

BOOK REVIEWS

The Flora of Greenland. Tyge W. Böcher, Kjeld Holmen and Knud Jakobsen. Pp. 312, with 66 text figures, 2 coloured plates and a map of Greenland with floristic provinces and districts. Illustrated by Ingeborg Fredriksen. Translated from Danish by T. T. Elkington and M. C. Lewis. P. Haase & Sons, Copenhagen. 1968. Price £5.

Greenland is considered to be the largest island in the world, having an area of 850,000 square miles which is about nine times as big as that of the British Isles. Its flora of vascular plants, however, consists only of about 500 species (including microspecies), whilst the number of native species of vascular plants in the British Isles is about 2,180 (including microspecies). This is due to the fact that Greenland is situated mainly in the Arctic, where a low summer temperature and a short growing season affect the vegetation. In addition, except for a coastal fringe of varying width up to 95 miles, it is covered by a huge continuous ice cap, rising to a height of several thousand feet at its centre.

Much attention has been devoted to study of the Greenland flora and vegetation, because the growing conditions near the ice cap or on nunataks (small ice-free summits of rocky mountains protruding through the ice cap) are similar to those which prevailed in Europe and N. America during the glacial period. The Greenland flora has also provided an interesting subject for the study of the relationship between the North American, Icelandic and Scandinavian floras and of their origin, because Greenland is located between the Canadian Eastern Arctic (being separated only by some narrow straits in the North-West, and by the wide Baffin Bay in the West), Iceland (separated by the Denmark Sea in the South-East) and Svalbard (separated by the Greenland Sea in the North-East).

Although the investigation of the Greenland Flora commenced about 200 years ago, the first scientific Flora of Greenland, *Conspectus Florae Groenlandicae*, was published by J. Lange in 1880, with two supplements in 1887 and 1892, where 371 species of vascular plants were recorded. Subsequently very extensive botanical explorations were carried out, and they have resulted in *Grønlands Flora*, produced in 1957 by T. W. Böcher, K. Holmen and K. Jakobsen, well-known Danish experts on the Greenland flora. This first edition (in Danish) embodied the results of critical study of many difficult groups and contained 485 species of vascular plants. For those not familiar with Danish there was a short English Guide, together with translated abbreviations of plant occurrence and frequency. The second edition appeared in 1966. It was slightly modified, but enlarged and much revised, especially in respect of some critical groups in the following genera: *Dryas*, *Potentilla*, *Papaver*, *Cerastium*, *Stellaria*, *Campanula*, *Carex*, *Trisetum*, etc. Twelve figures, each containing illustrations of several species, were added, making 62 figures showing habit and morphological detail of about 290 species, as well as four figures of leaf-shapes, diagrams of flowers and types of inflorescence. As a result of recent discoveries the number of species dealt with was considerably increased.

The English translation of the second edition of Böcher, Holmen & Jakobsen's *Grønlands Flora*, now being reviewed, is well done by two British botanists, Dr. T. T. Elkington of the University of Sheffield, and Dr. M. C. Lewis of the University of Birmingham. The two versions of the second edition are nearly identical, except that the introductory chapter dealing with botanical terminology in the Danish version is omitted in the English one, where it is replaced by a glossary of botanical terms at the end of the book. The book contains 496 species, few of which are adventive or introduced. Of these species about a quarter are natives of Britain, some of these being represented in Greenland by a different variety or subspecies. Several species are new, being endemics to Greenland, e.g. *Hieracium trigonophorum* Oskarss., *Taraxacum amphiphrons* Böch., *Sisyrinchium groenlandicum* Böch., etc. *Rhododendron vanhoeffenii* Abrom., found at Karajak Nunatak in Continental West Greenland, is possibly a good species according to the authors, but may be an intergeneric hybrid between *Ledum palustre* L. and *Rhododendron lapponicum* L. The Greenland '*Equisetum* × *trachyodon* (A. Braun)', which has been reported from Qagssiarsuk at Igaliko Fjord in SW Greenland, also offers a problem. *E.* × *trachyodon* is supposed to be a hybrid between *E. hyemale* L. and *E. variegatum* Schleich. ex Weber & Mohr. As *E. hyemale* has not been found in Greenland, the occurrence of *E.* × *trachyodon* has been explained by its introduction there by Norsemen settlers in the past. However, examination of material referred to *E.* × *trachyodon*, collected in the above-mentioned locality and preserved at the British Museum (Natural History), revealed that it shows a remarkable resemblance to *E. variegatum* var. *wilsonii* (Newm.) Milde, occurring in Kerry. The late A. H. G. Alston, who examined Rosenvinge's specimen of *E. hyemale* var. *doellii* Milde, on which the Greenland record of *E.* × *trachyodon* was based, came to a conclusion that it is not *E.* × *trachyodon*, but represents a form of *E. variegatum* (cf. Polunin 1959). The Flora also contains 30 distinct hybrids, of which two are supposed to be intergeneric hybrids, between *Leucorhiza albida* var. *straminea* (Fern.) Å. Löve and *Platanthera hyperborea* (L.) Lindl., and between *Agropyron violaceum* (Hornem.) Lge. and *Elymus arenarius* subsp. *mollus* (Trin.) Hult. A considerable number of changes in nomenclature are made, some for taxonomic reasons, by raising some minor taxa to specific rank, e.g. *Lycopodium dubium* Zoega and *Carex boecheriana* Löve, Löve & Raymond, or by sinking some species to a lower rank, e.g. in *Draba*; others owing to misapplication of a name, e.g. *Thymus drucei* Ronn. is replaced by *T. praecox* subsp. *arcticus* (Dur.) Jalas and *Campanula rotundifolia* L. by *C. gieseckiana*

Vest; and still others for purely nomenclatural reasons, bringing the nomenclature more up to date, e.g. *Euphrasia arctica* Lge. ex Rostr. is replaced by *E. frigida* Pugsley.

With regard to the pteridophytes, the generic names follow *Flora Europaea*, except for *Thelypteris phegopteris* (L.) Slosson, which in the first edition was treated as *Lastrea phegopteris* (L.) Bory and in the second as *Phegopteris connectilis* (Michx.) Watt. The generic limits in the phanerogams in some cases are different from those adopted by British botanists. Thus, *Comarum* is kept apart from *Potentilla*, *Melandrium* from *Silene*, *Viscaria* from *Lychnis*, and *Elytrigia* and *Roegneria* from *Agropyron*, but *Chamaepericlymenum* is united with *Cornus* and *Arctous* with *Arctostaphylos*. The correct spelling of the generic name of the Sea Sandwort is *Honkenya*, not *Honckenya*. Some specific names of the first edition familiar to the British botanists have been replaced by names rejected in Dandy's *List of British Vascular Plants* and in recent British Floras, e.g. *Callitriche intermedia* Hoffm. by *C. hamulata* Kütz. and *Carex curta* Good. by *C. canescens* L. Some further discrepancies are as follows: *Atriplex latifolia* Wbg. is used instead of *A. hastata* L., *Calamagrostis neglecta* (Ehrh.) G., M. & S. instead of *C. stricta* (Timm) Koel., and *Pheum commutatum* Gaud. instead of *P. alpinum* L. *Potamogeton pusillus* subsp. *groenlandicus* (Hagstr.) Böch. should be referred to *P. berchtoldii* Fieb.

We are told in the Preface which sections of the book were done by the three Danish authors. The first chapter 'Earlier accounts of the Greenland Flora' deals with a history of exploration of the Greenland vascular plants, giving an account of published species lists and Floras. It is accompanied by a list of references. The chapter 'The occurrence and distribution of the species' shows the vegetational belts in Greenland and floristic provinces. Special attention has been directed to the descriptions of the most important types of Greenland plant communities, such as copse; herb slopes; snow-patches; grassland slopes; arctic-subarctic steppe; dwarf-shrub heath or heather moor; fell-fjeld; communities on solifluction soils; beaches and dunes; saltmarsh; bog; fen, marsh and wet flushes; and freshwater lakes. The descriptions are brief, but they characterize each type of habitat well, and include a mention of some of the most characteristic plants of each habitat. The main part is devoted to a taxonomic treatment of pteridophytes and phanerogams. It is well done and easy to use. The arrangement, with some modifications, is similar to that adopted by Clapham, Tutin & Warburg's *Flora of the British Isles*, where pteridophytes are placed at the beginning and monocotyledons at the end. There are keys to major groups, families, genera and species. Descriptions of all taxa are given with clear characters, followed by the chromosome number (based mainly on Jørgensen, Sørensen & Westergaard's cytological studies on the Greenland plants), by details of habitat, distribution of the species in Greenland, information about references to distributional maps published in other books or periodicals, and particulars about the total range of species. It is a pity that a key to all species of *Taraxacum* has not been produced, species of the sect. *Spectabilia* being left out. Of 17 species belonging to the Section, 14 are not supplied with descriptions. The taxonomical part is followed by a good glossary of botanical terms, a bibliography of works dealing with the distribution of plants occurring in Greenland, a carefully prepared index, and a map of Greenland with floristic provinces and districts.

The book is an excellent work, well produced; misprints are rare. Any adverse criticisms do not diminish its scientific value. The illustrations prepared by Miss Ingeborg Fredriksen are of a high standard, both from a scientific and an artistic point of view, and they will be of great assistance.

It must be mentioned that Greenland is still an open field for scientific exploration. Firstly, many areas in that vast country have not been visited, and it is possible to discover plants which may be new to Greenland or may provide new records for a particular area. Secondly, visitors could study its fascinating plant life, especially near the ice cap or on nunataks. Thirdly, many plant groups still need careful study from the cytotaxonomic point of view, e.g. *Cochlearia*, *Papaver*, *Salix glauca* L. agg., *Stellaria*, *Hieracium*, *Taraxacum*, *Poa*, and species related to *Agropyron pauciflorum* (Schwein.) Hitchc. e.g. *Roegneria virescens* (Lge.) Böcher, Holmen & Jakobsen.

The *Flora of Greenland* will be of great value to all who are interested in the Greenland flora and in arctic botany in general. Unfortunately, it is rather expensive.

REFERENCES

- BÖCHER, T. W., HOLMEN, K. & JAKOBSEN, K. (1957). *Grønlands Flora*. København; ed. 2 (1966).
 CLAPHAM, A. R., TUTIN, T. G. & WARBURG, E. F. (1962). *Flora of the British Isles*. ed. 2. Cambridge.
 DANDY, J. E. (1958). *List of British Vascular Plants*. London.
 JØRGENSEN, C. A., SØRENSEN, TH. & WESTERGAARD, M. (1958). The Flowering Plants of Greenland. A taxonomical and cytological survey. *Biol. Skr. Dan. Vid. Selsk.* 9, No. 4.
 LANGE, J. (1880). *Conspectus Florae Groenlandicae*. Suppl. 1 (1887); Suppl. 2 (1892) by L. K. Rosenvinge. *Medd. om Grøn.* 3.
 POLUNIN, N. (1959). *Circumpolar Arctic Flora*. Oxford.
 TUTIN, T. G. et al. (ed.) (1964). *Flora Europaea*. Vol. I. Cambridge.

A. MELDERIS

Excursion Flora of the British Isles. A. R. Clapham, T. G. Tutin and E. F. Warburg. Second Edition. Pp. xxxv+586. Cambridge University Press. 1968. Price £1 10s.

Six years have elapsed since the publication of the second edition of the *Flora of the British Isles*, and in that time many advances have been made in the study of British plants. Much, but not all, of this is reflected in the pages of the new edition of the *Excursion Flora*. As in the first edition, the descriptions are concise but adequate, and the keys practical and workable. The completely revised treatment of the ferns including comparatively recent revisions in *Dryopteris* and *Polypodium* is in line with modern thinking, though taxonomists still tend to disagree on the correct delimitations of taxa in the latter genus.

The main weakness of the work is I feel, in the inconsistent treatment of certain genera. Jonsell's excellent revision of the north-west European species of *Rorippa* is adopted, but the equally competent revision of *Ranunculus* section *Batrachium* by Cook is ignored, as is Nilsson's work on *Claytonia*, Nordborg's revised treatment of *Sanguisorba* and Harley's recent findings on *Mentha*.

There are the usual number of inevitable changes in nomenclature, e.g. *Erodium cicutarium* L. subsp. *bipinnatum* (Willd.) Tourlet for *E. glutinosum* Dumort. and *Agrimonia procera* Wallr. for *A. odorata*, but *Petrorhagia prolifera* is surely a slip for *P. nanteuillii*, the former species being absent from the British Isles where it is replaced by the latter. It is, however, easy to criticize and the revision of a national Flora is a major task. The present book may therefore be considered the most up-to-date account of the flora of our islands, and in view of its compact size and moderate price is certain to find its way into the hands of all those interested in British botany.

D. H. KENT

Evolutionary Biology. Edited by Th. Dobzhansky, M. K. Hecht and W. C. Steere. Vol. I. Pp. xi+444. Appleton-Century-Crofts, New York. 1967. Price \$14.

This is the first volume of a serial publication designed to provide expert reviews in the wide and growing field of evolution. It contains eight articles, and an idea of their range may be given by quoting some of their titles, e.g. 'Chemical Evolution', 'Variation and Taxonomy of the early Hominids', 'Permanent Heterozygosity'. There are three articles which are likely to be of special interest to readers of *Watsonia*. The first of these, on the 'Use of Computers in Studies of Taxonomy and Evolution', is by D. J. Rogers, H. S. Fleming and G. Estabrook. This is easily the best article on this subject which we have ever read. It is clear, cool and critical. It describes what can and cannot be done with the aid of a computer, and it makes an excellent analysis of known applications under the two main headings of data processing and data correlation. Particularly important is the point made by the authors that rarely can a single person perform an operation of this kind successfully; the biologist will generally need the help of a mathematician, so that the problem under investigation can be properly programmed, and the results correctly interpreted.

The second article to be discussed is that on 'biochemical systematics' by the late R. E. Alston. This again is of very high quality and it is also extensive (100 pages). Alston points out that the main work in this field so far has been on secondary compounds such as the phenolics, and that these often provide illuminating information about taxonomy at the level of the species or the genus. But above the level of the genus, Alston does not see that the use of such compounds as criteria of evolutionary relationship is likely to be of much importance, though there are some notable exceptions, as for example in the work of McClure on the Lemnaceae. He sees the use of information about macromolecules, such as proteins and nucleic acids, as showing most promise in the future for the student of evolution.

The third article to which we would direct attention is that of G. L. Stebbins on 'Adaptive Radiation and Trends of Evolution in Higher Plants'. Stebbins points out that botanists have not recognized the adaptive and selectionist basis of evolutionary trends in higher plants as generally as zoologists have in animals. The fact that in green plants the modes of nutrition are so uniform means that the possible ways of becoming adapted to the environment are fewer, so that parallel evolutionary trends are expected to be more frequent. Stebbins points out ways in which trends affecting adjustment of both vegetative and floral parts may show adaptive reversals, though there are certain other trends which appear to be irreversible. He stresses the importance of studying developmental patterns and the nature of the meristem in relation to such questions as number of floral parts, vestigial structures, and trends from radial to bilateral symmetry.

The literature in the articles is covered up to 1965; there is an adequate index. There can be no doubt that the volume, in spite of its rather high price, is most valuable, and we look forward to the continuation of the series.

D. H. VALENTINE

Primer of Chromosome Practice. G. Haskell and A. B. Wills. Pp. xv+180. Oliver & Boyd, Edinburgh and London. 1968. Price £2 5s.

This book is intended to provide elementary practical instruction in chromosome cytology for those with limited resources, being aimed at students and teachers, but it also claims to be useful to research workers and technicians. According to the authors no concise practical book has previously been available but at this price the present volume is unlikely to appeal to those with limited means, as many will prefer to purchase Darlington & La Cour (1962) for practical instruction and refer to more advanced library sources for the theory.

Part I, approximately one-third of the book, is devoted to elementary theory covering mitosis and meiosis—unfortunately illustrated by a series of rather poor photomicrographs of *Vicia faba*—followed by informative accounts of chromosome form and number. The subject of polyploidy is dealt with at some length and followed up in the techniques and statistics sections by instructions for investigating some of the secondary effects of polyploidy in higher plants, e.g. the determination and significance of size distributions of stomata and pollen. This feature may well prove of interest to amateur botanists who have access to a microscope.

Part II (Techniques) covers the use of the microscope, simple staining, plant meristem squashes, anther smears, pollen culture, spermatocyte squashes and simple wax embedding for microtomy. A number of additional techniques are briefly described, including methods for meiosis in the locust testis, *Drosophila* salivary gland chromosomes and, perhaps rather ambitiously, the culture of human leucocytes for metaphase chromosome counts. A useful appendix lists sources of materials and describes the rearing of locusts and fruit fly larvae.

Although it is in general a readable little book, one's first impression is marred by a number of obvious printing errors and the poor quality of the plates; Plate XXXVI left, for example, is completely unintelligible. Several of these show incorrect adjustment of the microscope and wrong exposure, hardly a good advertisement for the section on photomicrography. Some of the practical techniques are treated too superficially for the beginner to succeed without much trial and error. This is a pity, because a book such as this should anticipate as many as possible of the likely pitfalls to enable the beginner working in isolation to diagnose his failures.

REFERENCE

DARLINGTON, C. D. & LA COUR, L. F. (1962). *The Handling of Chromosomes*. (ed. 4.) Allen & Unwin, London.

K. J. ADAMS

Flora der Schweiz und angrenzender Gebiete. Hans Ernst Hess, Elias Landolt and Rosmarie Hirzel. Vol. I: Pteridophyta—Caryophyllaceae. Pp. 558 with 9 maps and numerous text illustrations. Birkhäuser Verlag, Basel. 1967. Price sFr. 118 (approx. £12).

The vital statistics of this *Flora* are awe-inspiring to say the least. As a solid brick, $11\frac{1}{2} \times 9\frac{1}{2} \times 2\frac{1}{2}$ in., weighing precisely 8 lb. $5\frac{1}{2}$ oz., it will stick out prominently from any library shelf. One is almost reminded of Cruikshank's vignette 'The Librarian's Nightmare'. Truly this is a fine monument to Helvetian non-conformism, and this not only in respect of its size. In their introduction the authors explain that they have chosen this unusual format on two grounds: firstly, to integrate text and illustrations in a convenient manner and, secondly, to keep the cost of production down. This may be true, but if one thumbs over the work an almost outrageous waste of space becomes immediately apparent. There is no reason whatsoever for covering only one half of a page with print when there is no illustration on that page. Roughly calculated, about 35 per cent of the book consists of empty space. For some curious aesthetical whim of a publisher, the buyer of this book is landed with both an unreasonably high price and an extremely unwieldy volume (there are two more to come, *nota bene!*). I just wonder whether or not the producers of this book have thought for how long the binding will stand up to the stress of everyday use? The reviewer's copy is already showing signs of fatigue.

The first volume consists of a preface, introductory notes and the systematic treatment of the Pteridophyta, Gymnospermae, Monocotyledones and Dicotyledones as far as and including the Caryophyllaceae in the system of Engler & Prantl. The introduction provides a brief but excellent survey of the geography, geology, orography, floristic history, soil and vegetation of the area. The text is accompanied by nine fine coloured maps and some extremely well executed black and white illustrations as well as diagrams.

The systematic section includes concise descriptions of the higher taxa followed by reasonably exhaustive family descriptions. The genera for each family are keyed out in clearly arranged and numbered dichotomous keys which seem to work rather well. Generic descriptions are adequate, and the printing of essential characters in italics is commendable. The same layout is used in the specific descriptions, which are supplemented by biological data such as times of flowering and fruiting. For each species a paragraph on habitat, cytology and distribution is provided. The critical notes on relationships and taxonomical status of each

plant will be of great value. Chromosome counts are given wherever available and are correlated with the relevant literature. The authors' taxonomic concept is in places rather out of date. One can only regret that more recent classifications of certain groups have not been taken into account, and it is disappointing to see that the writers of this monumental work are in many cases out of step with another great contemporary achievement, namely *Flora Europaea*. Why are genera such as *Asplenium*, *Athyrium*, *Woodsia*, *Polystichum* and even *Blechnum* still included in the *Polypodiaceae*, when most modern authors distribute them quite rightly over several independent families? Viewpoints differ and always will; but, whereas taxonomic concepts are debatable, any disregard for the established rules of botanical nomenclature, laid down by the Code and generally accepted by all sensible botanists, is intolerable. To one's dismay, names such as *Picea excelsa*, *Pinus montana*, *Sorghum vulgare*, *Phragmites communis*, *Muscari racemosum* and others have been used in favour of their legitimate substitutes. Also most regrettable is the use of *Lastrea* whereas other floras, notably *Flora Europaea*, have chosen *Thelypteris*. In view of the fact that this otherwise brilliant work will be the standard flora of Switzerland for the rest of the century, and possibly even the last one to be written, such blemishes are disturbing. And this becomes even more painful if one knows of Dr. Becherer's lifelong labours in Switzerland towards nomenclatural stability. The authors' statements 'auch änderten wir in der Regel keine Namen, die schon längere Zeit eindeutig verwendet worden sind' and '... waren die Argumente für Namensänderungen auf Grund der Priorität meistens nicht zwingend' express a defiance of the Code. The reviewer, although sympathetic toward non-conformism of many kinds, can only say that this sort of attitude is arrogant, if not irresponsible.

Rosmarie Hirzel's line drawings are exact as well as beautiful. The agrostologist is a little disappointed about the complete lack of spikelet details in many instances which would have been of great assistance to the less initiated student of this difficult family (e.g. *Heleochoa*, p. 271; *Cynodon*, p. 276; *Phragmites*, p. 228; *Gaudinia*, p. 290 and others). In a few cases the habit drawings are executed on far too small a scale, thus rendering the illustration almost useless (e.g. *Tragus*, p. 277; *Mibora*, p. 278; *Poa*, p. 332). Certainly there was no shortage of space for a more appropriate magnification!

Despite these shortcomings, which are no more than tiny pimples on an otherwise immaculate face, the authors are to be congratulated on their tremendous achievement, which is based on the labours and experience of generations of eminent Swiss botanists. The book can be thoroughly recommended to all students of European plants, provided that they can afford the price.

EDMUND LAUNERT

Critical Supplement to the Atlas of the British Flora. Edited by F. H. Perring. Pp. viii+159. Botanical Society of the British Isles and Thomas Nelson & Sons Ltd., London. 1968. Price £4 10s.

This Supplement contains all that was excluded from the *Atlas* proper (1962): *Hieracium*, *Euphrasia*, *Sorbus*, *Alchemilla*, *Rubus* and other critical genera, as well as diverse species-groups, hybrids and various infraspecific taxa; in all about 500 taxa. Consequently, most data are based on checked herbarium records, and the comments on the maps in the text form an essential part of the book. These are the main differences between the *Supplement* and the *Atlas* itself.

The editor's work must have been as varied as the taxa concerned. Some of the detail and much of the research and determination work was done by him, alone or in active collaboration with experts on different groups; some parts of the book, on the other hand, were written wholly by relevant specialists. The mere organizing and maintaining of this kind of work is a big task. In short, the book is an excellent example of well-planned team-work, involving the collaboration of numerous botanists.

The *Supplement* contains an astonishing amount of data that will be of interest to non-British botanists, even to those working in countries not immediately adjacent to the British Isles. As regards the *Atlas* itself, a good map is by far the best way to give distributional data. It eliminates the difficulties of language and place-names, too. The value of the maps will be increased when detailed plant maps come from other countries; but even now the text comments give abundant data on distribution outside the British Isles, thus considerably increasing the significance of the maps themselves. However, even if these islands are considered alone, they form a well-defined and reasonable phytogeographical area. It is useful to know that the two books now contain maps for all the British vascular plants that it is possible to map.

The *Atlas of the British Flora* occupies a nearly classic position among works on plant mapping and its methods. Much the same may be said of the *Supplement* too. It demonstrates very clearly that almost every kind of difficult taxon can be mapped, even in fair detail. In their layout the maps and the accompanying text gives a strong impression of providing a highly elastic pattern, easily adapted to various problematic plants. Every case is considered separately, and the best feasible possibility chosen. It does not matter that, when necessary, even very incomplete maps are given. Thus for an aggregate species (often already treated as such in the *Atlas* proper, to which clear page references are given), it has sometimes been possible to

determine infraspecific segregates for only some of the records; these, however, give the main trends in the distribution of the segregates. In fact, this is only a question of scale. In cases where exact determinations of segregates of a collective taxon are few in number, the use of larger squares for recording would, of course, give an impression of greater completeness. But the reader can very easily imagine for himself this generalization on the basis of the basic data for 10 km. squares. The situation in question is very clearly demonstrated in the text, and misunderstanding is hardly possible.

A positive feature of the book is the fact that complicated taxa and their records are accepted just as they are. Collective and uncertain records, intermediates, etc., are often omitted entirely. In several cases the text indicates which criteria are used in the limitation concerned, which expert is responsible for the maps, and whether records other than revised herbarium material are used. These are indicated by different map symbols. Throughout the book the relevant herbaria and other sources are listed. All this gives the reader a feeling of safety and allows him to judge the reliability of each case for himself. Literature references enable further records to be traced. Several maps and texts are based partly or wholly on recently published taxonomic studies. In fact, the *Supplement* is a good collection of references to and summaries of the British taxonomic literature concerned. Of course, it includes abundant unpublished material as well.

The text often gives short descriptions of the characteristics, habit, ecology and other biogeographical features of the taxa, and of known or assumed relationships with other taxa. This kind of information will certainly prove useful, particularly to foreigners whose knowledge of these plants is less intimate, and to whom the literature in question is not always readily available.

Although the local microspecies and other endemics will be quite unfamiliar to most non-British botanists (e.g. *Hieracium*, about two-fifths of the whole book), the numerous text comments on genera and species-groups will certainly be of universal interest. The book includes details of the distribution of a good representation of various exceptional categories of taxa (no matter, perhaps, what their names are for our present purpose), brilliantly depicting the genus as it occurs in Britain, and probably also elsewhere though it would be represented there mainly by different microspecies. In this book *Hieracia* (the *H. pilosella* group are treated as a separate genus, *Pilosella*) are living organisms with differing distributions and ecology, not dusty herbarium specimens, taxonomically and phytogeographically meaningless and remote and without interest for most botanists. These plants may prove to behave similarly elsewhere. The *Rubus fruticosus* group is represented by a selection of different types of distribution in the British Isles. However, the cover of mystery still prevails on *Taraxacum*; only three maps are given.

Some small, mainly technical, details catch a foreigner's eye as somewhat disturbing. Although even the isolated black solid dots in the maps are nearly always easy to find, the thin open circles and crosses are more often really difficult to see (e.g. pp. 19, 36, 152). Coastal localities cannot be seen at a glance, and complicated shorelines in several places form configurations of 'o' or 'x' which can hardly be solved without comparison with a neighbouring map. Fortunately the arrows show some of the most isolated localities, and the text may prevent serious misunderstandings. A map with vice-county names and numbers would have helped a foreigner when reading the text comments and in finding the thin symbols (although this information is given in the *Atlas* proper).

A considerable waste of space is caused by publishing all maps in their entirety, particularly those on pp. 77-88 (*Hieracium* Sections *Alpina* and *Subalpina*, 35 maps), which are almost all of taxa restricted to the Scottish Highlands. However, there are two splendid exceptions: a single large-scale ordinary map for the *Hieracium* species of the Section *Alpestris* in Shetland (p. 119) and a mere list of taxa and localities for 14 very rare *Potamogeton* hybrids (p. 139). On the other hand, the inclusion of two or even more taxa (often related) in one map with different symbols has spared much space. In considering layout the editor has clearly attempted very successfully to keep taxonomic entities together. If this attempt has sometimes succeeded at the expense of space the intention is nevertheless good.

As a rule the most necessary synonymy seems to be given. However, although a reader in northern Europe will immediately find that two of the three rare Teesdale *Alchemillas* expressly noted in the text (*A. subcrenata* and *A. acutiloba*) are very common in his country, he may need to ascertain that the third, *A. monticola*, is really *A. pastoralis*, the commonest of all.

Difficult groups and taxa ought not to be omitted from any mapping projects. Perhaps it is more practical to treat them separately, often consulting the appropriate experts and using exceptional methods in the checking and finishing phases. The resulting maps may not always be as complete as most others, but will still be of value. Mapping of critical taxa is not meaningless or impossible. The *Supplement* will no doubt give a fruitful impetus to the mapping of such plants in other countries too. It shows the main methods and principles to be followed in making such efforts elsewhere. These principles were in general by no means unknown earlier; but the *Supplement* contains a good collection of them, and constitutes a bold experiment in realizing them on a large scale. The editor and the other British botanists concerned deserve the very best congratulations for their beautiful work.

JUHA SUOMINEN

To obtain the 1½ million records used in the original *Atlas*, people of widely varying botanical ability—from national experts down to schoolchildren—had to be enrolled for field work, and it was inevitable that doubtful records would get through. This was not serious: it was the distribution patterns that were important.

The *Critical Supplement* was a different matter, for the very nature of critical groups made correct recording essential. But generally only the more competent observer will attempt to record criticals, much use was made of herbarium material and the knowledge of specialists, and it is clear that the compilers very thoroughly scrutinized the data. The result has surely justified the long time that this work was in production.

The book is uniform in format and presentation with the original volume. But here each map is accompanied by an explanatory text—a rather essential feature with critical groups and certainly one that adds to the interest of the maps. The value of maps of minor taxa in arguments about the origin and history of our flora will be obvious.

Undoubtedly the greatest single achievement in the work is Sell and West's mapping of all the British *Hieracium* microspecies that they recognize. One is filled with admiration for their industry in determining 50,000 specimens and processing the resulting information and for their making this available for the *Critical Supplement* when it could well have formed a separate work. The majority of us, mindful of the 223 names in Dandy's *List*, have despondently written '*Hieracium* sp.' too long. Sell and West's maps will surely encourage many to try at least to learn the commoner microspecies if not to master this difficult genus, for these maps show how few microspecies occur in most districts except the Scottish Highlands, which ones can be expected in any district, and the interesting distribution patterns of many of the microspecies (e.g. *H. shoobredii* in the Highlands, *H. strumosum* in the southern half and *H. vulgatum* in the northern half of Britain, *H. trichocaulon* in the south-east, *H. umbellatum* subsp. *bichlorophyllum* in the south-west).

Everyone will have a different idea of what taxa should have been included. Most of those one could reasonably expect are here, including—as well as *Hieracium*—*Alchemilla*, *Sorbus*, *Euphrasia* and *Rhinanthus* complete. We have to be content with a selection of the better-known *Rubi*. Evidently there is a problem in getting adequate data on common difficult-to-identify taxa. Consequently, as the compilers admit, the maps give only a rough idea of the distribution of the *Rubi* and the segregates of *Polypodium vulgare*, *Ranunculus ficaria*—and, oddly, *Nasturtium officinale* which one would have expected most people to be familiar with by now.

There are obviously good reasons for the absence of some taxa. It is difficult, if at all possible, to be sure of *Callitriche platycarpa* and the subspecies of *Asplenium trichomanes* without microscopic examination of pollen and spores; even cytological study has not solved the problem of the mountain *Cochleariae*; *Salix arenaria*, despite its specific rank in *Flora Europaea*, hopelessly grades into *S. repens* in Britain; and in my experience *Polygonum arenastrum* is by no means always satisfactorily distinguishable from *P. aviculare*. But I should have liked to see maps for *Symphytum officinale* with cream-coloured flowers, *Galeopsis bifida*, *Juncus kochii* and the segregates of *Tripleurospermum maritimum*.

It was an excellent idea to show records of the common intermediates as well as the main types in *Montia fontana*, *Malus sylvestris*, *Monotropa hypopitys* and *Centaurea nigra*. Mapping both the prostrate types in *Genista tinctoria* and *Sarothamnus scoparius* will do much to end a long-standing confusion—though in the case of the *Genista* the accompanying text is rather ambiguous.

The compilers have wisely limited *Asplenium adiantum-nigrum* subsp. *onopteris* to the south-west Irish plants. But they state that they accepted as *Erodium glutinosum* only densely glandular plants with flowers less than 7 mm. in diameter and 2–3-flowered peduncles—though it is known that this species can be eglandular with 12 mm. flowers and 5-flowered peduncles. Yet the map actually appears to show the distribution of *E. glutinosum* correctly.

What does one do when one meets with a marsh dandelion? The reasonable deduction from the maps is that one records *Taraxacum palustre* in Islay, *T. spectabile* in the Isle of Man, and both in Northumberland! But, seriously, as the compilers note, recorders have evidently had different concepts of *Palustria* and *Spectabilia*. Some have held the common view that *Palustria* cover the dandelions with appressed outer phyllaries, common in acid boggy meadows in the north and west. Others have followed Allen in restricting *Palustria* to local plants of rich fen and referring the rest of the marsh dandelions to *Spectabilia*. A composite map might have been a solution.

There are not the interesting climatic and ecological implications in the distribution of most hybrids that there are in the distribution of species and subspecies, because the occurrence of a hybrid normally depends on the chance of the parents growing together and crossing. Yet the maps of such hybrids as *Asplenium × alternifolium*, *Drosera × obovata*, *Scutellaria × hybrida* and *Juncus × diffusus* are welcome as the data were available. A few hybrids have distribution patterns in their own right through vegetative spread or introduction by man. *Equisetum × litorale*, *Nasturtium microphyllum × officinale*, various *Menthas*

and Potamogetons, and *Glyceria* × *pedicellata* are examples included in the *Critical Supplement*. One wishes that *Veronica anagallis-aquatica* × *catenata*, *Juncus acutiflorus* × *articulatus* and *Carex demissa* × *hostiana* in the same category could have been added, but here again there is the problem of obtaining adequate information about common plants with poor distinguishing characters.

A book of this type inevitably raises interesting taxonomic questions. Those of us who have been perplexed by material of *Arenaria serpyllifolia*, *Monotropa hypopitys*, *Arctium minus* or *Centaurea nigra* will agree with the segregates being treated as subspecies in each case. Although it is reputed to have a different chromosome number, *Arenaria leptoclados* seems morphologically no more distinct from *A. serpyllifolia* than does var. *lloydii*, and the treatment here of all three as subspecies is reasonable. *Valerianella olitoria* var. *dunensis* and *Catabrosa aquatica* var. *minor* are probably more worthy of the subspecific rank accorded to them here than some other recent 'subspecies' that one can think of. But do *Poa angustifolia* and *P. subcaerulea* really deserve full specific rank?

The maps remind one of the unsatisfactory taxonomic situation in *Euphrasia*. It is now well known that there are two chromosome numbers in this genus in Britain, correlated with well-marked morphological characters, and that hybrids are abundant and fertile *within* each group but very rare *between* them. Is there not overwhelming justification here for treating the two groups (and possibly the rather different *E. salisburgensis*) as full species with the more distinct and widespread of the microspecies as geographical and/or ecological subspecies? The local Scottish endemics could be dropped, for taxonomists agree that not all material can be satisfactorily referred to one or another subspecies.

Much the same can be said of the annual Salicornias. Possibly leaving aside *S. pusilla*, the mass of unsound 'species' would be better reduced to two readily identifiable major ones based on the two levels of ploidy. If such a revision had already been done it might have been possible to map these major species for the *Critical Supplement*.

The compilers are to be congratulated on this fine book. It is indeed a worthy memorial to the great pioneers of 'critical' British botany to whom it is dedicated, and it has made worth while the efforts of all of us who contributed records.

P. M. BENNETT

Pflanzensoziologie und Palynologie. Bericht über das internationale Symposium in Stolzenau/Weser, 1962, der internationalen Vereinigung für Vegetationskunde. Reinhold Tüxen (editor). Pp. xvii+275. Verlag Dr. W. Junk, Den Haag. 1967. Price f.50 (approx. £5 15s.)

The symposia organised by Prof. Tüxen at Stolzenau, and more recently at Rinteln, have become a well-known meeting place of those interested in phytosociology. Naturally, a large proportion of those attending the symposia come from Germany; in this respect the 1962 symposium is not untypical, with the second largest contingent (of 8 members) provided by that nation of admirable linguists the Dutch. Of the 28 papers in the present volume, 24 are in German, 3 in French and 1 in English.

Pollen-analytical investigations of vegetational history inevitably impinge intimately on phytosociological questions, and a number of contributions are concerned with the detailed interpretation of pollen diagrams in terms of the plant communities around the sampling site. G. Lang contributes a critical and more general consideration of the validity of comparing sub-fossil and modern assemblages; he concludes that some Late-glacial and early Post-glacial vegetation-types no longer exist, and that few present-day communities can be older than the Sub-Boreal. How far this is true perhaps depends on how narrowly one defines one's communities, and how far afield one is prepared to look for analogies to past communities. Other topics considered include the concepts of community and sociology in various branches of science (K. Friedrichs), the relation between present-day vegetation and pollen spectra (J. Heim), Quaternary vegetational history in Yugoslavia (A. Serceji), a comparison between vegetational development in the Eemian and an earlier (?Cromerian) interglacial in Denmark (S. T. Andersen), vegetational history in Minnesota (W. van Zeist and H. E. Wright) and Japan (Tokio-Suzuki), the flora of Rumanian peat bogs (E. Pop), the interpretation of macrofossil assemblages in north-west German peats (G. Grosse-Brauckmann), pollen analyses of soils, and the relation of soil profile features to Weichselian climatic and vegetational change (A. Dücker) and to prehistoric human activity (H. Zoller).

Probably the papers of most general interest to B.S.B.I. readers will be Fr. J. J. Moore's phytosociological evaluation of Irish pollen diagrams and Dr. Franklyn Perring's 'The Irish Problem'. Fr. Moore points out that in the relatively young landscape of Ireland there are two completely different groups of soils—calcareous and base-poor respectively—with corresponding vegetation types, and that this difference is clearly reflected in Irish pollen diagrams. He cites evidence indicating that ash (unlike birch) is not seral to oak in Ireland, and suggests that on base-rich soils ash and elm form the climax forest. Dr. Perring's admirable paper on the Hiberno-American and Lusitanian elements in the Irish flora has already appeared in print in

this country, but may well be more accessible, even to English readers, in the present volume. Dr. Perring stresses the important point that similar distribution patterns do not necessarily imply that species have similar histories or ecological requirements.

Participants in the symposium will undoubtedly value this volume as a record of an enjoyable and intellectually stimulating occasion; the opening and closing remarks convey something of the friendly atmosphere in which these gatherings take place. To the non-participant, the volume offers some papers of considerable individual interest; it also offers a variety of entry points into the central European literature of the fields embraced by the title of the symposium. Unfortunately, its value on both counts is lessened by the five-year interval between the symposium and the publication of its proceedings.

Prof. Tüxen and his Dutch publishers have been largely successful in surmounting the hazards of trilingual publication, though some of the English summaries would have benefited from checking by someone familiar with the language and the subject concerned.

M. C. F. PROCTOR

The Principles of Pollination Ecology. K. Faegri and L. van der Pijl. Pp. ix+248. Pergamon Press, Ltd., Oxford, 1966. Price £3 3s.

It may be as well to begin by explaining what this book is about; no doubt *Blütenökologie* would convey a more immediate and accurate impression to a Continental botanist than 'Pollination Ecology' does to an English-speaking reader. In fact, this is an up-to-date introduction to 'classical' floral biology, written by two well known authorities on subjects related to pollination. As the authors emphasize, they have set out not to produce a comprehensive handbook, but to present the principles of the subject, which the reader may supplement and develop from his own wider reading and observation. Despite the expectations that may be aroused by the title, many obvious ecological relationships of the pollination process are touched on only briefly or omitted altogether. Nevertheless, within the limitations imposed by a rather short book, the authors have placed pollination firmly in the context of current thought in related branches of science, and have ably reviewed the more important developments of classical floral biology since the days of Knuth.

The book begins with a brief summary of the history of the subject, and a terse couple of pages on techniques, followed by two interesting short chapters on 'Pollination as spore dispersal' and 'Spore and pollen dispersal in lower plants and gymnosperms'. Chapter 5, on 'Pollination' runs to over 100 pages and forms the core of the book. It is followed by shorter chapters on 'Retrograde developments' (autogamy and apomixis), on the adaptations of three major groups of zygomorphic flowers, on 'Pollination ecology and speciation' and on 'Applied pollination ecology'. The book concludes with 65 pages of 'Case histories'—short accounts of the pollination of particular genera or species—a brief epilogue, and 12 invaluable pages of references. The 'Subject index' could with advantage have been more comprehensive.

Chapter 5 includes a short account of the structures of the angiosperm flower, and its general adaptations to pollination. The morphological 'flower' is distinguished from the 'blossom' or 'pollination unit', which may be a part of a flower (as in *Iris*), a flower or a group of flowers. There is a short but good account of wind pollination. The fidelity relationships of flowers and their visitors are discussed, and there is a rather detailed consideration of the various attractions to animal visitors that the flower provides. The authors give a simple division of blossom types into a number of broad categories, and the rest of the chapter is taken up with accounts of the main syndromes of adaptation to pollination by members of various animal groups. This includes good accounts of sapsomyophily, and of bird and bat pollination.

Floral biology has suffered so much from uncritical repetition of 'facts' and assumptions from the older literature that the authors' fresh and critical approach comes often as a relief and sometimes as a revelation, even if one sometimes hesitates to agree with them. They point out that transfer of spores by insects is widespread in the lower plant groups (fungi, bryophytes, and possibly cycads and Gnetales. Their emphasis is (I believe rightly) on precision of transfer of pollen as the important factor in the evolution of pollination mechanisms, rather than 'cross fertilization' as such—though more could well have been said about breeding systems and the paramount part played by floral biology in their control. The authors eschew detailed classifications of flower types, and emphasize the importance of the adaptation syndrome, while at the same time pointing out that some looseness in the adaptation syndrome may assist in speciation and the build-up of adaptations. Adaptive radiation in relation to different pollinators is evident in so many families that this is a point which might have been further emphasized. The authors are certainly right in stressing that not all visitors are necessarily pollinators, and that many visitors may be irrelevant to the adaptation syndrome of a particular flower. Nevertheless, selection and adaptation take place in relation to the whole environment, and adaptation to a balance between several different pollinators or pollination mechanisms (of which the authors recognize some instances) must surely be common. By contrast with this tendency to diversification

there is an obvious tendency to convergence, remarked upon in various places in this book, but with little comment and no detailed discussion, though many examples lead one to feel that mimicry in relation to pollinators must be common among flowers.

The book is written in admirable and lucid (if sometimes idiosyncratic) English; a very little editing should have sufficed to deal with the remaining oddities—'Hymenopters' for 'Hymenoptera', 'respectively' (natural as *respektiv* or *beziehungsweise* in Scandinavian or German) for 'or', and so on. But these are trivial irritations. Errors and misprints seem to be few. One error is particularly unfortunate in that it is likely to be quoted and copied. The discovery of insect pollination is attributed to A. Dobbs (1750) (correctly) and 'H. Müller (1751)', apparently (apart from the intruding initial) on the authority of Sachs (1875, *Geschichte der Botanik . . .*), who himself was quoting at second-hand from Kölreuter. The reference, as correctly stated in Garnsey & Bayley-Balfour's English translation of Sachs's book, is to Philip Miller's *Gardener's Dictionary*, where the passage in question first appears in the article on 'Generation' in the 6th edition (1752).

However, these criticisms detract little from the book's very solid virtues. It is undoubtedly the best introduction to the subject available in English, and a book one warmly welcomes and can warmly recommend.

M. C. F. PROCTOR

ERRATA

Vol. 4 Part 5, p. 227 (1962), Table 2. Character 4 is not measured in mm. and the correct figures, reading from left to right, are 3·72, 6·35, 5·08, 7·70, 6·80, 7·13.

In the running-foot on each page of Vol. 7 part 1 (pp. 1-53), for 1968 read 1969 throughout.