in 1915–16 except for references to later works.

The main part of the monograph is divided into ten heads:—Historical review of the morphology, cytology, and development of bacteria; principles of comparative cytology; principles of comparative morphology; reproduction; cyclogeny: (*a*) causal factors, (*b*) conditional factors; basis for a comparative morphological classification of bacteria; relation of bacteria to other organisms; relation of mychotes to metamychotes; significance of cyclogeny in medicine.

In the present state of our knowledge of the life-cycle of bacteria such a table of contents appears peculiarly attractive. Its subdivisions, however, contain so many new terms that the great fault of the book becomes immediately apparent. It is extremely difficult to read because of the large number of new terms introduced. What can we say of a glossary of 134 terms in bacteriology, all of which, except two, are new, and twenty out of thirty cytological terms also new? Except from the man in the street there can be no criticism of precise scientific terminology, but most of us object to having to learn a new language in order to read a text-book. There can be no doubt that the author is on certain ground when he supports modern belief that comparative morphology of growth-forms should be the basis of classification. It would take us too far to attempt to discuss the details of the classification and of the new genera and species proposed. It should be pointed out, however, that the Myxobacteria are included as a family with the name of Chondromycidæ. The author states that he published

a paper of six pages on the systematics of this group on Oct. 9th, 1924. Jahn's 'Die Polyangiden' deals with the same group and "Publ. 1. 10. 24" appears on the cover. According to Enderlein, however, the date was November. The significance of this is that five of the new genera proposed by Jahn may be predated: *Podangium* by *Monocystia*, *Archangium* by *Ophiocystia*, *Synangium* by *Apelmocæna*, *Sorangium* by *Cystœcemia*, and *Chondrococcus* by *Dactylocæna*. It will be regrettable if names in what will be a standard work on the group should have to be replaced by those given in a small pamphlet presumably with diagnoses in incomprehensible terminology, and obviously with no real knowledge of the group.

Another claim to priority which the author appears to make is that he forestalled the work of Löhnis on bacterial life-cycles; apparently he forgets the paper of Löhnis and Smith which appeared in 1916.

In the section on the relations of the bacteria to other lower organisms there is a short account of yeasts and the statement "Es ist daher wohl mit der Möglichkeit zu rechnen, dass die Saccharomyceten gar nicht zu den Pilzen gehören, sondern ihre Verwandtschaft mehr bei den Protozoen zu suchen ist." One had thought that the true position of yeasts was no longer in doubt, but apparently bacteriologists still regard them as of uncertain position (see, *e. g.*, Browning's 'Bacteriology': Home University Library Series, 1925).

The text-figures are all drawn to a magnification of 10,000, and are from crayon drawings. Every drawing has a number—*e. g.* figs. 329 and 330 are two platelets of human blood!

The volume ends with a list of references occupying twelve pages, a list of figures, and an index. J. R.

Plants and Man. A Series of Essays relating to the Botany of Ordinary Life. By Prof. F. O. BOWER, Sc.D., LL.D., F.R.S. 8vo, pp. xii, 365. With Frontispiece and 148 figs. in text. London: Macmillan, 1925. Price 14*s.* net.

PROFESSOR BOWER has essayed "the difficult task of preparing some statement, stripped as far as possible of technicalities, which should, nevertheless, reflect the current outlook on some of the fundamental features of the Science of Botany. The present aim is to explain, for the general reader, in very general terms, how plants fabricate for their own life commodities that man finds so useful in his." Most of the essays appeared as a series of articles in *The Glasgow Herald* in 1924; these, illustrated by numerous text-figures, form the main part of the volume. It is unlikely that the book will attract one who has no knowledge of or interest in the workings of Nature, but, given an interest in Nature and also some slight acquaintance with the a, b, c of botany, the reader will find a well-written and highly interesting exposition of the inter-relation between animal-life in general and human in particular, on the one hand, and the plant-world on the other. An introductory chapter explains the dependence of the animal-world on the green plant, and a study of the green leaf indicates the mechanism underlying this inter-relation. A conception is supplied of the plant-body as a whole, and the

difference in method of growth between the higher plant and the animal, apparently rendering possible unlimited growth on the part of the plant, were it not for the incidence of mechanical factors, is explained. We note that Prof. Bower does not advocate the possibility of indefinite size and unlimited life for water-plants, where the mechanical factors play a minor part. The normal fixed position of the plant as contrasted with the animal renders necessary special methods for ensuring reproduction and adequate distribution of offspring.

A series of chapters, entitled "Meadow and Pasture," "Woodland," "Moor and Mountain," "The Sea-shore," "Golf-links and Playing-fields," "The Flower Garden," &c., supply texts for readable essays on the workings of Nature and the effects of interference of man in moulding Nature to his own ends, and in "Dessert Fruits," "Cereal Grains," and "Vegetable Foods" the value of his various food-substances is explained. The author alludes to the arrest of decay in the preservation of fruit, but does not explain why the "preserved" fruit is so often devoid of its distinctive flavour. "Timber, Textiles, and Twine" are also considered. If a new edition is called for, an explanation of the familiar knots in timber would be a useful addition. An account of symbiotic life leads on to fungi and bacteria and "Scavenging and Sanitation," and the book concludes with two general chapters on "Man's Dependence on and Influence on Vegetation," respectively. We congratulate Prof. Bower on his incursion into botanical literature of a lighter vein than we have been used to expect from him. It coincides happily with his release from professional duties at Glasgow after forty years of work, and he has our best wishes for long-continued health and vigour.

Physiologische Pflanzenanatomie. By Dr. G. HABERLANDT, Professor of Botany in the University of Berlin. Sixth edition, revised and enlarged. 8vo, pp. xvii, 671, with 295 text-figs. Engelmann: Leipzig, 1924. Price 22 Marks (19 Marks, unbound).

THE original edition of Dr. Haberlandt's *Physiological Plant-Anatomy* appeared in 1884. Inspired by the work of Schwendener, whose *Mechanischen Princip in Anatomischen Bau der Monocotylen* had appeared ten years before, Haberlandt attempted to give a correlated account of the structure and function of the various tissue-systems of the plant. His book was welcomed as a connected presentation on new lines of the facts of plant-physiology and anatomy, and its value to students is attested by the new editions which have been called for from time to time—in 1896, 1904, 1909, 1917, and 1924. The original edition was a modest volume of 398 pages, with 140 woodcuts.

In his Foreword to the present edition, the author expresses that sense of his limitations which is the hall-mark of the best scientific work. He suggests the desirability of a fundamental alteration in the plan of the work. To the request for the addition of a connected account of the physiological anatomy of the organs of reproduction he replies that he has neither the strength nor the courage for so far-reaching an undertaking. He also regrets the absence of a detailed treatment of the subject developmentally, but considers that the time for this is not yet ripe.

The subject-matter is included in the same fourteen sections as were adopted in the fourth edition (1909), the size and scope of which (650 pages and 291 text-figures) are comparable with those of the present edition. They are as follows:—(1) Cells and Tissues; (2) Tissue-building; (3) The Protective System; (4) The Mechanical System; (5) The Absorption System; (6) The Assimilation System; (7) The Conducting System; (8) The Storage System; (9) The Respiratory System; (10) Secretory and Excretory Organs; (11) Movement; (12) Sense-Organs; (13) Conduction of Stimulus; and (14) Secondary Thickening in Stem and Root.

Notices of previous editions will be found in the *Journal*, 1897, pp. 104–5 (edition 2), and 1904, pp. 210–11 (edition 3).

BOOK-NOTES, NEWS, ETC.

AT the general meeting of the Linnean Society on June 11th, Mr. Daniell Angell Jones and the Rev. Harry Joseph Riddelsdell, both well known as students of the British flora, were elected Associates.

Miss M. L. Green exhibited a living plant of *Corallorrhiza innata* from Northumberland, and also herbarium specimens.

Mr. T. A. Sprague showed a living specimen of *Geum rivale* with an abnormal flower from Odiham, Hants, and by drawings on the black-board demonstrated its peculiarity; he also showed similar malformations represented in pre-Linnean books.

Dr. W. Bateson exhibited Pelargoniums illustrating production of bud-sports. The popular conception of sports as novelties produced anomalously and by contemporaneous variation is probably incorrect. In all likelihood they are due to the emergence of a distinct, previously existing component, originally formed by somatic segregation at some early stage. Not very rarely the hidden component, perhaps most often a dominant, is arranged as a central core of a periclinal system, emerging regularly in buds formed adventitiously on roots of inverted plants. Not improbably the whole root belongs to the inner component, being a downward production of the core. Mosaic chimæras with islands showing a dominant also occur. A growing point arising in such an island forms a periclinal with the dominant external. The core on emergence is frequently still mosaic. Three zonal Pelargoniums showed respectively (*a*) female, (*b*) male, (*c*) total sterility associated with, and probably caused by, a peculiar epidermal component periclinally arranged.

Mr. Frederick Eyles contributed "Remarks on the Flora of Southern Rhodesia."

It was pointed out that the type occupying a larger area than any other is the open forest, with trees widely spaced, not often exceeding 50 ft. in height, with a sparse undergrowth. From the ecological point of view, water is, as elsewhere, the chief controlling factor: the edaphic influence is also considerable; while temperature has

less effect on distribution owing to the relatively small degree of local and seasonal variation. Practically no definite ecological work has yet been done, but a mass of notes has been prepared ready to be collated. No factor has a greater influence on the character and distribution of the flora of Rhodesia than that of the remarkable incidence of the annual rainfall. This occurs in two clearly defined seasons, viz. six months of wet season and six months of dry season. The consequence is that all perennials must be adapted to face and survive six months of drought every year. This necessity is met in the usual way by means of bulbs, tubers, and woody rootstocks, besides, in some cases, the provision of above-ground xerophilous devices to prevent excessive transpiration, such as the well-known hairy and waxy covering of leaves, or a reduction of their surface.

Royal Society of Arts. The Albert Medal of the Society for the current year has been awarded by the Council, with the approval of the President, H.R.H. the Duke of Connaught, to Lieut.-Colonel Sir David Prain, C.M.G., C.I.E., M.B., LL.D., F.R.S., "for the application of Botany to the development of the raw materials of the Empire." Sir David Prain is a distinguished botanist. When Director of the Royal Botanic Gardens at Calcutta, he developed the Government cinchona plantations of India, and organised a system for the cheap distribution of quinine through the Post Offices, thereby making the drug familiar in every village of India and saving unnumbered human lives. Subsequently, as Director of the Royal Botanic Gardens at Kew, his work has been of great value to those engaged in the trades in timber and in other vegetable products of commercial value. The importance of his work is appreciated by the scientific world and by Government Departments in this country and in India.

The Albert Medal was instituted in 1863 as a memorial of the Prince Consort, for eighteen years President of the Society, and is awarded annually "for distinguished merit in promoting Arts, Manufactures, and Commerce."

On the occasion of the Annual Summer Meeting at the Rothamsted Experimental Station on June 18, when the institution was host to a representative gathering of scientific and practical workers, the new pathological laboratories were declared open by the Right Hon. Lord Bledisloe, K.B.E., Parliamentary Secretary to the Minister for Agriculture. Previously to his appointment in the Ministry, Lord Bledisloe was Chairman of the Committee of Management of the Lawes Agricultural Trust, the governing body of the Experimental Station.

A number of members of the Botanical Exchange Club of the British Isles met at Dorchester House on June 26, on the occasion of the presentation of a book-plate to the Secretary, Dr. G. Claridge Druce. The presentation was made on behalf of the Club by Viscount Grey of Falloden, and Dr. Druce in reply gave some particulars of the Club from its commencement. A signed copy of the book-plate, which is very artistically designed and contains figures of two plants associated with Dr. Druce, is to be distributed to Members.

MOSSES FROM THE MT. EVEREST EXPEDITION, 1924.

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

In the July number of this Journal Mr. R. Paulson described the lichens collected by Dr. T. H. Somervell on Mt. Everest. Dr. Somervell also collected with the lichens a certain number of mosses, and the remarks as to the collecting-grounds, quoted in the above article from his letter to Dr. L. B. Trotter, apply equally to the mosses.

There were only five gatherings of mosses, four of which represented a single species—an undescribed species of *Grimmia*.

Grimmia Somervellii Dixon, sp. nov.

Cæspites densi, olivacei, sæpe nigrescentes, parvi, circa 1 cm. alti, sat faciliter dilabiles. Folia dense conferta, madida erecto-patentia, sicca *erecta, appressa, stricta*; e basi oblongo-ovata sensim late breviter lanceolata, parum angustata, concava, vix carinata, superiora ad apicem latiusculum subito in pilum *sat longum, terete*, sæpe flexuosum, *integrum* vel minime denticulatum protracta; marginibus omnino planis *vel uno latere leniter reflexis*; costa sat valida, ad basin 70–80 μ lata, ubique subæqualis, supra indistincta. Cellulæ superiores *valde obscuræ*, minimæ, incrassatæ, ad margines superiores *bistratosæ*, inferne subquadratæ et breviter rectangulares, parietibus parum sinuosis; basilares juxtacostales seriebus paucis lineari-rectangulares, elongati, marginales *seriebus numerosis brevissime rectangulares vel subquadratæ*, sat laxæ, sæpius hyalinæ.

Seta *erecta, brevissima*, 1–2 mm. longa; theca elliptica, parva, *flavida, lævis, leptodermica*, operculo aurantiaco, *rostellato*. Peristomium (vetustum) e dentibus flavidis, integris, sat conferte lamellatis, apicem versus aurantiacis, papillosis, instructum. Annulus latus. Spori minuti. Calyptra valde juvenis tantum visa.

Hab. Rongbuk Valley, 16,000–17,000 ft. (1001); 16,000–17,500 ft. (1004, 1005); on soil, 16,500–17,500 ft., 15 miles N. of Base Camp, near Lamna La Pass (1006).

The numbers are my own. No. 1001, which I consider the type, has numerous fruits, but all old and in rather poor condition. No. 1004, without fruit, is darker, more robust, with long, very white hair-points; No. 1006 a similar form with a few capsules.

The affinity is not quite certain; in most respects it resembles *G. montana*, but differs in margin sometimes reflexed, as well as in the more distinctly bi-stratose marginal cells, and the hair-point entire or practically so. I have not been able to detect stomata on the capsule-wall, but cannot state certainly that they are not present.

The second species collected was in some respects still more interesting, being Aongstrœmia julacea (Hook.) Mitt. This was collected above the Rongbuk Valley, east side, at 19,800 ft., a single large sterile tuft. This is by far the highest limit from which any moss has hitherto been collected, the greatest altitude hitherto recorded being 18,900 ft. (*cf.* Journ. Bot. 1924, pp. 228, 277).

Apart from this, the distribution of the species is a very remarkable one. *A. julacea* was described (as *Gymnostomum julaceum*) by Hooker, from Pichincha in the Andes Quitenses, at a height of about 13,000 ft., collected by Humboldt and Bonpland, and has since been found in the high Andes of New Granada, but the distribution is, I believe, very limited.

These localities remained the only ones known until, in 1917, I received from T. R. Sim a packet of mosses collected at 8000 ft. on Giant's Castle, Natal; this contained two mosses, both sterile and both new to South Africa, viz., *Ditrichum strictum* Hampe, with a high Andine and sub-antarctic distribution, and this same *Aongstræmia julacea*. The occurrence of this very distinct species in three such distant spots, and all at such high altitudes, is a very unusual and remarkable instance of geographical distribution, and suggests a precarious survival from an earlier period of a wider and perhaps general range. It may be, in fact, a parallel case to the insular distribution of certain sub-antarctic species, now restricted to such islands as Kerguelen, Fuegia, the Falklands, Lord Auckland's Is., and New Zealand, and common to all or some of them; and with little doubt relics of a former more or less general continental land-connection. In the present case the islands are represented by isolated mountain peaks, and the destructive force obliterating the intermediate stations would be not an influx of sea but an invading force of competing vegetation.

SOME ALCHEMILLAS NEW TO BRITAIN.

By C. E. Salmon, F.L.S.

In July 1922, during a holiday at Aviemore, E. Inverness, a special look-out was kept for *Alchemilla vulgaris* forms, both at high and low elevations. What a good centre this proved I think the following notes will show, as not only did we see all the British forms then recognized (with the possible exception of *A. pastoralis*), but we were fortunate in being able to add three others (*A. subcrenata* Bus., *A. tenuis* Bus., and *A. connivens* Bus.) to the British list.

These, as well as the other species new to our islands mentioned below (indicated by a *), were all determined by Dr. Jaquet, of Geneva, the able and close observer of this difficult genus, who has studied the varying forms in the field and herbarium under the eye of Dr. Buser, the monographer, who is, alas! no longer able to pursue the close study of these beautiful and interesting plants. To Dr. Jaquet I am most grateful for help in many ways.

*A. curtiloba Buser.—Amongst some specimens that came to me with the collection of the late H. T. Mennell (Journ. Bot. 1924, 81) was an *Alchemilla* collected by Miss M. Mennell in 1895, at Goathland, N.E. Yorkshire (v.c. 62), which has been thus determined by Dr. Jaquet. *A. curtiloba* was described in Mém. Soc. Fribourg. Sci. Nat. ii. p. 69 (1907), as follows:—"Plante de grandes dimensions, dressée, assez trapue, à axes velus d'un indument assez doux, à inflorescences et à feuilles plus ou moins glabres. . . . Feuilles radicales grandes, 9-lobées, reniformes, à lobes fort larges et peu profonds, égalant $\frac{1}{5}$–$\frac{1}{4}$ du rayon, arqués sur les feuilles inférieures, déprimés-triangulaires ou obtus-triangulaires sur les feuilles supérieures, souvent périphériques, à peine délimités. Dents 8–9 de chaque côté, moyennes, larges et peu profondes, mammiformes, mucronulées-pénicillées. Feuilles . . . . vert-bleuâtre et glabres en dessus, vert blanchâtre et veinées-réticulées, à mailles larges, en dessous, à mésophylle glabre ou parsemé de quelques poils, à côtes hérissées-poilues. Pétioles . . . . tous subvelus. Stipules étroites et extraordinairement allongées (jusqu'à 7 cm., y compris les oreillettes longues à $1\frac{1}{2}$ cm.); . . . . Tiges peu nombreuses (1–2), droites et dressées, fistuleuses, ... velues jusqu'au point de départ du 1er ou du 2e rameau, glabres au-dessus. Feuilles caulinaires assez grandes, a lobes à peine accusés, passant assez brusquement en de larges stipuliums en forme de collerettes inégalement et grossièrement crénelées-dentées. Inflorescence en corymbes lâches et diffus; . . . . pédicelles longs, les inférieurs égalant 3 à $1\frac{1}{2}$ fois, les supérieurs égalant les urcéoles. Fleurs moyennes, ... complètement glabres . . . . Urcéoles campanulés, ... sépales très larges-ovés, acuminés ou aigus. Calicule souvent énorme, calicinoïde. Style ne dépassant pas les filaments. . . . Fleurs larges de 4, longues de $3\frac{1}{2}$ mm. Urcéoles $1\frac{1}{2}$–$1\frac{2}{3}$, sépales $1\frac{1}{2}$, pédicelles $1\frac{1}{2}$–7 mm. . . . .

"La particularité des axes velus et des feuilles glabres en dessus place le *Curtiloba* dans le voisinage de *Pratensis*, dont il a, en outre, la taille, la consistance et l'indument. Mais le *Pratensis* a des feuilles arrondies, à lobes plus nombreux (–11) et plus allongés, vert-jaunâtre, poilues en dessous et d'une nervation réticulée moins manifeste, à mailles plus étroites. L'indument monte jusque dans l'inflorescence et ordinairement les urcéoles portent quelques poils. Les lobes des feuilles caulinaires sont bien accusés, écartés; les stipuliums réduits et sublaciniés-dentés. Les fleurs sont plus petites et plus condensées, les styles exserts à la hauteur des sépales."

It will thus be seen that whilst *A. curtiloba* is most closely allied to *A. pratensis*, it may be distinguished by the pubescence of the stem not extending so high, the more reniform (less orbicular) radical leaves which are less hairy beneath, their fewer, shallower lobes with broad shallow mammiform teeth, and by the larger flowers.

A. minor Huds.—This is the *A. filicaulis* Bus. f. *vestita* Bus., and Dr. Jaquet, after examining my British material, writes that it is merely *A. filicaulis* Bus., with the clothing of hairs extending higher up the stem and including the inflorescence. He says that in Switzerland the two names are actually considered as synonyms.

During my holiday in Scotland in 1922, I gathered typical *A. minor* near Aviemore and Kincraig (v.c. 96) and near Dalnaspidal (v.c. 89), and a very remarkable form of var. *filicaulis* Bus. near Avinlochan (v.c. 96). This was of a uniform distinct yellow tint, and had a peculiar habit and leaf-shape. Upon this Dr. Jaquet reported, "Diffère toutefois un peu du nôtre par les lobes plus allongés, subaigus."

A. PASTORALIS Buser.—Of two gatherings made in 1922 from the Spey banks near Aviemore, E. Inverness (v.c. 96), Dr. Jaquet reported:—(1) "Forme *truncata* probablement de *A. pastoralis* Bus."; (2) "Forme dévoyée probablement de *A. pastoralis* Bus."

As these examples, however, by their hairy pedicels and urceoles, leaf-surfaces less pubescent, and their toothing less regular, etc., appear to approach *A. minor* Huds. more closely than *A. pastoralis*, it seems safer to place my plants under the former for the present. Perhaps botanists visiting Aviemore will make fresh gatherings for investigation.

Mr. A. J. Wilmott kindly sent me growing plants of *A. pastoralis* from Teesdale (Journ. Bot. 1922, 165) in 1923, and they thrive well in my garden. They show well the distinguishing features of this beautiful *Alchemilla* (originally described by Buser in 1891, Notes Alch. crit. nouv. 18), particularly its bluish-green colouring, the 9-lobed orbicular leaves which are copiously hairy (almost velvety) on both sides and more or less silky in their youth, their characteristic toothing, and smaller flowers.

*A. SUBCRENATA Buser.—Dr. Jaquet has identified as this species a plant collected near Loch-an-Eilein, near Aviemore, Invernesshire (v.c. 96), in July 1922.

This was originally described in Magnier, Scrinia Fl. Select. fasc. xii. p. 285 (1893), as follows:—"Plante de grandeur moyenne, grêle et faible, se desséchant vite et se fanant facilement, d'une teinte claire, jaunâtre à l'état jeune, colorée d'un rouge corail ou d'un violet brunâtre foncé sur les parties exposées au soleil alors que d'autres espèces commencent à peine à changer de couleur, à indument plutôt faible (pl. paraissant glabre à première vue).—Rhizome faible, ordinairement non ramifié. Feuilles moyennes (3–12 cm. longues et larges), ... orbiculaires, 9- ou imparfaitement 11-lobées, lobes décroissant insensiblement depuis le médian, les extérieurs étalés se superposant au-dessus du pétiole assez central au point de former une feuille pseudopeltée. Lobes assez larges et profonds, ¼ rayon du limbe, semi-orbiculaires ou semi-obovés, plus profonds (jusqu'à ⅔ rayon) et paraboliques dans les grandes feuilles estivales, grossièrement dentés à l'entour. Dents 5–8 de chaque côté, assez égales, courtes et larges, porrigées ou un peu divergentes, acuminées ou brièvement aiguës dans les petits individus, mais mammiformes, mucronulées ou arrondies, crénelées comme celles d'un *Rosa dumetorum* dans les grandes feuilles. Feuilles minces, papyracées; en dessus d'un glauque saturé, poilues le long des plis et sur les bords, plus rarement sur toute la face; en dessous plus pâles, verdâtres ou souvent grisâtres, non glauques, plus fortement poilues de poils lâches ou dressés sur les nervures, très finement réticulées, à réseau transparent quand on les regarde contre la lumière et faiblement saillant des 2 côtés sur le sec. Stipules apprimées, longues et étroites, incolores ou verdâtres, se terminant par des oreillettes étroites, oblongues, porrigées, un peu dentées antérieurement. Tiges plusieurs (2–6), égalant à peu près 2 fois les feuilles, 9–46 cm. longues, grêles, assez faibles et herbacées, fragiles, décombantes et arquées-ascendantes dans la partie supérieure, flexueuses, dans l'entraînement des hautes herbes droites et dressées, d'abord d'un jaune paille, mais se colorant vite, poilues ou faiblement velues de poils moyens, assez raides et horizontaux jusqu'aux points de départs des premiers rameaux, rarement plus haut. Inflorescence assez maigre, mais relativement feuillée et élégante. Feuilles caulinaires à lobes profonds et écartés, ainsi que les stipuliums à dents nombreuses et aiguës. Rameaux assez courts, souvent fourchus, les dernières ramifications fines, capillaires. Inflorescences partielles plutôt pauciflores. Fleurs . . . . petites (3–3·5 mm. longues), glabres, plus rarement les inférieures avec quelques poils horizontaux à la base des urcéoles, d'une jaune clair ou verdatre. Urcéoles courts (1·5 mm.), campanulés . . . . turbinés-ovoïdes en fruits. Sépales larges, aigus, dressés après l'anthèse et masquant les styles très saillants . . . . Pédicelles dressés en avant, 1–2 mm. longs, égalant ½ ou 1½ fois les urcéoles . . . ."

When Dr. Jaquet returned my specimen from Geneva labelled *A. subcrenata* I compared it with the original description of that species and with examples from abroad, and noticing how, in my plant, the inflorescence was much more hairy, I returned it to him for re-examination. This he kindly did, and reported upon it as follows:—"C'est tout à fait identique à notre *subcrenata* Bus. sauf les urcéoles poilus dans votre plante."

Owing to its greater hairiness (extending up to the inflorescence) the Scottish plant approaches *A. minor* Huds., but it is taller, with larger more orbicular leaves with their toothing shorter, broader, and ±mammiform, the urceoles are campanulate, less elongated below, etc.

In typical *subcrenata* the stems are hairy up to the lowermost branches (rarely higher), and the urceoles are glabrous or rarely the lower ones have some horizontal hairs at their base.

*A. TENUIS Buser.—Dr. Jaquet determines several of my gatherings in Scotland as above. This species belongs to the section Heteropodæ (hitherto unrecorded as British) of the Vulgares group, in which the first or the first few petioles are glabrous or glabrescent and the remainder hairy.

A. tenuis was originally described by Buser in Bull. Soc. bot. Suisse, iv. 76 (1894), and its main characteristics are as follow:—

Plant medium size, slender, dark green.

Leaves 9-lobed, roundish-reniform, as in *A. heteropoda*, with lobes shallow ¼ of the radius (in spring), or broad triangular about ½ of radius (in summer).

Toothing as in *A. heteropoda* †, but narrower and more acute.

Leaves dark green above, paler below, obviously hairy on both sides or even subvillous (occasionally much more glabrous). Petioles of the first leaves weakly hairy or rarely completely glabrous, the rest hairy. Stipules moderately broad, deep purple at the base, terminating in elongated-triangular auricles.

† "Teeth 6–8, somewhat deep and rather broad, obviously unequal, those of the lower leaves semioval with hair points; those of the upper leaves acute and projecting."

Stems decumbent-ascending or arcuate, 2–3 times longer than the leaves, slender, as a rule patent-hairy up to and beyond the first branches, lowest internode rarely completely glabrous.

Stem-leaves moderately developed, lobed to $\frac{1}{3}$, lobes not patent. Stipules broadly lobed, with acute teeth, the upper ones with very fine indentations with hairy points giving the inflorescence an elegant appearance.

Inflorescence meagre and narrow, branches and forks forming acute angles, ascending; corymbs sparsely flowered in little umbels rather than clusters, pedicels filiform.

Flowers small (2·5 mm. long and broad), half the size of those of *A. heteropoda* †.

Urceoles when young obconical, when riper jug-shaped, suddenly narrowed below and somewhat elongated.

Calyx-lobes broadly ovate to ovate-triangular.

Pedicels in the middle as long as or a little longer than the urceoles.

He concludes by remarking that *A. tenuis* is distinguished from *A. heteropoda* Bus. (with which it might be confused) by its more slender and delicate growth, more acute leaf-lobes and toothing, its more deeply-cut and more finely-toothed stem-leaves, its narrower inflorescence with smaller, more compact clusters of flowers and its purple basal stipules. As a rule, heteropody is only weakly developed in *A. tenuis*, and only rarely is the first petiole completely glabrous.

I think the only British form with which *A. tenuis* can be confused is *A. minor* Huds. var. *filicaulis* Bus., but this lacks the ±glabrous primordial petioles, its habit and leaf-toothing are different, its flowers larger, etc. *A. tenuis* is now known from *v.c. 88* (*Mid-Perth*) Meall Greigh (recorded in Journ. Bot. 1914, 289, as *A. minor* var. *filicaulis*): *v.c. 89* (*Perth E.*) Sow of Athol; stream side, Dalnaspidal: *v.c. 96* (*Easterness*) by the Spey near Aviemore and near Kincraig Bridge; near Loch Ban, Boat of Garten.

A. GLOMERULANS Buser.—This was first recorded as a British plant by Mr. Wilmott in this Journal for 1922 (p. 163), localities being cited from Mid-Perth (v.c. 88) and Easterness (v. c. 96). The discoverer of the plant in the latter county, the Rev. J. Roffey, kindly gave me particulars as to the habitat, and this enabled me to see the plant *in situ*; unfortunately, the season (1922) was a late one, and at the time of my visit to the spot (July 8) the examples were practically only just above ground and scarcely in flower.

However, a week later, when botanizing about six miles away in one of the northern corries of Cairn Gorm, we were delighted to see the same species in good quantity and in more advanced condition. Dr. Jaquet, to whom gatherings from this station were submitted, named some of the specimens *A. glomerulans* and some *A. reniformis* Bus.

The latter was described by Buser in Jaccard, Cat. Fl. Valais. 127 (1895). It is known by its general glabrous appearance (but with the stems ±silky) and the whole plant (stems, leaves, and flowers)

† "Flowers 2–3 mm. long; 3–4 mm. broad."

of a bright yellowish tint, which turns in summer (under the influence of the sun) to a beautiful coralline-red or deep wine-colour. Other characteristics are its reniform, 9-, rarely 11-lobed leaves, glabrous upon both surfaces excepting the veins (and sometimes the lobes next petiole) beneath, and the silky petioles in summer; its whole inflorescence is a large diffuse corymb owing to its lower divaricate branches and the clusters of flowers being much unrolled and the elongated pedicels (1·5–3 mm.) diverging in all directions.

In some of the Cairngorm examples a purplish tint was noticeable upon some of the leaf-margins (*A. glomerulans* shares this feature also), but I do not think any of the specimens are truly *A. reniformis*. By their leaves being hairy on both sides, their compact glomerules of flowers, and in their other characters, the plants of the whole gathering appear to be decidedly *A. glomerulans*. Specimens brought home and grown on in the garden show well all these features and also that this species produces *early* leaves which are practically entirely glabrous, the summer ones showing the characteristic hairs upon both surfaces.

It is satisfactory to be able to add another vice-county (v.c. 89, East Perth) to its known distribution, as a plant gathered near Dalnaspidal in 1922 has proved, in cultivation, to be undoubtedly this species.

*A. CONNIVENS Buser.—One of the most interesting and beautiful Alchemillas found in Scotland in 1922, which struck one as distinct at first sight, has been determined by Dr. Jaquet as the above species.

This was originally described in Bull. Herb. Boiss. ii. 107 (1894) as follows:—

"Plante de taille moyenne, *grêle*, *élégante*, *à tiges décombantes*, d'un vert foncé pur, un peu luisant, prenant facilement un coloris estival foncé, d'un indument en somme faible, *à feuilles caulinaires fortement incisées*.— . . . . Feuilles moyennes, 9-lobées, *obliques-arrondies ou arrondies-réniformes*, à lobes extérieurs réduits ou formants une échancrure d'abord élargie, ... non ondulées, *mais formant cuvette et les lobes pliés en carène* sur le vif. Lobes assez peu profonds, atteignant $\frac{1}{4}$–$\frac{1}{3}$ du rayon du limbe, ceux des feuilles inf. semi-obovés ou semi-elliptiques, ceux des feuilles sup. arrondis-paraboliques, paraboliques-triangulaires ou largement triangulaires; tout dentés à l'entour ou délimités par de petites incisions courbes, longues de 2–3 dents, mais masquées par les plis sur le sec. Dents nombreuses, 7–9–11 de chaque côté, *égales*, *petites*, *étroites et serrées*, *pénicillées-aiguës*, *crochues-conniventes*. Feuilles planes, assez robustes et coriaces, d'un *vert foncé* pur en dessus, luisant sur le vif . . . . en dessous *glauques*. . . . Premières feuilles marquées de lignes soyeuses en dessus, glabres en dessous; *feuilles estivales plus ou moins soyeuses le long du bord et des plis, ou à partir du bord jusqu'à une ligne passant par le fond des sinus séparateurs des lobes et surtout en dessus*; brillantes-soyeuses sur les nervures et poilues sur le lobe avoisinant le pétiole en dessous. Pétioles assez grêles, *droits ou arqués*, ... *plus ou moins couverts de poils longs*, *droits*, *assez doux*, *qui*, *lâchement appliqués sur les jeunes pétioles*,

sont dressés ou hérissés sur les pétioles adultes surtout des grandes plantes; le pétiole de la dernière feuille estivale soyeux-brillant. Stipules larges et assex lâches, *séchant et brunissant vite* (à la manière du *glabra*), terminées par des oreillettes courtes, subovées, obtuses ou grossièrement dentelées. Tiges 2–6 par rosette, *décombantes*, et quoique 2–4 fois plus longues que les pétioles de la touffe radicale, ne s'élevant pas au-dessus de leur niveau, ...; ou *raides et droites comme une ficelle tendue, ou arquées-ascendantes* dans la partie antérieure . . . . , très grêles, *un peu fistuleuses et s'aplatissant fortement par la dessiccation*, ne se bifurquant pas avec les rameaux, ... *poilues ou faiblement velues jusqu'à la hauteur des premiers rameaux de poils longs, lâchement appliqués ou demi-écartés* ou, dans la f. *vegeta, plus ou moins horizontaux, d'apparence subplumeuse*. Feuilles caulinaires plutôt petites, *profondément incisées* (celles du milieu de la tige jusqu'à la moitié, les supérieures jusqu'au $\frac{2}{3}$), *à lobes étroites, rétrécis à la base, fortement écartés*, à dents aiguës; stipuliums un peu petits, à dents irrégulières et aiguës, comme lacérés. Rameaux et bifurcations courts, *fins et raides*, divergeant sous des angles très aigus; inflorescences partielles rapprochées; scorpioïdes brièvement pédonculés, peu déroules; . . . . *fleurs* ainsi *réunies en glomérules lâches*. Fleurs un peu *petites* ou moyennes, glabres . . . . Urcéoles d'abord assez larges-obconiques, en fruits turbinés ou ovoïdes, égalant plus ou moins les sépales triangulaires-ovés aigus . . . . Calicule bien développé, presque aussi long ($\frac{2}{3}$–$\frac{3}{4}$) que le calice. Pédicelles droits, raides, capillaires, les inf. égalant 2–1½ fois, les sup. égalant les urcéoles . . . .

" Fleurs 3·5–4 mm. . . . . Pédicelles 3–1·5 mm. . . . ."

He sums up by stating that *A. connivens* may be recognised by its very graceful appearance and rather noticeable hairiness, by its very straight, fistulose stems and deep green finely-toothed leaves folded into keels, and by its stem-leaves being very deeply cut with very separated lobes which strongly contrast with the comparatively slightly lobed root-leaves.

In *A. acutidens*, a close ally, the whole plant is much more glabrous, with hairs more appressed, the stems flexuous and hard, the leaves strongly undulate with larger teeth, and the flowers larger in less compact clusters.

A. connivens occurred by a stream near Dalnaspidal (v.c. 89, E. Perthshire) at about 2500 ft., and Dr. Jaquet has determined as the same species an example in my herbarium collected by the late E. S. Marshall in 1914 on Beinn a Chroin, Glen Falloch (v.c. 88, Mid-Perth) at the same elevation.

A. FIRMA Buser.—Dr. Jaquet has determined as this species two examples which I had labelled *A. acutidens* gathered in 1913 upon Ben Lawers (v.c. 88, Mid-Perth).

Whilst all the other species mentioned in this paper belong to the section Vulgares, *A. firma* is placed by Buser in the group Calicinæ. This includes such plants as *glaberrima* Schmidt, *fallax* Bus., *acutiloba* Steven, *speciosa* Bus., etc., and is mainly characterised as follows:—

Leaves sub-orbicular, flat, thin and papery, glabrous above, nervation finely reticulate, transparent, distinctly noticeable when dry. Leaf-lobes separated by cuneiform incisions of variable length. Flower-clusters often elongated with numerous, distant, large yellow flowers of a corolla-like appearance, long-pedicelled. Sepals relatively large, very acute; calicule often as long as calyx.

A. firma was described by Buser, in Magnier, Scrinia Fl. Select. xii. 279 (1893), as follows:—

"Plante moyenne, grande et vigoureuse pour le groupe . . . . Feuilles moyennes (3·5–11 cm. larges et 3·2–9·5 cm. longues), planes, obliques-arrondies 9-lobées, à lobes extérieurs se rejoignant ou laissant un sinus étroit, plus rarement rectangulaire au-dessus du petiole. Lobes étalés ne s'atteignant pas, assez larges et courts, ceux des feuilles inférieures semi-orbiculaires ou semi-obovés, $\frac{1}{4}$–$\frac{1}{3}$ rayon du limbe, ceux des grandes feuilles estivales plus étroits et plus aigus, paraboliques à triangulaires $\frac{2}{5}$, jamais tout à fait $\frac{1}{2}$ rayon, séparés entr'eux par une incision en coin, courte, mais nette, égalant 2–3 dents du bord. Dents 5–9 de chaque côté du lobe, un peu petites. Feuilles . . . . de l'épaisseur de bon papier à écrire, d'un glauque sombre en dessus, d'un blanc verdâtre en dessous, glabres des deux côtés, à l'exception de la partie supérieure des grandes nervures en dessous qui sont soyeuses. Tiges . . . . (1–2), égalant 2 à 3 fois les feuilles, 1–4 cm. longues, droites et raides . . . . faiblement poilues à la base (ainsi que les pétioles, 3–25 cm.), de poils longs, raides, lâchement appliques . . . . Inflorescence en corymbe, commençant dès le milieu de la tige ou plus haut, plus riche et plus compacte que celle du *glabra* Poir., bien feuillées. Feuilles caulinaires et les stipuliums moins profondément et plus grossièrement dentés que chez le *glabra*. Fleurs 4–5 mm. larges, comme celles du *glabra* . . . . Pédicelle 3–5 mm. . . . .

"Pour le port il tient le milieu entre les *Calicinæ* et les *Vulgares* glabres et rappelle notamment l'*alpestris* . . . ."

I hope this interesting plant will be gathered again and notes made upon the specimens when fresh to confirm Dr. Jaquet's determination. It is the only one of this Section hitherto reported from Britain.

THE ALGÆ OF LEICESTERSHIRE*.

BY FLORENCE RICH, M.A.

Introductory Note.

THE following list is compiled from records made in preparation for a new edition of the *Flora of Leicestershire*, planned just before the outbreak of war, but then postponed. It contains the species of Algæ enumerated in the 1886 edition by Mr. F. Bates, a careful and dextrous worker (dependent largely, however, for his determinations

* From the Department of Botany, East London College, University of London.

on M. C. Cooke's *British Freshwater Algæ*, 1882–4), and includes the Desmids determined by Mr. John Roy of Aberdeen. For the rest the work is mainly that of the present writer, who has had the advantage of the help of Dr. F. E. Fritsch (Professor of Botany at the East London College), and the privilege of using his library. Over 400 samples have been examined, in the collection of which assistance has been given very largely by Mr. A. R. Horwood (formerly of the Leicester Museum) and also by Mrs. J. Peters, Miss Jessie Ford, and a few of the pupils of Granville School, Leicester. The collections were made mainly in the years 1913–15, some a few years before and after; the months in which the greatest activity in collecting has been shown are May, June, April, and March (in descending order), whilst November, October, January, and December have yielded only a few samples each. In the subjoined list the actual months in which the various species were collected are indicated, after the locality, by the Arabic numerals 1–12.

The names of the localities given in the 1886 *Flora* are here curtailed, and the following abbreviations have been employed:—

Beacon, for the small upper pond on Beacon Hill.

Bradgate, for moorland pool, Bradgate Park.

Belgrave, for the large cooling reservoir at the Sewage Pumping Station, Belgrave, Leicester.

Colery, for the reservoir previously designated "Pond, Charnwood Heath."

Sulby, for Sulby Reservoir.

Saddington, for Saddington Reservoir.

Town End Close is the name of Mrs. A. B. Wyke's house at Knighton, Leicester.

In comparing the old record with the new, one of the most striking features is the diminution in the number of Desmids since 1882; this is specially the case with species of *Staurastrum*.

The Diatoms and Flagellates of Leicestershire, save for a short list in the *Victoria County History*, have never hitherto been systematically examined; only certain rich samples have now been dealt with. The sub-aërial Algæ are poorly represented in the present collection.

The names of observers are given in brackets in all cases where the records are not my own.

I have followed, as far as I could, the system of classification adopted by Prof. Fritsch in his forthcoming new edition of *West's British Freshwater Algæ*, which I have had the privilege of seeing.

I am indebted to the Department for Scientific and Industrial Research for a grant which has enabled me to devote so much time to this work.

CHLOROPHYCEÆ.

ISOKONTÆ.

VOLVOCALES.

CHLAMYDOMONADACEÆ.

CHLAMYDOMONAS Ehrenb.

C. intermedia Chodat. Ditch between Welford Road and Aylestone, 2.

C. glæocystiformis Dill. Braunstone, 3; var. *australis* Playfair. Hall Gates, Bradgate, 5.

Individuals of this genus were common in many pieces of water, but as they could only be examined in the preserved state specific determination was impossible.

PHACOTACEÆ.

PHACOTUS Perty.

P. lenticularis (Ehrenb.) Stein. Rather common in Sulby Reservoir, 7.

VOLVOCACEÆ.

VOLVOX Ehrenb.

V. aureus Ehrenb. Pond at Waltham, 6.

V. globator (L.) Ehrenb. Croft, 7, 8 (*Bates*). Anstey Lane and Beacon Plain (*Garner*). Thurnby (*Cooper*). Ditch, Narborough Bog, 11.

EUDORINA Ehrenb.

E. elegans Ehrenb. Pond near Narborough, 9 (*Bates*). River Soar, 9; Saddington, 9.

GONIUM Müll.

G. pectorale O. M. Ponds, Narborough, 7–9 (*Bates*).

SPHÆRELLACEÆ.

SPHÆRELLA Sommerfelt (*Hæmatococcus* Agardh).

S. lacustris (Girod.) Wittr. In puddles of rain-water, 11 (*Bates*). On *Elodea canadensis*, Wigston Grange, 6.

PALMELLACEÆ.

GLŒOCYSTIS Näg.

G. rupestris Lyngb. On old lichens, face of wet rock, 11 (*Bates*).

G. vesiculosa Näg. Ditch, Narborough Bog, 11.

PALMELLA (Lyngb.) Näg.

P. mucosa Kütz. Pale green gelatinous masses, spreading over old mosses, on wet rocks (*Bates*).

Sphærocystis Chodat.

S. Schroeteri Chodat. Ratcliffe on the Wreake, 3.

Palmodactylon Näg.

P. viride Kütz. Bogs near Pelder Tor, 5 (*Bates*).

Tetrasporaceæ.

Tetraspora Link.

T. gelatinosa (Vauch.) Desv. Ponds in the spring (*Bates*). Holly Hayes, 5.

T. lubrica (Roth.) Ag. Near Narborough, 3 (*Bates*). Pond near Braunstone Churchyard, 4; Hall Gates, Bradgate, 5; Pond, Tur Langton, 5.

Apiocystis Näg.

A. Brauniana Näg. Attached to submerged weeds, 3–6 (*Bates*).

Schizochlamys A. Br.

S. gelatinosa A. Br. Bradgate Park, 10 (*Bates*). Very rare, Colery Reservoir, 6.

PROTOCOCCALES.

Chlorococcaceæ.

Characium A. Br.

C. longipes Rabenh. Upper pond, Beacon Hill, 8.

C. Naegelii A. Br. Pond, south of Enderby, 4.

C. ornithocephalum A. Br. Attached to *Œdogonium œlandicum*, Colery (*Bates*). Beacon, 2.

C. Pringsheimii A. Br. Attached by means of a reddish-brown disc to *Vaucheria* sp., small pond, Braunstone, 3.

C. tenue Herm. On *Œdogonium* sp., pool, Narborough, 11.

Chlorochytrium Cohn.

C. Lemnæ Cohn. Pond between Welford Road and Aylestone, 2.

Cystococcus Näg., em. Treboux.

C. humicola Näg., em. Treboux. On trees, Bradgate Park. A Lichen constituent. Frequent.

Hydrodictyaceæ.

Hydrodictyon Roth.

H. reticulatum (L.) Lagerh. Cooling reservoir, Belgrave, July and October 1920; August and October 1921.

Pediastrum Meyen.

P. Boryanum (Turp.) Menegh. "Ponds, generally distributed, but abundant only in the rocky pools at Croft," 7–11 (*Bates*).

My own observations confirm the above; I have found it also at Croft, 3, 4, 5.

Var. *granulatum* Kütz. Croft (*Bates*).

P. duplex Meyen. Colery; Cropstone Reservoir (*Mott*), 7–9 (*Bates*). Blaby Canal, 5.

P. tetras (Ehrenb.) Ralfs. Croft, Narborough, Colery, etc., 5–10 (*Bates*). Beacon, 6, 10.

Eremosphæraceæ.

Eremosphæra De Bary.

E. viridis De Bary. "Amongst *Sphagnum*, etc., bogs, Spring Hill; moorland pool, Bradgate." Spring and autumn (*Bates*).

Chlorellaceæ.

Trochiscia Kütz.

T. aciculifera (Lagerh.) Hansg. Common in squeezings from moss, pond, Timberwood Hill, 6.

T. reticularis (Reinsch.) Hansg. Colery, 6; Holly Hayes, 5; Narborough, 5; Croft, 5; between Saltby and Sproxton, 6.

Oocystaceæ.

Oocystis Wittr.

O. elliptica G. S. West. Colery, 6.

O. gigas Archer, forma *minor* W. & G. S. West. Rye Hill Close, Oadby, 3.

Nephrocytium Näg.

N. Agardhianum Näg. Near Narborough, 9, 10 (*Bates*).

N. ecdysiscepanum W. & G. S. West. Beacon, 1.

N. Nägelii Grün. Colery, 5, 6 (*Bates*).

Tetraëdron Kütz.

T. caudatum (Corda) Hansg. Colery, 6.

T. dodecaedricum (Reinsch.) Hansg. var. *ornatum* F. Rich. in Journ. Bot. *supra*, p. 73. Pond, side of footpath leading to Swithland Wood, 5.

A slightly less elaborate form of the same variety found in a pond on the left of the drive leading to Leicester Frith, 5.

T. enorme (Ralfs) Hansg. Colery, 5; Croft, 9 (*Bates*).

T. regulare Kütz. Colery (*Bates*).

SELENASTRACEÆ.

ANKISTRODESMUS Corda.

A. falcatus (Corda) Ralfs. Ponds, generally distributed (*Bates*). In many places, 5, 6, 8, 9.

Var. *acicularis* G. S. West (*Rhaphidium polymorphum*). Beacon, 1.

A. setigerus (Schröder) G. S. West. Pond, Field Head, 8; Waltham, 6.

CŒLASTRACEÆ.

CRUCIGENIA Morren.

C. truncata G. M. Smith (pl. xxxvi. figs. 7–9).

Very little seen. It appeared to have a minute tubercle at the free extremity of each cell, but in other respects agreed with Smith's description *. Colery, 6.

SCENEDESMUS Meyen.

S. antennatus Bréb. Rocky pool, Croft. Rare (*Bates*).

S. bijugatus (Turp.) Kütz. Brook, Syston, 5.

S. hystrix Lagerh. var. *armatus* Chodat (Bernard, Alg. Unicell. d'eau douce in Dep. Agr. Ind.-Néerl. 1909, pl. vi. fig. 174). Colery, 6, 7.

S. obliquus (Turp.) Kütz. (*S. acutus*). Croft, 8–11 (*Bates*). Croft, 5; Belgrave, 7; near Holly Hayes, 5.

Var. *dimorphus* (Turp.) Rabenh. Associated with the type (*Bates*).

S. quadricauda (Turp.) Bréb. Ponds, generally distributed, 7–10 (*Bates*). I have found it from February onwards.

Var. *horridus* Kirchn. River Soar, 9.

S. serratus (Corda) Bohlin. Channel leading into Colery Reservoir, 6. This very closely resembles the figure given by Printz (*Beiträge zur Kenntnis der Chlorophyceen und ihrer Verbreitung in Norwegen*, 1915), but the outer cells are more produced laterally and the dimensions smaller: length of cell 13 μ, width of cell 3 μ, length of colony 13 μ.

CŒLASTRUM Näg.

C. microporum Näg. Colery, 5 (*Bates*).

C. schizodermaticum F. Rich, in *New Phytologist*, 1921, p. 234. Found in considerable quantity in two pieces of water in the grounds of Leicester Frith, April 1915.

C. sphæricum Näg. Beacon, 6; Sulby, 7.

ULOTRICHALES.

ULOTRICHACEÆ.

ULOTHRIX Kütz.

U. moniliformis Kütz. (*Hormiscia moniliformis*). Narborough, Croft, 6–10 (*Bates*). Pond in field, Town End Close, Knighton, 4.

* 'Phytoplankton of the Inland Lakes of Wisconsin,' part i. p. 146 (1920).

U. oscillarina Kütz. Knighton, 4; Grace Dieu, 5; Timberwood Hill, 6; Long Clawson, 6; and other places.

U. subtilis Kütz. Spring Hill (Victoria County History).

U. tenerrima Kütz. Colery, Moira, Spring Hill (*V. C. H.*). Rather widely distributed; abundant, 3, 7.

U. tenuis Kütz. Narborough Road, 2, 3 (*Bates*).

U. tenuissima Kütz. Lake, Wistow Park, 3; Stream, Grace Dieu Woods, 5.

U. variabilis Kütz. Attached to stones, etc., ponds and streams, in early spring (*Bates*). Abundant, 3–6.

U. zonata (Web. & Mohr.) Kütz. Brook near Cosby, 5, 6 (*Bates*). Pond between Thurnby and Houghton, 3; Medbourne, 7; Castle Donington, 4; Ditch, Normanton, 5.

HORMIDIUM Kütz.

H. murale (Lyng.) Kütz. (*Ulothrix radicans*). On damp walls and wet rocks, everywhere. Late autumn and early spring (*Bates*).

H. flaccidum A. Br. On soil in garden. Granville School, Leicester.

STICHOCOCCUS Näg.

S. bacillaris Näg. Tree-trunks, Granville Road, Leicester.

S. flaccidus (Kütz.) Gay. Ditch, Grace Dieu Woods, 5; on patches of soil devoid of grass, Victoria Park, Leicester.

RADIOFILUM Schmidle.

R. flavescens G. S. West. Pool in field, Misterton, 2; and other places.

ULVACEÆ.

ENTEROMORPHA Link.

E. intestinalis (L.) Link. Canals and streams; common, 7–9 (*Bates*). Market Harborough, 1894 (*Mott*). Very common in the River Soar; lake, Willesley, 9; stream, Packington, 9; Belgrave, 4.

MONOSTROMA (Thuret) Wittr.

M. bullosa (Roth) Wittr. On stones in ponds and streams, Narborough, Cosby, 2–6 (*Bates*). Braunstone, 3; Leicester Frith, 3; Huncote, 4.

MICROSPORACEÆ.

MICROSPORA Thur., em. Lagerh.

M. abbreviata Lagerh. Pool in field, Misterton, 2.

M. floccosa (Vauch.) Thur. Commonly distributed, 4–7.

M. fugacissima (Roth) Rabenh. Abundant (*Bates*); Bagworth 1894 (*Mott*).

M. fontinalis (Berk.) De Toni (*Conferva fontinalis* Berk.). Narborough, 9 (*Bates*).

M. pachyderma (Wille) Lagerh. Colery, 6; Braunstone, 4.

M. vulgaris Rabenh. Croft, Narborough, Cosby, 10–12 (*Bates*).

Prasiolaceæ.

Prasiola Ag.

P. crispa (Lightf.) Menegh. (*Hormidium parietinum* Kütz., *Ulothrix parietina* Kütz.). In spouts and all places where water drips, 8–10 (*Bates*). Woodhouse Eaves, 6.

Forma *muralis* G. S. West (*Schizogonium murale* Kütz.). "Fine examples of this species, showing the formation of a pseudo-thallus, were taken by Mr. Garner off an old tree-stump at Thurnby," December 1883 (*Bates*).

Cladophoraceæ.

Cladophora Kütz.

C. crispata Kütz. Narborough and Croft, 4–8 (*Bates*). Cropstone Reservoir, 1889 (*Mott*); Ratcliffe-on-the Wreake, 3; Sulby, 7.

C. flavescens Ag. Cropstone Reservoir, 1889 (*Mott*).

C. fracta (Dillw.) Kütz. Narborough, 2, 3 (*Bates*). Medbourne, 7; canal, Oakthorpe, 9.

C. glomerata (L.) Kütz. Canals and streams, everywhere (*Bates*). Cropstone, 1894 (*Mott*). Very common in swiftly-flowing water, 3–5.

Rhizoclonium Kütz.

R. hieroglyphicum Kütz., em. Stockm. Almost more common than *Cladophora*, 3, 5, 6, 7, 11.

CHÆTOPHORALES.

Chætophoraceæ.

Stigeoclonium Kütz.

S. fastigiatum Kütz. Croft. Spring and autumn (*Bates*).

S. nanum Kütz. Forming a dark green, slimy mat on dead leaves, in bog. Narborough (*Bates*).

S. stagnatile Hazen. Ditch at Enderby, 4. This is similar to *S. proteastum* Kütz., but is smaller.

S. tenue Kütz. (aggregate species.) Ditches, ponds, brooks, canals, 2–7 (*Bates*). Stream at Knighton, 4; and elsewhere.

Doubtful determinations:

S. subsecundum Kütz. Sparse branching and slight constrictions between the cells, but cells shorter than in the type. Knighton, 4.

S. variabile Näg. (aggregate species). Timberwood Hill, 6.

S. amœnum Kütz. Little Dalby, 3.

Draparnaldia Bory.

D. glomerata (Vauch.) Ag. This seems to have been much more common in 1884 than it is now. Bates says "attached to stones, weeds, etc., in water-courses, ponds, canals, etc." I have found it only in Grace Dieu Brook, May 1914.

Var. *distans*. Croft Hill, 2 (*Bates*).

D. plumosa (Vauch.) Ag. Margins of brook near Cosby, 5, 6 (*Bates*). Rather common at Holly Hayes, May 1915.

Chætophora Schrank.

C. elegans (Roth) Ag. This species is very like *C. pisiformis*, but my specimens agree well with the figure of *C. elegans* given by Hazen (Mem. Torr. Bot. Cl. xi. pl. 37). Wood, Narborough, 5; Coalville (hot stream from furnace-boilers), 5.

C. incrassata Hudson (*C. endiviæfolia* Ag.). Cropstone, 7 (*Mott*). Croft, Narborough, 5–10 (*Bates*). Attached to stems of aquatics. Much encrusted with calcium carbonate; canal, Sutton Wharf, 6.

C. pisiformis (Roth) Ag. Ditches, ponds, streams, and canals, sometimes on the shells of living *Limnæa stagnalis* (Bates), Thurcaston, 1894 (*Mott*). Bog, Narborough Wood, 5; Misterton, 2; ditch near railway, Narborough, 11; pond near Billesdon Coplow, 5.

C. tuberculosa Ag. Forming rounded, irregularly tubercled, gelatinous bodies, $\frac{1}{4}$ to $\frac{3}{4}$ inch across, on stones in a water-course near Narborough, 5 (*Bates*).

Microthamnion (Näg.) Kirchn.

M. Kützingianum Näg. Spring Hill (*Bates*). Croft, 3; Beacon, 10; Misterton, 2; pond east of Houghton, 4; Grace Dieu, 5; Sulby, 7.

M. strictissimum Rabenh. (*M. vexator* Cooke). Coating the walls inside a soft-water cistern, Northampton St., Leicester, 4–6 (*Bates*).

Dicranochæte Hieronymus.

D. sp. Timberwood Hill, 6. Very little found.

Aphanochæte Berth.

A. polychæte (Hansg.) Fritsch. On *Cladophora* and *Œdogonium*, Sulby, 7. Very little seen.

A. repens Berth. Croft, Charnwood Heath, etc. (*Bates*). On *Mougeotia*, *Tribonema*, *Cladophora*, *Rhizoclonium*, and *Œdogonium*, in several pieces of water, 5–11.

Gomontia Born. & Flah.

G. codiolifera (Chodat) Wille. Bescaby, 6.

PROTODERMA Kütz.

P. viride Kütz. On *Callitriche* and other aquatics, Knighton, 4; near Lubbesthorpe, 5; Leicester Frith, 5.

CHÆTOSPHÆRIDIACEÆ.

CHÆTOSPHÆRIDIUM Klebahn.

C. globosum (Nordst.) Klebahn. Colery, 6, 7. On *Vaucheria*, pond between Abbey Farm and Braunstone, 4.

CHÆTOPELTIDACEÆ.

CHÆTOPELTIS Berthold.

C. megalocystis Schmidle. Forming very irregular groups of cells, Braunstone, 3.

C. orbicularis Berthold. Beacon, 2, 7.

COLEOCHÆTACEÆ.

COLEOCHÆTE Bréb.

C. scutata Bréb. Generally distributed (*Bates*). Shackerstone Canal, 5; Castle Donington, 5; Misterton, 2; Beacon, 2.

TRENTEPOHLIACEÆ.

GONGROSIRA Kütz.

G. Debaryana Rabenh. Pond between Castle Donington and the Trent, 5; Beacon, 7.

Genus of uncertain position.

PLEUROCOCCUS Menegh.

P. Nägelii Chodat (*Protococcus viridis* Agardh. *Pleurococcus vulgaris* Näg.). "The universal pale-green, pulverulent growth on walls, palings, tree-trunks, etc., everywhere" (*Bates*). See *Die Süsswasserflora Deutschlands*, A. Pascher, Heft 5, 224, fig. 31. Still common all the year round.

P. angulosus Menegh. is also listed by Bates, but there is much confusion between these species.

(To be continued.)

NEW MALVACEÆ FROM BRAZIL.

BY E. G. BAKER, F.L.S.

DR. HOEHNE, of Butantan Institute, São Paulo, has recently sent a collection of Brazilian *Malvaceæ*, the greater part of which is now in the British Museum Herbarium. The plants were collected in São Paulo, Matto-Grosso, and Minas-Geraes. It was interesting to find *Pavonia costaricensis* Hochr. occurring in Matto-Grosso—Rio Jamary, between St. Cruz and Chibe, *Kuhlmann*, 2130 K (Dec. 1918). The collector describes the plant as a shrub, 60 cm. high; flowers unknown. This is the first record of the species from Brazil.

Descriptions of the novelties are printed below:—

Sida Bradei, sp. nov. *Caulis* ramosus, lignosus. *Stipulæ* parvæ, lineares. *Folia* cuneatim obovata, dimidia parte superiore dentata, dimidia parte inferiore integra, suprema angustiora oblonga, subtus cinereo-tomentosa et conspicue venosa, 20–25 mm. longa, 12–20 mm. lata, petiolo brevissimo, 2–3 mm. longo. *Flores* axillares brevissime pedicellati. *Calyx* cinereo-tomentosus, angustatus, ±8 mm. longus, dentibus acutis. *Petala* calyce longiora. *Carpella* 5, cinereo-tomentosa, haud aristata.

Hab. São Paulo, Botequim, Butantan, *Al. Curt. Brade*, 6864.

This plant has the aspect of *S. jamaicensis* L., but the leaves are distinctly more cuneate at the base and very cinereo-tomentose below. It is noticeable on account of the short pedicels and the five carpels.

Pavonia Hoehnei, sp. nov. *Caulis* erectus, cinereo-tomentosus. *Folia* ovata, margine crenato-serrata, basi cordata, discolora, subtus cinereo-velutina, lamina 7–10 cm. longa, 4·5–5·5 cm. lata, petiolo cinereo-tomentoso, 13–15 mm. longo. *Flores* solitarii. *Involucri* phylla 5, lata, ovata vel suborbicularia, calyce breviora, 6–7 mm. longa, cinereo-tomentosa. *Calyx* 9–10 mm. longus, dentibus triangularibus. *Petala* rosea, suborbicularia, venosa, ±2 cm. longa. *Stamina* numerosa, tubus staminis petalis brevior. *Styli* rami 10, stigmata capitata. *Carpella* ignota.

Hab. Caeté, Minas-Geraes, *F. C. Hoehne*, 6134. "Arbcampestre, fl. roxas."

This species has 5 remarkably broad involucral leaves, violet-rose-coloured petals about 2 cm. long, and softly tomentose leaves, cinereous below. It is allied to *P. platyloba* Fries, but differs in having very discolorous leaves and fewer bracts in the involucre and a calyx longer than the involucre.

Pavonia sessiliflora H. B. K., var. nov. **mattogrossensis**. *Caulis* erectus. *Folia* quam in typo angustiora, sæpissime lanceolata, præcipue subtus cinereo-tomentosa, 4–6 cm. longa, 12–17 mm. lata. *Flores* capituliformes. *Involucri* phylla linearia, lamina apice foliacea appendiculata. *Carpella* ut in typo.

Hab. Mattogrosso, Campo cerrado, *J. G. Kuhlmann*, 2143 K.

This differs from the type principally in the narrower leaves.

SHORT NOTE.

PITCHER-LEAF IN PINGUICULA VULGARIS. Mrs. Vera Higgins sends a photograph of a plant of *P. vulgaris*, in which one of the leaves has assumed a pitcher form. Mrs. Higgins writes: "We brought home half-a-dozen plants of *Pinguicula* from Ben Lawers last year, and this year they have grown and flowered well. When the flowers were dying down, one of the plants produced this curious leaf. There is a well-marked stalk, and the blade is completely fused, forming a deep cup very suggestive of a 'pitcher.' The mid-rib is faintly marked up the back, but the line of fusion up the front, where presumably the edges have joined together, hardly shows at all. The inner surface is glandular and the free edge tends to turn in slightly. Since this photograph was taken (July 2nd) two more leaves have developed on this plant, but both are normal. The plants have grown since last July in a seed-pan of leaf-mould and moss in a saucer of water in a greenhouse which is heated during the winter. They have never been fed artificially, but have collected for themselves a large number of crawling and jumping insects that live on the surface of the soil, but very few flies." The text-books on teratology do not record a pitcher formation in *P. vulgaris*, but E. Zederbauer in 1905 (Osterr. Botan. Zeitschr. iv. 176) described a similar case in *P. alpina*. Among plants of *P. alpina* and *P. vulgaris*, which had been brought into the Botanic Garden of the Vienna University for exhibition as insect-eating plants, one produced a single pitcher-like leaf, resembling that described above, but split for three-fifths of its length down the front.

REVIEWS.

Early Explorers in Australia. By IDA LEE (Mrs. CHARLES BRUCE MARRIOTT), F.R.G.S. 8vo, pp. xii, 651, maps and illustrations. London: Methuen. Price 21*s*.

IN this work Mrs. Marriott tells the story of Australian exploration from the time of Dampier, at the end of the seventeenth century, to the last journeys of Allan Cunningham in the first half of the nineteenth. Her point of view varies somewhat from that of most writers on such a subject, for, besides noting geographical discoveries and adventures of various kinds, she lays special stress on the botanical work done in the course of the several expeditions. It is highly absorbing to read how, piece by piece, the outline of the island continent came to be charted; and though the natural history does not equal the main story in interest, for the botanist the attention Mrs. Marriott gives to that branch cannot fail to enhance the value of the book. But her main object in writing is discovered when the labours of Allan Cunningham come to be treated, than whom no botanist, with the possible exception of Robert Brown, can be said to have rendered more valuable service in the botanical exploration of Australia.

Cunningham's journals are preserved in the Botanical Department of the Natural History Museum, and it is somewhat strange that they should not have been published at some time during the past century. Roughly, his labours may be divided into three parts: the first performed during the journey into the interior of New South Wales (1817), under Oxley, the Government Surveyor; this followed by three coastal voyages in the 'Mermaid' and one in the 'Bathurst' (1818–22), under Capt. King; and, lastly, the inland expeditions in which he himself acted as leader. The first part we must confess to have found somewhat tedious from its much repetition, floristic and otherwise.

The first expedition under Captain King proceeded *viâ* the West Coast to Goulburn Islands, visiting Timor on the way home. Next year the dangers of the East Coast were encountered, a stay being made at Endeavour river, Cook's old resting-place, in order to build a substitute whale-boat. On this voyage Cape York was rounded, and some of the N.W. coast surveyed. In July 1920 the 'Mermaid' left Port Jackson on a third cruise, crossing the Gulf of Carpentaria from the east and continuing the survey. The vessel had grounded badly at Port Bowen, and, as it was leaking, it was careened at a suitable spot on the N.W. coast, in consequence called Careening Bay, a name familiar to all who have used the *Flora Australiensis*. A picture of the little 'Mermaid' at this bay—it was but of 84 tons!—brings home to one the sublime audacity of the old seamen in facing formidable dangers with such primitive means as they had of overcoming them. Of course, Cunningham would make the most use possible of the detention; but he complains of his work, both here and elsewhere, being hindered by the hostility of the natives. A fourth expedition was despatched in July 1921, this time a larger vessel, a brig of no less than 165 tons register!, being placed under Captain King's orders. The west coast was visited on this occasion; but, as indicating how exacting this survey work is, it appears from the "Admiralty Sailing Directions" that large portions of the Australian coast are still unsurveyed!

Freed from his association with Captain King, Cunningham was seized with a desire for inland exploration. He was now geographical discoverer and naturalist in the wide sense, doing good work in both capacities. Several other journeys followed, journeys made memorable by his discovery of the Darling Downs and a route from the interior to the Moreton Bay district. After fourteen years of arduous labour, he returned home in 1831, but in 1836, his brother Richard having been killed by natives, he succeeded him as Colonial Botanist. Unfortunately, his health soon began to fail, and he died at Sydney in June 1839 in the forty-ninth year of his age, literally worn out by his exertions.

The book is enriched by charts and portraits, and the subject has been treated in a way that may well be considered as exhaustive. Mrs. Marriott has earned hearty congratulations for her success in raising this memorial to men whose services ought not to be, and, it is to be hoped, never will be, forgotten.

S. MOORE.

Dictionary of Botanical Equivalents. German-English, Dutch-English, Italian-English. By ERNST ARTSCHWAGER. *French-English,* by EDWINA M. SMILEY. Second Edition. Crown 8vo, pp. 124. Williams & Wilkins Co., Baltimore, U.S.A., 1925. (English Agents: Baillière, Tindall, & Cox.) Price 16*s.* 6*d.*

STUDENTS and other readers of foreign botanical literature are often at a loss for the meaning of a technical term which is not given in their dictionaries. The editors of this little volume have attempted to supply this need. They have also included the names of the more important economic plants, farm-weeds, and the larger plant-groups—thus, "Knabenkrautgewächse" is equivalent to Orchidaceæ, "Klappertopf" to *Alectorolophus minor.* Blank pages have been interleaved at the end of each section, to enable the owner of the book to amplify the list of terms. The work is based on Schneider's *Illustriertes Handwörterbuch der Botanik,* but many terms have been taken from other dictionaries as well as text-books and current literature. In the second edition, sections dealing with Dutch and Italian have been added, and the French and German sections have been amplified.

The editors acknowledge their appreciation of helpful criticism in the selection of the proper equivalents, but there is still scope for the selective process. Words in common use are included which the student will find in his own dictionary, such as *Baum* and *boom* (tree), *Weide* (willow, pasture), *Wald* (forest), *thé* (tea), *tomate* (tomato); and such phrases as *met glanzende vruchten* (with shining fruits), *met groote wortels* (with large roots), *op roken groeiend* (growing on rocks), *Wahrscheinlichkeitswert* (probable value) scarcely come under the category of "accurate translations of technical terms." Nor will the student be much helped by explanations such as *Unterschiedsschwelle* (threshold of perceptibility of difference), *Walzendrehflieger* (plants with Haleis type of fruit-wings), *Wasserhaushalt* (usage of water in plants), *Wasserblatt* (water-shedding leaf), and *Wasserblütler* (hydrophyllous plant).

The idea underlying the work is an excellent one, but the book needs revision and careful editing and proof-reading—for example, on page 68, *Scirpus* sylvaticus (erroneously styled "bulrush"); page 69, *Eupatorium cannabium* and Ceratophyllaceæ. The Appendix, "Sans Tache," indicating the ideal of the publishing firm to produce books "without blemish," falls a little flat, and will hardly compensate the student for the very high price he is asked to pay for the book.

The Cactaceæ. Descriptions and Illustrations of Plants of the Cactus Family. By N. L. BRITTON and J. N. ROSE. Vol. i. pp. vii, 236, 36 pls., 302 figs., 1919; vol. ii. pp. vii, 239, 40 pls., 305 figs., 1920; vol. iii. pp. vii, 255, 24 pls., 250 figs., 1922; vol. iv. pp. vii, 318, 37 pls., 263 figs., 1923. Carnegie Institute, Washington.

A SHORT notice of vol. iii. of Drs. Britton and Rose's great work on the Cacti appeared in the Journal in 1923 (p. 183), but no general account of the whole work has been given. The Introduction describes the origin and progress of the work, which has involved nearly twenty years of study in the field, greenhouse, and herbarium by the two authors and various assistants. The cost of investigation and publication has been borne by the trustees of the Carnegie Institute.

In 1912 Dr. Rose visited the herbaria and living collections in London and on the continent of Europe, and in succeeding years the West Indies, portions of the West and East Coasts of South America, Venezuela, and Ecuador were visited by one or other of the authors. The Cactus regions of the southern United States have been thoroughly explored and, previously to 1912, all the Cactus deserts of Mexico. Numerous collections have also been received from different portions of the area.

The last previous systematic account of the family was that given by K. Schumann in the *Pflanzenfamilien* in 1894. Schumann knew of about 1500 species distributed through 25 genera, a considerable increase on the thirteen genera with about 1000 species recognized by Bentham and Hooker in the *Genera Plantarum* in 1867. Britton and Rose enumerate 123 genera, but give no inclusive estimate of the species. The great increase in the number of genera is only partly accounted for by the discovery of new forms. Several of the well-known old genera have been broken up, and a large number of the new genera are based on species of *Echinocactus* and *Echinocereus.*

The work is purely taxonomic; there is no general morphological discussion, and the description of the family is confined to a paragraph in which the characters are tersely stated. Perhaps the authors will take some other opportunity of discussing points of morphological interest on which the comparative study of so many forms may have thrown additional light. The taxonomic work is certainly sufficient burden for one book. The genera are arranged under the same three tribes—*Pereskieæ, Opuntieæ,* and *Cereeæ*—as were adopted by Schumann. *Pereskieæ* includes the single genus *Pereskia* with 19 species, *Opuntieæ,* eight genera and at least 300 species, the majority of which are contained in *Opuntia;* while the tribe *Cereeæ* comprises the remainder, including most of the genera and three-fourths or more of the species of the family. It is here subdivided into eight subtribes. The fifth tribe contains the two genera *Discocactus* and *Cactus*; the latter a revival of the Linnean name for a group of species which has been known, since Link and Otto restored the old Tournefortian name in 1827, under the name *Melocactus.* Britton and Rose recognize 18 species of *Cactus.*

The authors are careful to indicate under each genus the type-species. Reference to the genera would have been easier if a running number had been adopted throughout the work; as it is the enumeration begins afresh under each tribe. A key to the species follows the generic description; each species is briefly described (in English), notes as to distribution, variation, &c., are given, and also a list of the illustrations.

An important feature of the book is its illustrations, which include

137 coloured plates and very numerous text-figures, many of these are the work of Miss Mary Eaton at the New York Botanical Garden; a large proportion of the text-figures are photographic reproductions of living specimens.

The first three volumes are indexed separately; the index of vol. iv. covers the whole work; the type of the index is uniform, it would have been helpful if synonyms had been distinguished by italics.

In undertaking the systematic enumeration of the species of Cactaceæ Drs. Britton and Rose attempted a very difficult piece of work. The material available in herbaria and living collections was scanty and inadequate, and the difficulty of tracing described species often great. The authors have earned the gratitude of all who are concerned with this remarkable and interesting family.

BOOK-NOTES, NEWS, ETC.

British Museum. Annual Report for 1924. The annual report of the Museum is still issued in the very reduced form adopted since the War. It is an 8vo pamphlet of 18 pages (price 9*d.* net). It contains a return of the number of persons admitted to the two Museums and a short statement of the principal objects added to the collections, with some notes on general progress at Bloomsbury and the Natural History Museum. The Natural History Museum was visited by 521,901 persons, an advance of nearly 30,000 on the previous year; 25,392 visits were made to particular departments for the purpose of study; these include 3362 to the Department of Botany. In reporting on the Natural History Museum, the Director, Sir Sidney Harmer, writes: "The Museum's most pressing need is now an increase in its staff to enable the immense growth of the collections to be dealt with and to meet the heavy calls made on the time of its officers for advice upon all kinds of scientific and economic questions. The Trustees have made representations to the Treasury on the subject, but authority has been granted for the addition of only three posts to the scientific establishment."

London Catalogue of British Plants. We have received a copy of the new (eleventh) edition of the Catalogue, and hope to publish a notice of it in the next number of the Journal.

THE Annual Meeting of the British Association will be held in Southampton from August 26 to September 2, under the Presidency of Professor Horace Lamb, F.R.S. Previous meetings of the Association have been held in Southampton in 1846 and 1882. The President of Section K (Botany) will be Prof. J. Lloyd Williams of University College, Aberystwyth, and the subject of his address will be "The Phæophyceæ and their Problems." Dr. D. H. Scott will give a lecture on "Some Points in the Geological History of Plants," and a joint discussion with the Geography Section on "Tidal Lands" has been arranged. Intersectional discussions will also take place on "The Teaching of Biology in Schools" and "The Distribution of Animals and Plants in relation to Continental Movements."

IDENTIFICATION OF LOUREIRO'S SPECIMENS IN THE BRITISH MUSEUM HERBARIUM.

By S. Moore.

THE bulk of João de Loureiro's (1715–1796) Cochinchinese plants were collected in the neighbourhood of Hue, a district in his time included in the kingdom of Cochin-china. The botanical museums of London, Paris, and Lisbon were, it would appear, the only ones to receive specimens described in the *Flora Cochinchinensis* (Lisbon, 1790). Unfortunately, the Lisbon plants were destroyed about the early seventies of last century, in consequence of their having been allowed to get into a useless condition (A. De Candolle, Phytogr. 429). Of the Paris collection, comprising 88 species, a list with identifications will be found in Gomes's *Elogio historico do Pe João de Loureiro* (1865). The British Museum set, forming the most important of these consignments, was sent in 1774 by the collector to his friend Capt. Riddel, of the East India Company's Service, who presented it to Sir Joseph Banks, and thus to-day it forms part of the British Museum Collection. Besides these there are a very few at the Museum received from Paris, with tickets in Robert Brown's handwriting. From the mention of Loureiro plants by Bergius, Mat. Med. 5 (1778), and by the younger Linnæus, Suppl. 331 (1781), it has been supposed that specimens of some of these might be in the Linnean Herbarium at Burlington House; but Dr. Jackson informs us that this is not the case. The unsatisfactory state of many of the specimens is matter for regret, wanting as they do either flowers or fruit or both, and sometimes even leaves, and in other cases, where flowers are present, they are in so early a state as to be virtually useless, if not for generic, for specific determination: in spite of this, it will be seen that the efforts to solve difficulties attending imperfect material have met with a certain amount of success.

In the copy at the Museum of *Flora Cochinchinensis* the specimens to be seen there have been ticked off. Occasionally attempts to find these have failed, apparently because no note was entered at the time as to the order or genus in which they were deposited or to which they had been transferred. In this connection one would specially mention *Dartus*, *Triceros*, and *Pterotum*, three well-known puzzles; but no doubt these specimens will some day come to hand. In the following pages little more has been attempted than to lift the veil from certain riddles insoluble by botanists who have not enjoyed access to Loureiro's specimens: interpolated among these attempts will be found a few notes, marked with his initials, by the late Mr. James Britten, and one can only express one's regret that these are the only items in the memoir with which his name may now be connected. For many years Mr. Britten had been interested in the subject, one highly attractive to a man so devoted to what may be called botanical antiquities; but other work was given the

preference. Use has been made of a Brown MS., in which had been entered the names of many of Loureiro's plants, together with an opinion in most cases of their affinity. The Solander MSS. with Dryander's occasional descriptions of these plants have also been consulted where necessary.

To Mr. E. D. Merrill, now of California University, Berkeley, so well known for his valuable work on the Philippine flora, acknowledgments are due for most valuable help rendered. Not only has Mr. Merrill sent over a quantity of typescript dealing with the matter in question, but he has generously presented to the Department of Botany a typescript volume of nearly 700 pages, devoted to the elucidation, in the fullest manner possible, of Loureiro's plants. Though a few of the suggestions in this volume, as was only to be expected, are not borne out by the specimens, in other cases his anticipations have proved extremely happy. It is hoped that the present memoir will be of some use to Mr. Merrill when preparing for the press the important work which is to embody all his researches on the subject. Mr. Ridley, our best authority on the botany of South-Eastern Asia, has very kindly allowed me to make occasional use of his great knowledge. The labour of looking up the various specimens has fallen upon Mr. James Ladbrook, Senior Clerk in the Department, whose valuable services are hereby gratefully acknowledged.

The various items are dealt with in the order in which they appear in the *Flora Cochinchinensis* and with its pagination; alongside in each case is given the page in Mr. Merrill's typescript volume already mentioned.

PHYLLODES PLACENTARIA Lour., 13 (Merrill, 125).

Phyllodes is an older generic name than *Phrynium*, which latter, however, is in the Vienna list of *nomina conservanda*. In Fl. Brit. Ind. vi. 259, *P. placentaria* is reduced to *Phyrnium capitatum* Willd., a course in which K. Schumann (Pflanzenr. Marant. 53) doubtfully concurs. Relying on Loureiro's description of the flowers as white, whereas those of *P. capitatum* are purple, Merrill thinks Loureiro's plant to be *P. parviflorum* Roxb. There are good specimens of *P. placentaria* at the Museum, and, seeing that the inflorescences have the pungent bracts of *P. parviflorum* and not the muticous ones of *P. capitatum*, Merrill's conclusion would seem to be correct.

ANTHOXANTHUM PULCHERRIMUM Lour., 29 (Merrill, 50).

Assigned by Merrill to *Eragrostis amabilis* Wt. & Arn., a reduction "based largely on the fact of a Rumphian synonym cited by Loureiro." It is, however, *Centotheca lappacea* Desv. (*Poa malabarica* L.), as determined by Solander on the sheet from Loureiro, endorsed by Dryander as Loureiro's species, and described as such by Dryander in Sol. MSS. iii. 291. There is no Loureiro ticket on the sheet.—*J. B.*

It is worthy of note that Loureiro calls "cilia" the deflexed spinules on the flowering glumes, whence the plant derives its name.

AXIA COCHINCHINENSIS Lour., 36 (Merrill, 573).

Bentham and Hooker (Gen. Pl. ii. 153) suggest that this may be a *Boerhaavia*, and in this they are followed by Dalla Torre and Harms. Merrill leaves the case undecided. Loureiro describes his plant as having, among other features, a 3-leaved perianth, a 10-fid corolla, and an inferior ovary, in all which statements he is incorrect, for the specimen, as Dryander found, is really a *Boerhaavia*, and most probably *B. diffusa* L., although the material is not good enough to warrant certainty on the last point. No doubt Loureiro mistook the bracts for a perianth, while the ovary looks very like an inferior one, closely invested as it is by the lower part of the perianth. As for the 10-fid corolla, five deeply emarginate lobes might easily be mistaken for double the number of entire ones.

PHANERA COCCINEA Lour., 37 (Merrill, 234).

Concerning this, Merrill remarks: "Loureiro's species is not accounted for by Gagnepain in his consideration of the Indo-Chinese species of *Bauhinia* in Lecomte, Fl. Gén. Indo-Chine, ii. 119–151, where forty-one species of the genus are recognised." It may further be stated that neither at the British Museum nor at the Kew Herbarium has success crowned efforts to identify this plant with any hitherto described. We must therefore assume that it still awaits a modern collector. It is *Bauhinea coccinea* DC. Prodr. ii. 516.

Loureiro's description may be supplemented with the few following details. *Folia* pergamacea, supra glabra subtus in nervis puberula, pleraque 5·5–7·5 × 4·5–5·8 cm.; horum lobi ovati, obtusi, 1·5 cm. long. vel paullo ultra; petioli 1·5–2 cm. long., uti ramuli prima juventute fusco- vel ferrugineo-velutini. *Pedicelli* 7 cm. long. *Calycis* tubus 1·5 cm.; segmenta 5 (ex Loureiro, 4), 2 cm. long. *Petalorum* unguis circa 2 cm. long.

CYLINDRIA Lour., 69 (Merrill, 576).

"A genus of uncertain status known only from Loureiro's description. It is doubtless identical with some well-known genus, although no author has succeeded in placing it in its proper family," *Merrill.*

Though there is no flower remaining on either of the three small Museum specimens of this plant, Dryander had for examination one of which he wrote a detailed description (Solander MSS. i. 317) agreeing with Loureiro's in most points, the chief difference relating to the stamens; he says of these, "filamenta brevissima; duo tantummodo visa in specimine exsiccato, quatuor autem a Loureiro numerata." He regarded the plant as an *Olea*, a genus in his time including *Osmanthus*, *Linociera*, and other genera now kept distinct. *Cylindria rubra* is certainly an *Oleacea*: in this Family tetrandrous flowers may occur (*Linociera*, *Notelæa*, and very occasionally *Olea*). From the fact of the branches of the inflorescence frequently ending in slightly clavate tips bearing usually two or three sessile flowers, and since Loureiro describes the corolla-lobes as linear ("*Cylindria*

dicitur ob corollæ lacinias tubum teretem continuantes"), *Linociera* is suggested as the genus to which the plant should be referred, although it is not impossible that the description may apply to an *Osmanthus* or an *Olea*. Unfortunately, the material cannot be matched in our herbaria. The following descriptive points may be mentioned:—

Folia lanceolata, breviter vel longiuscule acuminata, apice obtusa, basi obtusa vel acuta, margine subdistanter denticulata dimidio axiali integra, coriacea, glabra, 4·5–6 × 1·5–2·5 cm.; petioli 4–6 mm. long. *Paniculæ* laterales seu terminales, foliis sæpe longiores. *Drupæ* crudæ ovoideæ, apice subito acutatæ, in sicco rugulosæ, 3·5 × 2·5 mm.

BUDDLEIA Lour., 72 (Merrill, 431).

Of this the Solander MSS. (iv. 195) contains a full description by Dryander under the name *B. spicigera*, which he also wrote on the herbarium sheet. In the MS. appears the name "Tralliana, Loureyro gen. 16," followed by the native name which corresponds with that printed in the *Flora*, where the plant stands as *Buddleia asiatica*. The reference "gen. 16" does not refer, as I had expected it would, to the Loureiro MSS. already described, nor does the name Tralliana anywhere appear in it. No Loureiro label is attached to the specimen, so it would seem that there must have been a Loureiro MS. which cannot now be traced. Some other labels of similar style bear references to "G.," followed by a number.—*J. B.*

POLYOZUS BIPINNATA Lour., 74 (Merrill, 519).

Polyozus is one of four Loureiro genera, presumed *Rubiaceæ*, somewhat hastily, as will hereafter appear, pronounced by Hooker indeterminable from the author's bad descriptions and the specimens preserved in the British Museum. He went even farther in the present case and, apparently on account of its alleged possession of bipinnate leaves, declared *Polyozus bipinnata* "certe non *Rubiacea*." Merrill writes: "This is the type of the genus *Polyozus*, and is known only from Loureiro's description. I believe it to refer to *Plectronia* [i.e., *Canthium*] with the characteristically distichous arrangement of the leaves and branchlets described as bipinnate leaves." A happy surmise this, for the specimen is certainly that of a *Rubiacea*; but unfortunately the inflorescences are in a proliferous state, so that dissection cannot help in identification. In spite of this there can be little, if any, doubt that our plant is conspecific with a Cochinchina specimen of Thorel's communicated from Paris under the name "*Canthium didymum* Roxb. var. *rostrata* Thw.," as also with a Mergui specimen of this species at Kew (*Griffith*, 694 *a*), both with similarly proliferous inflorescences. *Polyozus bipinnata* is therefore almost, if not quite, certainly synonymous with one of the forms of the variable *Canthium didymum* Gaertn.

LEPTA TRIPHYLLA Lour., 82 (Merrill, 285).

A long discussion of the history of this plant, by J. J. Bennett, will be found in *Plantæ Javanicæ*, p. 99 (1840), with a reference to the full description by Dryander in the Solander MSS. (xx. 165), who names it *Brucea trifolia*; in a note on the Herbarium sheet he says, "Not a *Brucea*, but of the family of some Rutaceæ." As the Herbarium sheet shows, the plant, as Bennett (*l. c.*) remarks, "has been most singularly bandied about by various authors"; Bennett referred it to *Xanthoxylum*, but did not name it specifically. It is discussed by Merrill in Philip. Journ. Sci. vii. 375–7 (1912), who names it *Evodia pteleæfolia* (Champ.) Merrill.—*J. B.*

COLUMELLA PEDATA Lour., 82 (Merrill, 343).

This is accepted as equivalent to *issus pedata* Lam., and perhaps correctly, but the specimen is extremely poor.

OCTARILLUM FRUTICOSUM Lour., 90 (Merrill, 383).

Certainly an *Elæagnus*, as is generally understood, but, the specimen being in leaf only, the species cannot be determined.

CYATHULA GENICULATA Lour., 102 (Merrill, 170).

Not the type of the genus *Cyathula* as generally supposed. Hiern (Cat. Welw. Pl. 893) showed that Loureiro's specimen (at the British Museum) is really *Achyranthes aspera* Linn. Instead of Loureiro, Blume (1825) must therefore be cited as the authority for the genus.

ATHRUPHYLLUM LINEARE Lour., 120 (Merrill, 415).

Merrill quotes from Brown's Prodromus, 533, his reduction of "*Athyrophyllum* (sic) Lour." to *Myrsine*—"fide iconis cel. D. Car. Konig, e specimine ab auctore misso,"—and adds "the specimen or drawing is probably in the British Museum." We have no drawing, and the only representative of the plant is a small twig and some detached fruits and leaves which were in a packet inscribed in a hand which I do not know, though I have met with it in connection with other Loureiran specimens—"Fl. & fruct. Atruphylli Lour." There is no reason to doubt the authenticity of this, and, as Merrill says, "Loureiro's specific name should be adopted in *Rapanea* as the oldest valid one"; Poiret (Suppl. iii. 709) had already placed it in *Myrsine* (=*Rapanea*) as *M. linearis*. The Kew Index, following Roemer and Schultes, refers this to *M. Athyrophyllum* R. Br., a name which Merrill also quotes; it has, however, no real existence, as Brown (*l. c.*) simply includes *Athyrophyllum* (as he spells it) without any binomial combination.—*J. B.*

Mez (Monogr. Myrs. 361), without seeing the plant, refers *A. lineare* with doubt to his *Rapanea neriifolia*, and this is most likely the affinity. But the leaves are not quite similar in the two, those of the Loureiro plant being only 3·5–4 cm. long, while the fruits are only 3·5–4 mm. in diameter, whereas, judging from a specimen (Nagasaki, *Maximowicz*) authenticated by Mez himself, the fruits of *R. neriifolia* measure 6–7 mm. across. Until more satisfactory material comes to hand the plant may be known as RAPANEA LINEARIS, comb. nov.

CERIUM SPICATUM Lour., 136 (Merrill, 576).

Because of Loureiro's erroneous description, *Cerium* has remained in the limbo of *genera incertæ sedis*; yet with the specimens before one, the solution of the riddle is ridiculously easy. There are neither leaves nor flowers, but a few ripe capsules, of which four are still in position. The main stem is fistular, indicating herbaceous habit, and it and the branches show signs of the leaves having been decurrent. The inflorescence, though Loureiro calls it a spike, is evidently racemose with rather distant fruits on slender down-curved pedicels 5–7 mm. in length. The small calyx has five triangular acute segments. The globular, brown, glabrous, somewhat shining capsule is 3 mm. in diameter, and when its crustaceous envelope is broken a honeycombed placenta is seen with seeds nestling in its cavities. Stem, branches, and axes of inflorescence, it may be added, are very pale brown in colour.

Loureiro's description runs:—"Bacca parva, globosa, locularis; loculis multis, pentagonis, regularibus, 1-spermis." From this it is clear that he mistook for cells of the fruit the honeycombed chambers of the free-central placenta in which the seeds are lodged, and this has contributed mainly to the uncertainty as to the plant's position. In all the above points, as also in the leaves as Loureiro describes them, *Cerium spicatum* agrees with the widely diffused *Lysimachia decurrens* Forst. (*L. multiflora* Wall.), to which, in spite of the specimens wanting leaves and corollas, it may with absolute confidence be referred.

DASUS VERTICILLATUS Lour., 142 (Merrill, 577).

The specimens are without flowers and fruit. Merrill says of it: "The description is suggestive of *Lasianthus*," and most probably he is correct; he is certainly so as regards the Family. Loureiro described the leaves as tomentose below; but this may refer to the earliest stage of a leaf quickly becoming glabrous or nearly so. Without the inflorescence one is inclined to name this plant *Lasianthus Poilanei* Pit. (*Poilane*, 234, collected in Cambodia). There are no leaves on the Museum specimen of this quite as young as the youngest on Loureiro's specimens, but the upper part of a young leaf of *L. Poilanei* immediately adjoining the tip and the tip itself are covered with closely-set hairs similar to those on the Loureiro plant, the rest of the leaf being more or less glabrous. One may therefore suppose that in the earliest stage of these leaves their underside would answer to Loureiro's "tomentose" as well as those on Loureiro's own specimens do.

AIDIA COCHINCHINENSIS Lour., 143 (Merrill, 430).

The flower is described as having a 5-toothed calyx, a superior hypocrateriform corolla hairy at the throat, and 5 sessile anthers inserted in the tube's mouth at the sinuses of the lobes. It is itself a tree with white, very durable wood much used in building. Merrell's note runs: "Dr. Chevalier reports the local name cited by Loureiro ['Cây Tlai'] still in use for the species currently known as *Fagræa fragrans* Roxb.—I have personally observed the timber about the entrance of the old Spanish fort at Taytay, Palawan, which when examined in 1913 had apparently been in position in the damp masonry for at least 100 years, and showed practically no sign of decay. The timbers were of this species of *Fagræa*, which is common in Palawan." The wood of *F. fragrans* is said to be yellow, a point of minor importance, and the alleged superior corolla of *Aida* might be an error of observation; but when it is remembered how the anthers of *F. fragrans* are poised on long filaments projecting far beyond the corolla, whereas those of our plant are said to be sessile, we must conclude that Merrill's identification will not hold.

The Museum specimen is undoubtedly a *Randia*, and in this Ridley, who kindly made a careful examination of it, agrees. As usual, unfortunately the material leaves much to be desired, consisting as it does of but two small leaf-bearing pieces, one of them with the remains of an inflorescence but no flowers, and a detached fruit in very early condition. Tree Randias are few, so that but little choice is presented here; but a search through Museum and Kew sheets has lead to the conclusion—Ridley again agreeing or, rather, suggesting—that *Randia eucodon* K. Schum. is the identification sought. With this the specimens, so far as they go, agree, the only difficulty being in the shape of the corolla. This would now be called campanulate with a short but very distinct suddenly-ending tube, which sudden ending would seem to have induced Loureiro to call the corolla hypocrateriform. It is to be hoped that further search will be made for this plant.

ANTHERURA RUBRA Lour., 144 (Merrill, 514).

Merrill writes of this, it "seems to be known only from Loureiro's description, from which I take his genus *Antherura* to be a synonym of *Tarenna*, but this reduction is by no means certain." Poiret referred the plant to *Psychotria* (*P. rubra* Poir.), and it is the *P. antherura* of Roemer and Schultes. Loureiro's specimen is a poor one, consisting of a short piece of stem, some imperfect leaves, and a fair number of fruits, a few still in position. The fruits are the characteristically ribbed ones of *Psychotria*, to which genus *Antherura* certainly belongs, and Ridley confirms this decision. Comparison of the specimen with the East Asian Psychotrias leaves virtually no doubt, unsatisfactory though the material is, that the identity we are seeking is the common *Psychotria elliptica* Ker (*P. Reevesii* Wall.).

There are two difficulties in the way here. One is the "simple" stigma of Loureiro's description, the stigma of this genus being normally 2-armed. But Pitard (Fl. Indo-Chine, iii. 362) says the stigma of *P. elliptica* is "légèrement renflé au sommet, à lobes soudés," which bears out Loureiro's statement. The second and greater difficulty relates to the tailed anthers, concerning which Loureiro writes: "Filamenta 5, brevissima, fauci corollæ insidentia.

Antheræ sagittatæ, stantes: apice caudato, longo, reflexo," and these apical tails, he adds, are red in colour. But the anthers of *Psychotria* are almost always obtuse and rarely even acute; how, then, can this alleged tailed condition be accounted for? Assuming Loureiro's plant to be *P. elliptica*, a species with filaments considerably longer than the anthers themselves and not "very short" as described, which filaments arise each from a pulvinus in the corolla throat and, though they answer to the description in bud, lengthen considerably when the corolla opens, the explanation submitted is that Loureiro wrote his description partly from a flower in bud, partly from one more advanced from which the anthers had fallen off while the wilting filaments had become tinged. On a hasty glance into such a flower, he might easily mistake the pulvinus for the anther, and the filament would in consequence be considered its tail.

Extravagant though this supposition may seem, it must be remembered we are dealing with a writer who made many mistakes in his descriptions, some of them certainly not more serious than those alleged here. Finally, Cây lâu, the native name for *A. rubra* is also, according to Pitard (*l. c.*), the Cambodian for *P. Reevesii*, as well as for *P. adenophylla* Wall., and the Annamese for *P. montana* Bl. and *P. Poilanei* Pit., but these other species will not serve our purpose.

There is another Loureiro specimen under this name, but obviously quite different from the true plant. It is represented by a few oblong lanceolate grey-coloured alternate leaves 4·5–10 cm. long and 1·5–3 cm. broad, detached or upon short pieces of stem. This may possibly be a *Glochidion*, but it may very well be something quite different. The sheet has no Loureiro ticket.

STIGMANTHUS CYMOSUS Lour., 146 (Merrill, 517).

Although it has been a standing puzzle since Loureiro's time, and although the specimens are poor and in fruit only, this proves to be nothing more than the familiar *Morinda umbellata* Linn. Loureiro's description of the fruit as 1-celled and many-seeded, while the stigma is very large, is explained by the massed ovaries peculiar to the genus.

EVONYMUS CHINENSIS Lour., 156 (Merrill, 535).
BRYONIA COCHINCHINENSIS Lour., 595 (Merrill, 535).

Merrill points out the identity of these. The *Bryonia* was referred by Cogniaux (in herb.) to *Gymnopetalum cochinchinense* Kurz: of the *Evonymus* we have no specimen. Mr. Merrill suggests the name *G. chinense* for the plant, apparently because the *Evonymus* stands earlier in the book; but this creation of a new synonym for a plant already well known under a correct name seems unnecessary, except on the principle of "priority of place," which is not recognized by the Rules of Nomenclature.—*J. B.*

APOCYNUM JUVENTAS Lour., 167 (Merrill, 444).

Merrill writes of this: "Loureiro's description apparently applies to *Tylophora*, but the status of his species is uncertain. Costantin, in Lecomte, Fl. Gén. Indo-Chine, iv. 113, places it as a synonym of *Tylophora ovata* Hook., which in turn was based on *Diplolepis ovata* Lindl., but considers it a species insufficiently known." *Diplolepis* was the name proposed by R. Brown (Mem. Wern. Soc. i. 41) for a Chilian plant: to this Lindley (Trans. Hort. Soc. vi. 68) added two Chinese species now referred to *Tylophora*, and shortly after (*l. c.* 268) a third from China which he called *Diplolepis ovata*. *Tylophora ovata* is assigned to "Hook." on the authority of Steudel (Nomencl. ed. 2, ii. 726), who cites for it *Diplolepis ovata* Lindl., though how or where Hooker comes into the case does not appear. Decaisne (DC. Prodr. viii.) makes no mention of *D. ovata*, but in the list of *species exclusæ* at the end of *Apocynum* we find "*Apocynum Juventas* Lour. = *Tylophora ovata*," a name he omits to deal with elsewhere; he thus merely repeats Steudel. *T. ovata* is not included in Maximowicz's account of East Asian Asclepiadaceæ, neither is the name taken up by Forbes and Hemsley in *Index Floræ Sinensis*.

Loureiro's specimen (the sheet is without a Loureiro ticket) is very poor, consisting of a leafless rusty-hairy climbing stem, and five detached leaves (opposite insertion), covered on both sides, but especially the lower, with a grey or grey-brown tomentum, ovate, suddenly and very shortly acuminate, truncate at base, the largest 7·5 × 4 cm. on a tomentose petiole, and having about 18 nerves on each side of the midrib. There are no flowers, but the base of an inflorescence is preserved and its three dichotomous branches all thickly covered with hispid tawny hairs. According to Loureiro the flower is yellowish green ("luteo-viridis"); it has a "nectarium" (corona) of five connivent lobes and a concave bifid stigma. The description, which will not do for any known Indo-Chinese species of *Tylophora*, fits in well with *Streptocaulon*, and when one compares the specimen with *S. tomentosum* Wight, so far as the material goes, the agreement is so close between them as to leave no reasonable doubt that the two are conspecific.

With regard to the flowers of *S. tomentosum*, Costantin (*l. c.*) says they are brownish or yellowish brown or brown-violet, a range of colour but little enlarged by including the yellowish green noted above. In the absence of flowers, it would scarcely be advisable to adopt the oldest trivial for the species.

There is other material at the Museum bearing the name "Juventas." The sheet, also without a Loureiro ticket, on which this is mounted is endorsed as follows, in Dryander's handwriting:—"Sent under name of Juventas, Hà thu ô; but must be a mistake, as it does not agree with the description of *Apocynum Juventas*, Lour. Cochinch. 167. The specimen sent before under the same name agrees with the description of the stem and leaves." There are neither flowers nor fruit on the specimens, which are those of a twining plant, glabrous except for the very young parts, with opposite, ovate or oblong-ovate leaves, minutely cuspidulate at the tip, truncate or very slightly cordate at base, 2–2·5 rarely up to 3·5 cm. long, and 1–1·5 cm. broad, on petioles about 5 mm. in length. The short peduncles, only some 3 mm. or so long, bear at the top a cluster of

tiny hairy bracts. Both at the British Museum and at Kew there are specimens of a small-leaved form of the widely-distributed *Tylophora asthmatica* Wt. & Arn. exactly resembling those of Loureiro under notice.

But what is this plant in *Flora Cochinchinensis*? It will be observed that on the same page and immediately above *A. Juventas* Loureiro describes his *Apocynum reticulatum*, which he identifies with *Olus crudum minus* of Rumphius, Amb. lib. 7, c. 41, t. 40. fig. 2. Suggestions have been made as to the identity of both these plants; but the matter has never been cleared up satisfactorily. Now the figure of Rumphius, although its leaves are larger than those of Loureiro's *A. reticulatum*, are a fair representation of an ordinary form of *Tylophora asthmatica*, including the short peduncles as well as—an unusual feature among Asclepiadaceæ—yellow flowers which Loureiro claims for his plant; in fact, Loureiro's identification, if this suggestion be correct, is a very much better one than many of his others. It is therefore submitted that this second "Juventas" is really *Apocynum reticulatum* Lour. = *Tylophora asthmatica* Wt. & Arn., and *Olus crudum minus* Rumph., and that the mistake was due to Loureiro (or an assistant) affixing the name *A. Juventas* in error to *A. reticulatum* and *vice versâ*: this supposition is strengthened by the fact that while *T. asthmatica* yields a most valuable drug, and might by a little exaggeration be said, as Loureiro relates was said of his Juventas, by its use to make old people young again, this being the reason for his trivial, *Streptocaulon tomentosum* enjoys no such reputation.

Hexanthus umbellatus Lour., 196 (Merrill, 198).

Robert Brown (Prod. 403), after examining the Loureiro specimen, considered it conspecific with his *Tetranthera ferruginea* from Australia, a conclusion Bentham (Fl. Austral. v. 306) thought very doubtful. Merrill supposes *H. umbellatus* to be a form of *Litsea amara* Bl., and in this he seems to be right.

Eystanthes sylvestris Lour., 235 (Merrill, 578).

A note in a Brown MS. gave the key to this long-standing puzzle. Against this name he had written "Xanthophyllum?," and upon examination this turns out to be the true solution. The material consists of branches, half-a-dozen detached leaves more or less broken, and a number in a capsule of very small buds, the largest only 2 mm. in length. Fortunately, these buds are large enough to confirm Brown's suggestion without leaving the slightest doubt on the point. The following details may be stated:—

Ramuli subteretes, glabri, cortice brunneo obducti. *Folia* oblongo-obovata, obtusa, brevipetiolata (pet. fusci circa 5 mm. long.), integra, circa 5–10 × 2–4 cm., in sicco brunneo-lutescentia, chartacea, glabra, pag. utraque (sed præsertim subtus) perspicue reticulata. *Flores* in racemos axillares, simplices vel pauciramosos, fulvo-sericeos digesti; alabastra extus fulvo-sericea. *Sepala* ovata, ext. quam int. paullo latiora. *Petala* oblongo-ovata; carina obtusa. *Stamina* 8; filamenta apice villosula; antheræ ovato-oblongæ, muticæ. *Discus* prominens, lobatus. *Ovarium* villosulum; stylus latus, glaber; stigma bilobum. Ovula pro loculo verisimiliter 4.

This description does not apply exactly to any species of the genus treated by Gagnepain (Fl. Indo-Chine, i. 242). The plant may therefore be known provisionally as Xanthophyllum sylvestre, comb. nov.; this on the supposition that, although *Eystanthes* has 24 years' priority over *Xanthophyllum*, the latter will be added to the list of *nomina conservanda*.

Scutula scutellata Lour., 235 (Merrill, 399).

Cogniaux (DC. Mon. Phan. vii. (Melast.) 1157) seems to have misread the above name on the Loureiro sheet as *S. umbellata*, and (*l. c.*) enters Loureiro's plant under the latter name. His error has been followed by later authors, and the plant has been named "*Memecylon Lureirii*" in the Herbarium itself. Loureiro's plant, however, is doubtless his *S. scutellata*, as written up by Dryander on its receipt by Banks, as *S. umbellata* is not indicated in the Flora as ever having been received by him. Triana (in Trans. Linn. Soc. xxviii. 156) notes that he failed to find *M. Lureirii* among Loureiro's types in the Herbarium, nor, apparently, did he see *M. scutellatum* there.—*J. B.*

Hydrogeton heterophyllum Lour., 244 (Merrill, 33).

This was reduced by Poiret (in Lam. Encycl. Suppl. iv. 534 (1816)) to *Potamogeton* as *P. octandrum*—a name which, as Merrill points out, will have to stand. Merrill's conjecture that it is identical with the plant described later (1856) by Hasskarl as *P. javanicus* is confirmed in his Supplement by Arthur Bennett, who writes that he found "in the herbarium of the British Museum, without collector, a specimen labelled 'Rao hai tom (?) l'au Octandr. Hydrogeton heterophyllum Lour. Coch. 244.' The label is dark coarse brown paper, the ink evidently very old. The specimen is typical *Potamogeton javanicus* Hassk. It is in all probability from Loureiro's collection." Bennett's conjecture is correct. The collector's name is on the back of the sheet, following the old custom prescribed by Linnæus; the native name (not quite correctly transcribed) and class are in Loureiro's hand, the Latin name in that of Robert Brown).—*J. B.*

Graebner, it may be remarked, cites the plant at the end of the genus as one of his "species excludendæ vel incertæ" (Pflanzenr. Monogr. Potamog. 142).

Larus caryophyllus Lour., 250 (Merrill, 195).

This is certainly a *Cinnamomum*, but cannot be *C. Culilawan* Bl., to which Meisner doubtfully referred it, evidently without seeing a specimen. The small leaves when examined under the glass are seen to have a well-marked reticulation: these organs measure only 3–6 cm. long by 2–3·7 cm. across; the petioles are 6–8 mm. long. Loureiro's "nectarium glandulosum" clearly refers to the innermost (fourth) whorl (staminodes). Attempts to match these specimens have failed: moreover, they do not "run down" to anything in Fl. Cochinch., as Merrill also found. The following is a description:—

Cinnamomum caryophyllus, comb. nov. Planta *foliis* ovatis vel ovato-lanceolatis obtusis 3-nervibus (nervis lat. folii apicem haud attingentibus) pag. sup. nitidis glabris; *paniculis* folia excedentibus laxe paucifloris minute griseo-pubescentibus; *pedicellis* floribus longioribus; *perianthii* lobis subæqualibus obtusis omnino deciduis; *antheris* serr. I & II 4-locellatis eglandulosis ser. III 2-locellatis basi glandulosis; *staminodiis* aliquanto clavatis; *ovario* anguste ovoideo, perianthio tubo omnino obtecto.

Panicula usque 6 cm. long. Pedicelli 3–6 mm. long. Perianthium 3 mm., stamina 1·5–vix 2 mm. long. Antheræ serr. I & II oblongo-truncatæ, 1 mm. long., ser. III ovoideæ, ·5 mm. long. Staminodia circa 1 mm., ovarium circa 1·5 mm. long.

(To be continued.)

NOTES ON DIATOMS.—No. 3*.

By F. W. Payne.

Ditylum trigonum Bail., D. inæquale Bail., Triceratium (Ditylum) sol H. v. H.

In some Plankton from Hong Kong the prevalent forms were various species of *Chætoceros*, and many valves (no frustules) of the form called by Van Heurck *Triceratium* (*Ditylum*) *sol* (figured in Syn. Diat. Belg. pl. 115: also in Schmidt's Atlas, t. 152, figs. 5 & 9). It is hardly necessary to say that this diatom has no claim to the title of *Triceratium*. It is an undoubted *Ditylum*.

Among the above and numerous other diatoms, the forms occurred which are the subject of this paper and are illustrated in fig. I. (p. 258).

The writer has seen *Ditylum* reproducing by fission in the ordinary way among diatoms:—the division of the frustule into two at a median plane; the development of two valves at this plane; subsequent separation; and two frustules formed in place of the original one. The process is figured on pl. 96. fig. 7 in Péragallo's Diat. Mar. France, *Ditylum Brightwelli* (probably a variety of *D. sol*); also in Brightwell's figure, Q. J. M. S. 1858, pl. 8. fig. 4.

But in the Hong Kong gathering were forms of *Ditylum* in which the frustule developed only one new frustule; the second, oldest, valve being barren, and pushed off as the newcomer became fully grown. It was not an isolated case that was observed. More than a hundred frustules showing the phenomenon were selected and mounted; and many were dissected, exhibiting a rigid regularity in the shape of the valves, according to their position in the original (primary) frustule or in the secondary frustule subsequently formed.

There were apparently two forms of the secondary frustule, differing somewhat in size and shape of their valves, yet showing

* No. 1. *Liostephania* and its Allies. Wheldon and Wesley, London.
No. 2. *Coscinodiscus blandus*. 'Nuova Notarisia,' 1925.

strong similarities (compare in fig. I. the secondary frustules 12 and in 3 with 4, 5: and the valves 14 and 9, 6 and 15); but the gathering suggested no reason for this. No secondary frustule showed any indication of the development in it of a third frustule, though (fig. 17) one or two had developed the zone considerably.

The writer is of opinion that these forms cannot be regarded as a definite species of *Ditylum*. It seems to him that a diatom which merely replaces itself by another single diatom is bound to be extinguished within a short period under the wear and tear of its existence. Every time some marine animal makes a meal of the plankton, the number of individuals must decrease until final extinction. In the writer's opinion these forms must represent a phase in the life-history of some (perhaps well-known) diatom.

The secondary frustules may be resting spores, and, from their association with that species and similar markings, those of *Ditylum sol*.

In seeking a connection between the forms figured and their origin, it may be noted that the oldest valve (fig. 10) bears a considerable likeness in valve-view to *Ditylum sol*. In front view (fig. 11) they are more unlike. The spine of *D. sol* rises from a depression; in fig. 11 it rises from the top of a triangular pyramid. The shapes of the valves, too, differ; but in considering this, fig. 20 is of weight. It represents a frustule of *Ditylum* from the surface of Yedo Bay: and in this it will be noted that one valve has its spine on the summit of a pyramid, while the spine of the other valve of the same frustule rises from a deep depression. It is not likely that these valves change their shape after formation. They are thoroughly siliceous, and bear handling well.

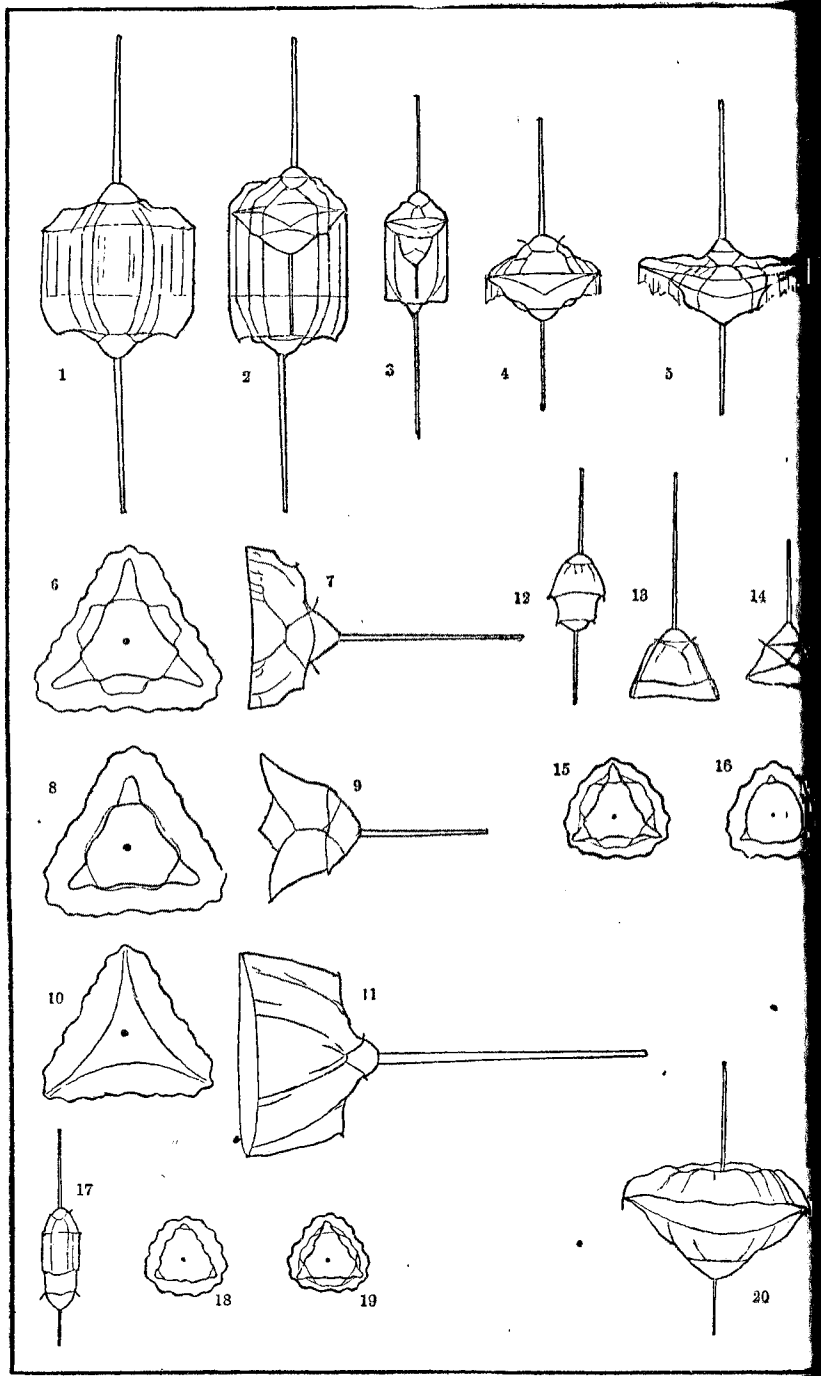
After turning over and examining from all points of view hundreds of these forms, and after going through all available literature, the writer is of opinion that the secondary frustules described correspond exactly with the forms found by Professor Bailey in a gathering from San Antonio Bay, Pará River, at a depth of 4 fathoms (Boston Journal of Nat. Hist. vii. pl. 8). These he named *D. trigonum* and *D. inæquale*. The primary frustules (figs. 1, 2, 3) the professor apparently did not meet with.

In Van Heurck's 'Treatise on the Diatomaceæ' (Baxter's translation), p. 424, Bailey's two species are inserted as synonymous with *Ditylum Brightwelli*, but the Hong Kong forms were associated with multitudinous specimens of *D. sol*; while in Yedo Bay, where *D. Brightwelli* was common, the forms described in this paper were absent.

The only slides of *Ditylum trigonum* and *inæquale* indexed in the British Museum Collection are (1) No. 25703 (H. L. Smith's slide No. 142) which contains only *D. sol*. This cannot by any stretch of imagination be described, as Bailey gives it, "*D. trigonum*," "two triangular *pyramids* applied base to base." (2) No. 12721, a slide of Rabenhorst's, of material from St. Paul's; but no example of the species can be found on it.

In Syn. Diat. Belg. (pl. 114) Van Heurck gives a figure of

Fig. I.



NOTES ON FIG. I.

1 represents a primary frustule; 2 and 3, the same with secondary frustules forming; 4, 5, 17, secondary frustules whose spines have developed and pushed off the oldest valve; 10 and 11, front and side view of the oldest valve (the lowest in fig. 1); 6 and 7, the younger valve of the primary frustule; 8 and 9, the last valve developed (in the secondary frustule).

Habitat: 1–19, Hong Kong Plankton. 20, surface of Yedo Bay. Size: Frustules (drawn under $\frac{1}{4}$ inch) range from ·09 mm. to ·02 mm. in breadth (actual size). Valves (drawn under $\frac{1}{8}$ inch) range from ·06 to ·02 mm. in breadth.

Only contour-markings are drawn: those, that is, which are due to foldings or flexure of the hyaline frustule. The granulation of all the valves is similar to that in *Ditylum* (' *Triceratium* ') *sol* (Syn. Diat. Belg. pl. 115)—a circle of granules round the base of the spine, slightly elongated radially, from which proceed lines of granules, diminishing in size until they reach the margin of the valve.

Number of forms examined: about 300, of which 100 were sketched or mounted—many, too, being dissected.

The Plankton material was not prepared as usual with acid, but repeatedly washed with distilled water, till all vegetable matter had decayed and been decanted off.

1. Primary frustule, before development.
2, 3. Primary frustules developing secondary frustules.
4, 5. Secondary frustules; the oldest valve having been pushed off by the growth of the spine.
6 to 11. Dissections of No. 2 to show front and side views of its valves.
10, 11. The oldest (bottom) valve of 2; front and side.
6, 7. The second valve in age of 2.
8, 9. The innermost (youngest) valve of 2.
12. Secondary frustule of the smaller size.
13 its older, and 14, its younger valves, front view.
15 older, and 16, younger valves, side view, of another similar specimen.
17. Secondary frustule of the smaller size, with lengthened zone: but no signs of producing a new frustule. (Compare fig. 7, plate 152, Schmidt's Atlas.)
19 & 18. Side view of valves of smaller form of secondary frustule. (Compare 15 and 16, 6 and 8.)
20. A frustule of *Ditylum* sp. (surface of Yedo Bay), showing one pyramidal valve and one depressed on the same frustule. None of these forms were seen in the Hong Kong gathering. Several frustules were observed in the Yedo Bay gathering in which *both* valves were pyramidal.

D. inæquale, which does not well correspond to Bailey's definition or the details of his figure. The latter says "*inæquale* differs from *trigonum* in having one side turgid, the other less turgid and rising considerably within the margin." Bailey's figure shows a marked difference in the height of the valves, Van Heurck's drawing hardly any. Still it is probably one of the secondary frustules described in this paper. They vary much in shape; the valves figured seem to be chosen on account of their abnormal character. Deby tells us that Bailey's collection and types should be in the possession of the Museum of the Natural History Society of Boston, but that most of them have disappeared. Probably the original specimens of *D. trigonum* and *D. inæquale* are lost.

If the writer's forms are the same as those of Prof. Bailey, and if the view of the former as to the permanent existence of a species

the frustules of which only reproduce one individual is correct, Bailey's two species should disappear from the list of diatoms. But the relation of the forms discussed to *Ditylum sol* remains yet to be observed.

The question arises, Is the method of growth exhibited by this *Ditylum* confined to this one form? Does it occur among other diatoms? It is certainly improbable that it happens in one only among the many thousands of known species. One thing is certain, in most cases it would be difficult to see, the frustules being usually so thin. In *Ditylum* the long spine keeps the valves apart, and renders observation easy.

A note, finally, as to the method of dissection used by the writer—a method very fruitful in the examination of diatoms. The frustule to be dissected is placed in a drop of distilled water, as small as possible, on a cover-glass. Close to it is placed a similar drop of sulphuric acid. Breathed upon, the two coalesce. Into this the tiniest fragment of potassium chlorate is dropped. No action takes place till it is heated to dryness on a metal plate over a Bunsen flame. When cold, and examined under an inch power, the diatom or its parts will be found embedded in a thin film of potassium salts, which, if breathed upon, will dissolve and enable the dissected forms to be lifted out and transferred to a drop of distilled water; after washing in which they are dried and mounted. If the frustule has not broken up, a slight trituration in the distilled water with the mounting hair will cause it to separate. The drops etc. should be as small as possible to prevent the material reaching and being carried over the edge of the cover-glass, with probable loss of the diatom or some of its parts.

ADDENDUM TO "LIOSTEPHANIA AND ITS ALLIES"*.

In the above-named critical revision of the Diatomaceous genera *Liostephania*, *Dictyolampra*, and *Actinogonium*, Ehr., and certain species of *Asterolampra* created by Greville, I endeavoured at some length and with many figures to prove that the forms discussed were not diatoms, but casts or impressions of the valves of diatoms (mostly of the genus *Asterolampra*). The protoplasmic contents of the valves had swollen, increased in bulk, and become silicified, taking a more or less perfect impression of the face of the valve in contact: generally imperfect.

Since the publication of my revision, I have met with another instance of this phenomenon in the genus *Eunotia*.

When Ehrenberg examined the fossil deposits of Auckland, New Zealand, he found a series of diatoms to which he gave the name *Ophidocampa*; a linear, slightly curved valve, transversely striated, the margin showing serpentine undulations. Following his usual plan, he made species depending on the number of undulations or

* F. W. Payne; Wheldon and Wesley, London. 1922.

denticulations of the margin: "*O. ternaria*, *O. quaternaria*, etc., ... *O. tridenaria* (13 denticulations)." All these are described and figured in the 'Abhandl. Konigl. Akad. Wissen.,' Berlin, 1869, but are now grouped together under the common name of *Eunotia serpentina* (Schmidt, Atl. pl. 290. fig. 8).

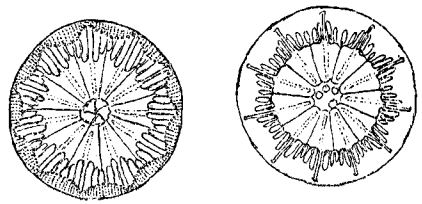


Fig. II.—Valve of *Asterolampra* (left fig.). On the right an unusually fine *Liostephania*, formed in a similar valve. Barbados. It is extremely rare to find the *Liostephania* in situ.

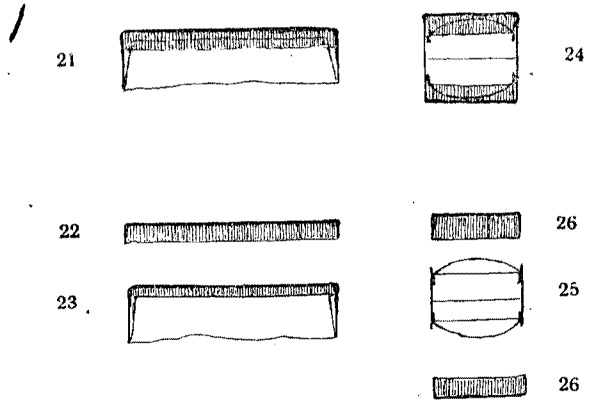


Fig. III.—21, Ehrenberg's *Ophidocampa tridenaria* (*Eunotia serpentina*), as found at Auckland, New Zealand. Fossil. Interior usually crowded with débris and small diatoms. Length ·16 mm.

22, *Eunotia* valve, separated from 23, the contents strongly silicified: a high power and an oblique light will show the markings impressed by the valve more or less well, rarely so perfectly as in the figure.

24, *Eunotia pectinalis*, var. *Soleiroli* K., showing external *Eunotia* valves and internal frustule, as usually found and mounted. Length ·06 mm. 26, External valves removed, showing internal frustule (25).

(All figures front view.)

Ehrenberg's figures are all normal, excepting that of *O. tridenaria*, the front view of which is represented as broadly rectangular (fig. 21); but he gave no explanation of this—merely figured and described its shape.

While recently examining some of the Auckland, New Zealand, deposits, it occurred to me to try the method of dissection described above (p. 260); and I found that the massive, somewhat irregular, rectangular form could be separated from a normal *Eunotia* valve, which fits upon it closely, like a cap (figs. 22, 23). The swollen contents of the valve showed, more or less well, traces of the markings of the *Eunotia* in which they were formed; which is precisely what happens in the *Liostephaniæ*, formed and sometimes found in the valves of *Asterolampræ* (fig. II., p. 261). The only difference, apart from outline, is that while *Liostephaniæ* are rarely found *in situ*, *O. tridenaria* has rarely lost its valve.

It must not be forgotten that a British *Eunotia* (*pectinalis*, var. *Soleiroli* K.) (fig. 24) has an internal frustule (an occurrence among diatoms more common than is generally known) from which the external *Eunotia* valves can be dissected (see figs. 25, 26); continued boiling in acids will sometimes remove both valves of the external frustule, leaving the internal frustule attached to the zone in perfect condition (fig. 25). Oblique illumination will show slight traces of the markings of the external valves—impressed, doubtless, at an early stage of development. But this internal frustule, delicate, hyaline, and diatom-like, cannot be likened to the contents of the valve of *O. tridenaria*. The coarse heavy form from this last is only found in valves (as with *Liostephaniæ*), though normal frustules of *O. tridenaria* are to be met in the deposit—frustules, that is to say, showing no trace of the phenomenon I have described above.

I should add that the phenomenon is not confined to valves with thirteen, but may be seen in those with fewer, denticulations.

THE ALGÆ OF LEICESTERSHIRE.

By Florence Rich, M.A.

(Continued from p. 238.)

ŒDOGONIALES.

Œdogoniaceæ.

(Only those species are enumerated in which the reproductive organs could be observed.)

Bulbochæte Agardh.

B. intermedia De Bary *β depressa* Wittr. Colery, 7. Also found on one of Bates's slides for the same place, 1884, growing on the stems of a *Nitella*.

B. mirabilis Wittr. Near Narborough, 10 (*Bates*). Colery, 7 (fragments only).

Other fragments of *Bulbochæte* were also observed in Blaby Canal, 5; Saddington, 5; Canal, Oakthorpe, 9; and pond, Waltham, 6.

Œdogonium Link.

Œ. Areschougii Wittr. Spring Hill, 6–9 (*Bates*).

Œ. Bernardense Bates. Found, and named as a new species, by Bates near St. Bernard's Abbey, 6–10.

Œ. Boscii (Le Cl.) Wittr. Sulby, 7.

Œ. Braunii (Kütz.) Pringsh. Narborough, 6, 7 (*Bates*). Scraptoft, 5; Elmesthorpe, 6.

Œ. capilliforme Kütz. Narborough, 6, 7 (*Bates*).

Œ. cardiacum Hass. Pelder Tor and Narborough, 5–7 (*Bates*).

Œ. ciliatum (Hass.) Pringsh. Croft Hill, 5 (*Bates*).

Œ. concatenatum (Hass.) Wittr. var *rectangularis* F. Rich in Journ. Bot. *supra*, p. 72. Canal, Sutton Wharf, 6; Sulby, 7.

Œ. cryptoporum Wittr. Timberwood Hill, 6.

Œ. excisum Wittr. Narborough, 6, 7 (*Bates*).

Œ. fragile Wittr. Between Hinckley Rd. and Braunstone, 4. forma *valida*. Nr. Swithland Wood, 5.

Œ. macrandrium Wittr. *β æmulans*. Knighton, 5.

Œ. oblongum Wittr. Very little seen. Scraptoft, 5.

Œ. obsoletum Wittr. Colery, 6; Sulby, 7; near Billesdon Coplow, 5. The supporting cell is enlarged as Wittrock figures but does not describe.

Œ. ælandicum Wittr. Colery, 6–8 (*Bates*).

Œ. platygynum Wittr. Spring Hill, 1–7 (*Bates*).

Œ. Rothii Pringsh. Narborough and Croft, 8 (*Bates*).

Œ. rufescens Wittr. f. *exiguum* (Elfv.) Hirn. Colery, 6; Saddington, 5; Sutton Wharf, 6; Sulby, 7.

Var. *Lundellii* (Wittr.) Hirn. A form of this variety in which the oogonia occur in series (2–6) was found in Colery Reservoir, 6, and Saddington Reservoir, 5.

Œ. rupestre Hirn. Scraptoft, 5.

Œ. sphærandrium Wittr. & Lund. Bescaby, 6.

Œ. undulatum (Bréb.) A. Br. Moira (Victoria County History).

Œ. Vaucherii (Le Cl.) A. Br.; Wittr. Narborough, Croft, Cosby, 6–7 (*Bates*), Sulby, 7.

Œ. vulgare Wittr. Narborough, 6 (*Bates*). Bates may have been referring to *Œ. cryptoporum* var. *vulgare*.

CONJUGATÆ.

Series **Mesotæniales** (Saccoderm Desmids).

Gonatozygon De Bary.

Gonatozygon Ralfsii De Bary. Rocky pool, Croft (*Roy*).

Mesotænium Näg.

M. Endlicherianum Näg. Bradgate, Spring Hill (*Roy*); Timberwood Hill, 6.

M. macrococcum Kütz. (*M. Braunii* De Bary). Spring Hill (*Roy*).

M. mirificum Arch. Enderby (*Roy*).

M. violascens De Bary. Wet rocks, Croft (*Roy*).

CYLINDROCYSTIS Menegh.

C. Brebissonii Menegh. Bradgate (*Roy*); with zygospores on wet rock, Croft (*Roy*); Timberwood Hill, 6.

Var. *minor* W. & G. S. West. Ditch bounding garden of Leicester Frith, 4–6.

C. crassa De Bary. Croft (*Roy*).

NETRIUM Näg.

N. digitus (Ehrenb.) Itzigs. & Rothe. (*Penium digitus*). Bradgate, Spring Hill (*Roy*); Beacon, 2, 6, 7, 8, 9.

Series Zygnemales.

ZYGNEMACEÆ.

SPIROGYRA Link.

Only those species found with zygospores are enumerated.

S. affinis (Hass.) Kütz. Swithland Wood, 5; Woodle Head (Rutland), 5.

S. calospora Cleve (*S. protecta* Wood). Near Narborough, 6 (*Bates*); ditch near Swithland Wood, 5; Canal, Blaby, 5. Neither Petit nor Borge speaks of the inflation of the cells that have failed to conjugate, and which is very noticeable here. Middle coat of zygospore scrobiculate.

S. catenæformis (Hass.) Kütz. Pond north of Colery Reservoir, 7; Billesdon Coplow, 5; Bescaby, 6.

S. communis (Hass.) Kütz. Sawley Bridge, 5; Bescaby, 6.

S. condensata (Vauch.) Kütz. Near Narborough (*Bates*); Croft, 5. Abundant in ponds near Hamilton, 5.

S. flavescens Cl. Var. α *gracilis* Hass. 6 (*Bates*).

Var. β *flavescens* Hass. Narborough, 4–6 (*Bates*).

S. Grevilleana (Hass.) Kütz. Swithland, 5; Town End Close, 5, 6; Scraptoft, 5; near John o' Gaunt, 5; near Billesdon Coplow, 5.

S. inflata (Vauch.) Rabenh. Scraptoft, 5; Knighton, 5.

S. insignis Hass. Narborough, 3–5 (*Bates*).

S. jugalis (Dillw.) Kütz. Croft, 5; near Swithland Wood, 5; Gallows Lane, Willesley, 9; Bescaby, 6. Although there are 3–4 chromatophores in some filaments most cells in the present sample have 5 or 6.

S. Jürgensii Kütz. Canal, Blaby, 5.

S. longata (Vauch.) Kütz. Generally distributed (*Bates*). Lea Lane, 4; Croft, 5; Sulby, 7; Billesdon Coplow, 5.

S. majuscula Kütz. (*S. orthospira*). Distinguished by its four straight and parallel chromatophores. Large pond near Burbage Wood, 5. Two zygospores in one cell were not uncommon; binate spores have previously been described for *S. communis*, *S. Weberi*, *S. bellis*, and *S. velata* *.

S. maxima (Hass.) Wittr. (*S. orbicularis* Kütz.). Narborough, Colery, 4–9 (*Bates*). Ditch, Cavendish Bridge, 5.

S. nitida (Dillw.) Link. Croft, Narborough, Colery, 6–11 (*Bates*), Croft, 5.

S. porticalis (Müll.) Cl. Locally abundant (*Bates*). Near Narborough, 4; cross-roads Atherstone to Sheepy Magna, 4.

S. quadrata (Hass.) P. Petit. Town End Close, 6; Measham, 5.

S. Spreeiana Rabenh. Near Swithland Wood, 5; Scraptoft, 5; Bescaby, 6.

S. tenuissima (Hass.) Kütz. Narborough district, 4, 5 (*Bates*). Cropstone Reservoir. 1894 (*Mott*). Croft, 4, 5; Town End Close, 5; nr. Swithland Wood, 5.

S. varians (Hass.) Kütz. Found very commonly, but with zygospores in April and May only.

S. velata Nordst. Narborough, 4, 5 (*Bates*).

S. Weberi Kütz. Narborough (*Bates*). Cropstone, 1894 (*Mott*). Nr. Swithland Wood, 5; Bescaby, 6.

ZYGNEMA Agardh.

Though this genus is abundantly represented I have not found any specimens with ripe zygospores or even fully conjugated.

Z. cruciatum (Vauch.) Ag. Croft, Narborough, Colery, Bradgate, Blaby. "In ripe fruit, August" (*Bates*). Shackerstone Canal, 5; Saddington (conjugating), 5; Normanton, 5; John o' Gaunt, 1; Braunstone, 4.

Z. pectinatum (Vauch.) Ag. Pond near Bescaby, beginning to conjugate, 6.

? *Z. Ralfsii* (Hass.) De Bary. Very common and conjugating, pool, Sawley Bridge, 5.

? *Z. stellinum* (Vauch.) Ag. Pool, High Sharpley, 5.

Z. Vaucherii Ag. Colery, 5 (*Bates*). Cropstone, July 1888 (*Mott*).

DEBARYA Wittr.

D. lævis (Kütz.) West. Very common in pond near Woodle Head, Rutland. Forming zygospores, 5.

* "Observations on the Conjugatæ," W. & G. S. West, Ann. Bot. xii. 29 (1898).

ZYGOGONIUM Kütz.

Z. ericetorum Kütz. Whitwick, 1863 (*Sir Oswald Mosley*). Forming a greenish stratum on damp pathways and heaths, High Sharpley, High Cadman, and other places (*Bates*). On damp heath, Beacon Hill, frequently.

SIROGONIUM Kütz.

S. sticticum (Engl. Bot.) Kütz. (*Choaspis stictica*). Pond between Castle Donington and the Trent, 5; with zygospores and very common. Shackerstone Canal, 5, in the conjugating state only. Canal, Sutton Wharf, 6, with zygospores. Roadside pond, near Seagrave, 10, not reproducing.

MOUGEOTIACEÆ.

MOUGEOTIA Agardh.

M. elegantula Wittr. Beacon, 2, conjugating. Saddington, 5, beginning to conjugate.

M. genuflexa (Dillw.) Ag. (*Mesocarpus pleurocarpus*). Bates says "Abundant everywhere, but never yet found in fruit," Lake, Ashby Park, 1894 (*Mott*). Narborough, 6 conjugating, 11; Canal, Sutton Wharf, 6.

M. nummuloides, Hass. (*Mesocarpus nummuloides*). Bogs, Spring Hill. In ripe fruit, May (*Bates*).

M. scalaris Hass. Market Harborough, 1895 (*Mott*). Woodlo Head (Rutland), 5.

M. viridis (Kütz.) Wittr. (*Staurospermum viride*). Near Bardon Hill and Benscliff Wood, in ripe fruit May and June (*Bates*). Timberwood Hill, 6; near Blackbrook Reservoir, 5; High Sharpley, 5; Bescaby, 6, with zygospores.

Specimens of this genus were very commonly found in these collections, but usually not in a determinable condition.

DESMIDIALES (Placoderm Desmids).

PENIUM Bréb.

P. cruciferum (De Bary) Wittr. Small pond on Timberwood Hill, very rare, 6.

P. curtum Bréb. Rocky pool, Croft; small pools, Swithland slate-pits (*Roy*). Crowds of individuals on one of Bates's slides for 1882.

P. lamellosum Bréb. Bradgate, Spring Hill (*Roy*).

P. navicula Bréb. Bradgate, Spring Hill (*Roy*).

P. spirostriolatum Barker. Probably, but very few seen. Beacon, 6.

CLOSTERIUM Nitzsch.

Cl. acerosum (Schrank) Ehrenb. Croft, Cropstone, Narborough (*Roy*). Stream near Whitwick Church, 5; Long Clawson, 6; Narborough, 4; Croft 5.

Var. *truncatum* Gutw. Braunstone, 3.

Var. *minus* Hantzsch. Pond, waste ground, Melton Rd., near Leicester (*Roy*). Near Billesdon Coplow, 5.

Cl. acutum (Lyngb.) Bréb. Bradgate, Narborough. Spring Hill, Colery, Woodhouse (*Roy*), Colery, 6.

Cl. aciculare Tuffen West. Woodhouse (*Roy*).

Cl. angustum Hantzsch. Melton Rd. near Leicester (*Roy*).

Cl. Cornu Ehrenb. Bradgate (*Roy*).

Cl. costatum Corda. Bradgate (*Roy*), Beacon, 1–10.

Cl. Cynthia De Not. Colery, 6.

A stouter form, Hanging Rocks, Woodhouse Eaves, 6.

Cl. Dianæ Ehrenb. var. *arcuatum* (Bréb.). Rabenh. Beacon, 1, 2, 7.

Cl. Ehrenbergii Menegh. Narborough, Colery (*Roy*). Town End Close, 4, 5; Sulby, 7, and many other places.

Cl. intermedium Ralfs. Spring Hill, Colery (*Roy*). Beacon, 6; pond south of Colery Reservoir, 6.

Var. *hibernicum* West. Hall Gates, 5.

Cl. Jenneri Ralfs. Narborough (*Roy*).

Var. *robustum* G. S. West. Beacon, 2; Canal, Oakthorpe, 9; Croft, 5.

Cl. juncidum Ralfs. Bradgate, Colery (*Roy*). Canal, Blaby, 5.

Cl. Kützingii Bréb. Beacon, 8.

Cl. lanceolatum Kütz. Shallow stream between Quorn and Buddon Wood, 7; Belgrave, 6. A few individuals show a slightly sigmoid form.

Cl. Leibleinii Kütz. Several places (*Roy*). I also found it to be widely distributed from March to December.

In Sulby Reservoir (July 1915), in addition to typical individuals, a very small form was noticed. Width 16 μ; distance between apices 89 μ.

Cl. linea Perty. Narborough (*Roy*).

Cl. lineatum Ehrenb. Bradgate (*Roy*). Beacon, 2, 6, 9.

Cl. lunula (Müll.) Nitzsch. Bradgate, Beacon (*Roy*).

A form with fewer ridges than the type present in a pond at Scraptoft, 4.

Var. *intermedium* Gütw. Braunstone, 3.

Grönblad (1920) describes a similar form to the one here present under this variety, but with a query.

Cl. moniliferum (Bory) Ehrenb. Roy gives three localities. I have found it very commonly distributed.

Cl. macilentum Bréb. Croft (*Roy*). Ditch near Swithland Wood, 5; pond south of Colery Reservoir, 7.

Cl. Malinvernianum De Not. Narborough.

Dimensions greater than those given in West's Monograph (width 70 μ; distance between apices 430 μ).

Cl. parvulum Näg. Croft (*Roy*); Colery, 6.

Cl. peracerosum Gay. Near Holly Hayes, 5; Pond, Waltham, 6.

Cl. Pritchardianum Arch. Widely distributed, and in a pond near Holly Hayes with zygospores, 5. In this pond a sigmoid form was also present (*vide supra*, p. 75 *).

Cl. pronum Bréb. Croft (*Roy*).

Cl. Ralfsii Bréb. var. *hybridum* Rabenh. Beacon, 2, 9.

Cl. rostratum Ehrenb. Croft, Narborough (*Roy*). Pond south of Colery Reservoir, with zygospores, 7; Ditch, Narborough, 5; Hanging Rocks, Woodhouse Eaves, 6.

Cl. setaceum Ehrenb. Bradgate Colery (*Roy*).

Cl. siliqua W. & G. S. West. Near Billesdon Coplow, 5.

Cl. striolatum Ehrenb. Bradgate, Spring Hill, Colery, High Sharpley, Croft (*Roy*). Forma apicibus leviter dilatis, sub-capitatis. Ditch near Swithland Wood, 5.

Cl. tumidulum Gay. Common in a boggy patch between Saltby and Sproxton, June 1919, with zygospores (*vide supra*, p. 74, where the zygospores of this species are described for the first time).

Cl. Venus Kütz. Beacon. In all the samples collected from this little pond from October 1913 to January 1923.

Docidium Bréb.

D. Baculum Bréb. Cropstone Reservoir, 1888 (*Mott*).

Pleurotænium Näg.

P. Ehrenbergii (Bréb.) De Bary (*Docidium Ehrenbergii*). Bradgate, Colery, Croft (*Roy*). Beacon, 1, 2, 6, 7, 8, 10. An abnormally inflated semi-cell was noticed in one individual resembling West's *forma* (Desmids, i. 207).

P. trabecula (Ehrenb.) Näg. Very rare. Canal, Blaby, 5; Sulby, 7; Beacon, 1.

P. truncatum (Bréb.) Näg. (*Docidium truncatum*). Bradgate, Cropstone (*Roy*).

Tetmemorus Ralfs.

T. Brebissonii (Menegh.) Ralfs. Bogs, Spring Hill (*Roy*).

T. granulatus (Bréb.) Ralfs. Bradgate, High Sharpley, Spring Hill (*Roy*). Beacon (rare), 7.

* F. Rich, "Further Notes on the Algæ of Leicester."

T. lævis (Kütz.) Ralfs. Bradgate, High Sharpley, Beacon. "Beautifully conjugated with numerous zygospores, bogs, Spring Hill" (*Roy*). Pond on Timberwood Hill, rare, conjugated, but no ripe zygospores seen, 7. Ditch, Grace Dieu Woods, very rare, 5.

Euastrum Ehrenb.

E. ansatum Ehrenb. Bradgate (*Roy*). Beacon, 2, 7.

E. binale (Turp.) Ehrenb. Bradgate, Spring Hill (*Roy*).

b, Ralfs, in the same two localities (*Roy*), see, however, below under *E. insulare*.

E. dubium Näg. Very few examples of a small Desmid were found, which is probably a form of the very variable *E. dubium* with which its dimensions agree. Beacon, 7, 8, 9.

E. elegans (Bréb.) Kütz. (*E. declive*). Bradgate, Colery (*Roy*).

E. insulare (Wittr.) Roy (*E. binale* var. *insulare*). West says "*E. insulare* was originally described as a variety of *E. binale*, and under this name it is recorded by Bates for Leicestershire." I have found a *Euastrum* agreeing with the description given by West (Desmids, ii. 68), with the exception that the apex is more strongly retuse-emarginate than is figured by him, the side-view, in consequence, ending in a sharper angle. Pond, Timberwood Hill, 6.

E. oblongum (Grev.) Ralfs. Bradgate; Colery, 5 (*Roy*). Colery, very rare, 6.

E. verrucosum Ehrenb. Bradgate (*Roy*).

Micrasterias Ag.

M. denticulata Bréb. Recorded by Roy for three pieces of water, Bradgate, Spring Hill, and Beacon Plain. I have only found it in one pond, which is evidently the one indicated by Bates as Beacon Plain. Beacon Hill, Upper Pond, v.r. in February and September 1914; v.r. in July 1920.

M. rotata (Grev.) Ralfs. Beacon (*Roy*).

Cosmarium Corda.

A very common genus, but only the following species have been determined:—

C. abruptum Lundell. Croft, Narborough (*Roy*).

C. bioculatum Bréb. Narborough (*Roy*).

C. Boeckii Wille. Bradgate, Colery (*Roy*).

C. Botrytis (Bory) Menegh. Roy enumerates several places where this was found; he says, "With zygospores among *Œdogonium capilliforme*," Narborough. I have also found it fairly frequently.

(The zygospores attributed to var. *paxillosporum* of this species on p. 267 of my paper in this Journal in 1918 have since been found to belong to *C. obtusatum* var. *Horwoodii*.)

C. calcareum Wittr. Narborough (*Roy*).

C. Corbula Bréb. Spring Hill, Colery (*Roy*). Common in Colery Reservoir, with numerous zygospores, June 1914.

C. crenatum Ralfs. Bradgate, Colery, Beacon (*Roy*). Pond south of Colery Reservoir, 7.

C. Cucumis Corda. b, *helvetica* Nordst. Bradgate, Spring Hill, Colery (*Roy*).

C. Cucurbita Bréb. forma *minor* W. & G. S. West. Very common in ditch, Grace Dieu Woods, 5; Near Blackbrook Reservoir, 5; Ditch, Ulverscroft Lane, 5.

C. cucurbitinum Biss. (*Penium cucurbitinum*). Tank in field, Long Clawson, 6.

C. etchachanense Roy & Biss. John o' Gaunt, 1.

C. formosulum Hoff. Quite a common Desmid, 3, 5, 6, 7, 11 (chiefly 5, 6, 7).

C. granatum Bréb. Canal, Sutton Wharf, 6; John o' Gaunt, 1.

Var. *sub-granatum* Nordst. 1888. forma Borge 1903, with 10 crenations in the semi-cell. North Evington, 7; Long Clawson, 6; Canal, Sutton Wharf, 6; Sulby, 7.

C. holmiense Lund. var. *integrum* Lund. Ditch in Lea Lane, 4. This resembles Borge's figure in *Botaniska Notiser*, 1913 (tab. i. fig. 10), which shows a very slightly retuse apex suggesting var. *saxicolum*; it does not, however, belong to this variety, as it has not an open sinus. John o' Gaunt, 1; Narborough, 5.

C. humile (Gray) Nordst. (*C. cœlatum* Ralfs). Bradgate, Colery, Beacon (*Roy*). Canal, Oakthorpe, 9.

C. impressulum Elfv. Ratcliffe-on-the-Wreake, 3.

C. Kjellmani Wille. Bradgate, Colery (*Roy*).

C. læve Rabenh. North Evington, 7; Ditch, Normanton, 5.

b, *septentrionale* Wille. Croft, Narborough, Cropstone (*Roy*).

C. margaritiferum (Turp.) Menegh. Colery, pond at foot of Croft Hill (*Roy*). Colery, 6.

C. melanosporum Archer. Bradgate (*Roy*).

C. Meneghinii Bréb. Roy gives five localities, and I have found it widely distributed, 5, 6, 7, 9.

C. nitidulum De Not. Colery (*Roy*).

C. notabile Bréb. Pond, Melton Rd., nr. Leicester (*Roy*).

C. obtusatum Schmidle var. *Horwoodii* F. Rich. Described in this Journal for March 1925. Common, and with zygospores, in the tank of a spring in a field at Long Clawson, 6; Croft, 5; near Moira station, 8; Canal, Oakthorpe, 9.

C. ochthodes Nordst. Colery (*Roy*). John o' Gaunt, 1.

C. ornatum Ralfs. Narborough (*Roy*).

C. perpusillum West. This resembles forms of *C. Meneghinii*, but the lower lateral margins are not parallel. It agrees well with the remarks made by Fritsch (Ann. S. Afr. Mus. ix. pt. 8, 553, fig. 28 *d*, 1917). The upper lateral margins, or one only of them, may lack the median crest. It closely resembles *C. Meneghinii* forma, Borge 1903; "lateribus semicellularum divergentibus." Pond, Tur Langton, 5; Scraptoft, 5.

C. punctulatum Bréb. Narborough, Spring Hill, Colery (*Roy*).

Var. *subpunctulatum* (Nordst.) Borge. Forming zygospores in Colery Reservoir, 6.

C. pygmæum Archer. Bradgate, Colery (*Roy*). Colery, 6.

C. Regnellii Wille. v.r., Croft. 4, 5; Moira, 8.

C. reniforme (Ralfs) Archer. Narborough, Colery (*Roy*). Lake, Wistow Park, 3; Canal, Oakthorpe, 9.

C. speciosum Lund. v.r., Tiny pool, Narborough Bog.

Var. *simplex* Nordst. John o' Gaunt, 1.

C. sportella Bréb. Colery, 6.

C. sub-crenatum Hantzsch. Ditch, Normanton, 5; John o' Gaunt, 1; near Saltby, 6. Remarkably constant in dimensions:—Length 35–36 μ; width 27–29 μ; isthmus 9–10 μ.

C. sub-protumidum Nordst. Colery, 6; Saddington, 9.

C. sub-speciosum Nordst. Spring Hill (*Roy*).

C. tetragonum (Näg.) Arch. v.r., Croft, 3.

C. Turpinii Bréb. Sulby Reservoir, 7.

Arthrodesmus Ehrenb.

A. convergens Ehrenb. Colery (*Roy*).

A. incus (Bréb.) Hass. v.c., Upper pond, Beacon Hill, 6.

Var. *Ralfsii* W. & G. S. West. (As *b*, Ralfs) Bradgate, Colery (*Roy*).

A. triangularis Lagerh. Beacon, 2, 6, 10, with zygospores in June. Colery, 6, with zygospores. The zygospores of this desmid were described for the first time from this collection (*vide supra*, 77). Forma *Boergesen*, 1890. Beacon, 2.

Staurastrum Meyen.

S. alternans Bréb. Croft (*Roy*). v.r., Canal, Oakthorpe, 9.

S asperum Bréb. Spring Hill (*Roy*).

S. avicula-Bréb. Croft, Colery (*Roy*).

S. Brebissonii Archer. Colery, Spirng Hill (*Roy*). v.r., Colery, 6.

S. controversum Bréb. Spring Hill (*Roy*).

S. cuspidatum Bréb. Colery, 6.

S. cyrtocerum Bréb. Colery, 6.

S. Dickiei Ralfs. Bradgate, Colery (*Roy*).

S. dispar Bréb. Spring Hill (*Roy*).

S. furcatum (Ehrenb.) Bréb. Bradgate (*Roy*).

S. glabrum (Ehrenb.) Ralfs. Beacon, 7.

S. gracile Ralfs. Filter-beds, Cropstone (*Roy*).

S. hirsutum (Ehrenb.) Bréb. Bradgate, Spring Hill (*Roy*).

S. inflexum Bréb. Bradgate, Croft (*Roy*).

S. margaritaceum (Ehrenb.) Menegh. Bradgate, Croft, Spring Hill (*Roy*). v.r., Small pond, Timberwood Hill, 6.

S. mucronatum Ralfs. Colery (*Roy*).

S. orbiculare (Ehrenb.) Ralfs. Croft, Spring Hill (*Roy*).

b, *extensum* Nordst. Bradgate (*Roy*).

S. paradoxum Meyen var *parvum*. Beacon, 6, 7, 8.

S. polymorphum Bréb. Bradgate, Copstone, Croft (*Roy*).

S. punctulatum Bréb. Bradgate, Narborough, Spring Hill, High Sharpley, Beacon (*Roy*). Town End Close, 5; Croft, 5; near Allexton, 4; Moira, 8; Narborough, 5.

S. tetracerum (Kütz.) Ralfs. Croft, Colery (*Roy*).

SPONDYLOSIUM Bréb.

S. papillosum W. & G. S. West. This is the *Sphærozosma excavatum* of Roy, Colery. Common in Colery Reservoir, 6.

HYALOTHECA Ehrenb.

H. dissiliens (Smith) Bréb. Bradgate; Beacon; conjugated with zygospores, bogs, Spring Hill; Colery (*Roy*). v.r., Colery, 6.

b. *bidentula* Nordst. Colery (*Roy*).

Forma *tridentula* Nordst. Spring Hill; Colery (*Roy*).

SIPHONALES.

VAUCHERIACEÆ.

VAUCHERIA DC.

Sterile examples of this genus were found very commonly in all parts of the country except the Ashby-de-la-Zouch district, and in all months of the year except August and December. The following species were found with reproductive organs:—

V. aversa Hass. Ponds etc., 3–5 (*Bates*).

V. Dillwynii Ag. Narborough, 1–3; Croft, 1 (*Bates*).

V. geminata Walz. Narborough and other places, 2–5 (*Roy*). Swithland, 7; swiftly flowing stream between Saddington and Shearsby, 4; Sawley Bridge, 5; Long Clawson, 6; Ingarsby, 4; Croft, 10.

Var. *racemosa* Walz. Associated with type (*Bates*).

V. hamata Walz. Near Abbey Farm, 4; near Thrussington, 3; Braunstone, 3.

V. ornithocephala Agardh, forma *polysperma* Heering. Pond in Little Shaw Lane near Markfield, 3.

V. repens Hass. Croft, 3; near Abbey Farm, 4; near Thrussington, 3; near Bescaby 6.

V. sessilis (Vauch.) DC. Generally distributed. In fruit spring and autumn, up to December (*Bates*). This is perhaps the commonest species of *Vaucheria*; I have found it in the "fruiting condition" from March to November.

V. terrestris Lyngb. Common everywhere on damp earth, 1–3 (*Bates*). On mud, Cropstone, 1894 (*Mott*). Banks of ditch, Evington, 3; South Croxton, 4.

V. uncinata Kütz. Pond, Stapleford, 3.

(To be continued.)

PLANT PROTECTION.

BY WILFRED MARK WEBB, F.L.S., F.R.M.S.

EVERY now and then an effort is made to combat the selfishness, on the one hand, of those members of the public who do not respect the scenery, the birds, and the wild flowers which are our heritage, and, on the other, of those collectors whose greed also lessens the amount of beauty in the world and detracts from its scientific interest.

The recent crusade against the leaving of litter is now being supplemented by another against plant-destruction, and we are pleased to see that the Society for the Promotion of Nature Reserves is following in the foot-steps of the Bristol Naturalists' Society, or perhaps acting at its instigation. At the same time the wording of the circular addressed by the first-mentioned body to the County Councils, suggesting, as it does, the sudden discovery that plants are in danger, is calculated to raise a smile on the part of those who have been anxious to obtain protection for them during many years.

It may at this point be interesting to recall some attempts in this direction. In the year 1885 "Sylvanus Urban, Gentleman," the Editor of *The Gentleman's Magazine*, in his "Table Talk" urged the necessity of societies for the protection, among other things, of wild flowers, and as a result he received a letter from the late Mr. George Musgrave telling him of the formation of such an organization, which was called *The Selborne Society* *. This and its branches for many years issued pleas on behalf of Wild Flowers and Ferns, which appeared on posters, in hotel prospectuses, and in the many popular guide-books of the Homeland Association.

It was obvious that the hawkers who made a livelihood by collecting and selling roots were not likely to be influenced by any pious exhortations, and ferns more particularly were being removed to such an

* Between the years 1887 to 1892 a Committee of the British Association issued full reports "On the Disappearance of British Plants."

extent from their natural haunts to gardens that local societies also began to agitate (a leaflet issued by the University of Bristol Botanical Club is before us), and by the end of the year 1910 several County Councils had passed the following by-law, viz., Devon, Dorset, Essex, Surrey, and East and West Sussex :—

> "No person shall (unless authorised by the Owner or Occupier, if any, or by law so to do), uproot or destroy any Ferns or other Wild Plants growing in any road, lane, roadside waste, wayside bank or hedge, common or other public place, in such a manner or in such quantities as to damage or disfigure any such road, lane, roadside waste, wayside bank or hedge, common, or other public place.
>
> "Provided that this By-Law shall not apply to persons collecting specimens in small quantities for private or scientific use."

It is understood that Surrey would have made a much more stringent rule but for the opposition of the Home Office. The regulation only applied to public places, and about this time the formation of the Plant Protection Section of the Selborne Society was mooted, of which Dr. A. B. Rendle, became Chairman. It made a very strenuous attempt to carry things further, as the following, taken from a joint letter sent by the late Lord Avebury (President) and Dr. Rendle to the newspapers at the end of 1911, will show :—

> "We have already received the kind support and co-operation of the press when putting forward a plea for Plant Protection. The first part of our scheme was to enlist the sympathy of the Educational Authorities throughout the country, and we have met with the heartiest response to our suggestion that they should distribute our special leaflets to schoolmasters and mistresses, and put up a card of advice to children in their schools. As a matter of fact, many thousand copies have been asked for, and as the Council of the Selborne Society has authorised the Plant Protection Section to apply any funds which it may receive to the furtherance of its own work, we now make a definite appeal to all those who would fain see something done to preserve the British Flora to send in subscriptions and helpful information to the Secretary."

Besides the leaflets mentioned, others were written and circulated dealing with the general question and prepared specially for the public, while the late Professor Boulger, at the request of the Selborne Society, also drafted a bill which it was hoped to introduce in Parliament, with a schedule of the plants to be protected. The time was not considered opportune for this to be done, and the War intervened.

It is worthy of note that by the end of 1920 the following County Councils had also made a by-law with regard to wild plants :—

Isle of Wight, Kent, Leicester, Monmouth, Norfolk, Oxford, and Denbigh.

At the Council Meeting of the Selborne Society held last July, when a letter from the Bristol Naturalists' Society was discussed, it was decided that if it were felt that the Plant Protection Section would be a help it should be asked to take up its work once more.

The welcome publicity that the Society for the Promotion of Nature Reserves has given to the subject should encourage the members to act again.

OBITUARY.

Harold Warren Monington

(1867–1924).

Some of our readers will hear with regret of the death of H. W. Monington, who twenty-five years ago was a frequent visitor to the Department of Botany, his chief interest being British mosses. He was born at Plumstead, Kent, August 11, 1867. Owing to an accident at the age of eight he was during boyhood more or less of an invalid, but on regaining health when about seventeen he took up the study of British plants, and spent much of his leisure botanizing among the Surrey Hills. He passed many holidays collecting in the Highlands, and ascended Ben Lawers thirty-nine times. In 1911 he removed from South-west London to Horley, in Surrey, where he planned a garden of two acres extent, including an alpine rockery and pasture, also a water-garden. His health broke down two years ago, and he removed to Swanage, where he died on September 5th, 1924.

He was a Fellow of the Linnean Society from 1898 to 1923, and was at one time frequently to be met at the Society's rooms.

He contributed notes to the Journal on *Alchemilla vulgaris* in Kent (1888, p. 311), Merionethshire plants (1890, pp. 248, 9), *Physcomitrium sphæricum* in Surrey (1899, p. 85), all new county records; and a short paper on *Sphagnum medium* Limpr. in Britain (1900, pp. 1–3, tab. 405). He also supplied the account of the mosses in the *Victoria History of the County of Surrey* (i. 1902).

I am indebted for some personal details of this note to Miss N. F. Monington, who has informed me of her brother's wish that his collections should be offered to the Museum. A. B. R.

REVIEWS.

The Romance of the Fungus World. By R. T. and E. W. Rolfe. 8vo. Pp. xx, 309, with 85 plates and text-figures. Chapman & Hall, London. Price 12*s.* 6*d.* net.

The Messrs. Rolfe's account of Fungus Life in its numerous guises, both real and legendary, is an eminently readable and informative book, which should fulfil its object—namely, to afford a fresh view-point from which these peculiar plants may be surveyed, and thus to create a more general interest in them. The book is dedicated

to the late George Massee, formerly of the Kew Herbarium, to whom the authors acknowledge their indebtedness for an introduction to the fungus world; and they have found a guide and friend in Mr. J. Ramsbottom, of the British Museum, who has written the Foreword. In the more strictly botanical chapters the structure and life-history of the Fungi is described in language as simple as possible, and the subject-matter is helpfully illustrated by means of a number of the late Worthington Smith's drawings, borrowed, by permission of the Trustees of the British Museum, from his *Synopsis of the British Basidiomycetes*. The Messrs. Rolfe have spread their net widely, and have brought together a great amount of interesting information on the Fungi. Fungi in Mythology, Folk-lore, and Fiction supply a somewhat amusing introduction, which has involved some investigation of ancient and modern literature; and the chapters on the economic uses, cultivation, action as poisons, &c., give evidence of extensive research into the literature of the subject.

There are a number of excellent photographic reproductions, the originals of some of which are by the authors, others by Mr. A. E. Peck of Scarborough or from other sources; these admirably illustrate individual species, often in their natural surroundings.

The text is well and clearly printed; the index errs, if anything, on the side of clearness, the first entry under each letter of the alphabet being so painfully conspicuous as to distract attention from the following entries. We congratulate the authors and wish the book the success it undoubtedly deserves.

Vagandi Mos. Reiseskizzen eines Botanikers, von Dr. Herman Knoche. I. *Die Kanarischen Inseln*. 1923. 8vo, pp. 304, with 24 photogr. plates and numerous text-figures. Libraire Istra, Strasbourg; n.d.

This is an account of the travels and observations of a botanist during six months' stay in the Canary Islands—from December 1915 to June 1916. Dr. Knoche visited all the islands of the group, and a map (on p. 4) indicates his different routes. In the Introduction he briefly describes the geology, topography, and climate of the islands, and reviews the far-reaching changes which their vegetation has undergone, since the advent of the European, by deforestation and introduction of alien plants, especially those of the Mediterranean region. The greater portion of the book is devoted to a description of the vegetation of the districts visited on the various journeys. The character of the vegetation is illustrated by numerous quarter-plate photographic reproductions and also by diagrams of the distribution of plant-associations.

The latter portion of the book, about 70 pages, is occupied by a list of the plants collected during the winter and spring 1915–16.

The distribution among the islands of the species listed is indicated, frequently with the aid of a sketch-map in which the stations of the plant are noted, and notes on critical or variable species are also included. A new species, *Sonchus fauces-Orci*, is described and figured (tab. 24)—a shrubby species found in rock-crevices at the "Barranco del Infierno," Teneriffe.

Botanists who are familiar with the islands will find pleasure in reading Dr. Knoche's "travellers' notes," and to those who are proposing a visit the volume will serve as a useful companion.

Winter Botany. By William Trelease, Professor of Botany in the University of Illinois. Second edition, revised. Pocket size, pp. xlii, 396, with numerous text-figs. Author: Urbana, Illinois, U.S.A., 1925. Price $2·50 net.

This charming little volume is a companion to the author's plant-materials of Decorative Gardening, a summer manual which gives instruction in the means of distinguishing and naming the trees and shrubs of American parks and gardens. The winter-characters of wild and cultivated trees and shrubs are used to differentiate 328 genera belonging to 94 families of flowering plants and deciduous conifers. Species and varieties are differentiated to the extent that in all 1100 forms may be run down by means of the keys. A key to the genera occupies thirty pages, while the greater part of the text is devoted to descriptions of the winter-characters of woody plants systematically arranged, with a key to the species under each genus. The description of the genus is greatly helped by clear line-drawings showing the characters of the twig, bud, and leaf-scar, and the author also adds notes on the affinities, distribution, and uses of the plant, with references to literature on the winter-characters. There is also a useful glossary. Obviously, the test of such a book must be in the field, park, or garden, but, so far as can be judged by a general examination, the gratifying reception accorded to the first edition is likely to be extended to its successor.

BOOK-NOTES, NEWS, etc.

Protection of Wild Plants. In the May number of the *Journal* (p. 150) we commented on the effort in this direction of the Bristol Naturalists' Society. The following circular has recently been issued by the Society for the Promotion of Nature Reserves:—

"The Council of the Society for the Promotion of Nature Reserves has learnt with concern that many species of Wild Flowers and Ferns in various parts of the country are in real danger of being exterminated, owing to heavy picking of the flowers or uprooting of the plants. The gravity of the danger has been increased by the greater

accessibility of the country districts as a consequence of the development of motor vehicles. The extermination of any of the native flora would often adversely affect the amenities of the countryside, and would be an irreparable blow to the scientific study of this branch of Botany.

"The Council therefore appeals to the County Councils to take the necessary steps for the protection of the Wild Flowers in their several districts by the issue of by-laws or in such other ways as may seem desirable to them. Much of the damage may be due to thoughtlessness and ignorance, and good results might be obtained if notices requesting the public not to pick the flowers or remove the plants were placed in suitable places, and if also in such districts the children in the schools could be instructed in the harmfulness of heavily picking flowers or removing plants. It might be desirable in certain instances to constitute reservations for the protection of rare species."

We are indebted to Mr. Wilfred Mark Webb for a short article (see p. 273) indicating some of the work already accomplished in this connection.

The comments in the May number called forth an interesting letter from Mrs. E. G. Britton, Secretary of the Wild Flower Preservation Society of America, in which reference is made to a fund, the interest of which has been used for propaganda purposes, such as prizes for essays by teachers and pupils in the Public Schools, printing and distribution of these essays in the schools, distribution of coloured plates of some of the rarer of the wild flowers as Arbor Day prizes; lantern-lectures to clubs and schools are also being arranged.

The Royal English Arboricultural Society. We received from the Secretary—unfortunately, too late for insertion in the last number—a notice of a series of provincial meetings which have been arranged for the purpose of affording an opportunity to land-owners and others to study various systems of woodland management and of fostering a greater interest in Forestry generally. These meetings will be followed by the Summer Meeting at Norwich during the first week in September. The objects of the Society are the advancement of scientific and practical Forestry and Arboriculture in all branches and the dissemination of a knowledge of the sciences allied thereto. A quarterly journal is issued, summer meetings are arranged each year to woodland areas, local visits to woods are arranged by County Secretaries, and winter meetings for lectures and discussions are being organised, examinations for woodmen and foresters are conducted, and the Society has a loan library. The Secretary's address is Estate Office, Haydon Bridge, Northumberland.

Botany of Queensland. We have received a budget of reprints from the Department of Agriculture, Brisbane, reporting the activities of Mr. C. T. White, Government Botanist. They include an

account of the vegetation of Moreton Island (*Queensland Naturalist*, iv. 86–91), and a number of extracts from the *Queensland Agricultural Journal* (1924), illustrating native trees and some troublesome weeds, and also descriptions of *Phytolacca dioica* (South America) and *Celtis sinensis* (China), the value of which as fodder-trees for cattle during periods of drought is emphasised. An article by the Assistant Government Botanist, Mr. W. D. Francis, describes the development of buttresses in Queensland trees (Proc. Roy. Soc. Queensland, xxxvi. no. 3). These growths occur in certain rain-forest trees with an Indo-Malayan affinity; the conditions with which they are associated are a heavy rainfall, high relative humidity, absence of much direct sunlight on the soil surface, and an extensive development of surface-roots.

Enumeration of Philippine Flowering Plants. Fascicles 3 and 4 of vol i. of Mr. Elmer D. Merrill's enumeration are almost entirely occupied with the Orchidaceæ, for the elaboration of which Prof. Oakes Ames is responsible, and of which 103 genera are recognised.

English and German Botany in the Middle and towards the End of the last Century (*New Phytologist*, August 12). Prof. F. O. Bower refers to the stagnation in the Botanical atmosphere at the older British Universities in the middle of the nineteenth century, and contrasts it with the intense personal activity of the giants of the period—Darwin, Hooker (he might have added Bentham), and Huxley. It was necessary for the younger generation of teachers to seek inspiration in the German laboratories where Sachs and De Bary were instructing graduates from European and over-seas Universities in modern methods of study. Prof. Bower seeks an explanation for the position at home in the great expansion of Imperial interests which had taken place in the early Victorian time. The whole energy of the great botanical establishments "had been concentrated upon the floristic exploitation" [? exploration] "of the British Dependencies." "The cataloguing of the floras of these lands raised far-reaching questions of geographical distribution which worked in readily with the nascent views as to descent. It was, indeed, the commanding interest of such matters which tended to drift attention away from the intensive study of the laboratory." "That strange period still has its lesson for us to-day. At the present moment the tendency of British Botany is once more towards concentrated application to Imperial needs of another sort from those of the Victorian age. Agriculture, Forestry, Plant-Pathology, and Plant-Breeding all rightly command the interest of young aspirants, and the State is beginning to offer the inducement of salary, attainable on rapid qualification. It is for those who direct the progress of the teaching of the science to take care that they shall not, by allowing too early specialisation along applied channels, send out specialists too quickly and imperfectly qualified. But the more grave risk is that they should allow the central institutions to lose again their

hold upon the broad stream of pure science, as their predecessors did at the middle of the last century, by over-concentration upon special requirements. The Empire needs the progress of Botany at large, not only of one or another phase or aspect of it." The last sentence expresses a very big truth. Botany has grown so much and branched so widely that specialism has become necessary for the individual, but a broad and intelligent interest and co-operation will tend to maintain an even balance, not only between the different phases of the science, but between the science itself and its applications—even though, as Prof. Bower will admit, a stream is an elusive thing to hold.

A Scheme of Plant-Phylogeny. Al. Borza (Bull. d'informations du Jardin et Musée Botan. de l'Université de Cluj, Roumanie, v. 36) gives a diagrammatic representation in tree-form illustrating the evolution and affinities of the natural groups of plants. The author supplies a French summary of his communication, which is in Roumanian. Four stages of evolution are distinguished, Protophyta, Thallophyta (including Myxomycetes), Archegoniatæ, and Angiospermæ; each springs from the one below and becomes more or less branched. Thus the Angiospermæ spring from the Coniferous stock (which itself arises from the Lycopodiales) by way of a Ranalian branch, from the base of which the Monocotyledons spring, followed in succession by the Centrospermæ, Rosales, and Parietales. From the last-named spring the Columniferæ, from the stock of which arise the Sympetalæ veræ—Rubiales, Ebenales, Contortæ and Ligustrales, and Tubifloræ. The remaining orders of Sympetalæ are associated with other branches, Campanulatæ with Parietales, Ericales with Columniferæ, and Primulales with Centrospermæ, with which the Monochlamydeæ are also associated.

THE *Pharmaceutical Journal* (June 13th, 1925, pp. 658–660) prints an interesting note on the Lancashire Working-men Botanists. The writer recalls the early history of the Working Men's Club which met at the Golden Lion, Harpurhey, near Manchester. One of the best-known of the original members was John Horsefield, a hand-loom weaver, who was at one time president of the Prestwich Botanical Society. The writer gives many reminiscences and anecdotes of some of the other members.

British Flowering Plants. Two additional sets of coloured postcards have just been issued by the British Museum (Natural History). Series No. 7 contains *Cardamine pratensis*, *Geranium Robertianum*, *Epilobium hirsutum*, *Saxifraga granulata*, and *Arum maculatum*; and series No. 8 *Nymphæa alba*, *Polygala calcarea*, *Vicia Cracca*, *Petasites hybridus*, and *Taxus baccata*. The cost of each series, with a descriptive leaflet, is one shilling. As in the case of the series previously issued, the cards are colour-photographic reproductions from the original drawings by Miss Beatrice Corfe. Other series, including one of the British Orchids, are in preparation.

IDENTIFICATION OF LOUREIRO'S SPECIMENS IN THE BRITISH MUSEUM HERBARIUM.

BY S. MOORE.

(Concluded from p. 256.)

GUILANDINA GEMINA Lour., 265 (Merrill, 238).

Besides inflorescences and fruit the sheet contains only detached (compound) pinnæ of the leaves. Supposing Loureiro to have written his description with these portions of leaves in view, he would naturally call the leaves simply pinnate as he has done. The specimen is undoubtedly *Cæsalpinia Bonducella* Flem. as Merrill suggests.

BARYXYLUM RUFUM Lour., 266 (Merrill, 240).

There are two sheets thus named. The first has branches and the rhachis of a few leaves, and some detached leaflets and flowers. The flowers seem to be those of a *Peltophorum*, and Pierre, who saw the sheet, has marked it "perhaps=Peltophorum dasyrhachis Kurz." But the leaflets are certainly not of that species, nor of any in Fl. Indo-Chine, though, of course, *B. rufum* may represent a species of *Peltophorum* not found by later collectors. The sheet in question has a Loureiro ticket, according to which the native name is "Cây Lim"—the name in the Flora is "Cây Lim vang." A second sheet bearing this name, but without flowers, has not a Loureiro ticket, the name being written on the back in the unknown handwriting previously referred to. Pierre endorsed this "perhaps a sp. of Glycine"; but this is not a happy suggestion, for the leaflets agree closely with those of *Gymnocladus chinensis* Baill., and moreover a legume named "Cây Lim" in the carpological collection almost certainly belongs to *G. chinensis* and cannot be that of a *Peltophorum*. Some curious points arise here, for *G. chinensis* not being a Cochinchina or even a South China plant, how did Loureiro obtain a specimen? Then in the diagnosis of *Baryxylum* he describes the fruit as having eight seeds, whereas the legume in question has but four. Further, the heavy red wood and yellow flowers are those of a *Peltophorum*, whereas *G. chinensis*, the so-called "soap-tree," has white flowers. We seem here in the presence of a problem impossible of solution until Loureiro's collecting-ground has been thoroughly ransacked.

ALOEXYLUM AGALLOCHUM Lour., 267 (Merrill, 278).

Loureiro's specimen is without flower or fruit and wants an original ticket. It was identified by Dryander as *Aquilaria ovata* Cav., and so closely resembles Wallich 7250 *a* from Silhet (*A. Agollocha* Roxb.) that both specimens might be supposed to come from the same tree. But the description of the flower is not that of an *Aquilaria*; and although the writer's account of the fruit as a legume is not so erroneous as appears on the surface, his statement that the flower had a calyx of 4 deciduous members and 5 petals longer than the calyx puts *Aquilaria* out of the case. This has led Merrill to place *Aloexylum* among "Leguminoseæ of doubtful position." But here a difficulty arises. Undoubtedly Loureiro had

before him one of the Aloe-woods, for he gives a full account of the properties of the tree he is describing. He also tells how he succeeded in obtaining only one flower-bearing branch, the flowers of which, on account of the journey's length, arrived in an unsatisfactory state, "ita ut nec petalorum formam, nec antheras & stigma satis distincte observare datum fuerit." Hence we can only conclude that he really had an *Aquilaria* to deal with, and that the flower he described was leguminous and had got mixed up with the specimen, or alternatively that he trusted to his memory when drawing up the description and was deservedly penalised for his pains. It is worth noting that under the name *Ophispermum sinense* he describes an *Aquilaria*, and quite correctly (*vide* Roxburgh in Trans. Linn. Soc. xxi. 199).

AULACIA FALCATA Lour., 273 (Merrill, 289).

Usually supposed to be a species of *Clausena*: Merrill decides that Loureiro's description applies to *Micromelum pubescens*. The Museum specimen is not a good one, but examination of it proves Merrill to be correct.

ACOSTA SPICATA Lour., 276 (Merrill, 412).

Synonyms of this are *Vaccinium Acosta* Raeusch (1797), *V. spicatum* Poir. (1810), and *Agapetes*? *spicata* Dun. in DC. Prod. vii. 556. In spite of Loureiro's description of the leaves as opposite, a very occasional occurrence, this is a *Vaccinium*, and accordingly, using the oldest trivial, must be known as *Vaccinium spicatum* Poir. Endeavours to match this have met with no success. The amplified description is as follows:—*Ramuli* rigidi etsi graciles, angulati, subtiliter puberuli cito glabrescentes. *Folia* coriacea, 2–4·5 × 1–2·5 cm.; petioli 2–4 mm. long. *Racemi* usque circa 6 cm. long. *Bracteæ* ovato-lanceolatæ, acutæ, pleræque 3–8 mm. long. *Bracteolæ* filiformes, ±1·5 mm. long. *Pedicelli* crassi, bracteolis circiter æquilongi. *Calycis* tomentelli tubus subglobosus, 1·5–2 mm. long., 1·5 mm. lat.; lobi triangulares, acuti, 1·25 mm. long. *Corolla* pansa 4·5 mm. long.; lobi sursum recurvi, 1·25 mm. long. *Filamenta* pubescentia, 2·3 mm., antheræ 2·5 mm. long. *Bacca* verisimiliter nondum matura subglobosa, humectata 3 mm. diam.

ADENODUS SYLVESTRIS Lour., 294 (Merrill, 345).

This was mentioned by Poiret (Lam. Encycl. Suppl. ii. 704) as *Elæocarpus sylvestris* Poir., though he does not seem to have had access to a specimen. Merrill accepts it as a species of *Elæocarpus* which he cannot match from Gagnepain's account of the genus in Fl. Indo-Chine, but thinks near to and perhaps identical with *E. Bonii* Gagnep., a species with appendiculate anthers. All attempts to match this having failed, the following detailed description is appended:—

Elæocarpus sylvestris Poir. *Arbor*; *foliis* obovato-lanceolatis obtusis basi in petiolum attenuatis margine crenato-serratis utrobique glabris pallidissimeque nitidis; *racemis* axillaribus plurifloris quam folia brevioribus; *pedicellis* floribus sæpissime brevioribus minute puberulis; *alabastris* anguste ovoideo-oblongis obtusis; *sepalis* oblongo-lanceolatis acutis extus glabris intus minutissime puberulis margine subtiliter sericeo-tomentosis; *petalis* sepala paullo excedentibus ambitu obovatis usque ad medium vel interdum minus alte in lacinias filiformes 11–15 divisis extus glabris intus prope basin minute puberulis margineque sericeo-tomentosis; *staminibus* 14–17 filamentis abbreviatis antheris apice obtusis necnon inappendiculatis minute puberulis; *disco* e glandulis 5 contiguis perspicuis basi bilobulatis minute etsi arcte sericeo-cinereis sistente; *ovario* depresse globoso sericeo-cinereo 3-loculari quam stylus inferne cinereus ceterum glaber breviore; *ovulis* pro loculo 2 collateralibus.

Folia (lamina) usque 8 × 4 cm., pleraque 6–7 × 2–3 cm.; costæ lat. utrinque 5–6, marginem versus aperte arcuatæ; petioli 7–15 mm. long., anguste alati. Racemi longit. 5 cm. nunquam excedentes. Pedicelli nutantes ±2·5 mm. long. Sepala 4 mm. long. Petala 5 mm. long., juxta medium 1·5 cm. lat., apice 2 mm. Filamenta ·75 mm., antheræ 2 mm. long. Ovarium 1 × 1·2 mm.; stylus 2·25 mm. long. Drupa nondum matura cylindrica, obtusa, microscopice cinereo-puberula, 4–4·5 mm. long.

Position of the genus apparently next *E. tonkinensis* A. DC., which has acuminate leaves, oval-acuminate nearly glabrous sepals, glabrous petals, no less than 40 stamens, and a conical ovary as long as the style.

Loureiro's statement "Germen longiusculum" evidently refers to the young fruit; it cannot apply to the depressed-globular ovary.

EUGENIA CORTICOSA Lour., 308 (Merrill, 394).

From the unsatisfactory nature of the material, it is impossible to tell to what species of *Eugenia* this should be referred.

OPA ODORATA Lour., 309 (Merrill, 393).

This is the *Sizygium odoratum* of De Candolle (Prod. iii. 260), who unites with it a Chinese plant collected by Staunton, of which there is good material at the Museum. Hemsley (Ind. Flor. Sin. i. 297), apparently because of Berg's *Eugenia odorata*, proposed for the Chinese plant the name *Eugenia Millettiana*; but he followed De Candolle in considering it conspecific with Loureiro's *Opa odorata*. Examination of the two types shows them to belong to different species, although there is between them a close general resemblance. The chief differences may be shown as follows:—

Loureiro's Plant.	*Staunton's Plant.*
Leaves lanceolate, with a considerable number of rather large glands, red in transmitted light.	Leaves ovate, somewhat thicker, so that the glands are not, or very rarely, visible in transmitted light.
Flowers at the ends of the panicle branches all on stalks of 2 mm. long or more.	Branches of the panicle usually tipped with 2–3 sessile or subsessile flowers.
Calyx oblong-turbinate, pustular, 2 mm. wide under the lobes.	Calyx smooth or nearly so, broadly turbinate, 3 mm. wide under the lobes *.
Berry ovoid, barely 4 mm. in diameter.	Berry sphæroidal, 5 mm. in diameter.

* Written some years ago. Recent examination has failed to confirm this, no flowers being now discernible on the specimens.

Further details of *O. odorata*, which is a true *Sizygium*, may be added, namely: *Folia* usque 6×2 cm., sæpius circa 4·5×1·5 cm.; petioli 3 mm. long. *Paniculæ* usque 7×3 cm., pleræque vero ±4 cm. long. *Pedicelli* ±3 mm. long. *Calyx* (ovario incluso) 3 mm. long.; tubus vix 2 mm., lobi rotundati, ·5 mm. long. *Filamenta* 3 mm., stylus 4·5 mm. long.

The plant, in all probability an endemic species, could not be matched either at the Museum or at the Kew Herbarium. Hemsley's name will, of course, apply to the Chinese plant. On this case the following references may be given:—Bot. Beechey's Voy. 187; Seem. in Journ. Bot. 1863, 281; Journ. Arnold Arbor. v. 67.

DECADIA ALUMINOSA Lour., 315 (Merrill, 422).

In a note in Journ. Bot. lii. 146 this was referred provisionally to the Amboynan *Symplocos syringoides* Brand., but a re-examination of the material does not support this view. The fact is the flowers are in too early a state to warrant definite naming. Perhaps when the Loureiro country has been thoroughly searched, specimens secured in exactly the same condition as his *D. aluminosa* may enable a determination to be made. It may be as well to emphasize the fact that, with a view to naming doubtful Loureiro plants, it is important for specimens to be gathered showing flowering and fruiting in all stages.

DODECADIA AGRESTIS Lour., 319 (Merrill, 375).

The specimen consists of nothing more than a branchlet with three attached leaves and one detached. Stem and leaves drying dark, glabrous. *Leaves* ovate-oblong, very obtuse at apex, at base obtuse, shining on upper face opaque and less dark below, thinly chartaceous, penninerved, quite entire, about 8×4 cm., with 5 pairs of fine ascending side-nerves like the midrib impressed above and projecting on the underside; petioles 1 cm. long., channelled above. *Stipules* apparently none. According to Loureiro the flowers are in racemes; they have 12 sepals, as many petals, and 30 stamens.

In Gen. Plant. i. 1007 *Dodecadia* is thought to be allied to *Homalium*, and Dalla Torre and Harms, who assign it to *Flacourtiaceæ*, are of approximately the same opinion, as also is Merrill. In the Paris list it is considered to be a *Grewia*; but the entire penninerved leaves put this suggestion out of court. The absence of stipules and the general appearance of the leaves is against *Homalium*, while *Mimusops*, another possibility, has different nervation. There is, however, a genus that, exception being made for the alleged 12 sepals and petals (apparently a case of double counting) to which it is believed nothing in the Flora of Eastern Asia conforms, seems to answer to the description better than any of these, and affords almost a match, though not quite. That genus is *Diospyros*, and against it only one objection can be urged, namely the racemose inflorescence. But besides the well-known fact of Loureiro's looseness in terminology *à propos* of inflorescences, it must be remembered that, although the inflorescence in *Diospyros* is usually very short and often reduced to a single flower, in some cases the cymes are considerably longer and might easily be mistaken for racemes.

If this identification be correct, it would appear that the plant has not been collected since Loureiro's time.

VATERIA FLEXUOSA Lour., 334 (Merrill, 587).

A few detached fruits are all that represent this at the Museum. They are trigonous, 1-celled, 5 mm. in diameter on stalks 2 mm. long., each on a stipe of 5 mm. They contain a single, ascending, arillate seed with dark brown crustaceous testa and fleshy cotyledons. The sheet is marked in Brandis's handwriting "cfr. *Mischocarpus*," to which genus the plant in all probability belongs; but as Loureiro mentions petals, unless he was mistaken it cannot be the common *M. sundaicus* Bl., which is without petals.

ARSIS RUGOSA Lour., 335 (Merrill, 348).

The specimen agrees closely with Wallich 1098 β, referred by Masters (Fl. Brit. Ind. i. 393) to *Grewia Microcos* Linn. var. *rugosa* Mast. Merrill considers our plant to be *G. paniculata* Roxb., but the clothing of the leaves is quite different in the two, and *A. rugosa* has the inflorescence with very few bracts of *G. Microcos*. True, the nectary is surrounded with a ring of hairs which is a character of *G. paniculata* and not of the other according to Gagnepain (Fl. Indo-Chine, i. 533); but Wallich's plant has this hairy ring as also have other specimens referred to *G. Microcos*.

MENTHA STELLATA Lour., 361 (Merrill, 474).

Merrill names this "*Dysophylla ramosissima* Benth. in Wall. Cat. (1829) No. 1543; DC. Prodr. xii. (1848) 158 in syn." I do not see how this name can be maintained: Wallich's *List* (usually cited as "Wall. Cat.") is a mere list of names, and names quoted in synonymy are excluded by the *Rules*, by which (Art. 53) Loureiro's trivial is also excluded. The earliest name published with description, which is also that by which it is most generally known, seems to be *D. verticillata* Benth. in Wall. Pl. Asiat. Rar. i. 30 (1830). Specimens from Loureiro are, as Merrill supposes, in the British Museum Herbarium.—*J. B.*

VOLKAMERIA PETASITES Lour., 388 (Merrill, 467).

This is certainly not *Clerodendron infortunatum* Gaertn. as Schauer thought (DC. Prodr. xi. 667), nor is it the *Petasites agrestis* of Rumphius, although Loureiro himself cites the name as a synonym. In default of a specimen, Merrill has no option but to leave the plant unidentified. The material consists of two specimens wanting only corollas except for a tube of one here and there: it agrees precisely with an Annam specimen at Kew collected by O. Kuntze and published by him as *Clerodendron subpandurifolium* O. Ktze. (Rev. Gen. Pl. ii. 506). So absolute is the similarity that there seems no reason to prevent the species being known henceforth as **Clerodendron Petasites**, comb. nov. The colour of the corolla, it may be

mentioned, is yellow-green ("viridi-lutea") according to Loureiro, green ("viridis") according to Kuntze.

TRIPINNA TRIPINNATA Lour., 391 (Merrill, 495).

This plant sustains the incubus of several synonyms; of these the most curious is *Colea tripinnata* Seem., *Colea* being a genus of Mascarene *Bignoniaceæ*. The Museum specimen is a *Vitex*, and that Loureiro was dealing here with a species of that genus is clear from its native name, "cây den," the same as Pierre gives for one of his Cochinchina species of *Vitex* (No. 1838), which, however, has 5-foliate, not 3-foliate leaves like the other. Loureiro, when he described the leaves as "tripinnate," must have meant trifoliate; moreover, the fruit with its many seeds (not seen) must be that of some other genus, as has before been pointed out.

There being no expanded corollas, only extremely young buds in fact, it is impossible to name this definitely: it is very like and may well be conspecific with Pierre 1864, itself a very imperfect specimen, as represented at the Museum.

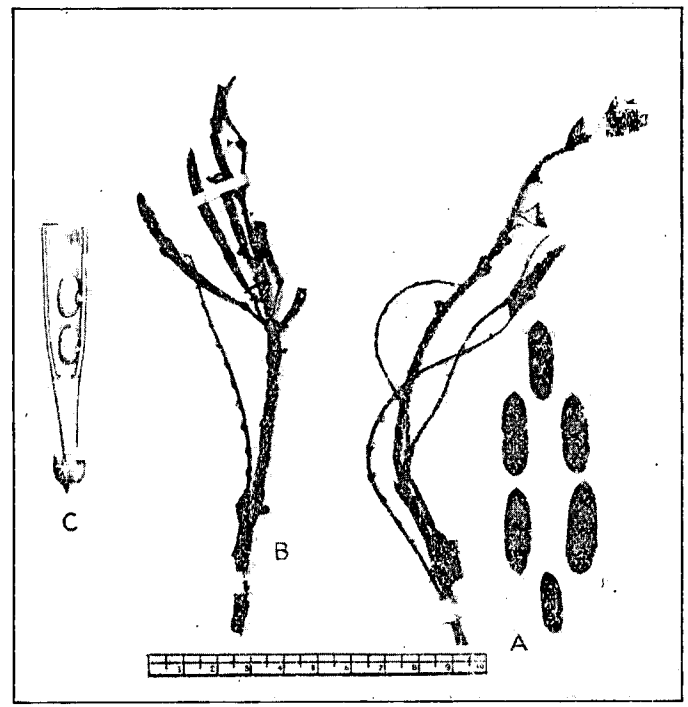
GRONA REPENS Lour., 450 (Merrill, 254).

The genus *Grona* Lour. is kept up by Bentham (Gen. Pl. i. 535), who makes it include, beside Loureiro's plant, 2 or 3 tropical Asian species with 1-foliate leaves among other features. Bentham (*l. c.*) suggests that the Museum specimen named as above is not the true *G. repens* Lour., being nothing more than *Desmodium polycarpum* DC. (sphalm. *polystachyum*). Merrill considers the description of *G. repens* answers well for *D. polycarpum*, though Loureiro "neglected to state whether the leaves were simple or compound." The Museum specimen is certainly *D. polycarpum*, but inasmuch as not one of its leaves is whole, Loureiro might easily have assumed the foliage to be simple, as he apparently did, although he does not say so definitely. Under these circumstances Merrill's suggestion should be adopted, namely that the other species of *Grona* recognised by Bentham must be given a new generic name, that of *Grona* itself being merged in *Desmodium*.

SARCODUM SCANDENS Lour., 462 (Merrill, 248).

Cursory inspection suffices to dispose of Merrill's suggestion that the leaves and fruit described by Loureiro under this name do not belong to the same plant. It is true the best-preserved leaflets are detached upon the sheet; but the few still attached, although much folded, are plainly identical with the others, and moreover the two specimens in fruit are exactly like the one in flower, both as regards the inflorescence and what remains of the foliage. Bentham (Gen. Pl. i. 498) admits *Sarcodum* as a genus apparently close to *Millettia*, but differing in its legume and in the leaves which, he says, are rather those of *Tephrosia*. The pod, it may be remarked, though externally like that of *Indigofera*, has no internal septa; also its hairs are basifixed and, while the carina is spurless, the anthers are muticous. The nature of its pod also forbids the merging of *Sarcodum* in *Sesbania*

as in *Tephrosia*. There seems no reason, therefore, to dissent from Bentham's view, and, inasmuch as the specimens answer to nothing in Gagnepain's account of Indo-Chinese *Papilioneæ* (Fl. Indo-Chine, ii. 218 *sqq.*), one is forced to conclude that *Sarcodum scandens* has hitherto escaped the notice of subsequent collectors. A few notes, supplementing the original description, may here be appended: with the help of these and the accompanying figures it is hoped the species will some day be retrieved in the form of perfect specimens.



Sarcodum scandens Lour.—Portion of herbarium sheet showing:—A. Shoot bearing inflorescence consisting of young buds, each in the axil of an acuminate bract: the leaves from this have been detached. B. Branch bearing fruit. C. Drawing of base of ripe legume cut open to show two seeds (S. M.).

Ramuli subteretes, dense fulvo-tomentosi. *Folia* usque 10 cm. long.; petioli ±2 cm. long. *Foliola* pleraque opposita vel subopposita verisimiliter ultra 20, rhachi fulvo-tomentosæ circa 10 cm. long. insidentia, subsessilia, longiuscule apiculata, supra fere glabra subtus pilis fulvis appressis pubescentia, 23–27 × 6–8 mm.; costæ lat. utrinque 6, valde arcuatæ. *Stipulæ* lanceolatæ, acuminatæ, circa 8 mm. long. *Stipellæ* bipartitæ, filiformes, circa 2·5 mm. long., uti stipulæ dorso fulvo-tomentosæ. *Racemi* dense fulvo-tomentosi, foliis

circiter æquilongi. *Bracteæ* imbricatæ, diutule persistentes, lanceolatæ, longe caudato-attenuatæ, dense fulvo-tomentosæ, 15 mm. long. *Pedicelli* 6 mm. long. *Calyx* campanulatus, fulvo-tomentosus, paullulum post floritionem 3 × 5 mm. *Legumen* circa 4·5 cm. long., 3 mm. lat., breviter stipitatum, glabrum, in sicco nigrum, pedicello 7–9 mm. long. insidens. *Semina* circa 10, oblonga, utrinque obtusissima, rubro-brunnea, 3 mm. long.

There being no fully-developed flowers, further floral measurements are not given.

Callista amabilis Lour., 519 (Merrill, 219).

Merrill writes: "The figure given by Kränzlin [Pflanzenr. Monogr. Dendrob. 314, f. 27] was drawn from the type-specimen [in herb. Mus. Brit.]. Kränzlin recognised the genus as allied to but distinct from *Dendrobium*, and describes a second species from Annam, *Callista annamensis* Kränzl." Reference may be added to the correspondence in Gard. Chron. 1909, ii. 354, 393, 431; 1910, i. 19, 34, where the plant is discussed and (incorrectly: see U. Dammer, *l. c.* 35) identified with *Dendrobium thyrsiflorum* Rchb. f. by Mr. James O'Brien, who proposed the name *D. amabile*: a specimen so named by him is in the British Museum Herbarium.—*J. B.*

Phyllanthus Emblica Lour., 553 (Merrill, 303).

"The Linnean species was certainly correctly interpreted by Loureiro," says Merrill. But this is a mistake, judging from the Museum specimen, which is quite different in foliage from *P. Emblica* Linn., though it may perhaps be a member of § *Emblica*. The unsatisfactory nature of the material forces silence at this point.

Trema cannabina Lour., 563 (Merrill, 140).

The late C. B. Robinson saw Loureiro's Museum specimens, and decided that they were not referable to *T. amboinensis* Auct. as had been suspected. Merrill thinks *T. cannabina* should prove to be *T. amboinensis* Bl. (= *T. virgata* Bl.), and in this he is certainly correct.

Stephania rotunda Lour., 608 (Merrill, 182).

The specimens are males, and with flowers which were described by Miers (Contrib. Bot. iii. 215). In face of this it is strange to find Diels (Pflanzenr. Monog. Menisp. 275) saying that the flowers are unknown. Moreover, his surmise that *S. rotunda* should be placed next to his *S. brachyandra* is incorrect, for the synandrium is distinctly stipitate, although not at all lengthily so; and this brings the species close to *S. sinica* Diels. Flowers barely 2 mm. in diameter. Sepals ·6 mm. long. Petals ·5 mm., stalk of androecium ·4 mm. long.

Triadica cochinchinensis Lour., 610 (Merrill, 322).

This is the *Excæcaria Loureiroana* of Müll. Arg., who imperfectly describes it (DC. Prod. xv. 2, 1217). With *Excæcaria* (ex parte) merged in *Sapium* it becomes *Sapium cochinchinense* O. Kuntze. Pax and K. Hoffm. (Pflanzenr. Euph.-Hippom. 252) copy Müller Arg.'s diagnosis, and place the species next to the African *S. ellipticum*, with which it certainly seems to have affinity. The description may thus be supplemented:—*Folia* 4–6 × 2–3 cm.; petioli tenues, 2–3·5 cm. long. *Spicæ* evolutæ 3–4·5 cm. long. *Bracteæ* abbreviatæ, ovatæ, obtusæ, utrinque glandula magna rugulosa circa 1·5 mm. long onustæ, 3–5-floræ. *Pedicelli* ♂ ±1·5 mm. long. *Calyx* ♂ cupularis, breviter denticulatus, ·4 mm. alt. *Antheræ* ·6 mm. lat. *Capsula* tricocca, subglobosa, glabra, humectata 8 mm. diam. *Semina* epulposa, testa brunnea prædita, 3·5 mm. long. et lat.

Excæcaria cochinchinensis Lour., 612 (Merrill, 321).

Loureiro writes of this: "squamis amenti polyfloris"; this applies evidently to both sexes. Müller Arg. considered the Indian *E. crenulata* Wight conspecific with this; but Pax (*op. cit.* 160) thinks it might be the same as *E. bicolor* Hassk. (well known as cultivated for its brilliant foliage, as Loureiro says his plant was), only he objects that "bracteæ plurifloræ describuntur." But in the quotation cited above, may we not suppose Loureiro to mean that there are many scales and many flowers *in the whole spike*? In fact, he must mean this, because the ♀ flowers are always solitary within the bract. Although there are no ♂ flowers remaining on the specimen, there seems good reason to accept our plant as conspecific with *E. bicolor*, and consequently Loureiro's trivial must supplant Hasskahl's.

Restiaria cordata Lour., 639 (Merrill, 510).

This is an *Uncaria*, as J. J. Bennett noted years ago upon the Museum sheet. Using the oldest trivial it becomes *U. cordata* Merr. = *U. pedicellata* Roxb. (see Haviland in Journ. Linn. Soc. xxxiii. 77). Loureiro's faulty description made recognition impossible without consulting the type, so that until comparatively recently *Restiaria* found its place among *genera incertæ sedis*. He describes only the calyx and ♀ parts, adding: "plantam cum floribus masculis non obtinui," the fact being that, as the present state of the specimen indicates, all the corollas (of course, with their stamens) had fallen when he wrote the description, and he rashly inferred the flowers to be unisexual.

Oxycarpus cochinchinensis Lour., 647 (Merrill, 368).

Pierre (Fl. Forest. Cochinch. sub t. 66) described a Cochinchina *Garcinia* under the name *G. Loureiri*, differing from Loureiro's description of his *Oxycarpus cochinchinensis* in fruit and in possession of 4-celled (not 2-celled) anthers. Unfortunately, it is not possible to say whether this step was justified: it might well be that Loureiro's description is incorrect; but nothing can be said about this owing to the Museum specimens including, besides stem and leaf, no flowers and only a single young fruit.

MIMOSA NODOSA Lour., 649 (Merrill, 229).

The specimen is very imperfect, having neither flower nor fruit and only one attached leaflet. So far as it goes, it agrees well with *Pithecolobium Clypearia* Benth. var. *acuminata* Gagnep.

RHYTIS FRUTICOSA Lour., 660 (Merrill, 308).

Müller Arg. examined this at the Museum, and gave a short description of it under the name *Antidesma fruticosum* Müll. Arg. (DC. Prod. xv. 2, 259). Full details are as follows:—*Frutex* orgyalis, novellis ferrugineo-sericeis; *ramulis* mox puberulis cortice griseo obductis; *foliis* brevipetiolatis oblongo-oblanceolatis basi angustatis integris vel distanter minuteque denticulatis firme membranaceis costis obscure puberulis exemptis cito glabris; *stipulis* parvis subulatis minute ferrugineis; *floribus* ♂ et ♀ in spicas paniculatas sat densifloras sericeo-ferrugineas quam folia longiores brevioresve digestis; *florum* ♂ subsessilium bracteis oblongo-ovatis acutis; *sepalis* 4 suborbicularibus ciliolatis; *antheris* 3, sessilibus inter se liberis; pistillodio columnari antheris æquilongo puberulo; *florum* ♀ bracteis ovatis rotundatis dorso hirsutulis; *sepalis* 4 lanceolatis acutiusculis; *ovario* ovoideo uti sepala hirsutulo; *stylis* bifidis.

Folia usque $10 \times 3{\cdot}3$ cm., sed sæpius minora, sc. $\pm 6 \times 2{\cdot}5$ cm., supra in sicco fusca subtus brunnea. Stipulæ circa 2 mm. long. *Inflorescentiæ* usque 6 cm. long. vel breviores. Utriusque sexus bracteæ 1 mm. long. et sepala totidem. Ovarium vix 1×1 mm.

Mistaking the ovarian rudiment for an ovary, Loureiro described the ♂ flowers as hermaphrodite.

BACCAUREA SYLVESTRIS Lour., 662 (Merrill, 308).

Müller Arg. (DC. Prod. xv. 2, 457) without seeing a specimen places this in § *Hedycarpus* next *B. lanceolata*, a species it does not at all resemble, except roughly in foliage. The Museum material is ♀, which most probably is all that Loureiro saw, as he is silent about ♂ flowers, without which the position of this species in the genus cannot be determined.

PHYSKIUM NATANS Lour., 663 (Merrill, 34).

Merrill has overlooked A. L. de Jussieu's paper on this plant in Ann. Mus. Nat. Hist. Paris, ix. 402. Under *Vallisneria spiralis* Merrill cites as a synonym "*V. physcium* Juss. ex Spreng. Syst. iii. 900." Whence Sprengel derived this name is not apparent; Jussieu himself (*l. c.*) says: "on crait reconnoitre que le *physkium* n'est qu'un *Vallisneria* differémment décrit," and that it would be difficult to recognize even specific differences between the two supposed genera; and, so far as I know, there is no evidence to show that he subsequently altered his opinion. It may be noted here that Willdenow, in his edition of Loureiro (1793), says of *Physkium*: "Valde diversum a genere *Najas*; convenit potius cum *Triglochin*, sed fructu et calyce differt" (p. 815 in note). Merrill states that he has not seen the second edition: Willdenow's additions in the form of footnotes, although numerous, are not of great value and contain few determinations.—*J. B.*

After comparing *Vallisneria* and *Physkium*, de Jussieu (*l. c.*) adds: "peutêtre sera-t-il difficile d'en former deux espèces distinctes." Appended to this is a formal generic diagnosis of *Vallisneria*, based upon *V. spiralis*, in which he says: "Certò congener et *fortè* [ital. ours] conspecificum *physkium* Lour. Coch. 814" [ed. Willdenow], expressing a doubt upon the point which Sprengel must have thought justified his ascription to de Jussieu of the name *V. physcium*.

REFERENCES TO NOTES ON SOME ADDITIONS IN THE LONDON CATALOGUE, ED. 11, 1925.

BY C. E. SALMON, F.L.S.

IT has been suggested to me that it might be helpful if information could be given where botanists might obtain notes respecting some of the species or varieties in the new London Catalogue which are additional to those in the tenth edition (1908).

The notes that follow—far from complete—are an attempt to this end; and as many workers in our Islands have no opportunities of consulting important libraries, in the majority of cases (indicated by "See" before the reference) references are given to well-known British works or periodicals where helpful notes may be found instead of the actual volumes where the authors originally published their descriptions:—

5. *Thalictrum majus* Crantz b. *capillare* (Reichb.). See Eng. Bot. ed. 3, supp. 4; 1892.

9. *Anemone nemorosa* L. b. *robusta* E. J. Salisb. Ann. Bot. xxx. 526; 1916.

28. *Ranunculus Flammula* L. c. *ovatus* Pers. See Camb. Fl. ii. 128.

31. *R. Lingua* L. b. *glabratus* Wallr. See Rep. Watson B. E. C. 1918-20, 92; Journ. Bot. 1920, 275.

33. *R. acris* L. f. *pumilus* Wahl. See Journ. Bot. 1889, 204.

36. *R. aleæ* Willk. See Camb. Fl. iii. 134.

51. *Aconitum Napellus* L. b. *laciniosum* Ser. See Rep. B. E. C. 1918, 485.

62. *Papaver Rhœas* L. c. *chelidonioides* O. Kuntze. See Journ. Bot. 1912, 348.

65. *P. Argemone* L. b. *glabrum* Koch. See Camb. Fl. iii. 166.

93. *Barbarea vulgaris* R. Br. See Journ. Bot. 1916, 206.

98. *Arabis petræa* Lam. d. *faroënsis* (Horn.). See Rep. B. E. C. 1921, 470.

105. *Cardamine pratensis* L. b. *palustris* Peterm. See Druce, Fl. Berks, 47; 1897.

156. *Lepidium neglectum* Thell. See Journ. Bot. 1911, 164.

159. *L. Smithii* Hook. d. *papillosum* Dunn, Journ. Bot. 1896, 477.

227. *Silene Conoidea* L. See Camb. Fl. iii. 75.

229. *S. gallica* L. See Journ. Bot. 1880, 146.

239. *Lychnis dioica* Mill. b. *zetlandicum* Compton, Camb. Fl. iii. 73.

243. *L. Githago* Scop. b. *hiemalis* Compton, *op. cit.* 66.

245. *Cerastium tetrandrum* Curt. b. *dunense* C. E. S. Journ. Bot. 1913, 17. c. *zetlandicum* Murb. See Rep. B. E. C. 1910, 498. d. *eglandulosum* C. E. S. Journ. Bot. 1923, 89.

246. *C. subtetrandrum* Murb. See Rep. B. E. C. 1919, 550.

248. *C. semidecandrum* L. b. *glandulosum* Koch. See Camb. Fl. iii. 54. c. *congestum* Gren. See Journ. Bot. 1913, 17. d. *pellucidum* (Chaub.) *op. cit.* 1918, 247.

249. *C. viscosum* L. c. *elongatum* Druce, Camb. Fl. iii. 51.

250. *C. vulgatum* L. c. *macrocarpum* (Schur.). See Rep. B. E. C. 1921, 476.

262. *Stellaria glauca* With. b. *viridis* Fr. See Journ. Bot. 1910, 223.

270. *Arenaria serpyllifolia* L. d. *stricta* Towns. Fl. Hants, 57; 1883.

277. *Sagina maritima* G. Don d. *ciliata* Nordst. See Rep. B. E. C. 1914, 131.

279. *S. filicaulis* Jord. See Proc. Linn. Soc. 1922, 16.

281. *S. Reuteri* Boiss. b. *glabra* Ingh. & Wheld. in Journ. Bot. 1908, 109.

284. *S. scotica* Druce, Rep. B. E. C. 1911, 14.

288. *S. nodosa* Fenzl. b. *moniliformis* Lange. See Rep. B. E. C. 1911, 14.

296. *Polycarpon tetraphyllum* L. b. *diphyllum* DC. See Journ. Bot. 1914, 329.

299. *Montia fontana* L. See Journ. Bot. 1909, 267.

309. *Hypericum Desetangsii* Lamotte. See Journ. Bot. 1913, 317.

312. *H. humifusum* L.
313. *H. linariifolium* Vahl. } See Journ. Bot. 1915, 162.

350. *Geranium Robertianum* L. c. *celticum* Ostenf. Rep. B. E. C. 1919, 551.

351. *G. purpureum* Vill. b. *Forsteri* Wilmott, Journ. Bot. 1921, 95.

353. *Erodium Lebelii* Jord. etc. See Journ. Bot. 1920, 121.

372. *Genista anglica* L. b. *subinermis* Rouy & Fouc. See Journ. Bot. 1922, 203.

385. *Medicago falcata* L. *tenuifoliolata* Vuyck. See Rep. B. E. C. 1911, 17.

419. *Anthyllis maritima* Schweigg. b. *Corbierei* C. E. S. & Travis, Journ. Bot. 1917, 320.

441. *Vicia sylvatica* L. b. *condensata* Druce. See Journ. Bot. 1911, 234.

689. *Pyrus Malus* L. c. *Déséglisei* Rouy & Camus *. See Journ. Bot. 1918, 40.

699. *Saxifraga hirsuta* L. b. *acutidens* E. S. Marshall, Journ. Bot. 1912, 198.

708. *S. Drucei* E. S. Marshall; 709. *S. Sternbergii* Willd.

* By a regrettable error this interesting discovery is placed under *P. Malus* instead of the correct species *P. communis*.

b. *gracilis* E. S. M.; 717. *S. hypnoides* L. b. *robusta* E. S. M. Journ. Bot. 1918, 65.

711. *S. hirta* Sm.
to 717. *S. hypnoides* L. } See Journ. Bot. 1917, 153.

720. *Parnassia palustris* L. b. *condensata* Travis & Wheldon, Journ. Bot. 1912, 256.

727. *Tillæa aquatica* L. See Journ. Bot. 1922, 18.

751. *Callitriche intermedia* Hoffm. b. *homoiophylla* Gren. & Godr. See Journ. Bot. 1910, 111.

820. *Œnanthe fistulosa* L. b. *Tabernæmontani* (Gmel.). See Rep. B. E. C. 1911, 21.

823. *Œ. Lachenalii* C. Gmel. b. *approximata* Mérat. See Rep. B. E. C. 1917, 31.

833. *Angelica sylvestris* L. See Rep. B. E. C. 1920, 23.

930. *Achillea Millefolium* L. d. *conspicua* Druce, Rep. B. E. C. 1917, 34.

956. *Senecio vulgaris* L. See Journ. Bot. 1909, 304.

961. *S. erucifolius* L. b. *subintegrifolius* Druce, Rep. B. E. C. 1919, 563.

980. *Cnicus palustris* Willd. b. *ferox* Druce, Rep. B. E. C. 1911, 22.

1291. *Scorzonera humilis* L. See Rep. B. E. C. 1915, 202.

1294. *Jasione montana* L. d. *latifolia* Pugsley, Journ. Bot. 1921, 215.

1308. *Vaccinium uliginosum* L. b. *pubescens* Lange. See Journ. Bot. 1915, 90.

1310. *Oxycoccus quadripetala* Gilib. b. *microcarpus* Turc. See New Phyt. 1912, 406.

1315. *Calluna vulgaris* Hull b. *Erikæ* Asch. & Graeb. See Rep. B. E. C. 1911, 24.

1319. *Erica cinerea* L. b. *schizopetala* Boulger, Journ. Bot. 1912, 315.

1335. *Limonium binervosum* C. E. S. c. *humile* C. E. S., Journ. Bot. 1907, 25.

1337. *L. transwallianum* Pugsley, Journ. Bot. 1924, 131.

1346. *Primula farinosa* L. b. *littoralis* Heslop-Harrison, The Vasculum, Feb. 1921.

1368. *Erythræa*. See forthcoming article in this Journal.

1375. *E. portensis* Hoffmgg. & Link. See Journ. Bot. 1918, 321.

1381. *Gentiana campestris* L. See Journ. Bot. 1923, 88.

1383. *G. uliginosa* Willd. See Journ. Bot. 1924, 193.

1403. *Myosotis sicula* Guss. See Journ. Bot. 1923, 212.

1419. *Convolvulus arvensis* L. b. *linearifolius* Choisy. See Rep. B. E. C. 1916, 422.

1429. *Verbascum thapsiforme* Schrad. See Journ. Bot. 1919, 257.

1443. *Linaria vulgaris* Mill. c. *prostrata* Domin. See Rep. B. E. C. 1911, 26.

1471. *Veronica officinalis* L. c. *multicaulis* Wallr. See Rep. B. E. C. 1911, 26.

1478. *Euphrasia suecica* Murb. & Wettst. See Rep. B. E. C. 1912, 169.

1481. *E. nemorosa* Pers. b. *ciliata* Drabble, Journ. Bot. 1916, 75.
1482. *E. confusa* Pugsley. See Journ. Bot. 1909, 165; 1919, 172.
1489. *E. septentrionalis* Druce & Lumb, Rep. B. E. C. 1921, 298.
1490. *E. hirtella* Jord. See Journ. Bot. 1919, 173.
1492. *E. Vigursii* Davey b. *pallens* Bucknall, Journ. Bot. 1917, supp. 16.
1493. *E. campestris* Jord. b. *neglecta* Bucknall, *op. cit.* 19.
1519. *Orobanche reticulata* Wallr. b. *procera* (Koch). See Rep. B. E. C. 1908, 334.
1530. *Utricularia ochroleuca* Hartm. See Rep. B. E. C. 1910, 511.
1539. *Mentha longifolia* Huds. e. *alpigena* Briq. See Rep. B. E. C. 1913, 331.
1548. *M. Pulegium* L. b. *exigua* Huds. See Journ. Bot. 1916, 223.
1549. *Lycopus europæus* L. b. *pubescens* Benth. See Rep. B. E. C. 1918, 298.
1555. *Calamintha bætica* Boiss. & Reut. See Journ. Bot. 1923, 187.
1560. *Salvia*. See Journ. Bot. 1908, 97.
1568. *Prunella vulgaris* L. b. *nemoralis* Beguinot. See Rep. B. E. C. 1915, 206.
1575. *Stachys sylvatica* L. b. *immaculata* Cutting, Journ. Bot. 1921, 111.
1587. *Lamium hybridum* Vill. b. *dissectum* Mutel. See Journ. Bot. 1913, 259.
1598. *Ajuga reptans* L. b. *alpina* Koch. See Journ. Bot. 1923, 22.
1600. *A. genevensis* L. See Rep. B. E. C. 1918, 299.
1605. *Plantago Coronopus* L. d. *crithmifolia* Williams. See Journ. Bot. 1912, 56. f. *Sabrinæ* Cardew & Bak. fil., Rep. B. E. C. 1911, 29.
1606. *P. maritima* L. e. *Hudsoniana* (Druce) Rep. B. E. C. 1912, 170.
1607. *P. lanceolata* L. d. *dubia* Lilj. See Rep. B. E. C. 1911, 116.
1610. *P. major* L. c. *agrestis* Fr. See Rep. B. E. C. 1918, 522.
1614. *Herniaria ciliata* Bab. b. *angustifolia* Pugsley, Journ. Bot. 1914, 331.
1623. *Chenopodium album* L. See Rep. B. E. C. 1917, 50; 1921, 302.
1624. *C. leptophyllum* (Moq.).
1627. *C. Berlandieri* Moq.
1628. *C. hircinum* Schrad.
} See Rep. B. E. C. 1921, 305.
1632. *C. rubrum* L. c. *blitoides* Wallr. See Camb. Fl. ii. 163.
1636. *C. *capitatum* Asch. See Camb. Fl. ii. 166.
1640. *Atriplex patula* L.
1641. *A. hastata* L.
} See Camb. Fl. ii. 173, 176.
1648. *Salicornia dolichostachya* Moss, New Phyt. xi. 409 (1912).
1653. *S. appressa* Dum. b. *Smithiana* (Moss), Journ. Bot. 1911, 183.
1654. *S. disarticulata* Moss, *l. c.* b. *humifusa* Marshall, *op. cit.* 1915, 362.

1656. *Suæda maritima* Dum. b. *flexilis* Rouy. See Camb. Fl. ii. 184.
1657. *Salsola Kali* L. b. *glabra* Dethard.
1658. *S. Tragus* L.
} See Camb. Fl. ii. 185, 186.
1661. *Polygonum heterophyllum* Lindm.
1662. *P. æquale* Lindm.
1663. *P. calcatum* Lindm.
} See Camb. Fl. ii. 125, 126, 127.
1667. *P. minus* Huds. b. *elatum* Moss, Camb. Fl. ii. 121.
1685. *Rumex obovatus* Danser. See Rep. B. E. C. 1923, 60.
1686. *R. obtusifolius* L. b. *sylvestris* (Wallr.). See Journ. Bot. 1873, 129.
1687. *R. crispus* L. d. *planifolius* Schur. See Camb. Fl. ii. 139.
1693. *R. arifolius* All. See Rep. B. E. C. 1923, 58.
1696. *R. Acetosella* L. b. *angiocarpus* (Murb.). See Journ. Bot. 1898, 352 & Camb. Fl. ii. 132.
1713. *Euphorbia virgata* Waldst. & Kit. See Rep. B. E. C. 1918, 307.
1730. *Urtica dioica* L. e. *hispida* DC. See Journ. Bot. 1904, 10.
1736. *Betula pubescens* Ehrh. See Camb. Fl. ii. 83.
1738. *Alnus rotundifolia* Mill. b. *macrocarpa* Loudon. See Rep. Watson B. E. C. 1917–18, 74.
1739. *A. *incana* DC. See Rep. B. E. C. 1922, 622.
1740. *Carpinus Betulus* L. b. *provincialis* Gren. & Godr. See Camb. Fl. ii. 79.
1773. *Populus nigra* L. See Camb. Fl. ii. 10.
1778. *Hydrilla verticillata* Casp. See Journ. Bot. 1914, 257.
1795. *Epipactis leptochila* Godfery, Journ. Bot. 1919, 38. b. *dunensis* Stephenson, Journ. Bot. 1918, 2. c. *vectensis* Stephenson, *op. cit.* 1918, 1.
1809. *Orchis incarnata* L. c. *pulchella* Druce, Rep. B. E. C. 1917, 167.
1810. *O. prætermissa* Druce, Rep. B. E. C. 1913, 340. b. *pulchella* Druce, *op. cit.* 1919, 577.
1811. *O. purpurella* Stephenson, Journ. Bot. 1920, 164.
1814. *O. Fuchsii* Druce, b. *O'Kellyi* Druce. See Rep. B. E. C. 1914, 108.
1822. *Gymnadenia odoratissima* Rich. See Rep. B. E. C. 1917, 171.
1897. *Juncus maritimus* Lam. b. *atlanticus* J. W. White, Journ. Bot. 1914, 19.
1938. *Sagittaria *heterophylla* Pursh b. **iscana* Hiern, Journ. Bot. 1908, 277.
1977. *Zannichellia gibberosa* Reichb. See Rep. B. E. C. 1909, 420.
1988. *Eleocharis palustris* Roem. & Schult. b. *arenaria* Sonder. See Journ. Bot. 1915, 310.
1992. *Scirpus cæspitosus* L. See Rep. B. E. C. 1912, 180.
1996. *S. setaceus* L. b. *major* Lej. See Journ. Bot. 1913, 143.
2022. *Carex microglochin* Wahl. See Rep. B. E. C. 1923, 68.
2030. *C. paniculata* L. c. *pseudo-paradoxa* S. Gibson. See Journ. Bot. 1916, 14.

2038. *C. elongata* L. b. *umbrosa* Kneucker. See Journ. Bot. 1918, 250.
2040. *C. canescens* Lightf. d. *tenuis* Lang. See Journ. Bot. 1908, 371.
2045. *C. Hudsonii* Ar. Benn. c. *homalocarpa* (Peterm.). See Journ. Bot. 1906, 225.
2046. *C. gracilis* Curt. e. *sphærocarpa* Uechtr. See Rep. B. E. C. 1909, 422.
2049. *C. aquatilis* Wahl. e. *rigida* Ar. Benn. See Rep. B. E. C. 1910, 510.
2053. *C. Goodenowii* Gay d. *strictiformis* L. H. Bailey. See Rep. B. E. C. 1909, 422. e. *pseudo-trinervis* Ar. Benn., Rep. Watson B. E. C. 1912–13, 411; 1921–22, 188. f. *subcæspitosa* Kük. See Rep. B. E. C. 1909, 422. g. *recta* (Fleisch.). See Journ. Bot. 1906, 226. h. *tornata* Fr. & i. *stenocarpa* Kük. See Rep. B. E. C. 1909, 422.
2080. *C. extensa* Good. b. *latifolia* Boeck. See Rep. B. E. C. 1909, 422.
2081. *C. flava* L. b. *pygmæa* And. See Rep. B. E. C. 1909, 422.
2088. *C. riparia* Curt. b. *gracilis* Coss. & Germ. See Rep. B. E. C. 1920, 52. c. *humilis* Uechtr. See Journ. Bot. 1906, 227.
2089. *C. inflata* Huds. b. *borealis* Hartm. See Rep. B. E. C. 1910, 509.
2092. *C. saxatilis* L. c. *glomerata* Ewing. See Rep. B. E. C. 1910, 509.
2124. *Agrostis canina* L. d. *lævis* Hackel. See Journ. Bot. 1907, 249.
2152. *Avena strigosa* Schreb. See Rep. B. E. C. 1921, 322.
2153. *A. *fatua* L. See Rep. B. E. C. 1922, 634.
2158. *Phragmites communis* Trin. c. *flavescens* Custer. See Rep. B. E. C. 1915, 217.
2166. *Catabrosa aquatica* Beauv. c. *grandiflora* Hackel. See Rep. B. E. C. 1902, 63.
2174. *Poa remotiflora* Murb. See Journ. Bot. 1914, 193.
2184. *P. irrigata* Lindm. See Rep. B. E. C. 1912, 181.
2185. *P. palustris* L. b. *effusa* Asch. & Graeb. See Rep. B. E. C. 1909, 482.
2193. *Glyceria distans* Wahlb. d. *tenuifolia* Gren. & Godr. See Journ. Bot. 1903, 408.
2240. *Agropyron repens* Beauv. d. *lasiorachis* Hackel. See Journ. Bot. 1904, 10.
2241. *A. campestre* Gren. & Godr. See Rep. B. E. C. 1911, 144; 1923, 73.
2243. *A. junceum* Beauv. b. *megastachyum* Fr. See Rep. B. E. C. 1900, 652.
2245. *Lepturus incurvatus* Trin. See Rep. Watson B. E. C. 1908–9, 209.
2285. *Polystichum angulare* Presl. e. *Braunii* (Spenn.). See Journ. Bot. 1907, 451.
2322. *Lycopodium complanatum* L. See Rep. B. E. C. 1915, 219.
2328. **Azolla filiculoides* Lam. See Journ. Bot. 1914, 209, 269.

THE LONDON CATALOGUE: ELEVENTH EDITION.

[THE issue of a new edition of the London Catalogue * after the lapse of seventeen years is of great interest to all students of the British flora. At no period has the compilation of the list presented more difficulties than at the present time—difficulties associated with the delimitation of species, varieties, etc., and with nomenclature. The Editor, Mr. F. J. Hanbury, and his collaborator, Mr. C. E. Salmon, have earned the gratitude of British botanists, and will regard the various criticisms offered as an expression of the great interest excited by their work. In the following pages Mr. E. G. Baker and Mr. A. J. Wilmott contribute some general notes, and Mr. Pugsley supplies a critique on the treatment of the difficult genus *Hieracium*.—ED. JOURN. BOT.]

THE publication of the eleventh edition of the London Catalogue is an event of considerable interest to British botanists. In the Groups which it includes there are no fewer than 2362 British plants —a marked advance on the last edition, published in 1908, in which 2075 species were enumerated. Mr. Hanbury has called in several experts to his assistance, and he states in his Preface that he is especially indebted to Mr. C. E. Salmon for the great amount of work he has done in helping to draw up the Catalogue.

The compiling of a catalogue such as the present work is no easy task. Continual watch has to be kept on foreign taxonomic literature to see that the varieties, forms, or occasional species there described do not occur in this country. To take one or two recent instances, we might mention the work of Herr Danser on *Rumex* species and hybrids in the *Nederlandsche Kruidkundig Archief*; Herr Ronniger on *Thymus* in Fedde's *Repertorium*; and Herr J. G. Gunnarsson's Monograph on *Betula*.

Perhaps the most marked change from the previous editions will be noted in the genus *Hieracium* by the Rev. J. Roffey. The work of K. H. Zahn in *Das Pflanzenreich* has been very closely followed, and the sequence of the species is entirely different from that in previous catalogues. The list now begins with the subgenus *Euhieracium*, section *Cerinthoidea*, and finishes with the subgenus *Pilosella*, there being 248 species in all, but an explanatory paper by Mr. Roffey is much to be desired.

The genus *Rosa*, by Col. A. H. Wolley-Dod, is the result of much careful study and labour. There are enumerated no less than 46 varieties of *R. canina* alone, *R. dumetorum* Thuill., *R. glauca* Vill., and *R. coriifolia* Fr. being retained as species. We note that *R. Sherardi* Davies is subordinated to *R. omissa* Déségl. as a variety, but the former was published by Davies in his *Botanologia* in 1813, and the latter by Déséglise, in *Billotia*, in 1864. When varieties are transferred from one species to another, it seems advisable that the original author's name should be put in brackets; e. g. *R. tomentosa*

* *The London Catalogue of British Plants*: eleventh edition. By Frederick J. Hanbury. 8vo, pp. 58. George Bell & Sons, 1925. Price 10*d.*; interleaved and in limp cloth, 1*s.* 6*d.*

var. *pseudomollis* is now referred to *R. omissa* as a var. without doing this.

Rubus has been revised by the Rev. H. J. Riddlesdell, and *Carex* by Mr. Arthur Bennett. Regarding the latter genus, we notice that Kükenthal in his Monograph (in *Das Pflanzenreich*) considers the true *C. echinata* Murr. Prod. Stirp. Gotting. (1770) 76, *non aliorum*, to be the same as *C. Pairæi* Schultz, and not, as Mr. Bennett, the same as *C. stellulata* Good. Kükenthal states in his monograph :—(trans.) "Nearly all authors before C. B. Clarke confused *C. echinata* Murr. with *C. stellulata* Good. My friend Mr. C. B. Clarke first discovered this confusion and wrote to me, saying that the original specimens belonged to some species of the *C. muricata* group. Following up this information, I found three specimens in the herbarium of the Linnean Society, named, in Murray's own writing, *C. echinata*, and collected in damp fields in Thueringia, near Gottingen. These without doubt agree in all respects with *C. Pairæi* Schultz." We are unable to find the type of the Murray plant at the Linnean Society, and cannot, therefore, confirm this statement.

Mr. A. B. Jackson is responsible for the genus *Thymus*. He includes two species—*T. Serpyllum* L., with three varieties, and *T. ovatus* Mill., with two varieties, but the work of K. Ronniger should be consulted. The species included by Ronniger are:—(1) *T. pulegioides* L. (syn. *T. ovatus* Mill.); (2) *T. glaber* Mill. (*T. Chamædrys* Fries); (3) *T. Serpyllum* L.; (4) *T. pycnotrichus* Uechtritz; (5) *T. lanuginosus* Mill.; (6) *T. Drucei* Ronniger; (7) *T. neglectus* Ronniger; (8) *T. britannicus* Ronniger.

We have recently had a visit at South Kensington from Dr. Enander, the eminent Swedish salicologist, who is rather sceptical as to the occurrence in Britain of *Salix lanata* L. × *lapponum* L. He has examined the plants so named in the British Museum Herbarium, and would refer them as follows :—

Herb. E. F. Linton 186=*S. aurita* L. × *lapponum* L.; Herb. E. F. Linton, Glen Callater (far end), 8. viii. 1887=*S. lapponum* L.; Herb. E. F. Linton, Glen Callater, 24. vii. 1897=*S. caprea* L. × *lanata* L. (?); J. F. Pickard, Loch Brandy, Clova, Forfar=*S. aurita* L. × *lapponum* L.

Hybrids receive varying treatment in different parts of the Catalogue. In the genus *Rosa* they are often accorded separate numbers, while in other parts of the list they are given under one of the parents.

We shall miss many familiar friends :—*Carex glauca* Scop. is now *C. diversicolor* Crantz, *C. verna* Chaix is *C. caryophyllea* Latour, and *C. ampullacea* Good is *C. inflata* Huds.

This work, which is remarkably free from typographical error, will be invaluable and indispensable to students of the British flora. All British botanists must feel greatly indebted to Mr. Hanbury for the help he has given them by producing this new Catalogue.

E. G. Baker.

A new edition of the London Catalogue containing the numerous specific and varietal additions made to our flora during the last 17 years will be much appreciated. So much work has been done on *Rubus*, *Rosa*, and *Hieracium*, to say nothing of smaller critical genera such as *Saxifraga*, *Potamogeton*, etc., that it is good to see what the experts recognize. If to some the list of varieties seems at times unnecessarily long, it will not appear so to the collector who wishes some means of arranging the names in his collection. But as it is desirable that we should attempt to reach some degree of agreement in our lists of the British flora, a few criticisms may not be out of place.

In the first place, the lack of uniformity is unfortunate. It seems unreasonable that *Hieracium* should be so much extended while *Taraxacum* ("intentionally omitted"), to which so many forms have been added, should not be treated similarly. The cause of the phenomena, viz. apogamy, is recognized to be the same in both cases; and if *Taraxaca* are more difficult to discriminate for various reasons, that seems no reason why they should be neglected. Mr. Baker's comments on the numbering of *Rosa* seem justified. More serious is the lack of discrimination between varieties having inherited characters and mere forms (states) such as *Plantago Coronopus* b. *pygmæa*. And why should the wonderful names of the *Gymnadenia* hybrids be inserted while those of *Epilobium* are excluded? And "*Alchemilla acutidens* Buser—5/b. *alpestriformis* C. E. Salmon", should match "*Sorbus* (*Mougeoti* Soyer-Will. & Godr.)/b. *anglica* Hedl.—5," unless we are to understand that typical *Alchemilla acutidens* has been discovered in the country. Many absolute casuals are included; but if these, why not many others, some of which have better claims than some which are included?

Another botanical matter calling for comment is the marking of such plants as *Ranunculus arvensis*, *Lepidium ruderale*, *Lychnis Githago*, *Lamium album*, etc., with an asterisk. The asterisk is said to mean that the plant is "either most probably or certainly not aboriginal (native), but more or less established." *Lychnis Githago* is so constantly abundant in oat-fields in the North of Scotland that one doubts if all the plants were sown with the seed, and all the seed of foreign origin. So many plants of such situations become scarce when improved farming makes the crops cleaner, and some species disappear, such as *Delphinium Gayanum* (*D. Ajacis* auct. non L.), *Centaurea Cyanus* (such a beautiful sight in some German fields), etc. But that seems no reason to stigmatise all specimens as introduced. Why must one go to extremes? No doubt much *Medicago lupulina* is sown, and no doubt seeds escape to natural associations, so that it may be impossible to say whether a given specimen is a "British subject by birth" (parentage) or comes of naturalized stock. A great number of our species are in the same category. But what evidence is there that such plants as *Ranunculus arvensis* and *Lamium album* should be marked with an asterisk? How is it suggested that the latter is introduced?

It seems time that some extinct plants, such as *Senecio paludosus* and perhaps also *S. palustris*, *Erythræa latifolia* (whatever that may have been, hybrid or species), should, like *Carex Davalliana*, be

put within parentheses. If they should be refound they can be replaced, but the Catalogue should record the present position.

No doubt there will be much comment on the Nomenclature, and no doubt the editors expect it and are not likely to be troubled by it. But it seems a pity that they did not co-opt some competent nomenclator who would keep out unnecessary errors. Whatever views one may have as to the desirability of making orthographic corrections, it seems undesirable to have two Erigerons in the neuter and one in the masculine. *Scrophularia alata* Gilib. is accepted, but if one of his *nomina abortiva* be used, the rest must be, and are not. In a work of this kind it would be preferable to have criticism, even extensive criticism, of the manuscript, rather than criticism after the event. The editor could reserve the right of decision necessary to the production of uniformity. And in the nomenclature it is difficult to see what principles have been followed. Not the International Rules, for they demand the abolition of diphthongs, which are used throughout. Apparently some attempt has been made to avoid names which have been used in different senses, such as *Orchis maculata*, *Ulmus glabra*, etc. But it is just as reasonable to reject *Juncus inflexus* and many others, for though to British botanists they may seem less confused, they are not so in reality. And *Erythræa* (why not *Centaurium* if non-binominal works are used?) *Turneri* Wheldon & Salmon is unjustifiable on any recognized method of nomenclature. *Chironia littoralis* Winch *ex* Turner & Dillwyn is a perfectly definite plant of which types exist. The fact that Fries, who put the name into *Erythræa*, misused it and so caused some ambiguity, is no justification for rejecting the earlier name. This seems some queer warped relic of the Kew rule. The name *littoralis* must be used even if some different author has to be cited for the combination. And this brings one to speak of the lack of uniformity in citation which has ever characterized the London Catalogue. Sometimes we have the original author in parentheses, sometimes the author of the combination. There does seem a very good case for citing the original founder of the name, for the type depends on him, and it is possible to recognize what is meant when rank or genus changes. From this point of view De Candolle's Laws were preferable to those of Vienna, and the present mixture of De Candolle and Kew, by which a name can be changed as soon as the rank changes, renders stability of name and any attempt at serious cataloguing impossible. But however this may be, one cannot justify "*Ranunculus sphærospermus* (Hiern)." The name was founded by Boissier and Blanche in 1856, and reduced to a "forma" of *R. hydrocharis* by Hiern in 1871. From any point of view the citation is ridiculous. It is such things as this that some competent nomenclator might have prevented. Certainly it is impossible at present to prevent all such errors, but until the principles of taxonomy and nomenclature are understood it is impossible to make a beginning. However much one may dislike nomenclature and its troubles, it is impossible to avoid them by looking the other way. We are not told what happened to the ostrich, but one cannot suppose that it was a happy ending.

Remarks on some of the points noted while looking through the Catalogue may be of some interest.

Delphinium Ajacis L. is *D. orientale* Gay, as is proved by all the original specimens. The name of the formerly British plant is *D. Gayanum* Wilmott unless an earlier one should be found, as in the case of *Arabis Brownii* Jord. for *A. hibernica*.

Roemeria hybrida DC. is a mere casual.

"*Viola montana* L." I regard my argument against this as absolutely unanswerable.

Pyrus Malus c. *Deseglisei* Rouy & Camus. Rouy and Camus did not put this under *P. Malus*, but under *P. communis*, where other authors have retained it. Why is it put under *P. Malus*? *

Sorbus. It is useful to have a revised list of these, but we much need a detailed account of the British forms, since none has so far been given. To separate *S. scandica* so far from *S. arranensis* and *S. minima* seems certainly wrong, while what is called *S. fennica* seems to be more likely a hybrid between *S. arranensis* and *Aucuparia*. A revision of the British forms of the genus, with descriptions, is much needed. The narrow-leaved Scandinavian specimens, which have been referred to *arranensis*, may not be quite identical with the Arran plant: the few I have seen suggest this, and these endemic forms seem more likely to be relics than post-Glacial introductions.

Senecio lanuginosus Trow. To keep this as a species is certainly wrong. In a genus like *Senecio*, where self-pollination is general though cross-pollination may occur, one invariably finds, as one should on the Mendelian hypothesis, numerous semi-pure-breeding local forms. Heterozygous individuals continually increase the number of homozygous ones, and one can find, if one looks long enough, almost any combination of the variant characters breeding almost true. But one can also find places where characters are variable. On Pevensey shingles I found a spot where *Senecio vulgaris* was growing very uniform, except that half of it was woolly (typical "*lanuginosus*") while the other half was glabrous. In respect of this character of woolliness this stock was heterozygotic. In another place it would be another character which by accident had remained variable. But from my point of view the Pevensey series (see British Museum Herbarium) shows conclusively that *S. lanuginosus* is merely one of the forms of *S. vulgaris* just as a geneticist would expect.

Erythræa Turneri Wheldon & Salmon. Is this published? If not, it is very undesirable to create it as a *nomen nudum*.

Mimulus Langsdorffii Donn is a *nomen nudum*, and therefore invalid. The correct name is *M. guttatus* DC.

Calamintha officinalis disappears. British botanists have, I think rightly, kept it for *C. ascendens* Jord., but continental botanists generally use it for *C. sylvatica* Bromf. The International Rules state that originally comprehensive names must be retained for one of the parts. Unfortunately they give no precise indication of how this is to be done; hence much confusion since 1905. The type method is

* [See p. 292, Ed.]

the only way by which systematists can escape from what is a real difficulty, viz. how to keep names fixed among the continual changes in limitation of species etc. But mere rejection of troublesome names without attempt to typify them leads to the creation of unnecessary new names such as *Erythræa Turneri*.

Atriplex glabriuscula has a "b. *virescens* Lange," but no name is given to the var. a. *Babingtonii* of the Cambridge British Flora. But if one refuses to name both equivalent forms, it must be the var. *Babingtonii* which is put as b., for *A. glabriuscula* Edmondston was the var. *virescens*. There are other cases of this type of error in the Catalogue.

Altogether, it seems a pity that some form of co-operation cannot be found to produce a list which will not be full of small avoidable errors. It is a very great task for a single person to undertake, as a very extensive knowledge of synonymy and literature is required, besides a wide knowledge of genetics and plants in the field. It is in the hope that some way of doing this will be found that I point out certain defects which by co-operation might possibly have been avoided.

A. J. Wilmott.

The Genus Hieracium.

Perhaps the greatest innovation in the new edition of the Catalogue is the revision of *Hieracium*, which is now arranged to accord with the magnificent monograph of K. H. Zahn in Engler's *Pflanzenreich* (1921–23). This work has been done by Rev. J. Roffey, whose acquaintance with the genus is probably better than that of any other working British botanist, and whose knowledge is not limited to the British forms *. The collation of the British list with Zahn's work is a considerable task, for the monograph is a gigantic one. Zahn maintains 756 species, practically all with many subspecies, e. g. *H. Pilosella* L. has 624 subspecies and *H. murorum* L. 345. The index of species, with subspecies and varieties, occupies 120 pages and includes about 18,000 names.

As a result of the comparison, the 133 species (shown in 16 generic subdivisions) of the last edition of the Catalogue have become in the new one, with a few later additions, 248 species, which are placed in 12 generic subdivisions. These species correspond with the subspecies of Zahn. The changes in the grouping of species are considerable, and the sequence of the generic sections is altered, the *Vulgata*, *inter alia*, now preceding the *Alpina*. Moreover, the subgenus *Eu-Hieracium* is placed before *Pilosella*. Many plants formerly treated as varieties are raised to specific rank, and a large number (over 70) of specific names entirely new to the British flora are introduced. Many of these are followed by an older and better-known name in brackets, but about 40 of the new names are unfamiliar and without synonyms. On the other hand, several of the well-known old names disappear. *H. sylvaticum* Gouan, *H. vulgatum* Fr., *H. sciaphilum* Uechtr., *H. corymbosum* Fr. and *H. auratum* Fr.

* [Some notes by Mr. Roffey on the Hieracia in the Catalogue will be published in our next number.—Ed. Journ. Bot.]

now follow *H. murorum* L. into oblivion; and the ubiquitous *H. Pilosella* L., and the one notably non-boreal species in this country, *H. boreale* Fr., will be sought in the list in vain.

As compared with the former list, the present one, with its increased number of species, appears cumbersome owing to the reduced number of generic subdivisions. In each division (except *Amplexicaulia*) a large number of species appear without any indication of their affinities beyond the numerical sequence—in subsection *Eu-Vulgata* 59 species are printed in this way. In Zahn's monograph all of these names stand for subspecies under about 40 capital species, and their relationship would have been rendered much more clearly intelligible in the Catalogue if the capital species had also been shown, either as such or as *greges* under the sections. It would then have been readily seen, *e.g.*, that nos. 1032–1041 (*H. Schmidtii*—*H. Jovimontis*) were subspecies of *H. pallidum*, and nos. 1042–1047 (*H. basicrinum*—*H. ciliatum*) subspecies of *H. præcox*; and the affinities of the plants whose names are unfamiliar would have thus been generally indicated.

A comparison of the Catalogue and the Monograph shows that Mr. Roffey has not always followed Zahn in every particular, and there are probably good reasons for the deviations. While it must be unreservedly admitted that no British botanist possesses Zahn's incomparable knowledge of the genus, yet in dealing with such a complex group of plants, where an incredible mass of material has to be examined, and it is always impracticable to obtain enough, it is not humanly possible to avoid occasional errors; and a few cases of this kind have probably occurred among the British members of the genus. Two plants shown as British by Zahn are omitted from Mr. Roffey's list. These are *H. pellucidum* Laest., which Zahn treats as distinct from *H. lucidulum* Ley., and *H. pseudo-curvatum* Zahn, which differs from *H. curvatum* Elfstr. Conversely, several species appear in the list which Zahn does not recognize as British. The most notable of these, perhaps, are *H. grandidens* Dahlst., *H. scanicum* Dahlst., *H. cacuminatum* Dahlst. and *H. barbareifolium* Lönnr.—all recorded for a considerable number of British vice-counties.

A perusal of the new list suggests a few taxonomic criticisms. The breaking-up of *H. anglicum* Fr. first strikes the eye, and the separation of the varieties *jaculifolium*, *calcaratum*, and *longibracteatum* seems quite justified, for these plants are widely different from typical *H. anglicum*. The transfer of *longibracteatum* to *H. flocculosum* Backh. as a variety is, however, more questionable, and the removal of Mr. Hanbury's four species—*H. caledonicum*, *H. rubicundum*, *H. proximum*, and *H. scoticum*—from the *Oreadea* to the *Cerinthoidea* also offers food for reflection.

Among the *Oreadea* of the new list, the appearance of *H. ciliatum* Almq. (treated by Zahn as a subspecies of *H. præcox* Sch.-Bip., a Central European plant not hitherto regarded as British) seems a trifle startling to botanists accustomed to see it among the *Subvulgata*. And Zahn's treatment of *H. cambricum* F. J. Hanb. as a subspecies of *H. Wiesbaurianum* Uechtr., along with *H. hypochæroides* and

H. britannicum, may not generally commend itself, for surely no British member of the section is more clearly separable from its allies than *H. cambricum*.

The arrangement of the *Alpina*, however, which is not divided into *Genuinæ* and *Nigrescentes*, appears the most open to objections. The transfer of Backhouse's variety *tenellum* from *H. eximium* to *H. alpinum*, while *H. eximium* itself is removed to a distant position among the subspecies of *H. nigrescens* Willd., will hardly be accepted by botanists who know the living plants. And Zahn's inclusion of *H. lingulatum* Backh., a uniform and widely-distributed plant of the Scotch hills, among the 154 subspecies falling under *H. nigrescens*, which embraces such forms as *H. globosum*, *H. calenduliflorum*, *H. eximium*, *H. chrysanthum*, and *H. Backhousei*, but not *H. senescens* or *H. Marshallii*, seems almost equally unnatural. One essential feature of this section—the presence of glandular hairs on the foliage—is feebly marked in almost all of the British species, and it may even be doubted whether some of them are correctly placed here, although none are removed by Zahn.

The doubtful group *Alpestria* is merged in *Prenanthoidea* in the new list, and the old aphyllopodous section *Foliosa* is distributed between the *Tridentata*, *Sabauda*, and *Umbellata*. Among the last-named, *H. umbellatum* L. is notable as the only species of the subgenus whose varieties have not been elevated to the rank of subspecies.

In the nomenclature of the genus no attempt has apparently been made to quote authorities strictly in accordance with the rules, the original describers being usually cited for the names irrespective of any subsequent transfers or changes of rank. It may be remarked that *H. claropurpureum* Naegeli & Peter cannot be correctly used for the plant that has been shown to be clearly the *H. aurantiacum* of Linnæus.

The introduction of this new list of *Hieracia*, with its host of strange names, into a catalogue aiming at providing a useful working list of British Plants and adapted for an Index Catalogue and for marking Desiderata, may seem somewhat out of place when no British Handbook exists in which the new names occur; but it will serve the good purpose of bringing to the notice of our botanists the views of the greatest living authority on the genus with respect to our British forms; and though its use may tend at first to increase rather than diminish confusion, it may help to stimulate Mr. Roffey or some other hieraciarch to produce an adequate monograph of the British Hawkweeds, based on Zahn's greater work, and provided with complete *claves* of groups and species as well as uniform full descriptions, free from contradictions and everywhere showing regularly contrasting characters, without which in critical genera descriptions are so often worthless.

H. W. Pugsley.

THE BRITISH ASSOCIATION AT SOUTHAMPTON.

The Botanical Section at the recent meeting at Southampton (August 26 to September 2) attracted a large and representative attendance of botanists. The section met in the new University Buildings, and the Local Secretary, Miss F. M. Loader, earned the gratitude of all present by her efficient work of organization.

Prof. Lloyd Williams's Presidential address was entitled "The Phæophyceæ and their Problems." The President referred to Dr. Church's recent discussion of the group and the importance he has assigned to the Brown Seaweeds in connection with the marine origin of the Land Flora. While paying generous tribute to that author's memoirs as treasure-houses of knowledge, he was unable to follow all his conclusions, more especially with regard to the importance of the group in the chain of phylogeny and in the rejection of the theory of alternation of generations. He himself would prefer to regard *Fucus* as representing an extreme case of reduction of the gametophyte. The President reviewed the recent work of the group in its various aspects, and indicated numerous problems which still await solution. The remarkable trumpet-hyphæ described by Wille in 1885 have since been studied by various investigators, and some conclusions which will be described in detail in a forthcoming paper were indicated; but the functions of these structures and the meaning of various features in their histology are still doubtful. The function of the characteristic delicate hyaline hairs, forming the cryptostomata in the higher members of the group, also remains conjectural; it was suggested that in *Dictyota* they prevent sand and silt from settling on the thallus. Additional research is also required on the origin, composition, and function of the various bodies found in the Phæophycean cell, especially the sluggishly motile "fucosan" or "physodes."

Within recent years the most striking advance in algological study has been in our knowledge of the reproductive processes in the Phæophyceæ. Reference was made to Dr. Margery Knight's work on *Pylaiella*, the plants of which are either diploid or haploid and show a remarkable fluctuation in the cytological rhythm which contrasts with its firm stabilization in *Dictyota*. The discovery of gametophytes by different observers, as by Sauvageau in *Saccorhiza* and by Japanese observers in *Phyllitis* and *Laminaria*, indicates a startling difference in size between the sporophyte and gametophyte generations. The unique structure of *Saccorhiza* suggests its removal from the other Laminariaceæ as a distinct family. Conflicting accounts have been given of the development of the oosphere in *Sargassum*, and Tahara's statement that in one species there is no uninucleate stage in the oosphere requires confirmation.

Lantern-slides were shown illustrating the unique phenomena of fertilization in *Halidrys*, and problems of detail were suggested which demand for their solution a botanist who is also an expert physicist and chemist.

In conclusion, the President referred to recent ecological investigations from the Puget Sound Biological Station, and regretted the

paucity of ecological work on the Brown Algæ of our own shores. Our knowledge of their fruiting periods is scrappy and inaccurate: some plants, such as *Dictyota*, are exceedingly responsive to environmental changes; it would be interesting to trace the connection between such plastic organisms and the factors affecting them. A great desideratum is a new "Phycologia"; in particular, we need a new and well-illustrated Handbook of the Phæophyceæ.

The programme of papers was full and varied. Prof. Bower suggested a phyletic grouping of the Filicales, the expression of his prolonged study of the group, the succession being from the marginal to the superficial position of the sorus; the main mass of the Leptosporangiate ferns formed six main sequences. Dr. Knight and Dr. E. M. Delf contributed papers on Algæ, the former demonstrating the dependence of certain morphological features of *Ectocarpus* on variable external conditions, and the latter describing the sexual reproduction in the genus *Bifurcaria*.

The life-history and cytology of various genera of Fungi formed the subject of a group of papers, mainly contributed by the younger generation of workers. Palæobotany was represented by Mr. J. Walton's description of some features of biological interest in the foliage of fossil Equisetums, *Annularia* and pteridosperms, and Mr. and Mrs. Hamshaw Thomas adduced evidence for the derivation of the recently described Caytoniales, and incidentally the group of Flowering Plants, from a *Glossopteris* stock. Prof. Priestley discussed light and growth, attempting to bring to a common focus the phenomena of etiolation, including the remarkable morphological and structural changes induced by very brief exposures of etiolated plants to light, and the facts of phototropism as shown both in the higher plants and in fungus hyphæ. Dr. Macregor Skene's work on the supply of iron in nutrient solutions showed that chlorophyll formation was best in plants to which iron was supplied as citrate; chloride was less efficient and phosphate least so; but the difference was only marked in the early stages of growth. A paper on a cognate subject was that of Mr. J. Line on soluble Aluminium in relation to plant-growth in culture solutions and in acid soils. Miss E. D. Brain described a physiological zygomorphy in seedlings of *Lupinus*, the reaction to gravity being much more rapid when the hypocotyl is stimulated in the cotyledonary than in the intercotyledonary plane. Prof. M. C. Potter discussed temperature relations in wound reactions.

The flowering plants provided subject-matter in Dr. A. W. Hill's account of the interesting geographical distribution, Andine and Antarctic, of the remarkable umbelliferous genus *Crantzia*; Mr. T. A. Sprague's paper on the relative specific predominance of phanerogamic families in the floras of the world; and Prof. McClean Thompson's on the plasticity of the angiospermic flower in species of varied affinity, and some general problems in the evolution of modern floral types. Miss Davey described the seedling anatomy of some species of *Juglans*, and Miss A. V. Hay the morphology and anatomy of juvenile and adult leaves of the New Zealand varieties of *Sophora tetraptera*. Mr. T. J. Jenkin described the artificial production of

intergeneric hybrids in some British grasses. He had successfully crossed *Lolium perenne* with *Festuca rubra*, and the varieties *arundinacea* and *pratensis* of *F. elatior*, respectively. The hybrids in the first case were completely sterile, but an extremely low degree of fertility was found in the other cases.

Dr. J. Latter had studied the cytology of the pollen mother-cells in *Lathyrus odoratus*, and Dr. Balls and Mr. Hancock gave further information on the structural peculiarities of the seed-hairs of cotton.

An interesting but somewhat inconclusive discussion on Adaptive Characters was introduced by Prof. Bower, and one on Deviations from the Normal Course of Sexual Reproduction in Plants by Prof. Dame Helen Gwynne-Vaughan.

There was also a joint discussion with the Geography Section, on the Evolution and Colonisation of Tidal Lands, opened by Prof. F. W. Oliver, followed by Prof. J. W. Gregory.

The popular lecture was given by Dr. D. H. Scott, on the Transformations of the Plant World in Geological time.

A feature of the meeting was the appearance of Forestry as a sub-section of Botany, under the Vice-Presidency of Sir Hugh Murray, with Dr. A. W. Borthwick as Secretary.

Saturday and Sunday were devoted to whole-day excursions, the one to Butsher Down and Ditcham Park, the other to the New Forest. The sectional dinner was also well attended. Mr. F. T. Brooks again acted as Recorder, and Dr. Robinson and Prof. J. McLean Thompson as Secretaries.

The Association will meet in 1926 at Oxford.

REVIEWS.

British Botany.

(1) *British Weeds: their Identification. A Practical Handbook for the use of Estate Owners, Farmers, Gardeners, and Students of Agriculture, Horticulture, and Field Botany.* By Richard Morse, F.R.H.S., and Ray Palmer, F.E.S., F.Z.S. 8vo, pp. 207, 8 pls., 32 text-figs. Benn, London, 1925. Price 10*s.* 6*d.* net.

(2) *Native Orchids of Britain.* Descriptive Notes on all Species, together with some Hybrids and Abnormal Forms, with 56 photographic illustrations. By C. B. Tahourdin. 8vo, pp. 114. Author, 86 Manor Road, Wallington, Surrey. 1925. Price 5*s.*

(3) *British Woodlands, as illustrated by Lessness Abbey Woods. A General Survey of the Flora and Fauna.* By St. John Marriott. 8vo, pp. xviii, 72, 5 pls. & map. Routledge, London, 1915. Price 2*s.* 6*d.*

(1) *British Weeds* is the outcome of investigations and experiments carried on in various parts of the country for fifteen years; the

researches of other workers have also been drawn upon. The subject-matter of the book is divided into two parts, which are followed by several appendixes and indexes. Part I. describes the methods of propagation and dispersal of weeds, and some general methods of weed-control. A short chapter on alien weeds emphasizes the importance of an early and determined attack upon aliens, bearing in mind that many of our most troublesome weeds, which are now regarded as natives, are in reality ancient aliens, and are only found in cultivated ground. A key is given for the identification of British weeds; it is adapted for use by persons without knowledge of botanical terms, the characters adopted being obvious ones, such as flower-colour, number of petals, shape of fruit, &c. Part II., which comprises the main portion of the book, is a list of the weeds arranged alphabetically in four sections—Weeds of Arable Land, Weeds of Meadows and Pastures, Weeds of Lawns, Golf Greens, Gardens Paths, &c., and Weeds of Ponds, Lakes, and Water-courses. The names adopted are the usual common names, the botanical name follows in brackets, and local or less common popular names are also quoted. A brief description of the plant is given in simple English, the time of flowering is indicated and methods of control are suggested. Simple line-figures of the plant are sometimes included, and others are represented, reproduced by photography, on the plates. The appendixes include lists of weeds which are of economic use, poisonous or otherwise injurious to animals, or serve as host-plants for insect pests or fungoid diseases. Notes on chemical applications for weed-destruction and names of some books of reference are also given, and in the interest of the scientific student the weeds are classified under their respective families. There are three indexes—scientific names, local names, and popular names. We would suggest that in future editions the two latter might with advantage be combined.

The book is clearly printed and the text well-arranged; it should prove a useful handbook to all who are troubled with weeds, though perhaps the botanist may be surprised to find so many of his familiar friends in such bad company.

(2) Mr. Tahourdin modestly describes his book on the *Native Orchids of Britain* as by an amateur for amateurs, and thus explains the absence of scientific terms, definitions, sectional drawings, and dissections. He has, at any rate, produced a pleasing little volume which should be very useful to the many student-lovers of our flora who have not the technical knowledge to name their plants by one of the more serious "Floras." And some of the more serious botanists may be pleased to have a collection of photographs of the British Orchids.

The author has followed the arrangement given in the tenth edition of Babington's *Manual*, though he frequently does not follow the nomenclature adopted there, as, for example, in *Ophrys*, *Spiranthes*, and *Epipactis*. He has made himself familiar with recent work on British Orchids, and (on p. xiii) gives a list of articles in the *Journal of Botany*, by Drs. T. and T. A. Stephenson and Col. Godfery, which he suggests may be of assistance to students. He has also adopted the views of these authorities on *Orchis maculata*, as a synonym of which he cites *O. Fuchsii*, while *O. elodes* is preferred to *O. ericetorum*.

The photographs are generally life-size, except with the larger species, where reduction was necessary; in most cases only the flowering-spike is represented. The colour of the flower and the salient characters of the stem and leaves, the time of flowering, and a note on the distribution of the species, are printed on the page opposite the picture.

The illustrations vary somewhat in merit: some are very good, for instance, *Orchis hircina*, *O. pyramidalis*, *Spiranthes autumnalis*; others are less clear. We are glad to note the appeal which Mr. Tahourdin makes, in the Introduction, for the preservation of the species in their natural habitats.

(3) Mr. St. John Marriott's booklet on the natural history of an area which is also of considerable antiquarian interest is an outcome of scientific and historical work in Woolwich and its neighbourhood, of which for the past thirty years Mr. C. H. Grinling has been a moving spirit. The story of this work is told by Mr. Grinling himself in the Introduction to the little volume. In an Historical Preface, Mr. Marriott gives a brief history of the Augustinian Abbey from which the woodland takes its name; he also traces the changes of ownership since the Reformation to the present time, when the preservation of the natural facies of the area is seriously threatened. Fifty pages are devoted to an account of the vegetation. An exhaustive botanical survey has been made, and the present vegetation indicates that an oak-wood and an oak-birch-heath association were formerly represented, the latter perhaps derived from the regeneration of the former. In the higher ground, part of the oak-birch-heath association still remains practically unaltered except by coppicing, though it evidently once covered a much more extensive area. The ecology of the area is described in detail and illustrated by charts. There follow lists of the plants, the details of which embody work done to a great extent during the last few years. The flowering plants are represented by 328 species; there are three ferns, 111 mosses, 32 liverworts, about 320 fungi, 12 lichens, and 46 mycetozoa.

The account of the fauna occupies twenty pages; insect-life is still abundant, but mammals, reptiles, and amphibians are poorly represented. There is still work to be done on the pond-life and the galls.

The plates include some pleasing views of the woodland and its pools.

New Text-Books.

(1) *A Text-Book of General Botany for Colleges and Universities.* By Richard M. Holman and Wilfred W. Robbins, of the University of California. 8vo, pp. ix, 590, frontispiece & 373 text-figs. Wiley & Sons, New York; Chapman & Hall, London, 1924. Price 20*s*.

The authors of this text-book are respectively Assistant-Professor of Botany in the College of Letters and Sciences and Associate Professor of Botany in the College of Agriculture of the University of

California, and the book embodies the material of the lectures to the students in the two courses in General Botany. In their Preface the authors suggest that while the agricultural student will profit more by a broad survey of the whole field of botany than from a course restricted to those aspects which are most directly related to agriculture, the general student, on the other hand, will profit by the relation of the subject to agricultural practices and by the use of economic plants for illustrative material. Further, that the usual procedure of presenting the subject-matter of such a course by means of formal lectures is unsatisfactory, and that a text-book which presents the contents of the usual lectures would result in better teaching, since it would allow the instructor to devote more time and energy "to the more effective work of recitation, conference, and quiz." We are not quite clear as to how this principle is applied, but if it eliminates the formal lecture and establishes a closer relation between teacher and student and evokes a full discussion of the subject-matter of the portion for study, it seems to be an excellent plan. The authors also stress the importance of a knowledge of structure for the intelligent understanding of function and also of numerous well-labelled illustrations. The result is a clearly-written and well-illustrated volume which should also be useful to students outside California for revision work. It should go without saying that the students should attempt to realise the excellent descriptions and figures in a full course of practical work. The year's work is divided into two parts, the first dealing with the flowering plant as a whole, its organs and their functions, and the second with examples of the great groups of the plant kingdom and including a final chapter on evolution and heredity.

The majority of the illustrations are new, and the source is indicated in the case of those borrowed from other works. They are very clear and admirably labelled. We note, however, that the figure of English Ivy (*Hedera Helix*) represents the, to English readers, very familiar "*Ampelopsis Veitchii*."

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(2) *A Class Book of Botany.* By ERNEST STENHOUSE, B.Sc. Small 8vo, pp. xi, 514, with 363 text-figs. Macmillan & Co., London, 1925. Price 7*s.* 6*d.*

THE course of botany elaborated in this little volume has been drawn up primarily for the use of students preparing for University Matriculation, School Certificate, Senior Local, and other examinations of a similar standard. The author bases his method of presentation on a long experience as teacher and examiner, and has endeavoured to combine description and discussion with observation and experiment. The book contains a great amount of information, and will be helpful to the harassed teachers of girls or boys who have to work through the syllabus for one or other of the school-examinations in the limited time which can found for botany in the school curriculum. The flowering plant and its organs are studied under the two headings (1) Nutrition and Growth, (2) Reproduction, and experiments are suggested which can be carried out with simple apparatus. An appendix in the form of a Monthly Calendar indicates the plants in flower at the time, and also gives suggestions for practical work. Many of the illustrations are helpful, but others are open to the criticism so frequently made by examiners of the class of student for whom the book is intended; they do not illustrate! For instance, in the figures of specific plants with details of floral structure the reduction is often so great as to render the smaller figures useless. Some hundreds of recent examination questions are included in the form of exercises at the end of the various chapters. We note that this author also comes to grief over the identity of "*Ampelopsis Veitchii*," which he calls (p. 190) Virginian Creeper. It has certainly largely taken the place in cultivation of its more graceful American congener, the "Virginian Creeper," owing to its capacity for clinging to walls, but it is a much more recent introduction from Japan.

BOOK-NOTES, NEWS, ETC.

BRITISH BRYOLOGICAL SOCIETY. The Society held its Annual Meeting and Excursion at Ross, Herefordshire, for the Wye Valley, under the Presidency of the Rev. C. H. Binstead, Vice-President, in the absence of Dr. S. M. Macvicar, from August 14 to 21. The rocky limestone woodland of the Wye Gorge, including the Great Doward, Herefordshire, and Symonds Yat, Gloucestershire, was well explored and interesting plants were found, especially *Anomodon longifolius* and *Eurhynchium striatulum*; others included *Barbula Nicholsoni*, *Neckera crispa* var. *falcata*; *Aplozia atrovirens* var. *sphærocarpoidea*, *Scapania aspera*, *Madotheca lævigata*, &c. The Sandstone and Conglomerate of the Chase and Penyard Woods at Ross yielded *Campylopus flexuosus* in fruit, *Leptodontium flexifolium*, *Philonotis capillaris*, *Mnium stellare*, *Lophozia attenuata*, *Bazzania trilobata*, *Scapania compacta*, &c. May Hill, just over the Gloucestershire border, showed a relict swamp-vegetation, including several Sphagna, and Mr. R. O. G. Wynne gave a lucid account of the geological aspect, the May Hill (or Llandovery) rock and other Silurian strata being in evidence. During the visit to Trelleck Bog in Monmouthshire a very large number of interesting Sphagnum forms were detected, besides hepatics, as *Leptoscyphus anomalus*, *Cephalozia connivens* var. *compacta*, and *Lepidozia setacea*, while on rocks in woodland above the bog *Dicranum Scottianum*, new to v.c. 35, was found, and at Tintern *Eurhynchium curvisetum* was also recorded for the county. Several of the members included Lichens in their survey. The party, including members and friends, numbered 42; in the evenings the business of the Society was transacted. The officers were re-elected, except that, owing to Mr. D. A. Jones's coming absence abroad for some months, Miss E. Armitage was asked to act as Secretary temporarily. The Committee recommended that printing of a new edition of the *Moss Census Catalogue* be proceeded with. Dr. Trotter showed his very valuable card-index scheme for the purposes of bryological bibliography. The next meeting will be held at Ingleton, Yorks, at Whitsuntide, 1926.—E. ARMITAGE.

Botanical Bequest to British Museum. Miss Lilian Suzette Gibbs, an account of whose work recently appeared in the *Journal* (p. 116), has bequeathed to the Trustees of the British Museum all her collections of plants and books and papers connected therewith, now in the Botanical Department of the Museum. These include the collections made during her various botanical expeditions to Rhodesia, the Fiji Islands, Australasia, North Borneo, and the Arfak Mountains in Dutch New Guinea, on which are based her published accounts of the vegetation of these regions. Also collections made in the Hawaian Islands, Iceland, and South America. The collections are of special value for the elucidation of the origin and distribution of the high mountain flora of the Malayan Islands, Australia, and Polynesia. Miss Gibbs also bequeathed to the University of London such a sum as will produce a net annual income of £150 for a Studentship in Cancer Research, either on the physiological or chemical side, to be called "The Laura de Saliceto Studentship" in memory of her mother.

New York Botanic Garden. The *Bulletin of the Garden* (xiii. no. 46, July 30, 1925) contains the report of the work of the Garden for the year 1924. The President and Chairman of the Executive Committee appeals to private benefactors for a large sum of money in order to widen the scope of the work of the Garden to include experimental work on plant-physiology, soil-problems, plant-disease, and plant-breeding. For the solution of these problems the large and varied collections of the Garden present unrivalled opportunities, but there are needed properly trained experimental botanists and properly equipped new laboratories.

Mr. Charles Cumming Calder, B.Sc., Curator of the Botanic Gardens, Calcutta, has been appointed Director of the Botanical Survey of India in succession to Lt.-Col. A. T. Gage. Mr. Calder is a graduate of Aberdeen University, where he studied under the late Prof. J. W. H. Trail.

We note with regret the announcement of the deaths on Sept. 19, at Cambridge, of Sir Francis Darwin, the eminent plant physiologist, the third son and biographer of Charles Darwin, and on the same day, in Berlin, of the veteran African explorer and botanist, Dr. Georg Schweinfurth. We hope later to publish an appreciation of their work.

Correction.—The name *Anomacanthus*. The Acanthaceous generic name *Anomacanthus* applied to a plant collected by Mr. J. Gossweiler in Portuguese Congo and described by the writer in this *Journal*, vol. lxi. p. 161, has been found to be invalid. The genus was first described by de Wildeman and Th. Durand as *Gilletiella* in Bull. Soc. Roy. Bot. de Belgique, vol. xxxix. p. 71, 1900. Additional notes were published, together with certain photographs in *Etudes sur la flore du Bas- et du Moyen-Congo*, vol. iii. 1903–12. Whether the Gossweiller and Gillet specimens are conspecific is not yet certain, but it is hoped shortly to publish some further notes on the structure and taxonomy of *Gilletiella* (as it must be called).—R. D'O. Good.



H.M.Godfery del.

I. a, b. *NIGRORCHIS TOURENSIS* Godf.
II. c, d. *GYMNIGRITELLA MICRANTHA* Asch. & Graeb.
III. e. *GYMNIGRITELLA SUAVEOLENS* G. Camus.

THREE HYBRIDS OF NIGRITELLA NIGRA Reichb.

By Col. M. J. Godfery, F.L.S.

(Plate 573.)

1. ×Nigrorchis tourensis, hybr. nov. (*Nigritella nigra* × *Orchis maculata.*)

Tuber palmatum segmentis elongatis fastigatis. *Caulis* solidus, angularis, 31 cm. altus. *Folia* (4) linearia, acuta, maculata, 1 cm. lata. *Spica* ovata, densiflora, 4·5 cm. longa. *Bracteæ* angustæ, acutæ, purpureo-marginatæ, inferiores floribus longiores. *Flores* obliqui labio ascendente saturate coccineo. *Sepala* lanceolata, acuta, labio concoloria. *Petala* ovato-lanceolata, laxe conniventia. *Labellum* parvum, ovatum, leviter crenatum lobis lateralibus subevanidis. *Calcar* ovarium breve paullulum excedens, ore minuto.

This hybrid has not been previously described or named. *O. maculata nigra* was recorded by Jaccard without any description (Cat. Valais. 337, 1895), but Dr. Keller states that he has established the fact, by consultation with Chanoine Favre, by whom the plant was found, that it was certainly *Gymnigritella suaveolens* Camus, the second parent being *Gymnadenia conopsea* R. Br. and not *O. maculata* L.

He further states that a true specimen of *Nigritella nigra* × *O. maculata* was found by Handel-Mazzetti near Vienna, and an analysis of the flower was made by Herr Fleischmann, of Vienna, but nothing was published. The latter also analysed a flower of the specimen to which this paper refers, with which Dr. Keller says he was "extrêmement enchanté."

On the 17th July, 1924, in the neighbourhood of the Glacier de Tours, near Chamonix, while my wife and I were searching for *Gymnigritella suaveolens*, she drew my attention to a plant with deep carmine velvety flowers, looking at a distance somewhat like *suaveolens*, but with a short spike of a more brilliant colour, and long very narrow acute leaves conspicuously spotted with purple-black. I at first thought it was an unusual specimen of the richly coloured red-purple alpine form of *Orchis maculata*, which was abundant in the neighbourhood, but the linear leaves, the semi-reversed flowers, and the strong scent of vanilla soon convinced me that it must be a hybrid of *Nigritella*.

2. ×Gymnigritella micrantha A. & G. Syn., Mitteleur. iii. 843 (1907), in syn.

Nigritella nigra × *Gymnadenia albida* Richter, Plant. Eur. i. 279 (1890). *Nigritella micrantha* Kerner, in Verh. zool.-bot. Ges. Wien, xv. 227 (1865). *Gymnadenia micrantha* Wettstein, in Ber. Deutsch. Bot. Ges. vii. 317 (1889). *G. albida* × *nigra* Schulze, Orch. Deutschl. 46 (4) t. 46 *b*. *Leucotella micrantha* Schltr. *Nigribecchia micrantha* Camus.

On July 16th, 1924, whilst searching in vain for *Chamæorchis alpina* near the Col de Balme, I found two specimens close together of what looked like a dull pink *Nigritella*. They proved to be *N. nigra* × *G. albida*. The tubers had long white cylindrical fingers

and broadened rather spatulate lower leaves suggestive of *albida*. The short dense spike was like that of *Nigritella*, but the very small campanulate flowers resembled those of *albida*, the sepals and petals being short and rather broad, the lip trifid, and the spur very short and saccate. The upward-directed lips showed the strong influence of *Nigritella*. A careful search for further specimens met with no success, though both parents were abundant. This hybrid was new to France. It has only been found in the Tyrol, at Blaser bei Trins, at 1900 m. (*Sauter*), in the Pusterthal (*Hüter*), and at Alkuser Schober bei Lienz at 2000 m. (*Sauter*), also in Switzerland on Mt. Pilatus (*Ambey*), and in the Fexthal, Engadine (*Dr. Keller*).

3. × Gymnigritella suaveolens Camus, Mon. Orch. France, 82 (1894). *Orchis suaveolens* Vill., Pl. Dauph. ii. 38 (1787).
Nigritella fragrans Saut., in Rchb. Fl. Germ. exc. 121 (1830).
Nigritella suaveolens Koch, Syn. ed. 1, 796 (1837).
Nigritella nigra × *Gymnadenia conopsea*.

This well-known hybrid, although observed so long ago as 1787, does not appear to have been suspected of being of hybrid origin till 1839, when it appeared in Moritzi's Pfl. Graub. as *Orchis nigro* × *conopsea*. On the 15th July, 1924, after several days' search at the head of the Chamonix valley, where *Nigritella* was abundant, I had the good luck to find two specimens, at once recognizable by their bright dark rose-red flowers, longer spike, and taller habit as compared with *Nigritella*. Two days later, exploring a wider area, my wife and I found five further specimens, mostly isolated. The first plant found had a short ovate, all the others a long cylindrical, spike, and all were sweet-scented. They were very much alike, the spike varying from 4 to 6 cm. long, and the spur from 4 to 7 mm. in length. It has been found in France, Switzerland, Austria, and Germany. Usually the hybrid holds the mean fairly closely between the two parents, but Max Schulze (Orchid. Deutschl. 48, 5, 1894) figures two extreme forms:—(1) *Gymnadenia megastachya* Wettst. with broad leaves and bracts and a long loose spike of rose-coloured flowers with a slender spur as long as the ovary, of which a single specimen was found by Kerner near Innsbruck. (2) *G. brachystachys* Wettst., whose habit, stature, leaves, spike, and spur are essentially those of *Nigritella*, of which a single specimen was found by Kerner in the Achenthal. These two extreme forms may not improbably be secondary crosses between *suaveolens* and *G. conopsea* and *Nigritella nigra* respectively. Max Schulze follows Wettstein in regarding *Nigritella* as belonging to the genus *Gymnadenia*, in spite of the very marked differences between them. Perhaps he was influenced by Wettstein's theory that the occurrence of bi-generic hybrids ought to suggest the homogeneity of the genera concerned. If this held good *Serapias* and *Orchis* belong to the same genus, for numerous hybrids occur between them, and a similar remark would apply to the parents of *Cœloglossum viride* × *Orchis sambucina*, *Gymnadenia conopsea* × *Orchis maculata*, and *Aceras anthropophora* × *Orchis militaris*, all of which are figured by Schulze and the respective genera retained by him as distinct.

Rouy (Flore de France, xiii. 97) objects to the creation of what he rather unfairly calls "pseudo-genera," like *Gymnigritella*; but admits that the classification of hybrids under the genus which comes first alphabetically is purely arbitrary. He considers that, when the most salient character of one of the two parent genera reappears in the hybrid, it goes without saying that the hybrid must be put under the genus in question, quoting the hybrids between *Gymnadenia* and *Nigritella*, which have the ovaries untwisted, and are therefore, in his opinion, "incontestably" *Nigritella*. Max Schulze, as we have seen, puts them under *Gymnadenia*. Would it not be more correct to say that they belong just as much to *Gymnadenia* as to *Nigritella*? Many hybrids are goneoclinic, some specimens accentuate the characters of one parent, others those of the other parent. Should they then be allotted to different genera? It has been shown that the twisting of the ovary is of little, if any, value as a generic character (Orchid Rev. xxx. 3, 1922). Hybrids are not of pure blood, and cannot with scientific accuracy be allotted to the genus of either parent. *Gymnigritella* at least has the merit of indicating both of the parent genera, which appears to be less misleading than the allotment of a hybrid to a genus to which it does not exclusively belong.

Explanation of Plate 573.

I., *a*, *b*. × *Nigrorchis tourensis* Godf.
II., *c*, *d*. × *Gymnigritella micrantha* Asch. & Graeb.
III., *e*. × *Gymnigritella suaveolens* G. Camus.
I., II., III., natural size; *a*, *b*, *c*, *d*, *e*, enlarged.

THE HIERACIA OF THE LONDON CATALOGUE.

By the Rev. J. Roffey, M.A.

The Hieracium List has been so greatly changed in the new edition of the *London Catalogue* that some explanation seems necessary with regard to it. Within the last few years Dr. Zahn has given us, what we have not had since Fries and De Candolle, a complete monograph of this most difficult genus. It seems, therefore, desirable to bring British nomenclature into accord, and the present list is really nothing more than a list of the plants given by Zahn for Britain, with the addition of such new species and varieties as have been described as British since the issue of the last edition of the Catalogue in 1908. Zahn's knowledge of British hieraciology does not seem, unfortunately, to extend beyond the publication of Linton's *British Hieracia* and *Set*, and Dr. Williams's *Prodromus*. All plants described subsequently to these have, therefore, had to be inserted in his list, and, since very few of them are to be found in the national collections, the descriptions given by their authors have been the sole guide in doing this. It is, consequently, not unlikely that some of them may be wrongly placed.

The changed order of the Sections, notably the removal of *Alpina* and *Amplexicaulia* to a place between *Vulgata* and *Prenanthoidea*, may at first seem startling to British botanists; but its strangeness

is due to the connecting sections being unrepresented in Britain. When these are taken into account, and the genus regarded as a whole, it will, I think, be recognised that the order as given by Zahn is the better one.

The nomenclature of the species, or, more properly, the subspecies, is also that of Dr. Zahn. I mention below the very few instances in which I have departed from it. There are many unavoidable changes; when men in different countries have been working independently, it is, perhaps, inevitable that names should clash, and many names that have become familiar to us in Britain have to give way to others which claim priority. In most of these cases the old name has been given in brackets in the Catalogue itself.

1022. *Brigantum* (F. J. Hanb.).—Omitted by Zahn.

1023. *skyense* Zahn.—Das Pflanzenreich, iv. 280, p. 186: (*H. anglico*) "valde affine. *Folia* magna orbicularia vel ovata apice rotundata mucronata, valde glabrescentia; caulina 2, imum obovatum basi constricta vaginans, summum ovato-acuminatum. *Caulis* ex omnibus axillis longe ramosus 5–8-cephalus, *involucris* magnis atriusculis sparsim pilosis cum pedunculis dense glandulosis. Schottland: Skye (*Linton*)!" Zahn writes that the plant he thus describes was seen by him in some foreign herbarium, but he does not remember where. I have examined a good deal of Skye "*anglicum*" collected by the Messrs. Linton, but have not been able to detect any plant agreeing with this description. If any British botanist possesses such, I should be very grateful if he would allow me to see it. Perhaps I may mention here that Dr. Zahn has been suffering from a severe illness, which has precluded any further reference to him of obscure points.

1029. *pseudozetlandicum*, nom. nov.—*H. Shoolbredii* Zahn, *l. c.* 204; Linton, Set Brit. Hier. n. 155 (as *H. zetlandicum*): "Intermedia *cæledonicum-scoticum*. *Caulis* inferne pilosus, superne pilis patentibus ad basin nigris obsitus et sparsissime glandulosus. *Folia* obscure viridia, radicalia elliptico-lanceolata, apice acuta, basi cuneata argute dentata, dentibus paucis acutis, petiolis longiusculis pilosis, superne fere glabra, subtus pilosa; caulina 2–3 abrupte decrescentia subsessilia. *Caulis* 3–4-cephalus, pedicellis pilis ad basin nigris obsitis. *Involucra* 10–12 mm. atro-viridia, squamis exterioribus latiusculis obtusis, interioribus acutiusculis paulo angustioribus sparse breviterque pilosis, disperse glandulosis. *Styli* lividi. *Ligulæ* apice ±glabræ."

This is the Sutherland plant formerly placed to *H. zetlandicum* Beeby. The Rev. E. F. Linton has separated this plant from *H. zetlandicum* in his herbarium, and placed it in its present affinity, but without bestowing upon it a name, and, as Zahn's name is preoccupied by the Rev. E. S. Marshall's plant (n. 1086), it has been necessary to find one for it.

1030. *proximum* F. J. Hanb.—Zahn calls this *H. Hanburyanum*, keeping the name *proximum* for the plant (n. 1084) we know as *H. prætenerum* Almq. Mr. Hanbury's name was published in March, 1889 (Journ. of Botany, xxvii. 76); Nörrlin's *H. proximum* (*H. prætenerum* Almq.) was issued in a set (Herb. Mus. Fenn. ii. 151) in the same year, but apparently not described till later.

1032 b. *fealense* Beeby.—Not in Zahn.

1033. *dentifex* E. F. Linton.—Journ. Bot. xlix. 354 (1911).

1038 b. *vestitum* A. Ley.—Journ. Bot. xlix. 353 (1911).

1039. *decolor* A. Ley.—Journ. Bot. xlvii. 10 (1909)=*H. cæsium* Fr. f. *decolor* W. R. Lint., ed. 10. Zahn makes this plant a subvar. of *H. britannicum* F. J. Hanb., under the name of *Smithii* Baker ex Hanb. in Journ. Bot. 361 (1879) as *H. cæsium* var., Zahn, *l. c.* 266, 460.

1041. *jovimontis* Zahn in Koch, Syn. Deutsch. Fl. ed. 3, iii. 1813 (1901). Linton, Set, no. 9 (as *H. Schmidtii*); Clova.

1042. *basicrinum* Zahn, *l. c.* 234; "=*H. Sommerfeltii* v. *tactum* Linton, Brit. Hier. 28, pp. et Set, no. 108, vix F. J. Hanb. in Journ. Bot. xxxvi. 367 (1898)? Argyle, Inverness, Westmoreland."

1043. *bounophilum* Jord.—"England," Zahn, *l. c.* 235, without locality. I think that this is a mistake, probably by confusion with some form of *H. britannicum* Hanb., which Zahn in Hier. der Schweiz (1906) made a synonym of this. I have seen no British plant which I could attribute to *bounophilum*.

1045. *præcox* Sch. Bip.—In plenty at Smitham Bottom in Surrey, where it was first found by Col. Wolley-Dod in 1920. There is in Herb. Mus. Brit. an earlier specimen from N. Wales, named by Schultz-Bipontinus himself. The Surrey plant is var. *castanetorum* Sch. Bip., Cichoraceotheca, n. 22.

1048. *crinigerum* Fr.=*H. Schmidtii* Tausch c. *crinigerum* Fr. ed. 10.

1051. *pseudo-Leyi* Zahn, *l. c.* 251.—"*H. Leyi* (f. *culta*), Lint. Set, no. 128, *p. p.*! Ystolion Duon in Carnarvonshire.

(976 a. Ed. 10.—*H. Oreades* v. *brachymorphum* W. R. Linton is, as Mr. Linton states in Brit. Hier., merely an apocopated form.)

1058. *sordidum* W. R. Linton.—Journ. Bot. xlix. 353 (1911).

1061. *cambricum* F. J. Hanb.—See Journ. Bot. xlvi. 286 (1908).

1062 c. *splendens* F. J. Hanb.—Zahn (*l. c.* 272) calls this var. *Griffithii* F. J. Hanb., and divides it into two subvars. *splendens* and *Griffithii*. But see Linton in Brit. Hier. 28. d. *setosum* W. R. Linton.—Journ. Bot. xlix. 354 (1911).

(Zahn includes here *H. pellucidum* Læst., citing the localities given in Linton, Brit. Hier., and adding "(partim=*exotericum*)." I believe all the plants then included under *pellucidum* (excluding *lucidulum* Ley) can be referred to one or other of the *lepistoides-grandidens* group, and that we have not in Britain the true *pellucidum* Læst.)

1066. *longilobum* Dahlst.—See Journ. Bot. xlvi. 286 (1908). Zahn, does not give this as British.

1069. [*lepistoides* K. Joh.] b. *sublepistoides* Zahn.—Linton, Set, no. 38=[*serratifrons* Almq. c. *lepistoides* K. Joh. ed. 10].

1074. *torticeps* Dahlst.—Journ. Bot. xlvii. 14 (1909).

1075. *grandidens* Dahlst.—Journ. Bot. xlvii. 14 (1909).

1076. *exotericum* Jord.—Linton, Set, no. 37 (as *H. pellucidum*). Not infrequent in Surrey, and probably to be found throughout the South of England.

1079. f. *cuneifrons* Ley. I do not think this a good variety. In my experience it is always found in company with the type, and, although extreme forms can readily be distinguished, there are many intermediates.

1082. [*sparsidens* Dahlst.] b. *elatius* Ley.—Journ. Bot. xlviii. 326 (1910).

1086. *Shoolbredi* E. S. Marshall.—Journ. Bot. li. 121 (1913).

1087. *killinense* Zahn, *l. c.* 338 = *H. sylvaticum* Gouan β *micracladium* Williams, Prod. iii. 131 (1901). Linton, Set, no. 17 (pro *H. murorum* v. *micracladium*); Moffat and Killin.

1092. *orithales* E. F. Linton.—Journ. Bot. xlix. 355 (1911).

(Zahn includes as British *acrogymnon* Malm. See Linton, Brit. Hier. 55.)

1102. *Lachenalii* Gmel.—An older name for *H. sciaphilum*, which seems never to have been described by Uechtritz. There is no valid description in Deutsch. Bot. Monatsch. ii. 59 (1884), the reference given in *Index Kewensis* and Linton, Brit. Hier. The name appears to rest on a specimen issued by Baenitz in Herb. Eur. (1887) no. 3032.

The three subspecies which include *H. sciaphilum* and its vars. may be thus distinguished:

1. Involucres and pedicels with glandular hairs only ..... 2.
   Involucres and pedicels with glandular and simple hairs ..... *H. deductum* Sudre.
2. Stem-leaves 4–7, with broad strong teeth; pedicels long ..... *H. Lachenalii* Gmel.
   Stem-leaves 3–5, less strongly toothed; pedicels short ..... *H. chlorophyllum* Jord.

All three are commonly distributed in the South and West of England. The *H. sciaphilum* of Linton's Set (no. 22) is *H. chlorophyllum*.

1107. *deductum* Sudre.—Bull. Ass. Pyr. no. 220 (1898). *H. Jaccardii* Zahn in Dörfler, Herb. Norm. xxxvi. (1898), Sched. p. 186.

1109. *paucifoliatum* Jord.—There is a specimen in Herb. Mus. Brit. (f. *paucifoliata*), collected by the Rev. H. J. Riddelsdell at Radyr, Glamorgan (1911). I have seen it in one or two other places in S. Wales.

1112 b. *pseudodiaphanum* Dahlst. Bidr. iii. (1894) 172: "*Folia* caulina 1–3. *Squamæ* latiusculæ magis acuminatæ interdum pilis solitariis obsitæ, interiores acutæ, exteriores parcissime floccosæ. England!" Zahn, *l. c.* 382.

1118. Var. b. *dædalolepium* Dahlst. has been accidentally omitted.

1123. *stenolepsis* is a printer's error for *stenolepis*.

b. *subbritannicum* Ley.—Journ. Bot. xlvii. 12 (1909).

1124. *scandinaviorum* Zahn in Schinz & Keller, Fl. Schw. ed. 2, 286 (1905).—*H. sylvaticum* Linton, Brit. Hier. 38. *H. murorum* β. Linn. sec. Almq. Stud. (1881) p. xii.

1126. *rectulum* Ley.—Journ. Bot. xlviii. 326 (1910).

1133 e. *crassum* Ley.—Journ. Bot. xlviii. 326 (1910).

1135. Zahn distinguishes *three* varieties, as follows:—

α. *oxyodus* W. R. Lint. in Lint. Brit. Hier. 42 (1905).—*H. aggregatum* v. *prolongatum* Hanb. in Journ. Bot. xxxii. 228 (1894).—*H. stenophyes* v. *oxyodus* Lint. Set (1901), no. 149.

β. *delicatulum* Lint. Brit. Hier. 42 (1905).

γ. *prolongatum* Hanb. *l. c.*; Williams, Prod. 147 (1902).—Linton, no. 110.

1139 b. *policænum* Dahlst.—Not mentioned by Zahn.

1143 b. *subminutidens* Zahn, *l. c.* 450.—Linton, no. 67, *p. p.*: "foliis vix vel breviter paucidentatis." Llanwyrtyd.

1146 b. *plicatiforme* Dahlst.—"Folia caulina 1–3; squamæ latiusculæ parum floccosæ." Linton, no. 113. Mid-Perth.

1151 b. *dentulum* E. F. Linton.—Journ. Bot. xlix. 356 (1911).

c. *angustisquamum* Pugsley.—Journ. Bot. lviii. 284 (1920).

1155 b. *simplex* Ley.—Journ. Bot. xlvii. 50 (1909), as *H. septentrionale* v. *simplex*.

1157. *maculatum* Sm.—More than one plant is certainly included under this designation. Of the specimens I have seen, I think those which most closely resemble Smith's specimen in Herb. Linn. Soc. are some distributed by the B.E.C. from Bill Hill, Wokingham.

1158. *Watsonii* Jord. ex Sudre, Hier. Centr. France, 64 (1902). Should be searched for in the south of England. Sudre and Zahn both give "England" without further locality.

1160. *nigrosetosum* G. Schneid. in Osterr. Bot. Zeit. 1887, 199, pro var.: "*Folia* ±spathulata, sæpe cum caulinis 2–3 ±dentata. *Scapus* superne dense nigrosetosus et longius glandulosus. *Squamæ* aterrimæ. Aberdeen." Zahn, *l. c.* 626.

1178. *subnigrescens* Fr. = *H. atratum*.—Lint. Brit. Hier. 19, *p. p.*?

1182. *Isabellæ* E. S. Marshall.—Journ. Bot. li. 119 (1913),

1185. **pulmonarioides* Vill.—See Journ. Bot. lviii. 281 (1920).

1187. *strictissimum* Froel.—*H. strictum* Fr. Symb. 164, *pro parte*, and Epicr. 121, *pro parte*. Perth and Aberdeen. Zahn, *l. c.* 754.

1189. *lanceolatum* Vill.—Braemar, Zahn, *l. c.* 762.

1192. *subtruncatum* Beeby.—See Journ. Bot. xlvi. 286 (1908).

1204. *gothiciforme* Dahlst.—*H. gothicum* Fr. Symb. 121, *pro parte*, and Epicr. 114, *pro parte*. Forfar. Zahn, *l. c.* 864.

1214. *subgracilipes* Zahn.—Skye. Linton, no. 69, as *H. gothicum*, Zahn, *l. c.* 878.

1217. *Backhouseanum* Zahn.—*H. gothicum* v. *latifolium* Linton, Brit. Hier. 77 (1905); an Backh. Mon. 65 (1896), *pro parte*? Braemar (*Linton*, nos. 70, 96), Forfar, Skye, Caithness, Sutherland. Zahn, *l. c.* 881.

1222 f. *attenuatum* Dahlst., Zahn, *l. c.* 886, as subvar., "densius pilosum, glandulis longioribus." Brecon.

1223. *rubefactum* W. R. Linton.—*H. rigidum* Hartm. v. *rubefactum* in Journ. Bot. xlix. 356 (1911).

1229. *inuloides* Tausch.—"Rakon in Argyle (*Linton*)." Zahn, *l. c.* 897.

1230. *Latobrigorum* Zahn.—*H. auratum* Lint. Brit. Hier. 88, *pro parte*, and exs. no. 99, *pro parte*. *H. corymbosum* Lint. Brit. Hier. 87, *pro parte*. Sutherland, Forfar, Perth (*Linton*, no. 74), Argyle (*Linton*, no. 99, *p. p.*), Inverness (*Linton*, no. 46, pro *H. dovrense*), Caermarthen, Antrim,

b. *pseudauratiforme* Zahn, *l. c.* 899. "Foliis late ovato-lanceolatis utrinque floccosis elevato-nervatis, pedicellis canis vix parcepilosis obscure bracteolatis, squamis subangustis partim acutis, pilis brevibus pareis, stylis luteis" (aureis in *Latobrigorum*). *Kean* (? *Reay*), Caithness (*Miller*).

1232. [*striatum* Tausch.] b. *pseudauratum* Zahn, *l. c.* 901.—*H. auratum* Lint. Brit. Hier. 88, *p. p.*, et exs., no. 99, *p. p.*: "Pedunculis sparsim pilosis et microglandulosis, squamis subdense microglandulosis disperse obscureque pilosis, stylis luteis." Orkney; Pegal Bay, Hoy (*l. c.*); Scotland, N. of Ireland, N. of England.

1236. [*tridentatifolium* Zahn] b. *amplidentatum* F. J. Hanb.—"*H. corymbosum* v. *salicifolium* Linton, no. 122; *H. corymbosum* f. *flocculosa* Williams, Prodr. 174 (1902)." Zahn, *l. c.* 904.

1238. *strictiforme* Zahn, *l. c.* 906.—"A *stricto* differt foliis (rigide pilosis) vix vel obsolete denticulatis, pedunculis ±eglandulosis densiuscule patenti-pilosis, involucris parce microglandulosis subdense pilosis. Pili rigidiusculi diluti basi incrassata obscuri." Linton, no. 73, from Inverey.

1239. *umbellatum* (Linn.) Zahn f. *chlorocephalum* Uechtr. Jersey.
g. *dunense* Reyn. Guernsey.

Section Sabauda.

1. Involucres (and usually peduncles) with long hairs and glands. Stem hairy below and even to the apex. Leaf-margins with micro-glands ..... 2.
   Involucres with short glands and few or no hairs. Stem pilose or glabrescent below, nearly glabrous above. Leaf-margins usually without micro-glands. Peduncles usually epilose and eglandular ..... 4.
2. Involucres (and usually the peduncles as well) with long hairs exceeding the glands in number. Stem often ±epilose above ..... 3.
   Involucres (and often the peduncles) with glands more numerous than the simple hairs, or glandular only. Stem pilose to the top (often very hairy) ..... 1251. *obliquum* Jord.
3. Middle and upper leaves ovate, rounded at the base or slightly cordate, more rarely shortly and broadly ovate-lanceolate; all usually strongly dentate..... 1249. *dumosum* Jord.

   Lower leaves lanceolate, long attenuate to the base, middle ovate-lanceolate, shortly attenuate, sessile; all slightly dentate or nearly entire...1250. [*sedunense* Gremli] b. *perpropinquum* Zahn.
4. Involucres ±glandular with few or no hairs. Peduncles nearly always epilose ..... 5.
   Involucres eglandular ..... 1255. *vagum* Jord.
5. Middle and upper leaves ±broadly rounded at the base, sessile, ovate- or oblong-lanceolate, often large ..... 6.
   Middle leaves attenuate at the base, broadly or narrowly lanceolate elongate, usually with long and acute teeth ..... 1254. *nemorivagum* Jord.
6. Leaves dentate or coarsely serrate..... 1252. *lugdunense* Rouy.
   Leaves nearly entire or shortly mucronate-dentate ..... 1253. *virgultorum* Jord.

1249. *dumosum* Jord.—Robust. Stem smooth in upper part. Leaves rather coarsely dentate. b. *Carionii* Bor. Less robust. Stem often scabrous above. Leaves obsolete-dentate. Valley of the Duddon, Lancs (*Miller*).

1250 *b. perpropinquum* Zahn.—S. of England; common S. of London.

1251. *obliquum* Jord.—*H. boreale* v. *Hervieri*, ed. 10. *H. Hervieri* A. T., belongs to the Section *Italica*.

1252. *H. lugdunense* Rouy.—Very doubtfully British. Has been reported from the N. of Scotland, but probably in error.

1253. *virgultorum* Jord.—Probably the most generally distributed *Sabaudum* form in Britain.

1255. *vagum* Jord.—S. of England.

1256. *Luescheri* Zahn = *boreale* + *vulgatum*.—Rhayader Wells nr. Radnor (*A. Ley*).

1258. *tricholepium* N. P.—Clova.

1262. *latiusculum* N. P.—N. Somerset.

As has already been stated in the preface to the Catalogue, these are not *species*, in the ordinary acceptation of the term, but *subspecies*. The British *species*, as given by Zahn, are:—

1. *H. Mougeotii* Froel. Catalogue numbers 1020–1023.
2. *H. olivaceum* Gren. & Godr. 1024–1026.
3. *H. caledonicum* F. J. Hanb. 1027–1029.
4. *H. proximum* F. J. Hanb. 1030.
5. *H. scoticum* F. J. Hanb. 1031.
6. *H. pallidum* Biv. 1032–1041.
7. *H. præcox* Sch. Bip. 1042–1047.
8. *H. onosmoides* Fr. 1048, 1049.
9. *H. saxifragum* Fr. 1050–1055.
10. *H. Wiesbaurianum* Uechtr. 1056–1061.
11. *H. Sommerfeltii* Lindeb. 1062.
12. *H. norvegicum* Fr. 1063.

13. *H. murorum* Linn. 1064–1088.
14. *H. sagittatum* (Lindeb.) Dahlst. 1089–1099.
15. *H. diaphanoides* Lindeb. 1100, 1101.
16. *H. vulgatum* Fr. 1102–1117.
17. *H. levicaule* Jord. 1118–1122.
18. *H. bifidum* Kit. 1123–1135.
19. *H. cæsium* Fr. 1136–1145.
20. *H. subramosum* Lönn. 1146–1153.
21. *H. angustatum* Lindeb. 1154–1156.
22. *H. maculatum* Sm. 1157, 1158.
23. *H. alpinum* Linn. 1159, 1160.
24. *H. senescens* Backh. 1161, 1162.
25. *H. nigrescens* Willd. 1163–1173.
26. *H. atratum* Fr. 1174–1181.
27. *H. conspurcans* Nörrl. 1182, 1183.
28. *H. amplexicaule* Linn. 1184, 1185.
29. *H. prenanthoides* Vill. 1186–1189.
30. *H. carpathicum* Bess. 1190–1196.
31. *H. protractum* Fr. 1197.
32. *H. demissum* Strömf. 1198, 1199.
33. *H. levigatum* Willd. 1200–1228.
34. *H. inuloides* Tausch. 1229–1238.
35. *H. umbellatum* Linn. 1239, 1240.
36. *H. æstivum* Fr. 1241–1248.
37. *H. sabaudum* Linn. 1249–1255.
38. *H. flagelliferum* Rav. 1256.
39. *H. Peleterianum* Mérat. 1257.
40. *H. pilosella* Linn. 1258–1264.
41. *H. aurantiacum* Linn. 1265, 1266.
42. *H. pratense* Tausch. 1267.

THE ALGÆ OF LEICESTERSHIRE.

By Florence Rich, M.A.

(Continued from p. 273.)

HETEROKONTÆ.

HETEROCOCCALES.

Chlorosaccaceæ.

Mischococcus Näg.

M. confervicola Näg. Narborough district (*Bates*). Croft, growing on filamentous diatoms; very rare, 4.

Stipitococcus W. & G. S. West.

S. urceolatus W. & G. S. West. Growing on filaments of *Zygnema pectinatum* in a partially dried-up pond near Bescaby, 6.

Genus of doubtful position.

Botryococcus Kütz.

B. Braunii Kütz. (*Ineffigiata neglecta* W. & G. S. West). Beacon, 2, 6, 8; channel leading into Colery Reservoir, 7; canal, Oakthorpe, 9.

Chlorotheciaceæ.

Characiopsis Borzi.

C. turgida W. & G. S. West. v.r., Town End Close, 5; Leicester Frith, 5.

Chlorobotrydaceæ.

Chlorobotrys Bohlin.

C. regularis (West) Bohlin. Spring Hill (Victoria County History). Timberwood Hill, 6; Narborough Bog, 5.

Ophiocytiaceæ.

Ophiocytium Näg.

O. arbuscula (A. Br.) Rabenh. Croft, 3, 11; Town End Close, 2.

O. cochleare (Eichw.) A. Br. Bates gives it as not uncommon. I have found it in most months of the year except from August to October (inclusive) and mainly in the basin of the River Soar.

O. elongatum W. & G. S. West. Pond outside Swithland Wood, 5; Misterton, 2.

O. majus Näg. Pool, Misterton, 2.

O. parvulum (Perty) A. Br. Long Clawson, 6.

HETEROTRICHALES.

Tribonemaceæ.

Tribonema Derbès & Solier.

T. bombycina Derb. & Sol. Croft, Narborough, 9–11 (*Bates*). Very widely distributed, together with its forma *minor*; I have found it much more commonly in the earlier part of the year. From February it increases to a maximum in April and May, and is not often found subsequently.

T. tenerrima Gay. Croft, 2 (*Bates*). Scraptoft, 5; nr. Billesdon Coplow, 5; Leicester Frith, 4; Tur Langton, 5.

HETEROSIPHONALES.

Botrydiaceæ.

Botrydium Wallroth.

B. granulatum (L.) Grev. Twycross, 1863 (*Sir Oswald Mosley*), margins of Groby Pool (*Bates*); Birstall, 10 (*Mott*). On mud,

sides of Knipton Reservoir, 9. Mr. A. R. Horwood found it on the sides of Saddington Reservoir in 1914, but could not find it in 1915.

CHRYSOMONADINÆ.

Ochromonadaceæ.

Dinobryon Ehrenb.

D. marchicum Lemm. On *Œdogonium*, *Microspora*, and *Tribonema*, Colery, 6; on *Mougeotia genuflexa* and other plants, Narborough Bog, 11.

D. utriculus Stein var. *pusillum* (Awerinzew) Lemm. Narborough, 5.

D. sertularia Ehrenb. Beacon, 6, 7.

DIATOMALES.

(*a*) Centricæ.

Melosiraceæ.

Melosira Ag.

M. arenaria Moore. Groby Quarry, 6; Belgrave, 2.

M. varians Ag. One of the commonest diatoms in the county. Great quantities found in the River Soar.

M. (*Orthosira*) *orichalcea* (Kütz.) W. Sm. Narborough, 5. Unusual for this part of England.

Coscinodiscaceæ.

Cyclotella Kütz.

C. comta (Ehrenb.) Kütz. Sulby, 7.

C. Kützingiana Thur. North Evington, 7; Sulby, 7.

C. Meneghiniana Kütz. North Evington, 7.

(*b*) Pennatæ.

Fragilarioideæ.

Tabellariaceæ.

Tabellaria Ehrenb.

T. fenestrata Kütz. var. *lacustris* Meister. Beacon, 1, 2, 6, 7, 8, 10.

T. flocculosa Kütz. var. *genuina* Kirchn. Commonly distributed from January to June.

Denticula Kütz.

D. crassula Näg. River Soar, 9.

D. tenuis Kütz. North Evington, 7; Sulby, 7.

Meridionaceæ.

Meridion Ag.

M. circulare Ag. Present in abundance in a piece of water at John o' Gaunt, 1, showing a considerable range in size (length from 28 μ to 57 μ). Sides of Colery Reservoir, 6; Braunstone, 3; Knighton, 4; and other places. There were also present forms intermediate between *M. circulare* and *M. constrictum* Ralfs, though none with the knob-shaped end characteristic of the latter.

Fragilarieæ.

1. Diatomaceæ.

Diatoma DC.

D. elongatum Ag. North Evington, 7; Grace Dieu, 5; nr. Holly Hayes, 5.

Diatoma (*Odontidium*) *hiemale* (Lyngb.) Heib. Eye Brook, 6.

D. vulgare Bory var. *genuina* Grun. In many places scattered through the year.

2. Fragilariaceæ.

Fragilaria (Ralfs) Grun.

F. capucina Desm. Generally distributed. Var. *mesolepta* Rabh. Sulby, 7.

F. (*Staurosira*) *construens* Ehrenb. (*Odontidium tabellaria* W. Sm.). Ulverscroft Lane, 5.

F. crotonensis Kitt. var. *media* Schröter & Vogler. Town End Close, 4.

F. (*Staurosira*) *Harrisonii* W. Sm. Bradgate, 8.

F. mutabilis (W. Sm.) Grun. (*Odontidium mutabile* W. Sm.). Town End Close, 4.

F. virescens Ralfs. Aylestone, 6; Gumley Hall, 5; and many other places.

Synedra Ehrenb.

S. acus (Kütz.) Grun. Town End Close, 4; Smeeton Westerby, 5; pond east of Billesdon, 4.

S. amphirhynchus Ehrenb. Narborough, 5; Braunstone, 3.

S. delicatissima W. Sm. North Evington, 7; Town End Close, 4; Narborough, 4.

S. longissima W. Sm. var. *vulgaris* Meister. Wistow Park, 3; North Evington, 7; Narborough, 5.

S. paludosa Meister. Castle Donington, 4.

S. pulchella Kütz. Sutton Wharf, 6.

S. radians Kütz. Very common, found nearly everywhere.

S. ulna Ehrenb. Also very common.

Var. *æqualis* (Kütz.) Rabenh. Narborough, 4; Bradgate, 8.

Var. *subæqualis* Grun. Town End Close, 4; Braunstone, 3.

S. vitrea Kütz. (This grades into *S. splendens.*) Roadside ditch, Narborough, 4.

ASTERIONELLA Hass.

A. formosa Hass. Filter beds, Cropstone and Thornton Reservoirs (*Bates*). Groby Pool, 6.

3. EUNOTIACEÆ.

EUNOTIA Ehrenb.

E. (*Himantidium*) *arcus* Ehrenb. Dark pool in Buddon Wood, 7, present with many varieties; *e.g.* var. *plicata* J. Br., with a knee-bend, and another with two slight undulations on the ventral margin, 38 μ long, nearly 4 μ wide. Beacon, 7; and other places.

E. (*Himantidium*) *exigua* Bréb. North Evington, 7; Ulverscroft Lane, 5.

E. (*Himantidium*) *gracilis* W. Sm. Ulverscroft Lane, 5.

E. (*Himantidium*) *Veneris* Kütz. (*Eunotia incisa* Greg.). This and the two preceding species grade into one another. Buddon Wood, 7.

E. lunaris Grun. Common all over the county.

Var. *sub-arcuata* Grun. Castle Donington, 4.

Var. *excisa* Grun. Same locality.

There was also present in the trough at Castle Donington a bent form which showed many variations; frequently the bending resulted in an asymmetric form of the valve. Amongst these were found some of the freaks depicted by Mayer *, viz. *E. lunaris* lusus *bilunaris* and lusus *serpentina.*

E. paludosa Grun. (*E. gracilis* W. Sm.). Colery Reservoir, 6.

E. pectinalis Kütz. A common diatom of very variable form. In addition to the type, the following varieties occur:—

Var. *genuina* f. *curta* Mayer, Croft, 5.

Var. *minor* Kütz. Croft, 5.

Var. *media* O. M. Bradgate, 8.

Var. *ventralis* Mayer. Croft, 5.

Forma *ventricosa* Mayer. Gumley Hall, 5.

In this pond there are two other forms of *E. pectinalis* var. *ventralis* that do not correspond to any of the numerous figures given by Mayer (*loc. cit.*). He depicts all his forms of this variety (that has a ventral inflation) with straight dorsal margins, whereas many of the individuals here present have the dorsal margin curved. Then there is another form (also present in the Croft sample) which has both sides parallel (save for median inflation) and straight.

E. prærupta Ehrenb. var. *curta* Grun. Croft, 5.

E. Soleirolii Rabenh. Buddon Wood, 7; High Sharpley, 5.

* A. Mayer, "Die bayerischen Eunotien," *Kryptogamische Forschungen*, Munich, 1918.

ACHNANTHOIDEÆ.

ACHNANTHACEÆ.

ACHNANTHES Bory.

A. (*Microneis*) *Biasolettiana* Kütz. Wistow Park, 3.

A. (*Microneis*) *hungarica* Grun. *Ibid.*

A. (*Microneis*) *linearis* W. Sm. Aylestone, 6; Braunstone, 3; Sutton Wharf, 6.

A. (*Microneis*) *microcephala* Kütz. Narborough, 4.

A. (*Achnanthidium*) *coarctata* Bréb. Tank, Newbold, 10.

A. (*Achnanthidium*) *lanceolatum* Bréb.

Quite a common diatom. North Evington, 7; Narborough, 5; Castle Donington, 4; John o' Gaunt, 1; and other places.

Var. *Haynaldi* Cl. Town End Close, 4.

Var. *dubium* Grun. Narborough, 4.

Also a very small form, 8 $\mu \times 3\,\mu$, still showing the horseshoe mark.

COCCONEIS Ehrenb.

C. pediculus Ehrenb. Very common.

C. placentula Ehrenb. Also very common.

Var. *lineata* V. H. Belgrave, 2, together with type.

RHOICOSPHENIA Grun.

R. curvata (Kütz.) Grun. One of the commonest diatoms, widely distributed.

NAVICULOIDEÆ.

NAVICULACEÆ.

NAVICULA Bory.

N. (*Diploneis*) *elliptica* Cl. Aylestone, 6; Town End Close, 4; Blackbrook Reservoir, 5.

N. (*Neidium*) *affinis* Ehrenb. var. *undulata* Grun. North Evington, 7.

N. (*Neidium*) *amphirhynchus* (Ehrenb.) Pfitzer. Braunstone, 3.

Var. *majus* (Cl.) Meister. Pool, Old Parks, Ashby, 2.

N. (*Caloneis*) *amphisbæna* Bory. Waltham, 6; Bradgate Park, 8.

N. (*Caloneis*) *silicula* Ehrenb. (*N. limosa*). Aylestone, 6; Narborough, 5; Sulby, 7.

Var. *cuneata* Meister. Aylestone, 6.

N. (*Anomoioneis*) *sphærophora* Kütz. Narborough, 5; Braunstone, 3; Scraptoft, 4; Gumley Hall, 5.

N. (*Frustulia*) *vulgaris* Thwaites. Stream at Knighton, 4; River Soar, 9.

N. (*Amphipleura*) *pellucida* Kütz. North Evington, 7.

N. anglica Ralfs var. *minuta* Cl. Stream, Packington, 9.

N. cuspidata Kütz. Pool near Swithland Reservoir, 6; Belgrave, 6.

Var. *primigena* Dippel. Braunstone, 3; River Soar, 9.

N. dicephala W. Sm. Old Parks, Ashby, 2.

N. gracilis Ehrenb. Wistow Park, 3.

Var. *acuminata* J. Brun. North Evington, 7; Braunstone, 3; Sulby, 7.

N. hungarica Grun. var. *capitata* Ehrenb. Town End Close, 4; Old Parks, Ashby, 2; Braunstone, 3; Tur Langton, 5.

N. lanceolata Kütz. Wistow Park, 3; Waltham, 6.

N. oblonga Kütz. Aylestone, 6; Narborough, 5.

N. producta W. Sm. Narborough Bog, 11; near Newtown Harcourt, 4.

N. pusilla W. Sm. Narborough Bog, 5.

N. radiosa Kütz. var. *genuina* Grun. Aylestone, 6; Braunstone, 3; stream, Knighton, 4, and elsewhere.

N. rhyncocephala Kütz. A very variable species. Wistow Park, 3; Braunstone, 3.

N. viridula Kütz. John o' Gaunt, 1.

Pinnularia Ehrenb.

P. borealis Ehrenb. Croft, 7.

P. Brebissonii Rabenh. var. *genuina* O. M. Ratcliffe-on-the-Wreake, 3; Castle Donington, 4; Scraptoft, 4.

P. dactylus Ehrenb. Beacon, 10.

P. lata Bréb. Some individuals show a slight median enlargement—a not unusual feature of this species. Pond, south of Colery Reservoir, 7; Spring Hill, 4.

Var. *curta* Grun. Spring Hill, 4.

P. major Rabenh. Lea Lane, 4; Colery, 6; Buddon Wood, 7; Narborough Bog, 5.

Var. *paludosa* Meister. Aylestone, 6.

Var. *lacustris* Meister. Aylestone, 6; Beacon, 10.

P. mesolepta Ehrenb. Lea Lane, 4; Little Dalby, 3; John o' Gaunt, 1; Leicester Frith, 6.

Var. *stauroneiformis* Grun. Cow pond, High Tor, 6.

P. nobilis Ehrenb. Buddon Wood, 7; Wistow Park, 3; Beacon, 9, 10; Colery, 6.

P. stauroptera Grun. Var *semi-cruciata* Cl. Beacon, 7, 10.

P. sub-capitata Greg. var. *sub-undulata* O. M. Colery, 6; Beacon, 7, 10.

P. sub-solaris (Grun.) Cl. Old Parks, Ashby, 2.

P. viridis Ehrenb. var. *Clevei* Meister. Widely distributed.

Var. *elliptica* Meister. Waltham, 6.

Var. *fallax* Cl. High Tor, 6; Colery, 6.

Stauroneis Ehrenb.

S. anceps Ehrenb. var. *birostris* (Ehrenb.) Cl. Near Allexton, 4.

Var. *elongata* Cl. Braunstone, 3; Scraptoft, 4.

Var. *gracilis* Ehrenb. Packington, 9; Timberwood Hill, 6.

S. phœnicenteron Ehrenb. Gumley Hall, 5; Packington, 9; Leicester Frith, 5.

Var. *amphilepta* (Ehrenb.) Cl. Scraptoft, 4.

Pleurostauron Rabenh.

P. Smithii Grun. North Evington, 7; Castle Donington, 4; Waltham, 6.

Gyrosigma Hass.

G. acuminatum Kütz. Wistow Park, 3; Waltham, 6; Sulby, 7; and other places.

G. attenuatum Kütz. North Evington, 7; Braunstone, 3; and other places.

Gomphonemaceæ.

Gomphonema Ag.

G. acuminatum Ehrenb. Widely distributed.

Var. *Brebissonii* Grun. Castle Donington, 4.

G. angustatum Kütz. Knighton, 4; Scraptoft, 4; John o' Gaunt, 1.

G. Augur Ehrenb. Aylestone, 5.

G. capitatum Ehrenb. Castle Donington, 4.

G. constrictum Ehrenb. Very commonly found.

G. gracile Ehrenb. Boggy patch, Saltby, 6.

G. intricatum Kütz. North Evington, 7.

G. olivaceum Kütz. Wistow Park, 3; Braunstone, 3; Sutton Wharf, 6.

Var. *tenella* Kütz. Wistow Park, 3.

Cymbellaceæ.

Cymbella Ag.

C. affinis Kütz. Sulby Reservoir, 7.

C. amphicephala Näg. North Evington, 7; Old Parks, Ashby, 2; near Saltby, 6.

C. (*Cocconema*) *aspera* Ehrenb. (*C. gastroides* Kütz.). Very common in a pond near Billesdon Coplow, 5.

C. (*Cocconema*) *cistula* Hempr. Sulby Reservoir, 7.

Var. *insignis* also present here.

C. (*Encyonema*) *gracilis* Rabenh. Beacon, 7,

C. helvetica Kütz. Wistow Park, 3; North Evington, 7; near Billesdon Coplow, 5.

C. (*Encyonema*) *lacustris* Ag. Town End Close, 4; River Soar, 9.

C. (*Cocconema*) *lanceolata* Ehrenb. Wistow Park, 3; Sulby, 7; and other places.

C. (*Encyonema*) *prostrata* Berk. Sulby, 7.

C. (*Encyonema*) *ventricosa* Kütz. Sulby, 7.

Var. *lunula* Meister. Braunstone, 3; Ratcliffe-on-the-Wreake, 3; Castle Donington, 4.

AMPHORA Ehrenb.

A. ovalis Kütz. var. *typica* Cl. Common all over the county.

Var. *lybica* (Ehrenb.) Mueller. Scraptoft, 4.

Var. *pediculus* Kütz. Town End Close, 6; Old Parks, Ashby, epiphytic on *Nitzschia sigmoidea*.

(To be continued.)

THE PHYLOGENY OF VIOLACEÆ.

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

THE following is an abstract of a paper by H. Melchior (Fedde, Repert. Sp. Nov. Beihefte, Bd. xxxvi. 83–125 (1925), on the phylogenetic development of the Violaceæ and the affinities of the genera.

In considering the classification and phylogenetic development of the Violaceæ, it must be borne in mind that a false idea of the family is given by the study of the forms of our own latitudes, for the family is tropical and subtropical and the centre of development was doubtless in those regions. The genus *Viola* and a few representatives of some of the other genera must be regarded as outposts.

In general, there have been two main systems of classification in use. Gingins (Mem. Soc. Phys. et Hist. Nat. ii. 1 (1823)), extending the ideas of R. Brown (in Tuckey, Congo, 449 (1818)), divided them into: i. *Violeæ*: Petals unequal; ii. *Alsodineæ*: Petals equal; and this was followed by De Candolle, Lindley, and others, the genera *Anchietea*, *Schweiggeria*, *Amphirrhox*, and *Paypayrola* being added to the *Violeæ*. Bentham (Gen. Plant. i. 114 (1862)) recognised three groups, distinguishing the *Paypayroleæ* from the *Alsodeieæ* by the tube-like formation of the approximated claws of the petals. In spite of objections raised by Eichler (Martius, Fl. Brasil. xiii. 1, 375 (1871)) that there are transitions between the *Alsodeieæ* and the *Paypayroleæ* of Bentham in the length of the claws and in the shape of the petals, Reiche and Taubert in the Nat. Pflanzenfam. (iii. 6, 322 (1895)) followed Bentham except that the *Violeæ* were placed at the end, as derived forms, while the *Paypayroleæ* formed the beginning.

There are three questions of main importance: (1) which genus is to be considered most primitive and is thus to be placed at the commencement of the classification; (2) whether the phylogenetic development of the family can be made out from existing relationships; (3) whether the objections raised by Eichler are justified and thus whether the two-division classification is better than the three-division method of Bentham, Reiche, and Taubert.

Separate consideration of the various organs of the flower in the different genera shows that certain developmental progressions can be traced. The genera may then be placed according to the grade which they have reached in the progression. The underlying idea is that the family shows a gradual transition from actinomorphy to zygomorphy, and this is brought out in each of the progressions dealt with. The shape and arrangement of the petals may be considered as an example of the method followed.

Grade I. Petals similar and radial: *Rinorea*, *Allexis*, *Glœospermum*, *Isodendrion*, *Melicytus*, *Hymenanthera*.

Grade II. Anterior petal plicate in the middle line, apex rounded and up to double as broad as in the others: *Amphirrhox*, *Paypayrola*. To this weakly zygomorphic class belongs one species of *Rinorea*—*R. longisepala*, whose unpaired petal has a spoon-shaped point.

Grade III. Anterior petal often much larger with broadened tip and narrowed and grooved base. Lateral petals generally larger than the posterior ones: *Hybanthus*, *Agatea*.

Grade IV. Base of the unpaired petal forming a longer or shorter spur: *Anchietea*, *Corynostylis*, *Schweiggeria*, *Noisettia*, *Viola*.

Similar progressions from actinomorphy to zygomorphy are worked out in the Calyx, Androecium, Gynæcium, etc., and the following table shows the grades reached by the various genera in these particulars:—

		Calyx.	Corolla.	Androec.	Gynæc.
RINOREÆ.	*Rinorea*	I.	I. (II.)	I.–II.	I.–III.
	Allexis	I.	I.	I.	I.
	Glœospermum	I.	I.	I.	I.
	Melicytus	I.	I.	I.	I.
	Hymenanthera	I.	I.	I.	I.
	Isodendrion	I.	I.	I.	III.
	Amphirrhox	I.	II.	I.	I.
	Paypayrola	I.	II.	I.	III.
VIOLOIDEÆ.	*Hybanthus*	II.	III.	III.	III.–IV.
	Agatea	II.	III.	III.	IV.
	Anchietea	II.	IV.	IV.	IV.
	Corynostylis	III.	IV.	IV.	IV.
	Schweiggeria	IV.	IV.	IV.	V.
	Noisettia	V.	IV.	IV.	V.
	Viola	V.	IV.	III.–IV.	III.–VII.

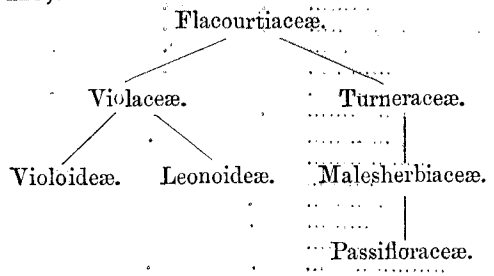
The table shows fairly clearly that there is a natural two-fold division, which should be adopted in preference to the three-division classification.

Rinorea is considered to be the most primitive of the living Violaceæ, not only because of its floral characteristics but because of the labile nature of the conformation of the floral whorls, particularly the androecium, and its wide distribution in the tropical parts of America, Asia, and its presence in Madagascar and New Guinea.

The Violaceæ, within their present limits, are undoubtedly a natural family, characterized, in contradistinction to the rest of the Parietales, by strong fixation of the numerical relationships of the floral whorls and by the absence of oil-glands, resin-canals, and extra-epidermal mucilage cells.

The generalized type from which the Violaceæ may have descended had, doubtless, bisexual, radial, tetracyclic, heterochlamydeous flowers with hypogynous insertion of the parts, and pentamerous calyx and corolla with free, spirally arranged sepals and petals, the latter being undifferentiated into limb and claw. The haplostemonous androecium was isomerous and with nothing in the nature of nectaries borne on the filaments, although there was perhaps already a small subulate appendage at the apex of the connective. As there are no staminodes, there is no evidence of a second whorl of stamens. The structure of the gynæcium is less certain, but it was doubtless unilocular with numerous ovules on the parietal placentæ. In most living genera there are three carpels, but in *Melicytus*, *Hymenanthera*, and *Leonia* there are from five to two, so that the original number was probably five, which has been reduced in most instances to three. Gerbault (Bull. Soc. Bot. Fr. lxix. 536 (1922)) has described several anomalies in species of *Viola* with four to five carpels, but never with more than five. Unfortunately, such observations are lacking for *Rinorea*.

Engler (*cf.* Nat. Pflanzenfam. Nachtr. 352 (1897)) placed the family in the subseries Flacourtiineæ of the Parietales, and Reiche and Taubert were also of this opinion. The family must have descended from a group with actinomorphic flowers, and so cannot be related to the Polygalaceæ, as has been sometimes suggested, and the author considers them to be related rather to the Flacourtiaceæ than to the Resedaceæ, near to which they are placed by Hutchinson (Kew Bull. 1924, 123).



The genus *Leonia* is placed in a subfamily, the Leonoideæ, because, though related to *Paypayrola* by the similarity of the androecium, it differs from all the Violaceæ in the quincuncial or irregular vernation of the petals in the bud; the anthers sunk in the

edge of the filament-tube and opening at the apex (half-extrorse); the peculiar irregularly-shaped nut-like fruit with an almost woody testa and with seeds embedded in a mucilaginous pulp. These characters, however, can be derived from the hypothetical generalized type described above, and the genus may therefore be regarded as a small side-branch of the main Violaceæ stem, which diverged very early.

The following is an outline of the classification suggested:—

Subfamily I. Violoideæ.

Tribe 1. Rinoreæ.

Subtribe *a*. Rinoreinæ: *Rinorea, Allaxis, Glæospermum.*
b. Hymenantherinæ: *Melicytus, Hymenanthera.*
c. Isodendriinæ: *Isodendrion.*
d. Paypayrolinæ: *Amphirrhox, Paypayrola.*

Tribe 2. Violeæ.

Subtribe *a*. Hybanthinæ: *Hybanthus, Agatea.*
b. Violinæ: *Anchietea, Corynostylis, Schweigeria, Noisettia, Viola.*

Subfamily II. Leonoideæ: *Leonia.*

OBITUARIES.

Francis Darwin
(1848–1925).

The death of Sir Francis Darwin at Cambridge on September 19 removed a very real link with Charles Darwin and the work, especially on the botanical side, of the great naturalist. Francis Darwin was the third son of Charles and Emma Darwin, and was born at Down. He was educated at the Clapham Grammar School and at Trinity College, Cambridge, gaining a first class in the Natural Sciences Tripos in 1870. After completing his medical work at St. George's Hospital, he spent eight years at Down as his father's assistant and secretary, and his name appears on the title-page of the *Movements of Plants* (1880). On the death of his father, he returned to Cambridge, where for twenty years he was associated with the School of Botany in the University, first as University Lecturer (1884–1888) and later as University Reader (1888–1904); from 1892–95 he acted as deputy to Professor Charles Babington. The School of Plant-physiology in Cambridge is the outcome of the teaching and research which he initiated, and Cambridge men who had the privilege of attending his courses will endorse the appreciation of the writer in *The Times* of September 21, which we take the liberty of quoting: "The students who attended his classes felt a deep affection for the teacher who, though not an eloquent or showy lecturer, attracted them by his personality and a modesty which in its sincerity came almost as a shock to the beginner unaccustomed to hear his seniors admit their own ignorance. It was always a pleasure to remain behind after a

lecture to ask for help in difficulties; one knew that he would be sympathetic and encouraging; all were made to feel that they were rather fellow-students than beginners asking stupid questions." An outcome of this teaching was a handbook published in collaboration with one of his first pupils, the late E. H. Acton, on the *Practical Physiology of Plants* (1894). The *Elements of Botany* (1895) is a remarkably clear introduction to the science, written on physiological lines, and was the outcome of the course on "Elementary Botany," which he gave during his Readership. After resigning the Readership he lived for a short time in London, making the newly-installed laboratory at the "Chelsea Physick Garden" his headquarters, but he soon returned to Cambridge and the University laboratory, and in 1898 transferred his father's scientific library to the Botany School.

Francis Darwin's published work in plant-physiology related to the movements of plants, a continuation of the work in which he was associated with his father, and bearing especially on the localization of sense-organs; and to the mechanism of transpiration. The latter included an exhaustive study of the movements of stomata, the results of which were published by the Royal Society (Phil. Trans. 1898). His best-known work is the *Life and Letters of Charles Darwin* (1887), which has been described as one of the best biographies ever written. It was supplemented in 1903 by *More Letters of Charles Darwin*, in two volumes.

Francis Darwin was elected to the Fellowship of the Royal Society in 1882, and served as Foreign Secretary 1903–07; in 1912 he was awarded the Darwin Medal. He received honorary degrees from many British and European universities, and was knighted in 1913. He was President of the Botanical Section of the British Association at the Cambridge Meeting in 1904, and was President of the Association at Dublin in 1908, the third botanist to hold that distinguished position—his predecessor was Joseph Dalton Hooker in 1868. In 1891 he had presided over the joint section Biology. On his return to Cambridge after his father's death he was elected a Fellow of Christ's College, and subsequently an Honorary Fellow.

To quote again from the notice to which we have already referred: "He was a keen musician and particularly interested in old instruments and in anything connected with old village customs. He had a strong sense of humour, and expressed his opinions of people with a refreshing directness; he was essentially human in his prejudices. Intolerant of all forms of insincerity, he was a staunch friend to those in trouble, and would always use his influence on the side of leniency; he would go out of his way to praise the work or actions of others, especially young men; never ashamed to show affection, he endeared himself in an unusual degree to those, whether his social equals or not, who had the privilege of knowing him well."

He was thrice married, and survived his third wife by a few years; he leaves a daughter and one son, Major Bernard Darwin.

James Sykes Gamble

(1847–1925).

The recent death of Sir William Schlich, at Oxford, at the advanced age of eighty-five, removed a most distinguished organizer and administrator of Indian forestry, who at the close of an eminently successful official life was selected to organise the School of Forestry at Oxford. His friend and fellow-worker James Gamble also spent his official life in the Indian Forest Service, but more on the practical side. Gamble was born in London in 1847, the second son of Dr. Harpur Gamble, R.N. He was educated at the old Royal Naval School at New Cross (which later became a Polytechnic) and at Magdalen College, Oxford, where he took a first class in Mathematics. After practical training at the Ecole Nationale des Eaux et Forêts at Nancy, he went to India in 1871. He served in British Burmah, Bengal, and, after reaching the grade of Conservator in 1882, in the Madras Presidency. In 1890 he was appointed Director of the Imperial Forest School at Dehra Dun, U.P.; he retired in 1899. His most important contribution to Indian forest literature was the *Manual of Indian Timbers*, published in 1881, with revised editions in 1902 and 1922. Gamble was a good botanist, as well as a forester, and his *Monograph of the Bambuseæ of British India*, published in the *Annals of the Royal Botanic Gardens, Calcutta* (1896), declared him the recognised authority on a very difficult group. He continued his floristic work after his retirement, and collaborated with the late Sir George King on *Materials for a Flora of the Malay Peninsula*, which he continued after King's death. He also monographed the Bamboos of the Philippine Islands. In 1915 he published the first part of a handy *Flora of the Madras Presidency*; his death has interrupted the work, of which six parts comprising the polypetalous and gamopetalous dicotyledons have been issued. He was also associated with the Oxford School of Forestry as examiner and lecturer in Indian forest-botany. He was elected F.R.S. in 1899, and in the same year received the C.I.E.; he had been F.L.S. since 1877. He died after a very short illness at his home at East Liss, Hampshire, on October 16, and is survived by his wife, whom he married in 1911.

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

The Genus Thymus ("Beiträge zur Kenntnis der Gattung *Thymus*," Fedde, *Repertorium specierum novarum regni vegetabilis*, xx. pp. 321–332, October 1924).—K. Ronniger enumerates the British species, forms, and hybrids, with descriptions and notes on the distribution of each. The various forms of *Thymus* may roughly be divided thus:—

A. *Thymus pulegioides* L. in a broad sense.
B. *Thymus Serpyllum* L. in a broad sense.

The distinctive features of each form are set out in a key as follows (an idea of the distribution is given in brackets after each) :—

I. Leaves thin, always glabrous, nerves not prominent below; plants not repent; flowering stem hairy on the angles (in 2 or 4 rows).—*T. pulegioides* L., sens. lat.

A. Suberect. Stem usually rather tall, 20–25 cm. high. Leaves comparatively large, averaging 9 mm. long, 5 mm. broad. Inflorescence as a rule elongate, interrupted, the lowest whorls distant.—*T. pulegioides* L., sens. str. (*T. ovatus* Mill.).
Not common in England—Southern counties; Gloucester; Stafford, etc.

B. Pseudorepent. Stem shorter, thinner, usually only 0·5 mm. thick. Leaves smaller, averaging 6–8 mm. long, 3–4 mm. broad. Inflorescence at flowering time usually capituliform, but also often elongate with lowest whorls distant, especially at fruiting-time.—*T. glaber* Mill. (*T. Chamædrys* Fr.).
Widely spread in England; also at Lerwick, Shetland.
f. *verticillatus* Lge.—Oxon and S. Essex.
f. *gracilicaulis* Ronn.—Herts; Is. of Wight; Middlesex.

II. Leaves rather thick, rigid, small; nerves prominent below, smooth or hairy. Repent plants. Inflorescence almost always capituliform.—*T. Serpyllum* L., sens. lat.

A. Flowering stem hairy all round.
1. Leaves glabrous or with short sparse hairs on the upper surface.—*T. Serpyllum* L., sens. str.
Not common in England; chiefly occurs in the South, but reaches Ben Lomond and Galway in the North.
a. Leaves elongate-elliptical, 2–2·5 mm. broad. Typical form (var. *Linnæanus* Gren. & Godr.). Internodes very short.—Var. *ericoides* Wimm. & Grab. (*non* Borbas). Forfar.
Top of flower-stem spreading villose.—Var. *rigidus* Wimm. & Grab. Kincardine.
b. Leaves obovate or elliptic, 3–4 mm. broad.—Var. *silvicola* Wimm. & Grab.
2. Leaves hairy above.
a. Hairs on leaves fairly dense; flower-stem shortly hairy, the topmost internode somewhat longer hirsute.—*T. pycnotrichus* (Uechtr.). Southern counties and Midlands; Scotland; Belfast.
b. Whole plant densely grey-villose; hairs on stem, at least on the upper node, as long as the stem is thick.—*T. lanuginosus* Mill. Sapperton, Gloucester; Snowdon.

B. Flowering stem hairy on the angles (two alternate sides glabrous).
1. Inflorescence large, the hermaphrodite reaching 1·5–2 cm. in thickness. Leaves obovate-elliptic, comparatively large, on average 5–8 mm. long, 3–3·5 mm. broad, usually thinly hairy on the surface, more seldom almost glabrous.—*T. Drucei* Ronn. Gloucester and Carnarvon; Scotland.

2. Inflorescence medium-sized, the hermaphrodite at most 1·5 cm. broad. Leaves smaller and narrower, usually only 1·5–3 mm. broad.
a. Leaves glabrous or with only very sparse hairs above.—*T. neglectus* Ronn.
Widely spread in England and Scotland; Co. Kerry, Ireland.
b. Leaves hairy above.—*T. britannicus* Ronn.
Widely spread in England and Scotland; also occurs in Ireland.

Hybrids.

pulegioides × *Serpyllum* (*T. Čelakovskyanus* M. Schulze in Mitt. Bot. Ver. Jena, viii. 39, 1890).—Kew; Norfolk; Perth.
pulegioides × *pycnotrichus* (*T. Henryi* Ronn.).—Sussex; Merioneth; Wigton.
pulegioides × *vulgaris*.—Only cultivated in England.

Scandinavian Species of Betula (*Monografi över Skaninaviens Betulæ*, med 32 Planscher, Av. J. G. Gunnarsson, Arlöv, 1925).—The author gives a careful revision of the Scandinavian species of *Betula* with their numerous complicated hybrids. The work is written in Swedish, but there is a summary in German. A key is given of the seven species of *Betula* occurring in Scandinavia, among which are the three British species—*B. verrucosa* Ehrh., *B. pubescens* Ehrh., and *B. nana* L.

Perhaps the greatest value of the revision to students in this country will be the description of various hybrids:—*B. nana* × *pubescens* Gunnarss. with four forms: *subnana* Gunnarss., *intermedia* Gunnarss., *subpubescens* Gunnarss., and *cuneata* Gunnarss. *B. nana* × *pubescens*, f. *parvifolia* Gunnarss. *B. nana* × *verrucosa* Gunnarss. with three forms: *subnana* Gunnarss., *intermedia* Gunnarss., *intermedia* Gunnarss., and *subverrucosa* Gunnarss. *B. nana* × *pubescens* × *verrucosa* Gunnarss.

As already mentioned, the work, a copy of which is in the Department of Botany, British Museum, is illustrated by thirty-two plates.

E. G. B. & C. E. S.

Saxifraga Geum, S. umbrosa, S. cuneifolia (*The Garden*, July 4th).—Dr. R. Lloyd Praeger discusses the distribution and distinctness of these three Robertsonian Saxifrages. As regards the two former, he says: "Both easily run wild, and having been for a long time in cultivation throughout the greater part of Europe, they have often been recorded as native, where they are only naturalised. I suspect that all the records from Central Europe—Germany, Switzerland, Austria—belong to this category (though Austrian botanists consider *S. umbrosa* native in ravines near Ternberg); certainly the records from England, Scotland, and Northern Ireland are inadmissible."

Small drawings are given of the leaf-shape of the various varieties of the three species and of their hybrids, which are numerous.

C. E. S. & E. G. B.

"VARIATION OF LEAF FORM IN POTAMOGETON PERFOLIATUS" (*New Phytologist*, May 1925).—W. H. Pearsall and Alice M. Hanby give an account of some experiments carried out with a view to finding the chief causes of this variation. They grew plants of *Potamogeton perfoliatus* in tanks under various light intensities and in culture media containing excess of calcium and excess of potassium. From the results of these experiments, they have come to the conclusion that the extreme variability of leaf-form in this plant is due to variations under natural conditions of (1) the light intensity and duration; (2) the calcium-content of the soil; (3) the ratio of potassium to the calcium in the soil if little calcium is present—a low light intensity and excess of potassium being associated with the production of narrow leaves and longer internodes, while excess of calcium leads to the production of broader leaves and shorter internodes. The broad-leaved form is thus clearly shown to be a plant of calcareous soil. The calcium apparently acts by accelerating cell-division and retarding all elongation. D. POWELL.

NEW COUNTY RECORDS (*The Naturalist*, March 1925).—The discovery of *Veronica hybrida* L. is reported at Moughton Scar, Mid-West Yorkshire (v.c. 64) by Mr. W. K. Mattinson, and in the same journal (July, p. 213) *Hippocrepis comosa* L. is recorded from Langton Wold, South-East Yorkshire (v.c. 61), by Miss G. F. Purchas. The former appears to be an interesting addition to Yorkshire as a whole; the latter lacks any personal authority for this vice-county in Watson's Top. Bot. C. E. S. & E. G. B.

FLORA OF BOURNEMOUTH.—The Rev. E. F. Linton has recently issued a second Appendix (price 2*s.* 3*d.*) to his *Flora of Bournemouth*. The first was included in the re-issue of his *Flora* in 1919, and in the present Supplement the pages are numbered (303–326) to follow on from the first and are similar in typography. It would have been interesting if the additional species and varieties (of which there seem to be several) had been indicated in some way: *Erodium neglectum*, *Geum intermedium*, and *Carum verticillatum* were not included in the former issues. Should not the records for *Utricularia intermedia* be placed under *U. ochroleuca* Hartm.? We have specimens from Talbot Heath, Dorset, which are undoubtedly the latter.
C. E. S. & E. G. B.

LIST OF PLANTS GROWING IN THE GROUNDS OF CAMPBELL COLLEGE, BELFAST.—The list has been compiled by S. A. Bennett and C. D. Chase, gradually year by year, with the help of the boys of the College. The ground covers 70 acres, and the list includes about 240 flowering plants, 10 ferns and horsetails, and 32 mosses. Introduced plants are indicated by an *. The arrangement is that of the *London Catalogue* and Dixon's *Handbook of Mosses*.

NOTES ON BRITISH PLANTS.

SUBULARIA AQUATICA IN MERIONETH.—This species has been known as a frequent constituent of the lakes of Carnarvonshire and Anglesey, but it has not so far been recorded for the county of Merioneth (v.c. 48). This summer it was found in small quantities in two lakes in this county: in Llyn Bodlyn, near Barmouth, a few plants were seen flowering at the end of July, and on July 31 it was found fruiting in the remote lake, Llyn Perfeddau.—N. WOODHEAD.

POLYGONUM DUMETORUM IN THE ISLE OF WIGHT.—It is unusual to find, in such a well-worked area as v.c. 10, a very distinct native flowering plant not already recorded. It seems therefore worth while to mention that during an excursion of the I.W. Nat. Hist. Society in September of the present year we came upon this graceful climber growing in fair quantity in a coppice, on the Lower Greensand, near Alverstone.—JAMES GROVES.

POTAMOGETON: OMISSIONS FROM LONDON CATALOGUE, ed. 11.—(1) *Potamogeton crispus* × *alpinus*.— × *P. venustus* Baagoe in Actes 1er Congrès Botan. 516 (1900); *P. crispus* × *alpinus* Baagoe in litt. et spec.; *P. Baagoei* Ar. Benn. ap. Graebner, Potamogetonaceæ in Engl. Pflanzenreich. 132 (1909), nomen.

This was sent to me by Mr. Matthews, collected by him and Mr. Barclay in the "River Earn, near Drumming, Mid-Perth, Aug. 1915." I have it also from the River Ythau above Ellon, Aberdeenshire. 1.8.1900. Dr. Trail. It is on record for two stations in Denmark only.

(2) *P. pusillus* L. var. *lacustris* Pearsall.—A. BENNETT.

SOME NOTES ON THE FLORA OF KENT.—*Lathyrus maritimus* Bigel.—I found a small patch of this plant at Hythe. As the public are not allowed on the rifle-ranges, except on Sundays, the area has not recently been much explored botanically. I do not remember ever having seen a record for this locality. I also found the plant at Kingsdown.

Orobanche caryophyllacea Sm.—I found two plants of this *Orobanche* in Folkestone Warren—a locality in which local botanists had almost given it up as lost.

Teucrium Botrys L.—Mr. John Jacob, of Dover, sent me specimens of this from a field near Crundale, East Kent, where it was fairly abundant. The plants agreed well with specimens I had taken from Box Hill, Selsdon, and Chipstead—the Surrey localities. Hanbury and Marshall suggested in their *Flora* that *Teucrium Botrys* would probably be found in other districts in Kent besides Upper Halling. It seems strange that such a distinct plant should have been overlooked at Crundale for so long.

During a short stay at Folkestone I also noticed—

Dungeness.—*Vicia lutea* L. (abundant by ponds), *Potentilla palustris* Scop., *Ranunculus Lingua* L., *Scirpus Tabernæmontani* Gmel., *Teesdalia nudicaulis* Br., and *Typha angustifolia* L.

Folkestone.—*Ophrys arachnites* Lam. (three colonies on the chalk by Cæsar's Camp).

Dover Cliffs.—*Brassica oleracea* L., *Crambe maritima* L., *Silene nutans* L., *Sagina maritima* G. Don, and *Rubia peregrina* L. *Lavatera arborea* L. was growing by Shakespeare's Cliff, where it has grown for many years.

Deal Sandhills.—*Erodium neglectum* Bak. & Salmon, *Silene conica* L., *Juncus acutus* L., and *Euphorbia Paralias* L. *Melilotus alba* and *arvensis* were growing near houses.

St. Margaret's Bay.—*Papaver hybridum* L. and *Poterium polygamum* W. & K.

Ham Ponds.—*Orchis incarnata* L., *O. prætermissa* Druce, *O. latifolia* L., and *O. Fuchsii* Druce: also the hybrids *O. maculata* × *O. prætermissa*, *O. latifolia* × *incarnata* (*O. Aschersoniana*), *O. prætermissa* × *incarnata*, *O. latifolia* × *O. prætermissa*. (All these were checked when fresh by my friend Mr. C. B. Tahourdin.)—J. E. Lousley.

SHORT NOTES.

Persistence of Plants in Unglaciated Areas of Boreal America.—The detailed study, during the present century, of the flora of alpine regions in that part of North America to the north-east of New England has shown that a great many of the plants have very remarkable geographical affinities. Most striking of all is the occurrence of a large group of forms, many endemic, identical with or closely related to species and varieties to be found elsewhere only in the western Cordilleras or, more rarely, in parts of continental Asia. In eastern America these plants have a very local distribution, and are confined almost exclusively to parts of the Gaspe Peninsula, the Long Range of western Newfoundland, the Magdalen Islands, and the Torngat Mountains of north-eastern Labrador. A very complete account of these and other plants of the same region has recently been published by Dr. M. L. Fernald in a Memoir of the Gray Herbarium of Harvard University (ii. 1925) (reprinted from Mem. Amer. Acad. xv. iii.), entitled "Persistence of Plants in Unglaciated Areas of Boreal America." In it the author points out that there is every evidence in favour of the view that the regions mentioned above and occupied by this flora of western affinities, remained almost completely unglaciated during the Pleistocene. He expresses the opinion that these otherwise western plants lived in the Arctic throughout the Pleistocene and made their migration into the present areas long before the last glacial advance in eastern America, and have not been derived subsequently by diffusion eastwards from the Cordilleras.

The memoir consists of a short generalized introduction followed by a detailed analysis of all the plants under discussion. This, in turn, is followed by an account of the Pleistocene glaciation of various parts of North America, and the memoir concludes with a long discussion as to the possibilities of dispersal of the plants prior to the Wisconsin glaciation.

Whether or not the explanation put forward by Dr. Fernald of the origin of this western element in the eastern flora is sound (and there

are several facts, such as the occurrence of many of these plants in isolated localities about the Great Lakes, which are not quite clear), the memoir is a most important contribution to plant-geography, especially from the point of view of the possibility of the persistence, during the Pleistocene glaciation, of preglacial floras in locally unglaciated regions within the main ice-cap.—R. D'O. Good.

Carex rigida Good.—Mr. Arthur Bennett has drawn my attention to the fact that Fernald (1925; in Mem. Gray Herbarium, ii. 267) uses the name *C. concolor* R. Br. for "*C. rigida* Gooden., non Schrank." Examination of this case shows that this is not correct, and that the well-known name need not yet be superseded. *C. rigida* Schrank (1789: *Baierische Flora*, 290) was not published as a species. It is preceded by an asterisk, and not by a number, and is exactly similar to his "*Polygonum mite*," which has been rejected for the same reason. Schrank evidently regards it as a "Spiel-art," of which he discourses in the introduction (p. 38). Personally, I should prefer to be able to take the earliest name for a plant irrespective of the rank, for to do otherwise really involves change of type and consequent confusion. But the rules as they stand do not allow this to be done, so Schrank's name cannot be used as being a specific trivial name antedating Goodenough's *C. rigida*. If it had been otherwise valid, there is no doubt that it must replace *C. firma* Host (1801), and it is strange that Kukenthal (1909: Pflanzenr. iv. 20, 567) does not make this change, as he cites the synonymy with dates. Those who in this way use *C. rigida* Schrank appear to be right in using the name *C. concolor* R. Br. (1824: in Parry, *Voyage*, Appendix, 283) for *C. rigida* Good. The types (from Melville Island) are in the British Museum, and were determined by L. H. Bailey as "*C. vulgaris* var. *alpina* Boott (*C. rigida* Gooden.)," by which name he means ordinary *C. rigida*—cf. Journ. Bot. xxviii. 172 (1890).—A. J. Wilmott.

A small Point in Nomenclature.—Looking through the new edition of the *London Catalogue* and other publications I am struck by the frequent disregard, by the authors of recently published specific names, of Recommendation XI. *b* (under Article 26) of the International Rules, which relates to the formation of a specific name when taken from the name of a man, and reads as follows:—"(*b*) When the name ends in a consonant, the letters *ii* are added (thus, *Magnusii* from Magnus, *Ramondii* from Ramond), except when the word ends in *er*, when *i* [is] added (example, *Kerneri* from Kerner)." This is to be regretted, as there cannot, I suppose, be two opinions as to the use of the double *i* being the more euphonious. For instance, what could be uglier or more forlorn-sounding than "*Langi*," a specific name given in July *Annals of Botany*? My brother and I, many years ago, were offenders in this particular, by naming a *Spartina S. Townsendi*, but, since we realised the mistake, we have written *S. Townsendii*, and I am pleased to see others are doing the same. Such cases may, I think, be treated as orthographic errors within the meaning of Art. 57, and the second *i* added when using the names.—James Groves.

REVIEWS.

Biologie der Flechten, Entwicklung und Begriff der Symbiose. By Dr. FRIEDRICH TOBLER. 8vo, pp. viii, 266, 1 col. pl., 67 figs. Borntraeger, Berlin, 1925. M. 13.50.

STUDENTS of biology will give a cordial welcome to this new treatise on Lichen biology and on the much-debated question of symbiosis. The author, Dr. Tobler, who is already well known to lichenologists, has included under the general term "biology" a comprehensive account of the work of himself and others on the origin, growth, and development of the lichen as a symbiotic plant. The contents are grouped under: I. Development and Growth; II. Physiology; III. Ecology; and IV. Symbiosis. To these chapters are added some pages on Phylogeny.

Tobler devotes considerable attention to the development of lichen hyphæ from the spore, up to a restricted thalline growth, a subject in which he himself has taken the lead in research by culture methods. In his review of the gonidia he gives due prominence to the work of Paulson and Hastings *, who found that the gonidium in most of our common lichens multiplied freely within the lichen plant by the production of autospores. Tobler states that "without doubt there is also multiplication by zoospores," though instances are rare and occur only in artificial cultures of the alga. A recent paper by Puymaly †, of extreme interest to lichenologists, has been overlooked: in it the gonidium of *Xanthoria parietina* has been described as a new genus and species, *Trebouxia arboricola* Puym., and there is reason to believe that Puymaly's results are as correct as they are enlightening and convincing.

A very full account is given of the formation and function of isidia and soredia; they are, as Tobler states, the chief agents of dispersal, but in Arctic regions, as Du Rietz ‡ has pointed out, these structures are rare and dissemination is secured as elsewhere by broken portions of the thallus. Ed. Frey § came to the conclusion that propagation, and more especially the first settlement on rocks, in a number of crustaceous species was mainly by the ascospores. The chapter on physiology contains much that is of importance: the products of hyphæ and gonidia are discussed as well as the special products of the symbiotic plant, such as lichen acids, colouring substances, &c. Tobler makes a general statement that air is necessary to colour-formation in the lichen and, therefore, the colouring is superficial: we would call his attention to the red layer embedded at the base of the apothecia in *Mycoblastus sanguinarius*.

Interesting accounts of ecology and a discussion of symbiosis follow. Tobler unhesitatingly ranges himself with those lichenologists who see in symbiosis the only reasonable explanation of the lichen plant; but he gives due consideration to the opinions of Bruce

* Journ. Linn. Soc. xliv. 497–506 (1920).
† Revue Algologique, i. 107–124 (1924).
‡ Svensk. Bot. Tidskr. xviii. 371–396 (1924).
§ Mitt. Naturf. Gesellsch. Bern, 1921, 85–281, 11 pls., 1 map.

Fink and of Church. It is impossible, however, to follow him in his acceptance of Sutherland's view of a parasitic fungus on *Pelvetia caniculata* constituting an approach to lichen formation. The Bibliography is especially full, though we regret the omission of M. C. Knowles's * brilliant ecological paper on the marine lichens of Howth. The notes on the contents of each book or paper are an original feature of great value, and enliven what are usually the rather dull pages of the ordinary scientific book.

The reader will realise that it has been impossible to give more than a bare summary of Tobler's important thesis. Though much of the matter has been previously collated and published, the new facts, the new illustrations, and the new critical standpoint are very valuable, and his work is a welcome addition to the standard authorities on lichens. In the preface he seems to imply that some apology is due for publishing a book in which so much of the material had already appeared in the Cambridge Handbook, "Lichens." The publication of the *Biologie der Flechten* is completely justified. Both works were begun in 1910, or earlier, well before the Great War, and both authors suffered from war conditions and from the inaccessibility of literature published during and after the war years. A. L. S.

A Catalogue of British Scientific and Technical Books. New edition, revised and enlarged. Demy 8vo, pp. xxii, 489. British Science Guild. London, 1925. Price 12*s.* 6*d.* net.

THIS volume is issued under the auspices of the Catalogue Committee of the British Science Guild, of which Sir Richard Gregory is Chairman. Miss D. Shaw, the Hon. Secretary of the Committee, has mainly been responsible for its production, but a number of expert classifiers have been called in to assist in some of the groups. Dr. Daydon Jackson has acted in this sense for the botanical section. The new edition contains 9515 titles as compared with 6566 in the original edition of 1921, and forty-six new sections have been added, including one on Horticulture. In the preface Sir Richard Gregory states that the aim has been to include all scientific and technical books issued by British publishers, except those of a very elementary kind, or the price of which is less than two shillings. With few exceptions only books in the lists of publishers at the end of December, 1924, are included.

The section on Botany occupies pages 246–260 and is subdivided into seven sections, namely, (i.) General, (ii.) Morphology, Physiology, (iii.) Geographical Distribution, (iv.) Algæ, (v.) Fungi, (vi.) Ferns and Mosses, (vii.) Flora. It includes 284 titles—the original edition included 198. The list is a useful one, though certain well-known books are omitted from it. For instance: has the much-used "Natural History of Plants," by Kerner, translated by Oliver, dropped out of publishers' catalogues? The introduction of a section on Ecology would obviate the inclusion of Tansley's "Practical Plant Ecology" under Morphology and Warming's

* Sci. Proc. Roy. Dublin Soc. xiv. 79–143 (1913).

"Œcology of Plants" under Geographical Distribution. Other instances of unexpected classification are the inclusion of Babington's "Manual of British Botany" and Bonnier's "Name this Flower" under "General" instead of under "Flora"; and the classifier must have been nodding to include Fryer's "Potamogetons" under Algæ! A cross-reference to Botany would have been helpful in the case of Carey and Oliver's book on "Tidal Lands." The author of the "Flora of Cornwall" was F. H. Davey, not Darey. The difficulties in the compilation of an extensive catalogue of scientific books are enormous, and these suggestions are offered with a view to the preparation of the next edition of this useful work which we shall expect in due course.

BOOK-NOTES, NEWS, ETC.

FLORA OF THE MALAY PENINSULA. With the issue of vol. v. (August 1925), Mr. H. N. Ridley's enumeration of the Seed-plants of the Malay Peninsula is now complete. The present volume contains the completion of the Monocotyledons (Palmaceæ–Gramineæ), the Gymnosperms (limited to eleven species of *Gnetum*, two of *Agathis*, three of *Dacrydium*, five of *Podocarpus*, and two of *Cycas*), and a Supplement including recent additions to the flora and various emendations and corrections. The author remarks that "there still remain in our forests a very large number of species at present uncollected and unknown, as very large areas of the Malay Peninsula have never been visited by any botanist, but this work, as far as it goes, gives a fairly complete account of the lowland flora on both coasts, and a good deal of the extraordinarily rich mountain flora of the interior. It is to be hoped that botanists will continue to collect and study plants over the large unexplored area."

HIPPOLYTE JACQUES COSTE (1858–1923). Coste's *Flore descriptive illustrée de la France* is well known to all serious students of the British flora, and some notes from an appreciation by H. Senén in the *Boletin de la Sociedad Ibérica de Ciencias Naturales* (June–July 1924) may be of interest. Coste spent his life as a humble village curé in the South of France. In his student days his preference for botanising to the more serious study of theology brought him into trouble, until he found a sympathetic friend in the future Cardinal Bourret. His stipend as a curé was a miserable pittance, never exceeding 1000 francs a year. But his clerical duties gave him opportunity for field-work, and he traversed on foot the Cévennes, the Pyrenees, the Alps, and the Central Plateau, building up his herbarium and accumulating observations. In 1885 he communicated an article, "Un Cyste hybride," to the Société Botanique de France, and from then onwards he published through the Society, of which he became Vice-President in 1922, the results of his work. His great work on the flora of France appeared in three volumes from 1900–1906. Shortly before his death he was decorated with the Légion d'honneur.

MR. VICTOR S. SUMMERHAYES, B.Sc., has been appointed to an Assistantship in the Herbarium at the Royal Botanic Gardens, Kew.

NOTES ON THE GENUS ERYTHRÆA.

BY THE LATE J. A. WHELDON AND C. E. SALMON.

THE arrangement of this genus and the appearance of fresh names in the new edition of the London Catalogue seem to call for some explanation, and the following notes, based upon the examination of many living and dried examples, explain the suggested changes:—

E. CENTAURIUM Pers. var. CONFERTA nobis.

Folia basilaria rosulata *plus minus persistentia, latiora* et plerumque *magis numerosa* quam in typo. Folia *etiam caulis dimidio superiore sæpe 5-nervia*, basilaria late ovato-oblonga, caulina elliptico-oblonga, omnia obtusa. Flores numerosi *pedicellis brevissimis in cymas confertas* digesti.

Exsicc. Wittr. iv. 39. *E. Centaurium* (L.) Pers. α *genuina*. Forma inflorescentia conferta; & iv. 40 (floribus pallide roseis).

If the example in Dickson, Hort. sicc. Brit. fasc. vii. no. 3 (1794), and the figures in Curtis, Fl. Lond. fasc. iv. 22 (c. 1782), and Engl. Bot. vi. 417 (1797), & ed. 3, vi. dccccix (1866), be taken to represent what may be called the typical form of the species, the variety *conferta* may be known by the following characters:—

Basal rosette *more or less persistent* and the leaves usually *more numerous and broader* than in type, broadly ovate-oblong; stem-leaves elliptic-oblong; all obtuse, often 5-*nerved even in the upper half of stem*. Stem stout (simple in small plants) with numerous lateral axillary branches (from about ⅓ from base), those in the upper third of stem leafless (except for the floral leaves), those below stem-like and leafy, all terminating in *compact clusters of numerous very shortly stalked flowers*.

Appears to be frequent in drier, more exposed, and more maritime situations than type; in very exposed places on the west coast of Scotland and Ireland it closely approaches some forms of var. *capitata* Koch.

Var. CAPITATA Koch, Syn. Fl. Germ. et Helv. 492 (1837). *Ic.* Engl. Bot. supp. 2719 (1831) as *E. latifolia*.

This variety has been known in our Islands for many years, and is occasionally confused with and reported as the true *E. capitata* Willd. It is distinguished from var. *conferta* by its short stout stem (3–10 cm. high), simple or branched, solitary or several. Basal leaves persistent, broad, often sub-orbicular, 5–7-veined. Upper leaves contiguous, frequently considerably longer than the internodes. Flowers sessile or subsessile in crowded compact heads.

In our Islands this seems a strictly maritime variety, only occurring either actually on the coast or within a short distance of the sea.

Wittrock's *E. Centaurium* (L.) Pers. α *typica* f. *subcapitata* (fasc. ii. 19) appears to be a state of var. *capitata* Koch, holding a middle position between that and var. *conferta*; we have it from several British stations.

A remarkable state or form of var. *capitata*—seen from only a

few localities—may be, perhaps, worth distinguishing as f. LAXIFLORA. In this the stem is taller and much branched, and the flowers are nearly all shortly pedicellate in contracted but hardly capitate terminal cymes which form a diffuse subcorymbose panicle.

Caulis quam in varietate laudata elatior, crebre ramosus; flores fere omnes breviter pedicellati in cymas terminales coarctatas sed vix capitatas paniculam diffusam subcorymbosam efformantes digesti.

Var. SUBLITORALIS nobis.

Caulis plerumque unicus, *juxta apicem tantum ramosus*. Folia basilaria rosulam parvam persistentem efficientia, *oblongo- vel obovato-spathulata, obtusa, basin versus attenuata*; caulina lineari- vel ovato-lanceolata. Flores *in cymas terminales plerumque sparsifloras* sæpe trichotomoso-corymbosas dispositi. Corolla *saturate rosea, magis concava quam in typo*. Calyx anthesi *longior quam in typo* sed nunquam corollæ tubo æquilongus, glaber, rarius leviter scabridus.

Exsicc. E. Centaurium Rich. Ringius, Hb. Norm. Suec. ii. 31.

Stems 10–30 cm. high, rather slender, usually solitary, *branched only near the summit*. Basal leaves in a small persistent rosette, *oblong- or obovate-spathulate, obtuse, narrowed below*; stem-leaves variable, linear- to ovate-lanceolate. Flowers in *terminal usually few-flowered cymes*, often trichotomously corymbose. Corolla *deep rose, more concave than in type*. Calyx at anthesis *longer than in type*, but never so long as corolla-tube, occasionally slightly scabrid.

It is probable that this plant is a hybrid between *E. Centaurium* and *E. compressa* var. *occidentalis*, but without definite evidence of this we place it as a variety of the former. It has a neat and distinct habit, with narrower leaves and more concave and more richly coloured corolla than in *E. Centaurium*; these features, combined with the plant's slight scabridity, seem to indicate some alliance with the other suggested parent. The latter is, however, quite distinct with its still narrower leaves, larger flowers, longer calyx, and (usually) considerable scabridity.

We have seen examples from Western England and Wales.

E. CENTAURIUM × PULCHELLA.

Caulis satis robustus, 4–20 cm. altus, a basi vel a medio valde ramosus ramis divergentibus. *Rosula* basilaris haud manifesta; caulis dimidium inferius crebro foliatum, internodiis brevibus. *Folia* iis *E. pulchellæ* similia sed certe majora 4 cm. long. attingentia, in ramis lateralibus minora. *Flores* numerosi in paniculas latas fasciculato-ramosas digesti, cymæ ultimæ tantum vere dichotomæ; flores axillares sessiles vel subsessiles, ceteræ pedicellis brevioribus quam in formis robustis *E. pulchellæ* fultæ. *Corollæ* lobi paulo minores et angustiores quam in *E. Centaurio* (circa 5 mm. longi sed aliquantum variabiles magnitudine), anthesi tubo æquilongi sed tandem circa dimidio breviores; tubus inter germen et limbum solum leviter contractus. *Calyx* anthesi tubo corollæ circa æquilongus, sub fructu idem $\frac{1}{3}$–$\frac{1}{2}$ æquans. *Capsula* cylindrica, 10 mm. longa; semina irregulariter angulata, foveolata, 42–50 μ diametientia.

Stem rather stout, 4–20 cm. high, much branched from base or middle with divergent branches; lower half of stem very leafy with short internodes. Distinct basal rosette wanting; leaves similar in shape to those of *E. pulchella*, but much larger; in well-developed plants 2–4 cm. long on the main stem. Flowers numerous in broad fasciculately-branched panicles, only the ultimate cymes truly dichotomous; flowers with shorter pedicels than in robust *E. pulchella*, the axillary sessile or subsessile. Corolla-lobes about 5 mm. long (but somewhat variable in size), rather smaller and narrower than in *E. Centaurium*, at anthesis as long as and in fruit about half as long as the tube; tube not greatly contracted between germen and limb. Calyx about equalling corolla-tube at anthesis, in ripe fruit $\frac{1}{3}$ to $\frac{1}{2}$ as long. Capsule cylindrical, 10 mm. long; seeds 42–50 μ in diameter, irregularly angular, pitted.

This interesting and apparently quite fertile hybrid was found by the late E. S. Marshall on the coast near Lytham and St. Annes, Lancashire (v.c. 60), in 1895; it was seen again in that neighbourhood by C. E. S. in 1901, who noted both parents occurring not far away. The hybrid is known also in N. Somerset (v.c. 6) and S. Essex (v.c. 18).

E. LATIFOLIA Sm.

The excellent description of this distinct plant given by Smith in 1824 (Engl. Fl. i. 321) *should* have prevented all the misunderstandings respecting it, both here and abroad, since those days. It is probable that some of these were due to the unfortunate fact that the plant figured in Engl. Bot. Supp. 2719 (1831) under Smith's name was not *E. latifolia*, but *E. Centaurium* var. *capitata* Koch.

The true plant is described and figured in Engl. Bot. ed. 3, 65, t. dcccvii. (1866); it appears to be endemic, confined to the coast of Lancashire (v.c. 59), and has not been seen in recent years. Since 1874 no one appears to have come across it. It has been suggested that the plant originated through the crossing of *E. pulchella* with one of the small capitate forms of *E. Centaurium*.

E. CAPITATA Willd.

Exsicc. Wittr., *E. capitata* Willd., *α typica* i. 11; *E. capitata* Willd. *α genuina*, iv. 38.

This plant has been carefully described and figured by F. Townsend in Journ. Linn. Soc., Bot. xviii. 398, t. 15 (1881), and there are also notes by him upon the subject in Journ. Bot. 1879, 327, and 1881, 87; the same author described and figured it in his Fl. Hampshire, 502, t. 1 & 2 (1883); 631, t. 1 & 2 (1904). It seems unnecessary to diagnose the plant afresh, which is distinct from all the other British species by the stamens being inserted at the base, and not in the throat, of the corolla. Occurs sparingly on the coasts of England (chiefly on the western side) and Wales, and has not yet been reported from Scotland or Ireland.

E. TURNERI nobis. *E. littoralis* auct. angl. *p. p.*; *Chironia littoralis* Turner, Bot. Guide, ii. 469, 1805.

Planta *parva*, subglabra; caules 2–8 cm. alti, solitarii vel 2–5-ni. Folia basilaria *obovato-subspathulata persistentia compacte* rosulata: folia caulina *lingulato- vel ovato-lanceolata* obtusa. Flores comparate *magni, rosacei*, in cymis *sparsifloris* laxis vel ±confertes subsessiles. Sepala *lineari-triangula apice haud attenuata*, anthesi tubum corollæ *æquantia vel fere æquantia*. Limbus corollæ *valde concavus fere poculiformis*, segmenta late ovata obtusa tubo circa æquilonga. Capsula quam sepala *duplo* (*raro fere triplo*) longior.

Ic. Engl. Bot. xxxiii. 2305, 1811 (as *Chironia littoralis*).

Exsicc. Don Herb. Brit. fasc. i. 7 (as *Chironia pulchella*); Wittr. *E. vulgaris* (Rafn.) Wittr. **litoralis* (Turn.) Sm.; Wittr. iv. 46 *a–c*.

Plant *small*, subglabrous or finely puberulous, stems 2–8 cm. high, solitary or 2–5. Basal leaves *obovate-subspathulate* in a *compact persistent* rosette. Stem-leaves *lingulate-lanceolate or ovate-lanceolate*, obtuse. Flowers *large, rose-coloured*, subsessile, lateral on longer pedicels, arranged in lax or ±compact *few-flowered* cymes. Sepals *linear-triangular*, acute, *not attenuated at the apex, nearly or quite as long as corolla-tube at anthesis*, soon becoming much shorter. Corolla-limb *very concave, almost cup-shaped*, segments broadly ovate, obtuse, about as long as tube. Capsule *twice* (*rarely nearly three times*) as long as sepals.

Wittrock's exsiccata (ii. 46 *a–c*) is labelled "*forma humillima, subglobosa*" with the following description:—"Forma subglobosa differt a forma typica, in Engl. Bot. l. c. delineata, internodiis caulis omnibus inevolutis (planta itaque quasi contracta, sæpius fere globosa); in f. typica internodium a cymate proximum longius evolutum est. Laciniæ corollæ in forma subglobosa paullo breviores sunt quam in f. typica."

This form of Wittrock's, which occurs in two or three places in Scotland, may be compared with the globular cushion-like state of *E. capitata* Willd., which occurs on the more exposed portions of our coastal downs and headlands; both are obviously conditions caused by environment.

E. Turneri may usually be easily recognized by its dwarf habit, persistent basal rosette, its ±compact heads of few large flowers, non-attenuated sepals, and long capsules. Occurs on the coasts of Northern England and Scotland.

E. COMPRESSA Hayne. *E. linariifolia* auct. plur.

Plant glabrous, puberulous, or ciliate-asperous. *Stems* solitary or many, 2–25 cm. high, tetragonous, slightly compressed, with raised lines or narrow wings, simple or branched, ultimate divisions dichotomous with an axillary sessile flower. *Leaves* sessile, slightly fleshy; radical obovate-spathulate to linear-oblong, narrowed below, in a ±persistent rosette; cauline linear-lanceolate to linear-oblong, not mucronate, erect, glabrous or ciliate-papillose at margins. *Flowers* few, large, deep rose, bibracteate at base, in terminal fastigiate cymes with the lateral pedicels ultimately lengthened. *Calyx* glabrous to

densely scabrous-puberulous, segments linear-attenuate or subulate, equalling or exceeding corolla-tube at anthesis. *Corolla*-limb concave with lobes (6–7 mm. long) oval, obtuse, ±as long as tube. *Capsule* subcylindrical, as long as, to one-third longer than, the calyx. *Seeds* spherical, reticulated.

Var. FRIESII nobis. *E. littoralis* Fries, Nov. Fl. Suec. fasc. ii. 29 (1814); fasc. vi. cont. 2, 100 (1823).

Caulis *glaber, gracilis, subflexuosus*, 10–25 cm. altus. Folia formâ et latitudine variabilia, sæpe supra medium quam alibi latiora; basilaria *pauca, subevanescentia*; caulina remota, *subpatula, lævia*, superiora erecto-patentia. Calyx *lævis* vel rarissime inferne scabriusculus, papillis conicis *quam latioribus vix longioribus*. Capsula quam calyx *paullulum longior*.

Exsicc. Fries, Herb. Norm. v. 9 [as *E. littoralis*]; Wittr., *E. vulgaris* (Rafn.) Wittr. *α genuina*, i. 2*a*, *b*, & *c*; *E. vulgaris* (Rafn.) Wittr. *α typica*, f. *sepalis paullo longioribus*, ii. 16; *E. vulgaris* (Rafn.) Wittr. *α genuina*, f. *macra, simplex vel subsimplex*, iv. 43.

Stem *glabrous, slender, subflexuose*, 10–25 cm. high. Leaves variable in shape and breadth, often broadest above the middle (*i. e.* narrowly oblanceolate). Radical leaves *few, subevanescent*; cauline distant, *subpatulous, smooth*, the upper erect-patent. Calyx *smooth* or rarely slightly scabridulous below, with papillæ conical, *scarcely longer than broad*. Capsule *slightly longer* than calyx.

All the British material that we have seen so far seems to be better placed under the following rather than *Friesii* itself:—

Forma MINOR nobis. *E. littoralis* Fr. Nov. Fl. Suec. fasc. ii. 29, 1814; *E. littoralis* Fr. var. *minor* Hartm. Handb. Skand. Fl. 101, 1820.

Planta *pusilla, 2–5 cm.* alta, sæpe caules numerosos emittens. Folia basilaria rosulata quam in var. *Friesii numerosiora et magis persistentia*; caulina angusta, linearia, obtusa, *internodia excedentia*. Flores in *cymas confertas* ordinati, bifurcorum ultimorum ramuli par infimum bractearum vix excedentes. Cætera ut in *Friesii*.

Exsicc. Wittr. *E. vulgaris* (Rafn.) Wittr. *γ minor* Hartm. f. *typica*, i. 7; *E. vulgaris* (Rafn.) Wittr. *β minor* Hartm. iv. 45.

Plant *small*, only *2–5 cm.* high, often with numerous stems. Leaves of the basal rosette *more numerous and more persistent*; cauline narrow, linear, obtuse, *exceeding the internodes*. Flowers in *compact cymes*, the branches of the ultimate forks barely exceeding the lowermost pair of bracts. Otherwise as in var. *Friesii*.

Coast of Northern England and Scotland; rare.

Var. OCCIDENTALIS nobis. *E. littoralis* auct. angl. *p. p.*

Caules quam in var. *Friesii* plerumque *crassiores*, solitarii vel plures, arrecti, *rigidi, anguste alati*, alæ superne *sæpe scabrido-ciliatæ*, papillis parvulis subcylindricis plerumque *longioribus quam latis* obsitæ. Folia plerumque juxta apicem quam alibi latiora, linearia vel lineari-oblonga, vel lineari-ovata aut lineari-obovata, obtusa, inferne attenuata; caulina *erecta*, approximata vel inter se remota; foliorum

omnium (præcipue superiorum) *margines scabrido-papillosi*. Flores in cymas aliquanto *sparsifloras fastigiatas* dispositi, florum *pedicellis sepalorumque marginibus et costis (interdum etiam tota superficie) dense papilloso-scabridis*. Capsula quam calyx circa *triente longior*.

Ic. Engl. Bot. ed. 3, iv. t. dcccviii. *bis*, 1866 [as *E. littoralis*].

Exsicc. Thielens & Devos, Kickxia Belg. iv. 317 [as *E. linariifolia* Pers.].

Stems usually *stouter* than in var. *Friesii*, solitary or many, straight, *rigid, narrowly winged*, wings *often scabrous-ciliate above* with short subcylindrical obtuse papillæ usually *longer than broad*. Leaves usually broadest near the apex, from linear to linear-oblong or linear-ovate or obovate, obtuse, narrowed below; cauline *erect*, contiguous or distant; *margins of all leaves* (especially the upper leaves and bracts) *scabrous-papillose*. Flowers in somewhat *few-flowered fastigiate* cymes, with *pedicels, and margins and main veins of sepals (sometimes the entire surface) densely papillose-scabrous*. Capsule about *one-third longer* than calyx.

On the Welsh coast and the shores of North-west England and South-west Scotland.

Var. BAILEYI nobis.

Planta plerumque *robusta sed pumila*. Caulis 4–10 cm. altus, aut plures a radice emissi aut solitarius et tunc *valde ramosus et crassus et fere lignosus*; internodia brevia. Folia linearia vel linear-spathulata, obtusa, inferne attenuata, *longissima, ramos axillares sæpe subæquantia*; basilaria in exemplariis bene evolutis *6 cm. long. et 5 mm. lat.* attingentia. Flores *numerosissimi* in unum capitulum vel plura capitula *dense conferti*; *bracteæ longæ, foliosæ*, capitula *subæquantes vel excedentes*. Capsula calyci circa *æquilonga*, raro paullulum longior.

Plant usually *robust, but dwarf*. Stems 4–10 cm. high, several from the root and *stout* or solitary and then *much branched, thick, almost woody*; internodes short. Leaves linear to linear-spathulate, obtuse, narrowed below, *very long, often subequalling the axillary branches*; in robust examples the basal leaves attain *6 cm. in length and 5 mm. in breadth*. Flowers *very numerous, closely crowded* in one or more *compact* heads which are *subequalled or exceeded by the long leaf-like bracts*. Capsule *about as long as* calyx, rarely a little longer.

This variety has a very distinct habit, the whole plant, even in tall examples, being usually about as broad as tall. Small specimens resemble var. *Friesii* f. *minor* and *E. Turneri*, but the calyx is more scabrous etc. than in the former and the leaves and sepals are longer etc. than in the latter.

This variety was first noted in the herbarium of the late Charles Bailey, where there are specimens gathered by him.

Coast of Anglesey and Lancashire.

E. PULCHELLA Fr. var. SUBELONGATA Wittr. [as a forma].

Ic. Engl. Bot. ed. 3, vi. dcccx. *bis*, 1866 [as *E. pulchella*].

Exsicc. Wittr. ii. 15, *a, b, c, d, & e*.

Of the several forms or states of *E. pulchella*, that named *subelongata* appears to us the most important. Wittrock's description, "Internodiis præcipue axis principalis subelongatis, modice ramosa (raro simplex)" may be amplified as follows:—

Stems slender elongate, 10–25 cm. high, simple below, ±dichotomously branched above; branches slender, open, with a flower in each axil. Leaves variable in shape, oblong to ovate-lanceolate, usually much shorter (two to five times) than the internodes. Flowers in lax cymes, solitary, pedicellate; cymes much less compound than in robust examples of the type.

Well-grown examples of this variety occasionally approach in habit *E. tenuiflora*, but may be distinguished by the more spreading branches of the inflorescence, fewer pairs of leaves on the main stem, etc.

E. TENUIFLORA Hofmgg. & Link.

Stem tall (1–3 dm.), simple below, with many erect fastigiate branches often above the middle. Leaves oval-oblong or ovate-elliptical, obtuse, often as long as internodes, the upper narrower; 5–9 pairs of leaves below the first branches of the inflorescence. Flowers pedicellate. Corolla-tube filiformly contracted for 2–3 mm. between apex of capsule and corolla-limb; corolla-segments very narrow.

Ic. Hoffmgg. & Link, Fl. Portugaise, i. 67, 1809.

Exsicc. Wittr. *E. tenuiflora* Hoffm. & Lk. *a genuina*, iii. 35 (f. filamentis staminum curtis, tubo corollæ longo).

The petal-tips of this plant are figured by Wittrock as erose, whilst in his drawing of *E. pulchella* they are shown entire. It appears that this is not a constant character, both species having occasionally an irregularly erose apex to one or more segments of the corolla.

Following many Continental authorities, we propose to keep this local plant as a distinct species, and not class it as a variety under *E. pulchella*. It seems to be recognized easily by its peculiar inflorescence-branching, numerous stem-leaves, etc. Isle of Wight! Jersey! Guernsey!

CLAVIS.

A. Annual or biennial. Stems erect with no barren branches; leaves without distinct petioles.

1. Stamens inserted in throat of corolla-tube. 2.
   Stamens inserted at base of corolla-tube. *E. capitata* Willd.
2. Flowers pedicelled or sessile. Corolla-lobes elliptic or lanceolate, subacute, small (up to 4 mm. long)..... 3.
   Flowers sessile or subsessile. Corolla-lobes broader, oval, obtuse, 5–7 mm. long ..... 4.
3. Flowers pedicelled. Main stem with 2–4 pairs of leaves, branches spreading-ascending. Corolla-tube nearly twice as long as limb. Anthers feebly twisted in a half-turn ..... *E. pulchella* Fr.

Flowers pedicelled. Main stem with 5–9 pairs of leaves, branches fastigiate erect. Corolla-tube nearly twice as long as limb	*E. tenuiflora* H. & L.
Flowers sessile in compact fasciculate terminal cymes. Corolla-tube subequalling limb. Anthers strongly twisted	*E. latifolia* Sm.
4. Leaves, especially basal, ±broad. Calyx-segments shorter than corolla-tube at anthesis. Limb of corolla scarcely concave	*E. Centaurium* Pers.
Leaves, especially basal, ±narrow. Calyx-segments equalling or exceeding corolla-tube at anthesis. Corolla-limb concave and often richer in colour ...	5.
5. Sepals linear-triangular, not attenuated at apex; capsule twice as long as calyx	*E. Turneri* nob.
Sepals linear, attenuated or subulate; capsule as long as, or ⅓ longer than, the calyx	*E. compressa* Hayne.
B. Perennial. Stems prostrate-ascending with decumbent barren ones bearing petioled leaves	*E. portensis* H. & L.

[*Obs.*—In fairness to my late friend, J. A. Wheldon, I should like to state that by far the larger proportion of the foregoing observations were made by him, chiefly in the preparation of an account of the genus for the now abandoned *Cambridge British Flora*. He asked me, early in 1924, to collaborate with him in preparing a short account of the British forms, but his death in November of that year robbed me of much of his valuable assistance and the paper is the poorer thereby. I should also like to take this opportunity of thanking Mr. S. Moore for help in preparing the Latin descriptions.—C. E. S.]

THE ALGÆ OF LEICESTERSHIRE.

By Florence Rich, M.A.

(Concluded from p. 330.)

Cymbellaceæ (*cont.*).

Epithemia Bréb.

E. Argus (Ehrenb.) Kütz. Saddington, 9.

Var. *Goeppertiana* Hilse. Ratcliffe-on-the-Wreake, 3.

E. granulata (Ehrenb.) Kütz. Tur Langton, 5.

E. Sorex Kütz. Ratcliffe, 3.

E. turgida Kütz. var. *genuina* Grun. Rather commonly distributed.

Var. *Westermannii* Kütz. Pond between Castle Donington and River Trent, 5.

E. Zebra (Ehrenb.) Kütz. var. *porcellus* (Grun.). Wistow Park, 3.

Var. *saxonica* Kütz. Ratcliffe, 3.

Rhopalodia O. Muell.

R. ventricosa (Grun.) O. M. (*Epithemia ventricosa* Kütz.). Narborough, 5; Saddington, 9.

R. gibberula (Kütz.) O. M. Narborough Bog, 5.

Nitzschiaceæ.

Bacillaria Gmelin.

B. paradoxa Gmelin. Usually found in brackish water, but is known to occur in the freshwater drains and dykes of the north-east and east of England (though not recorded in the Algal Floras of Yorkshire, Warwickshire, or Cambridge). In the River Trent Fritsch found one individual; in its tributary, the Soar, and on the adjacent mud, I have found great numbers exercising their characteristic movements (September 1915). Also found in streams under Whitwick Church, 5.

Nitzschia Hassall.

N. acicularis Kütz. Pond, Waltham, 6.

N. amphibia Grun. Wistow Park, 3; Sulby, 7.

N. dubia W. Sm. Town End Close, 4.

N. Heufleuriana Grun. Town End Close, 4.

N. Palea (Kütz.) W. Sm. Ratcliffe-on-the-Wreake, 3.

N. parvula W. Sm. Ratcliffe, 3.

N. sigmoidea (Nitzsch) W. Sm. Widely distributed.

N. subtilis Grun. Near Billesdon Coplow, 5.

Hantzschia Grun.

H. amphioxys Grun. Widely distributed, but never very abundant.

Homœocladia Ag.

H. filiformis W. Sm. River Soar, 9.

Surirelloideæ.

Surirellaceæ.

Cymatopleura W. Sm.

C. elliptica W. Sm. var. *genuina* Meister. Aylestone, 5; Sulby, 7; Packington, 9.

Var. *ovata* Grun. Sulby, 7; Sutton Wharf, 6.

C. Solea (Bréb.) W. Sm. var. *vulgaris* Meister. Generally distributed.

Var. *elongata* Meister. Town End Close; 4.

Var. *sub-constricta* O. M. Castle Donington, 4.

SURIRELLA Turpin.

S. angusta Kütz. East of Billesdon, 4; John o' Gaunt, 1.

S. apiculata W. Sm. John o' Gaunt, 1.

S. biseriata Bréb. var. *vulgaris* Meister. Ulverscroft Lane, 5; Bradgate Park, 8.

Var. *media* Dippel. Ulverscroft Lane, 5.

S. linearis W. Sm. Difficult to separate from *S. biseriata*; Ulverscroft Lane, 5; Blackbrook Reservoir, 5.

S. ovalis Bréb. A very common diatom.

Var. *crumena* Bréb. Packington, 9.

S. ovata Kütz. Stream, Knighton, together with *S. ovalis*, and much more common, 4. Waltham, 6.

S. spiralis Kütz. Very rare. John o' Gaunt, 12.

PERIDINIALES.

PERIDINIUM Ehrenb.

This genus is common in the small upper pond on Beacon Hill. It is also represented in a small pond, Smeeton Westerby, 5; stream, Thurnby, 2; pond in field at Elmesthorpe, 6; pool, High Sharpley, 5; Waltham, 6.

CRYPTOMONADINÆ.

CRYPTOMONAS Ehrenb.

Professor Fritsch described two new species of this genus in a sample I collected from a cow-pond near Houghton-on-the-Hill, 4 ("Notes on British Flagellates," *New Phytologist*, xiii. 341 (1914)). He described these provisionally as *Cryptomonas Richei* and *Cryptomonas anomala.*

EUGLENINÆ.

EUGLENACEÆ.

EUGLENA Ehrenb.

A great number of species present, but most of them in an undeterminable condition when examined.

E. acus Ehrenb. Misterton, 2.

E. hæmatodes (Ehrenb.) Lemm. Small pond north of Colery Reservoir, forming a brick-red skin over the surface of the water, 7.

E. proxima Dang. Cow-pond, High Tor, 6; Braunstone, 3.

E. spirogyra Ehrenb. Between Welford Rd. and Aylestone, 2; cow-pond, Leicester Frith, 5.

Var. *abrupte-acuminata* Lemm. Croft, 3; near Allexton, 4; Scraptoft, 4; Billesdon Coplow, 5.

E. tripteris (Duj.) Klebs. Swithland, 5; north of Colery Reservoir, 7.

E. viridis Ehrenb. Commonly distributed.

PHACUS Duj.

P. brevicaudata (Klebs) Lemm. (See F. E. Fritsch, "Freshwater Algæ of Africa," in Ann. S. Afr. Mus. ix. 602, fig. 42, *c*, 1918.) Quite common in the present collection; Croft, 3; near Swithland Wood, 5; High Tor, 7; Billesdon Coplow, 5; near Bescaby, 6.

P. oscillans Klebs. For figure, see F. E. Fritsch in Trans. Roy. Soc. South Africa, ix. pt. 1, 70, 1921. North of Colery Reservoir, 7; Braunstone, 3.

P. pleuronectes (O. F. M.) Duj. Narborough Bog, 5; Croft, 5; and many other places.

P. pyrum (Ehrenb.) Stein. Wistow Park, 3; Braunstone, 3; Narborough, 4; Leicester Frith, 4.

TRACHELOMONAS Ehrenb.

T. volvocina Ehrenb. Very widely distributed.

T. hispida (Perty) Stein. Widely distributed and nearly always associated with the preceding species.

RHODOPHYCEÆ.

BATRACHOSPERMUM Roth.

B. atrum (Dillw.) Harvey. "Has once sparingly occurred in a clear water-course near the bogs, Narborough," 5 (*Bates*).

B. moniliforme Roth. Narborough district, 4–7 (*Bates*). Pond, Beaumont Leys (*Garnar*); near Ulverscroft Priory about 1894 (*Mott*).

Var. *setigerum* Rabenh. Grace Dieu, 8 (*Bates*).

CYANOPHYCEÆ (MYXOPHYCEÆ).

Coccogoneæ.

CHROOCOCCACEÆ.

CŒLOSPHÆRIUM Näg.

C. Kützingianum Näg. Cropstone, 7 (*Mott*). Narborough Bog, 5.

MICROCYSTIS Kütz.

M. æruginosa Kütz. (*Clathrocystis æruginosa* Henfr.). Cropstone Reservoir, 1884 (*Mott*); Elmesthorpe, 6; near Grace Dieu ruins, 6.

M. incerta Lemm. (*Polycystis incerta* Lemm.). Colery, 6.

M. protogenita Rabenh.

In long-stagnant water. Croft, 4 (*Bates*).

GLŒOCHÆTE Lagerh.

G. Wittrockiana Lagerh. On *Cladophora*, canal, Oakthorpe, but so little seen that determination is doubtful, 9.

CHROOCOCCUS Näg.

C. cohærens Näg. "On all places where rain-water drips," 10, 11 (*Bates*).

C. turgidus (Kütz.) Näg. Colery, 6; near Saltby, 6.

MERISMOPEDIA Meyen.

M. elegans A. Br. Oakthorpe, 9.

M. glauca (Ehrenb.) Näg. Narborough, Spring Hill (*Bates*).

Lower pond, Beacon Hill, 3; east of Billesdon, 4; Sutton Wharf, 6; Beacon, 7.

CHAMÆSIPHONACEÆ.

CHAMÆSIPHON A. Br. & Grun.

C. incrustans Grun. On *Cladophora*, Hugglescote, 6; on *Rhizoclonium*, Sutton Wharf, 6.

Hormogoneæ.

OSCILLATORIACEÆ.

MICROCOLEUS Desm.

M. Chthonoplastes Thur. (*M. gracilis* Hass.). Croft (*Bates*). Cropstone, about 1894 (*J. L. Brain*).

M. lacustris (Rabenh.) Farlow. Very rare. Croft, 4.

M. vaginatus (Vauch.) Gomont (*M. terrestris* Desm.). On damp ground, near Crow Mills (*Bates*). Coalville, on banks of stream issuing from furnace-boilers, 5; road, Stoughton Drive, 8; on soil in a Leicester garden, 8. Several trichomes in one sheath, diminishing in number towards the apex; trichomes 6 μ wide; cells almost square.

LYNGBYA Ag.

L. æstuarii Liebman. This very variable species was present in great floating masses in the large cooling reservoir of the Belgrave Pumping-station, where the water is often quite hot, 7, 10.

L. contorta Lemm. R. Soar, 9.

L. Lagerheimii (Möbius) Gomont. R. Soar, 9.

L. major Menegh. Shackerstone Canal, 5.

L. ochracea (Kütz.) Thur. Near Stoughton (*Garnar*). Generally distributed (*Bates*).

L. putealis Montague. Plant-mass not noted, but the filaments agree well with the diagnosis given by Gomont*. Leicester Frith, 5.

PHORMIDIUM Kütz.

P. autumnale Ag. Newbold, 1; Croft, 3; east of Houghton, 4; and other places.

P. corium (Ag.) Gomont. Forming black mats in the narrow channel leading into Colery Reservoir, 6.

P. inundatum Kütz. (*Lyngbya inundata* Hansg.). Forming a slight stratum on mud etc. in ditches etc. (*Bates*).

P. Retzii (Ag.) Gom. (*Lyngbya papyrina* Kirchn.). Floating in canal near Crow Mills, 2 (*Bates*).

Forma *rupestris* Kütz. Trichomes constricted at the joints near the apex. John O' Gaunt, 1.

P. tenue Menegh. Narborough, 5.

P. uncinatum (Ag.) Gom. Grace Dieu brook, 5.

OSCILLATORIA Vauch.

O. ærugescens (Drumm.) Hass. Filter-bed, Cropstone, 11 (*Mott*).

O. amphibia Ag. (*O. tenerrima* Kütz.). Croft, Narborough (*Bates*). Beacon, 8.

O. chalybea Mertens. On mud, Croft (*Bates*).

O. formosa Bory. Hot stream from furnace-boilers. Coalville, 5.

O. limosa Ag. (*O. Froelichii* Kütz.). Generally distributed (*Bates*).

The same is still true, 3–6.

O. princeps Vauch. Belgrave, 2, 4, 6, 7.

O. splendida Grev. (*O. leptotricha* Kütz.). Croft, Narborough (*Bates*). Ditch, Grace Dieu woods, 5; pool, Narborough Bridge, colouring the water blue, 5.

O. tenuis Ag. Generally distributed, autumn and spring (*Bates*). Burley Pond (*Rutland*), 8; R. Soar, 9; Braunstone, 3; Belgrave, 4.

SPIRULINA Turpin.

S. major Kütz. (*S. oscillarioides* Kütz.). Croft, 9 (*Bates*). In hot water, Pumping Station, Belgrade, 2, 4.

* M. Gomont, *Monographie des Oscillariées*, 143.

NOSTOCACEÆ.

CYLINDROSPERMUM Kütz.

C. majus Kütz. Ponds near Narborough; Beacon, 6–12 (*Bates*). Ditch in field, Narborough, 5.

C. stagnale (Kütz.) Born. & Flah. (*C. macrospermum* Kütz). On damp garden pathways, 9, 10 (*Bates*). Canal, Oakthorpe, 9.

NOSTOC Vauch.

(Several species not in a determinable condition.)

N. cæruleum Lyngb. Narborough, 9 (*Bates*).

N. commune Vauch. On leaf of grass, Croft, 3, 5; Stoughton Drive, 8.

N. muscorum Ag. Near Narborough, 10 (*Bates*).

N. sphæricum Vauch. Croft and Narborough, 10 (*Bates*).

N. verrucosum Vauch. Narborough (*Bates*).

APHANIZOMENON Morren.

A. flos-aquæ Ralfs. Cropstone Reservoir, 9 (*Mott*).

ANABÆNA Bory [SPHÆROZYGA Ag.]

A. circinalis Rabenh. Cropstone Reservoir, 9 (*Mott*).

A. inæqualis (Kütz.) Born. & Flah. Swithland Reservoir, 7.

A. laxa (Rabenh.) A. Br. Tank, Long Clawson, 6.

A. nitellicola Bates. A species described for the first time in the 1886 *Flora of Leicestershire*. Pond, Charnwood Heath (*i. e.*, Colery Reservoir) (*Bates*).

A. oscillarioides Bory. Croft (*Bates*). Narborough, 5; Beacon, 2, 7, 8.

A. Thwaitesii Ralfs. Croft, 4 (*Bates*).

A. variabilis Kütz. Canal, Oakthorpe, 9.

A. Cookeana, comb. nov. (*Sphærozyga Cookeana* Bates). Moorland pool, Bradgate Park, 10 *.

SCYTONEMACEÆ.

TOLYPOTHRIX Kütz.

T. lanata (Desv.) Wartm. (*T. Ægagropila* Kütz.). Croft, Charnwood Heath, etc., 5–10 (*Bates*).

T. tenuis Kütz. Lemmermann in his *Brandenburg Algæ* makes this species include *T. lanata*. Sutton Wharf, 6.

T. sp. Very little present, Saddington, 5.

* Journ. Bot. xxv. 185 (1887).

RIVULARIACEÆ.

RIVULARIA (Roth) Ag.

R. dura Roth. Agrees with the description of this species, save that no sheaths were visible. Canal, Sutton Wharf, 6.

GLŒOTRICHIA Ag.

G. natans Thur. On stems of *Nitella*. Pond, Charnwood Heath, 1 (*Bates*).

G. pisum Thur. Near Grace Dieu, 5–9 (*Bates*).

STIGONEMACEÆ.

HAPALOSIPHON Näg.

A fragment found in Canal, Oakthorpe, but not enough to determine species, 9.

SPECIES.

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

A CYNIC, with a sufficiently wide knowledge of taxonomic literature and the materials on which it is based, could find much justification for defining a "species" as an organism or an aggregate of organisms to which a binomen is applied. Yet, with all its imperfections in practice, it is generally recognized that the species concept is essential. A unit of classification is necessary, not only in taxonomy but also in the other branches of botany, which taxonomy should serve. The taxonomist should, therefore, attempt to understand the needs of his fellow-botanists working on other lines than his, and it may be that he can obtain help from them towards the solution of his own problems.

Much has been written on the "species question" from various standpoints, and no exhaustive summary of the published matter will be given here. This essay is an attempt to state the difficulties which I have experienced in my taxonomic and geobotanical studies, together with such facts and considered opinions as would seem to help in obtaining a working basis for the immediate future. The essay deals with the species question as applied to Phanerogams. I have no qualifications for dealing with the corresponding problems in Cryptogams or in the Animal Kingdom.

Apart from the abstract concept of a species, every species consists of a number of individuals, and in this sense can be characterized inclusively and exclusively. In spite of many theories, varieties of experience, and differences in practice, it has not yet been possible to give to the term "species" an absolute definition which works in practical taxonomy. It has followed that many have held the view that a species is merely a convenient and more or less arbitrary grouping of individuals. Thus in forming or accepting the conception of each species the subjective element is allowed full play. "Splitting" and "lumping" of species often become merely a matter

of personal opinion, or of real or supposed convenience, or the expression of desires. This is unscientific, and for workers in other branches of botany often aggravating and unsatisfactory. Whether or not what we call a species is a natural unit, and many I believe are, or whether what we call species can never be other than more or less artificial groupings of individuals, it is desirable that some attempt should be made to state the criteria used in deciding specific limits, and to keep the species standard as uniform as possible. Most certainly should this be done by each author, who should keep to his criteria in all his published work, or should definitely state the changes he makes in them. Especially is this essential in phyto-geographical and bio-statistical studies. At least, let us reduce the subjective element as much as possible.

Species are based almost exclusively on morphological characters by the taxonomist. Yet constant morphological resemblances and differences do not by themselves prove that a given group is a species, because other groups than species have constant resemblances and differences. In the present state of our knowledge all taxonomic groups are based primarily on morphology. That certain characteristics of plant groups are physiological and express themselves in terms of function is not to be denied. We know, however, little about them yet, and the opportunities of studying them and their taxonomic value in the herbarium or in the field are, unfortunately, rare. Such facts as flowering period and habitat preferences and influences are often of considerable value, and collectors and field-workers should be encouraged to record their observations. It is, indeed, always desirable to keep in mind that a species is a group of living individuals. Anatomy is often useful, but rarely yields conclusive evidence on taxonomic questions. Cytology, judging from recent work on *Crepis*, *Rosa*, *Viola*, *Erophila*, *Cochlearia*, *Carex*, etc., is likely to prove of considerable value, but its scope is obviously much more limited than that of morphological taxonomy. Serological tests for species are not yet a practical proposition, nor, with very few exceptions, are bio-chemical ones. Modern genetics, even, is largely based on morphology, *sensu stricto*, for, though we say that characters are "carried" from generation to generation by genes, these genes are theoretical, and their presence or absence can only be demonstrated by the morphological, or in some cases functional, characters expressed.

The results recorded up to the present in genetics are disappointing to the taxonomist. Geneticists have dealt with inheritance. They have not, for the most part, concerned themselves with the ultimate origin or value of the characters which develop from the potentialities of the genes within environmental limits. Few have considered the needs of taxonomy. This, however, is no excuse for the taxonomist who ignores genetical work and its possibilities. Certain facts have undoubtedly been established by geneticists which have a direct bearing on taxonomic questions, and, though absolute criteria for species have not been discovered, certain taxonomic difficulties can be more clearly realized and expressed than previously. A greater

knowledge of modern genetical work would save taxonomists from falling into some common errors, especially in their so-called phylogenetic theories.

The characters whose gene inheritance has been investigated undoubtedly include some which, within the group taken, have been regarded as of classificatory value by taxonomists, even of specific value when considered in combination with other characters and other facts. These characters are usually segregated from crosses in a Mendelian manner, and some have been proved to have originated by apparent mutation. Many of the Mendelian allelomorphs, on the other hand, are regarded as of little taxonomic value by systematists; but there is no general difference in their inheritance from those which are regarded as varietal or specific. It is probable that both systematists and geneticists really deal with superficial "characters," and that the basic differences between groups are physico-chemical. It is unfortunate for the biologist that the discovery of the radio-active elements has induced so many of the best chemists and physicists to undertake atomic research, while bio-chemistry and bio-physics have been relatively neglected. It cannot be too often stated that taxonomic and genetical conclusions are tentative, but this is no reason for not making them as exact as possible. It should, moreover, be remembered that genetics includes Mendelism, and is not synonymous with it. Certain types of inheritance connected with chlorophyll distribution and flower size do not, apparently, conform with Mendelian laws, and the explanation given to some results concerning quantitative characters make one suspect that the simple Mendelian conceptions also fail here. Theoretical Mendelism was primarily based on the conceptions of unit characters, dominance, and purity of the gametes. It was broadened to include the factor hypothesis, that one character may result from the interaction of several genes, and conversely that one gene may influence several characters. The conception of dominance was found to break down in cases of blending, and it is possible that even the purity of the gametes is not an absolute law, for the "mosaic" nature of certain gametes, resulting in "mutants," has been suggested.

So far as I know, modern genetics has indicated no general qualitative differences in the characters with which it has dealt, such as would serve to distinguish groups of relatively different value. Characters can be classified in many ways, but these classifications overlap one another and none independently separates specific characters from varietal or generic in every group of flowering plants.

In spite of this, however, there does seem to be some qualitative basis for many species. This has been expressed by John Stuart Mill, in his *System of Logic**, as a "difference of Kind." "Species," he says, "differ in kind, the vast majority of genera and

* The following references will enable those interested to check the statements in this paragraph without reading the whole of Mill's work. Book I. ch. vii. § 4; ch. viii. § 4; Book III. ch. xxii. § 2; Book IV. ch. vi. § 4; ch. vii. § 4. The whole of chapters vii. and viii. in Book IV. should be read.

families, and varieties of the same species do not. To express in words a distinction of Kind is an impossibility. Kinds differ one from another in an indefinite number, 'an unknown multitude,' of properties and characters. We select a set of characters to discriminate each Kind from all other Kinds. Our selection of these characters is arbitrary and a matter of convenience, but separate Kinds really exist."

Some taxonomists have urged that the number of differences forms the test of specific as opposed to varietal distinction. To take an extreme example, a variety differs from the type of its species, or two varieties of the same species differ from each other, in one character only, while two species differ from one another in, say, twenty characters. It is, of course, often true that what are generally agreed to be varieties of the same species differ one from another by fewer apparent characters than do accepted species. No absolute definition can, however, be based on numbers of differences, because we find in practice that plant groups are of all degrees of morphological distinctness with regard to both quantitative and qualitative differences. The fallacy of attempting to define species by the number of constant differences alone becomes obvious when it is considered that all possible homozygous combinations have an equal chance of occurring amongst segregations from a cross between parents differing in a given number of allelomorphs. Such a case has been studied by Claussen in *Viola arvensis* and *Viola tricolor*. If plants differing from one another by one character represent varieties of one species, and those differing by twenty characters represent distinct species, how are plants differing by 2, 3, 4, 5, 6 . . . 18 or 19 constant characters to be classified? That species do generally differ in more characters one from another than do varieties of the same species is a truism, but absolute numbers cannot be given, and both in practice and in theory very varied opinions are expressed. Moreover, it is known that one gene may influence several characters, and, conversely, one character may be the result of the interaction of several independent genes.

Another consideration also shows how impossible it is to base specific distinction on the number of differences. The only species definition which I have seen, which appears to be theoretically absolute and to allow of no "heritable" variation within the species, is that of Lotsy, that a species is the sum total of completely homozygous individuals of exactly the same hereditary constitution. This may be a working unit for genetics, but in nature it is doubtful if many individuals, and still less taxonomic groups, are homozygous for all characters, or remain so for many generations. Even if we could investigate by breeding experiments every so-called species there is no known method of proving homozygosity with absolute certainty, as recent work with so-called "mutants" in *Œnothera* has shown. This being so, the taxonomist may be justified, at present, in placing individuals with different genetical constitutions within one species—that is, in the looser language of systematists, in admitting "heritable" variations within the species. Thus there

may be within the species as a whole many allelomorphic pairs, and the different characters may appear in as many combinations in different individuals as is mathematically possible—limited, of course, by linkage. When in a large series of wild specimens it is found that characters appear in various combinations, it may be a fair assumption that all belong to one taxonomic species, although one individual specimen may differ from another in several, even quite a considerable number of, distinct characters.

Failure to cross or sterility of offspring on crossing has been suggested as the main or sole criterion for specific limits. Numerous examples of fertile crossing between very distinct morphological groups constantly regarded as species have shown that this test also has no absolute value. On the other hand, the fact that two morphological groups will not breed together to yield successive generations of fertile offspring indicates that they are mutually isolated.

Very few taxonomists with a wide experience in the herbarium and in the field will admit that any one of the suggested methods of the origin of species explains the origin of all. There is a general consensus of opinion that natural selection occurs, but its action is more negative than positive. Some so-called species, perhaps a considerable number, are certainly habitat-species, as Bonnier's work has shown. Variations are of all degrees, even amongst mutations which have been genetically investigated, as the theory of multiple-allelomorphs indicates, and taxonomic evidence alone would suggest that apparently continuous variation and discontinuous variation merge into one another (unless the phrases are so used as to separate germinal and non-germinal variation).

Modern genetics has been largely combined in recent years with a modified form of the mutation theory—the discontinuous origin of new characters. It has also been shown that the majority of those new characters which have occurred under conditions of controlled breeding are recessive, and owe their appearance rather to the loss or modification of active genes than to the appearance of new ones. This has led to the idea of fractionization—an idea which, though difficult to accept when first presented to an orthodox botanist, is found on examination to be extremely suggestive. Thus it links together such apparently independent theories as the law of loss in evolution, Guppy's theory of differentiation, and Willis's age-and-area theory. From the taxonomic standpoint one may well believe that the splitting of species and, perhaps, its reverse, the fusion of species, are not uncommon.

Many so-called species in such genera as *Rosa*, *Erophila*, *Alchemilla*, *Taraxacum*, and *Hieracium* are certainly due to different combinations of genes brought about by crossing and kept constant by apomixis (apogamy or parthenogenesis in Winkler's sense). They are not the equivalent of species in genera which reproduce by normal amphimixis, but are clones *, and should have special taxonomic treatment. On the other hand, it is probable that in certain genera, such as *Viola*, *Thymus*, *Verbascum*, and *Centaurea* in the South-East

* Clone, the total of separate plants that have originated from one by vegetative multiplication.

European and Oriental floras, crossing, without so far as is known any apomixis, helps to account for the numerous morphologically, and probably phylogenetically, closely allied groups. Often a sufficient isolation enables these to become established as stable entities, which I should regard as species. Yet there is no doubt that many of the homozygous segregates from a cross fail to establish themselves as new entities, either because they are eliminated by natural selection, or they fail to become isolated and are reabsorbed into one or other of the parent species, or come to represent stages in the amalgamation of two species. Claussen points out the absurdity of naming for taxonomic purposes the segregates arising from *Viola arvensis* crossed with *V. tricolor*. With the characters he investigated (there are doubtlessly additional ones), 5,308,416 combinations, he says, are possible. Wittrock (1896) has recorded about 40, as subspecies, varieties, sub-varieties, forms, and sub-forms. This still leaves many to be named and described! There must, then, be some other criterion for a species than only morphological resemblances and differences. If a homozygous segregate from *Viola arvensis* crossed with *V. tricolor* survives, breeds, and produces a population which is definable by each individual within it possessing a similar set of characters and not possessing other characters, and this population is isolated and kept isolated, then I should consider that the segregate has given rise to a species.

This leads to a consideration of "isolation." Geographical isolation (connected with latitude, longitude and altitude, and barriers) is one form, and is probably more complex than is generally realized. Differences in flowering periods, in habitat preferences, and, possibly still more important, crossing incompatibilities may mean isolation just as much as spatial separation. Little is yet known about cross-incompatibilities, but, judging from recent work on *Nicotiana*, it would seem that intra-fertile inter-sterile groups may be found in one family (that is, arising from one cross).

In detailed phytogeographical studies there is always the danger of circular arguments being used. Certainly, when a limited portion of the whole distributional area of any one species is being studied, there is a tendency to consider small groups as species, while in taxonomic monographs the tendency is generally towards specific "lumping" and the recognition within the species of subspecies, varieties, etc., an excellent example being the recent monograph of *Saxifraga* in Engler's *Pflanzenreich*. Herbarium studies may, if the material and information available are sufficient, reveal geographical isolation for a set of specimens, and if definite morphological resemblances and differences are constantly correlated with the geographical isolation then specific distinctness may be claimed and justified. On the other hand, many examples are known of existing discontinuous distribution in what is clearly one species morphologically. As already stated, a species must be characterizable inclusively and exclusively in morphological terms.

A species is composed of individuals. It is a group of individuals classified together because every member has certain characters in common with every other member, and has not other characters, but every species does not contain the same number of individuals, nor are species separated one from another by characters similar in number and quality. Species may be morphologically "closely related" or morphologically "isolated." In extensive work one is forced to recognize collective or aggregate species, in the sense that there are naturally in-breeding groups composed of different homozygous and heterozygous smaller groups and individuals, some of which are often described as "microspecies."

No single absolute test for a species is yet known, and it is debatable if such is ever likely to be found, but as a working hypothesis the following criteria should be considered: a species is morphologically definable in that it has a sum-total of characters, and every individual within it has constant resemblances with every other individual within it, and constant differences from every individual of other species, even when the individuals are grown under diverse conditions; species are isolated one from another, sometimes geographically, sometimes by habitat preferences, sometimes by having different flowering periods, usually by not crossing naturally to produce completely fertile offspring; species may show chromosomal differences. A species is an isolated group of individuals whose sum of characters tends to keep constant by natural in-breeding. Obviously to prove a species on the above basis the widest studies are necessary, and since they are rarely carried out most taxonomic work must be regarded as tentative. Herbarium studies alone cannot satisfactorily decide a species, because no tests of stability are possible and material is rarely even relatively complete. Field-studies alone cannot decide a species unless these are exhaustive—that is, carried out over a long period of time and over the whole area of the supposed species. Genetical studies alone cannot prove a natural species, because, of necessity, artificial isolation is a *sine qua non* of genetical investigation.

A number of practical points suggest themselves. The description of single species as new should be discouraged, unless the whole genus, or section of the genus, is revised. The description of new species should be left more to the genus monographer. Those engaged on the study of a local flora should take more into account the range of variation of each species outside the limited area of their own special studies. Larger collections are necessary. Hundreds of specimens of a single species, in all its stages of growth, from every part of its area, and from every type of environment in which it grows, are none too many. More actual field-observations should be made and collecting done by the trained taxonomist. An experimental garden and laboratory should be attached to every herbarium.

A considerable number of critical examples have been worked out along the lines indicated above, and the more interesting of these are being published in separate papers. In the meantime, I should be grateful for help from my fellow-botanists, and it is worth emphasizing that negative results, especially in breeding experiments, are often of considerable interest to the taxonomist. In conclusion, I wish to thank Dr. Bateson, F.R.S., Dr. Stapf, F.R.S., and Mr. T. A. Sprague, B.Sc., for constructive criticisms of this paper.

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ROTHAMSTED EXPERIMENTAL STATION.

THE recently issued report for 1923–4 * of the Experimental Station of the Lawes Agricultural Trust, at Harpenden, gives an interesting account of the work of the station (founded in 1843 by the late Sir J. B. Lawes) under the directorship of Sir John Russell, F.R.S. The purpose of the work "is to discover the principles underlying the great facts of agriculture, and to put the knowledge thus gained into a form in which it can be used by teachers, experts, and farmers for the upraising of country life and the improvement of the standard of farming." The report deals mainly with work on the soil, especially the investigation of fertilisers and their effects on different crops, but of special interest are the results of the work

* Price 2*s.* 6*d.* To be obtained only of the Secretary, Rothamsted Experimental Station, Harpenden, Herts.

on the inoculation of leguminous crops. Since the discovery in 1890 that leguminous plants live in association with micro-organisms inhabiting the nodules on their roots, efforts have been made to improve the growth of leguminous crops by adding the appropriate organisms to the soil. Some successes were obtained on the Continent, but the method failed in this country, a failure which is now shown to be due to lack of compliance with certain necessary conditions. During the past three years the whole subject has been re-examined in the Bacteriological Department at Rothamsted. The failure of inoculation in many cases is shown to be due to the fact that the organisms were already present in the soil, but some condition essential to the growth of the plant was not realised, and the deficiency could not be remedied by merely adding more of the organisms. Further, it was shown that in many cases cultures died before reaching the farmers, and means have now been devised whereby the organisms can be transported alive. Again, the organism cannot flourish in soils having too great a degree of acidity. It has been ascertained that the organisms pass through a life-cycle including mobile stages in which they can travel to the plant, and non-mobile stages in which they cannot travel. The non-mobile stage can, however, be made to change into the mobile stage by certain treatments, especially the action of phosphates; this is no doubt one reason for the remarkable effect of basic slag in increasing the growth of clover on certain soils. Acting on these facts, a method has been devised which ensures an earlier commencement of spread of the organisms in the soil, and therefore a better chance of infection of the roots.

With the help of a grant from the Research Committe of the Royal Agricultural Society, extensive trials are being carried out at some thirty centres scattered throughout England to test the value of the method for lucerne, and inoculation has already proved of considerable value in new districts where the crop has not previously been grown, in some places doubling the growth in the first year as compared with the uninoculated plots.

It has also been shown that in the absence of traces of boron in the soil, many leguminous plants fail to grow, owing to the fact that the conducting vessels connecting the vascular system of the root with the nodule are not developed.

Another section of the report deals with the micro-organisms in the soil. Recent observations have demonstrated various fluctuations of the micro-organisms in natural field-conditions. In the case of bacteria two-hourly fluctuations have been recognised and measured. Superimposed upon these are daily fluctuations affecting both bacteria and protozoa, the level of numbers for any species at 9 A.M. varying from day to day. Further, there are seasonal fluctuations—a great rise in spring, a fall in summer, a rise in autumn, and a fall in winter; bacteria, protozoa, and apparently also algæ and fungi being affected. The cause of the daily, and probably of the hourly, fluctuations of bacteria is the fluctuation of the number of amœbæ which feed on them. The fluctuation of the amœbæ is partly

accounted for by the fact that their rate of reproduction depends upon the number of bacteria present; when the latter fall below a certain level no division of the amœbæ occurs; it begins only when they rise above this. Owing to greatly improved methods of counting the protozoa and cultivating the bacterial colonies, devised by members of the staff, it has been possible to estimate quantitatively the constituents of the soil-population. There is definite evidence that crops obtain only part of the possible food-supply, much of the rest being taken by soil-organisms and thus rendered unavailable. It is suggested that the algæ may be the worst offenders, but the matter is still under investigation.

OBITUARY.

George Schweinfurth
(1836–1925).

When in 1809 Napoleon conscripted soldiers for the Russian campaign, Schweinfurth's father fled from Wiesloch in Baden, first to Lübeck and afterwards to Riga, where he married the daughter of another fugitive family, from Stendal in Hannover. Here George Schweinfurth was born, the ninth and youngest child of his parents, in 1836. The early years of his school-training were spent at a boarding-school in the centre of Livland (Latvija), and later he attended the higher classes of the gymnasium of Riga. As a boy he would read books on travels and explorations, whereby a longing was aroused to travel the wide world as an explorer. He knew very well that he needed for this purpose physical strength and an iron constitution, and therefore early started training by taking, whenever he could, long walks through the country. When, aged 20, he for the first time came to Germany, he continued his bodily training in the Alps. For the first time he tested his capability on a lonely walk through the island of Sardinia, collecting plants. Having finished his studies on natural science in Munich and Berlin, he went, with a sum of 10,000 roubles which he had received from his mother, for his first trip to Africa, for a botanical exploration of the region of the Nile.

This first journey lasted from December 1863 till the summer of 1866. Schweinfurth travelled in a small barque along the coast of Egypt and Nubia, and visited the adjacent mountains; he returned *viâ* Sennaar to Khartoum, and discovered on the journey to Kassala and Maman the ancient city of tombs of the Bega. Besides botanical explorations, he had made a great number of geographical discoveries and contributed much towards the completion of the maps of the regions traversed.

In the following year the Academy of Science in Berlin granted him, out of the funds of the "Humboldtstiftung für Naturforschung und Reisen," the means for a botanical exploration of the area watered by the Bahr-el-Ghazal. Although he had at his disposal scarcely more than a thousand pounds, he was able to travel on this small sum more than three years, as by his amiability and humane qualities he everywhere made friends among Europeans, Arabs, and Negroes, who considered it an honour to help him in all his enterprises without accepting payment.

The remarkable record of his travels, which appeared first in 1873 in London under the title of "The Heart of Africa," showed that Schweinfurth was not only a botanist and geographer, but that an intelligence of an almost unique versatility was involved—to anthropologists, ethnologists, linguists, geologists, botanists, and zoologists, as well as to geographers, it gave something new. In poetical, sometimes dramatic, language, and with artistic drawings, Schweinfurth gave a picture of the land; on the one hand, by means of inscriptions and sculptures of tombs he showed the past, on the other, by describing the inhabitants, their customs, ways, and fashions, he illustrated the present, and by comparing past and present he depicted the evolution of culture. Schweinfurth's discoveries were made in a country never before trodden by a white man's foot, and the maps of these regions, which hitherto had shown large blank spaces, could now be filled in; he had established the north-western limitations of the basin of the Nile, discovered the Uëlle, and found and described the pygmy tribe of the Acca, thus confirming the ancient myth of the Pygmies. The Royal Geographical Society of London honoured Schweinfurth by bestowing upon him their gold medal.

In 1874, from January to the end of April, Schweinfurth was again in Africa in the great oasis of El Chargeh. In June of that year he founded at Cairo the Geographical Society, but held the Chair only for a year. From 1876 he devoted himself entirely to the botanical and geological exploration of the desert east and west of the valley of the Nile, drawing thirty new maps. During all this time he had his residence in Cairo. During the summer of 1880 he traversed the Lebanon, and in 1881 the island of Socotra and part of the north coast of Arabia were explored botanically, whither he went once more for a longer stay in 1889.

In July 1888 Schweinfurth removed his residence from Cairo to Berlin, but never spent a winter in Germany, always returning during winter and spring to northern Africa—Egypt, Algiers, or Tunis.

In the years 1891 to 1894 Schweinfurth made three journeys through the northern parts of Abyssinia, which were then occupied by Italy as "Colonia Eritrea," and collected mostly plants and antiquities. The remains from antiquity attracted him more and more; from 1892 he applied himself almost exclusively to the exploration of the paleolithic and eolithic epochs of Egyptian culture; more especially he investigated the hills near the ancient Thebes (Luxor) and gathered together rich collections, which he liberally distributed to museums and private collectors. In particular, remains of plants found in tombs as offerings to the dead, or elsewhere, attracted his attention, and he was always interested in the interpretation of ancient Egyptian pictures and sculptures of plants.

After having left Egypt for the last time in 1914, he devoted himself entirely to his collections, his library, and his diaries, which

were deposited in the Botanical Museum at Berlin (Dahlem). Up to the time of his death he was occupied with the investigation of the earliest ages of Egypt, the history of her cultivated plants, and her plant-geography. Though he had lately published little, he remained full of vigour and interested in events, and was always delighted to give his valuable advice when consulted.

Although small and slim, he enjoyed perfect health, and had practically never been ill. For the last months he sometimes complained that his legs would not carry him, but his eyesight remained good and strong, a fact that he attributed to the clear light of Egypt. He died in Berlin on September 19th within a short time of completing his eighty-ninth year.

A. K. SCHINDLER.

[WE are indebted to Dr. A. K. Schindler, of Huterbog, Brandenburg, for the above appreciation of Dr. Schweinfurth.—ED. JOURN. BOT.]

SHORT NOTES.

MOSS REMAINS IN RUSSIAN PEAT.—Prof. W. S. Dokturowsky, of Moscow, has within the last few years published two Reports on plant-remains in Russian peat-bogs, including a number of mosses. Since the publication of those reports he has determined some further species of mosses from new localities, and has asked me to publish a note on them.

1. Peat dug in Novaya Zemlya. *Cinclidium* sp. *Meesea triquetra* (L.) Aongstr. *Drepanocladus* sp. *Calliergon Richardsonii* (Mitt.) Kindb.

The following are from the 2nd Interglacial Period:—

2. Interglacial peat from Ljalowo, Gouv. Moscow. *Drepanocladus Sendtneri* (Schimp.) Warnst.

3. Interglacial peat from Sergiew, Gouv. Moscow. *Sphagnum teres* Aongstr. *Paludella squarrosa* (L.) Brid.

4. Interglacial peat from Studenij-Owrag, near Moscow. *Brachythecium* sp.

5. Interglacial peat from Spassky-Pogost, near Archangel. *Drepanocladus vernicosus* (Lindb.) Warnst.—H. N. DIXON.

INGHAM COLLECTION OF MOSSES.—Bryologists will be interested to learn that the late William Ingham's collection of British Mosses and Liverworts has, by gift, found a permanent home in the University of Leeds. It contains twelve thousand specimens, including gatherings by many well-known men of the past, such as Professor T. Barker, R. Barnes, Dr. R. Braithwaite, Boswell, J. Needham, J. Nowell, Dr. H. F. Parsons, W. H. Pearson, M. B. Slater, Dr. R. Spruce, Wm. West, J. A. Wheldon, and Wm. Wilson.

There is a large series of Harpidioid Hypna, vouched by H. N. Dixon, Wheldon, and Renauld, that will be valuable for the study of that polymorphic group. A comprehensive collection of Sphagna tested by Wheldon will supply types of the varieties and forms described in his synopsis of the European Sphagna.

Amongst plants having a sentimental value may be named the first British gatherings of *Tortula cernua* at Aberford and Conisborough, the first Yorkshire gathering of *Jubula Hutchinsiæ* at Hebden Bridge; *Thuidium Blandovii* gathered by Barnes at Halnaby, probably now lost to the county by drainage of the Carrs. The known history of *Tetraplodon Wormskjoldii* in the country is illustrated by a number of gatherings, including Selater's plant (1870), which remained unrecognised until Jones and Horrell refound it in the same district in 1901.

Many vouchers for New County records were sent to Ingham as compiler of the Census Catalogues of British Mosses and Hepatics; it is to be hoped that these will attract similar material in the future. Leeds is accessible; a convenient centre for the West Riding or even for the North of England.

Mr. W. H. Burrell, F.L.S., who has already expended time and skill in the arrangement of the specimens, has been appointed Honorary Curator of the Collection.

Vouchers for new plants or new county records, addressed to the Curator, will be placed in the collection.

PRUNUS SEROTINA Ehrhart, Beiträge, iii. 20 (1788).—"Prunus foliis lato-lanceolatis acuminatis simpliciter serratis glaberrimis subeglandulosis deciduis; serraturis adpresso-inflexis; infimis sæpe petiolo insidentibus; costa subtus bifariam pubescente; racemis simplicibus; petalis integerrimis.—*Die späte Traubenkirsche.*"

This tree, belonging to the same group as our native *Prunus Padus*, is to be found naturalised and self-sown in woodland near Peper Harow, W. Surrey. It was known to the Canadian soldiers as "The Rum Cherry." The Rev. W. A. Shaw, who showed the tree to Prebendary Burdon and myself in July 1925, in sending me the fruits on Sept. 21, writes:—"Crowds of Missel-Thrushes are stripping off all the berries as fast as possible, and Hawfinches are very partial to the kernels of the stones, or it would spread more on the Common here." The identification is agreed to by Mr. A. W. Exell and Mr. A. B. Jackson. Loudon (Encycl. of Trees and Shrubs, 1842) mentions *Cerasus virginiana* Michaux as naturalised in various parts of Surrey. But in this the serratures of the leaves are acute, instead of being, as in *P. serotina*, "*adpresso-inflexis.*"—J. E. LITTLE.

NEW BRITISH PLANTS.—In his notes on "The Hieracia of the London Catalogue" in the November number of the *Journal* (p. 315), Mr. Roffey regrets the absence from the national collections of many of the new forms described since the publication of Linton's *British Hieracia* and *Set*. Workers in other groups of the British flora have doubtless experienced the same difficulty. It would be to the general advantage if describers of new species, varieties, &c., would deposit authoritative specimens in the British Herbarium at the Natural History Museum, where they would be accessible to all workers.—A. B. RENDLE.

REVIEWS.

Plant Disease Fungi. By F. L. Stevens. 8vo, pp. 469, figs. 457. New York: The Macmillan Co., 1925. Price 16*s*.

According to the Preface, "The aim of this book is to present the more important facts concerning the morphology and taxonomy of the fungus parasites that affect plants of importance in the continental United States, with some discussion, also, of the more significant facts of morbid histology." Although nowhere stated in so many words—"Copyright, 1913 and 1925" cannot be regarded as very explicit,—the work is really a revised edition of the author's well-known "The Fungi which cause Plant Disease," a volume which has been much used as a text-book in this country. The very useful lists of references of the first edition are omitted and the reader is referred to the "previous work" for these—an inconvenient arrangement for students. The new references are given as footnotes. Space has been saved also by the omission of genera or larger groups whose representatives are of minor importance, and this has led to a shortening of the keys. It is doubtful whether such keys are not frequently more misleading than useful, seeing that so much has to be omitted; a comparison of the keys in the two editions reveals this weakness.

It is unfortunate that in a book which will without doubt be much used by students there should be great carelessness in the manner of quoting authorities—Berkley, Montaigne, Castaigne, Desmaziere, Guillermond are rather startling; Shrä., Gus., All., J. J. & R., Quel., Broud. are examples of slipshod or inaccurate abbreviations; and misspellings of specific names and the interpolation of a comma or a full-stop between the specific name and the authority occur occasionally.

On the whole, the book is satisfactory and gives an up-to-date account of much American work. A difference in stress from a British view-point naturally occurs—for instance, Silver Leaf is dismissed in a few lines.

The introductory sections to the different groups are in most cases excellent, but it would have been well to have given more modern accounts of the cytology of the Ustilaginales and the Basidiomycetes. Among other points: oospore-formation in *Phytophthora infestans* is not properly described; *Boudiera*, the cytology of which was worked out by Claussen is really *Ascodesmis*; *Rhopalocystis* Grove, 1911, is predated by *Aspergillopsis* Spegazzini; *Mycena epipterygia* is probably not the fungus intended as "injurious to various kinds of trees," and in any case the description is inadequate; the perfect stage of *Polythrincium Trifolii* is *Dothidella*, not *Phyllachora*; and *Ozonium* is often the sterile mycelium of an Agaric, e. g., *Coprinus domesticus* or *Psathyrella disseminata*.

The book is well printed and fully illustrated and the format is pleasant. It is to be recommended to all desiring an idea of the present state of our knowledge of plant-diseases.—J. Ramsbottom.

Catalogue of the Printed Books and Pamphlets in the Library of the Linnean Society of London. New Edition. Demy 8vo, pp. 860. Linnean Society, Burlington House, Piccadilly; Longmans; and Williams & Norgate. 1925. Price (to Fellows), cloth, 21*s*., paper wrappers, 18*s*. 6*d*.

The last edition of the Library Catalogue of the Linnean Society was issued in 1896, and has been out of print for many years. The present edition includes the accessions of the last twenty-nine years. No manuscripts have been included, as it is intended to bring out a separate Catalogue of these at a later date. Many entries of reprints from sets of periodicals already included have been transferred to a manuscript catalogue of pamphlets.

Fellows of the Society will welcome the new edition, which has been a desideratum for so many years. To many Fellows, especially those not residing within easy reach of the Society's rooms, the absence of a Catalogue has been a serious drawback, and the moderate price of the substantial volume should ensure for it a ready sale among the large number of Fellows who find in the use of the Library one of the most important privileges of their Fellowship.

As the work was practically complete on the appointment of a librarian in 1924, after the lapse of some years, the responsibility of its preparation is owed to the General Secretary, Dr. Daydon Jackson, who gratefully acknowledges the services of Mr. Spencer Savage, Clerk to the Society, "whose bibliographical skill and devotion to the present Catalogue have been of the greatest value." The smaller type employed, as compared with the previous edition, has enabled the size of the volume to be kept within reasonable bounds; but the use of clarendon type for the main heading (author's name, title of periodical, &c.) facilitates reference. The smallest type employed for details of periodical publications &c. is somewhat trying when used in quantity, as in the case of Bibliotheca Botanica and Zoologica, but this will doubtless be condoned in view of the advantage gained in saving of space. The printers, Messrs. Turnbull & Spears, of Edinburgh, have done their work well.

Each entry gives the author's name, the title of the book or pamphlet, and the place and date of publication. In the case of "separates" reference is given to the original publication. Octavo publications are not noted as to size, otherwise the size is indicated. Periodical publications are entered under their title in alphabetical order, thus Journal de Botanique, Journal de Conchyliologie, Journal of Botany, Journal of Ecology, &c.; the name of the editor is indicated, as well as changes in editorship. Thus, the Journal of Botany, in its sixty-three years of existence, is shown to have experienced seven changes of editors. Academies and Societies are entered under their place of publication, but when this is not evident cross-references are supplied. The publications of the British Museum (Natural History) occupy fifteen pages under that heading and are subdivided under Expeditions, Collections, History, &c., Guides, and Catalogues, the last-named being classified under the heading of the group of organisms—mammals, birds, plants, &c.—concerned. In the case

of composite works, such as the report of a scientific expedition, the contents of each volume are shown in detail with the name of the author responsible for each part. Books in Linnæus's own library are indicated by the letter ℔.

It is appropriate that Linnæus's works should have a specially distinctive heading. These occupy nearly fifteen pages and are classified under opera, collected works, orationes academicæ, epistolæ, vita, and academical dissertations; the order under each heading is chronological.

A scrutiny of the pages of the Catalogue gives rise to a few suggestions. It is evident that the library contains some proportion of incomplete sets. In some cases the periodical indicated may be of little or no value to the Society, though it may be of interest to chronicle its existence. For instance, of the Elliott Society of Natural History of Charleston and South Carolina, the library possesses Proceedings, vol. i. (1859), Journal, vol. i. (Articles 1 and 2) (1859), and Constitution and Bye-laws (1857). It would be interesting to know whether this represents all that was issued; and alternately whether subsequent issues are both desirable and to be obtained. Of the Geological and Natural History Survey of Minnesota the library contains the Second Annual Report (1874) and Bulletin, no. 4 (1887). Six successive titles raise similar questions: Naturalists' Journal and Miscellany, 1 part (1832); Naturalists' Miscellany, vols. i.–viii. only; Naturalists' Monthly, vol. i., nos. 4–5 (1887-8); Naturalists' Note-Book, vols. i.–iii. (1867–79); Naturalists' Pocket Almanack for 1863; Naturalists' Pocket Magazine, no. 9 (1798). Does "i.–viii. only" mean that only eight volumes were issued? Such examples might be multiplied. It seems likely that in some cases the library would benefit by the completion of these series, and the publication of the Catalogue affords Fellows an opportunity for cooperating towards this end. And this raises the larger question. The Catalogue reveals at once the wealth and deficiences of the library, and is a mute appeal to the generosity of the Fellows to increase its efficiency to a higher degree than is possible merely by the expenditure of the amount annually available from the Society's funds.

Die Zellmembran. By Dr. C. van Wisselingh, Professor at the University of Groningen (Holland). 8vo, pp. viii, 266, with 73 text-figs. Borntraeger, Berlin. 1924. Price 15 G.M.

This volume forms a section (Band iii./2) of the subdivision Cytologie of *The Handbuch der Pflanzenanatomie*, edited by Prof. K. Linsbauer. It is an exposition of our present knowledge of the various substances which enter into the composition of the plant cell-membrane arranged under the following headings:—Cellulose, Hemicellulose, Pectins and allied substances, Lignin and Lignification, Suberin and Cutin, Chitin, and Inorganic Substances—silica, calcium (oxalate and carbonate), iron, and manganese. The physical properties, chemical composition, reactions, oxydation, and other products and derivatives are described, and full references are given to the literature of each phase of the subject under discussion.

In a concluding chapter, entitled "Structure and Growth," the author gives a *résumé* of the results of the microscopic investigation of the structure of the cell-membrane, and of the views of previous investigators on its intimate structure. He then formulates his own conclusions, namely, that the cell-wall consists of layers of different chemical composition, and that layers richer and poorer in cellulose alternate and not cellulose-rich and cellulose-free layers. Finally, the author discusses the vexed question of the growth of the membrane. It is clear that neither the apposition nor the intussusception theory alone will explain all cases, and investigation on living material may be expected to throw more light on the problem. The author suggests the possibility that, considering the nature of the various materials involved, apposition may occur in some cases and intussusception in others. He agrees with the latest view of Strasburger that the cell-wall is secreted by the protoplasm.

There are three indexes, the first of authors to whose work reference is made in the text, the second a subject-index, and the third an index of the plants mentioned.

BOOK-NOTES, NEWS, ETC.

The new session of the Linnean Society was inaugurated on Thursday, Oct. 29, by a Dinner at Stewart's Restaurant, Piccadilly, attended by nearly one hundred Fellows and friends, followed by a Reception in the Rooms of the Society. The President (Dr. A. B. Rendle, F.R.S.) received the Guests in the Library, where a series of interesting exhibits was arranged. These included a portrait, in oils, of the late Prof. Daniel Oliver, F.R.S., recently presented by his son, Prof. F. W. Oliver, and a vasculum used by Charles Darwin during his Voyage in H.M.S. 'Beagle' (1831–1836), recently presented by the daughter of Brian Wynne, to whom it was given by Miss Sarah Darwin. Exhibits were contributed by the Imperial College of Science, the John Innes Horticultural Institution, the Royal Botanic Gardens, Kew, and the British Museum (Natural History). Prof. R. R. Gates, of King's College, showed a number of objects of botanical interest collected on his recent visit to the Amazon, and Mr. W. A. Roach, of the Rothamsted Experimental Station, exhibited a potato plant with small tubers developed as endogenous buds from true roots. Miss I. M. Roper showed a remarkable specimen of Wood-Sage (*Teucrium Scorodonia*), in which the well-developed inflorescence bore in place of flowers collections of small bright green leaves. Examination showed these to be associated with the presence of a mite (*Eriophyes*), and the phenomenon therefore resembled the big-bud disease of the black currant and similar transformations due to

mite-attack. The specimen was collected at Howth, near Dublin; a good-sized patch of the affected specimen was growing among others in normal flower.

Mr. R. T. Gunther, Curator of the Old Ashmolean, Oxford, gave an interesting lecture, well illustrated by photographs and lantern-slides, on "The Tradescants and their Collections." The collections of the Tradescants, which were mainly zoological, were of great scientific interest, as being the oldest museum specimens in the country. The present is the 300th anniversary of the year in which John Tradescant, by correspondence with merchants all over the world, inaugurated a Museum in his house in South Lambeth. The collections remained in London until 1683, when they were transferred (by Tradescant's widow) to Ashmole and given by him to the University of Oxford, where they were exhibited in the Ashmolean. Unfortunately the collections were later distributed, and many specimens were lost sight of. These had recently been discovered by Mr. Gunther, who hoped it would soon be possible again to exhibit them in a room in the Old Ashmolean Museum, beneath the room in which the Lewis Evans collection of Scientific Istruments has recently been arranged, thus reinstating them in the building which was specially erected for their reception in 1683.

At the General Meeting of the Society on November 5, Mr. Marius Maxwell described a beautiful series of photographic lantern-slides illustrating the home of the Eastern Gorilla, in the Burunga Mountains near Lake Kivu in the Belgian Congo. The views well illustrated the luxurious tropical mountain-vegetation.

Miss E. Bolton gave an account of her work on the species of *Neuropteris*, a fossil genus of Pteridosperms. The results indicated that very few of the accepted species are species in the ordinary use of the term, but are varietal forms belonging to a few group-species, and owe their characters to age and the position they occupied on the rhachis. It was pointed out that in the absence of the reproductive organs it was extremely difficult to recognise true species in these fossil forms.

During the meeting Mr. Hugh Hamshaw Thomas and the Rev. Philip Grafton Mole Rhodes were elected Fellows, and certificates were read in favour of seventeen candidates for Fellowship.

We regret to note the announcement of the death at Selby, Yorks, on November 7, of William Norwood Cheesman, J.P., F.L.S., President of the British Mycological Society and Past-President of the Yorkshire Naturalists' Union. A biographical notice will appear in the January number.

Correction. Combretum fruticosum, comb. nov., p. 115. This should read *Combretum fruticosum* Stuntz in U.S. Dept. Agric. Bur. Pl. Industry: Inventory of Seeds and Plants Imported, no. 31, p. 86 (1914). We are indebted to Mr. T. A. Sprague for drawing our attention to this combination, which we had (perhaps excusably) overlooked.—W. Fawcett, A. B. Rendle.

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