 Watsonia, **8**, 168–180 (1970).

Book Reviews

Perspectives in Phytochemistry. Edited by J. B. Harborne and T. Swain. Pp. 235. Academic Press, London. 1969. Price £3. 3s. 0d.

The contents of this volume will be of much greater interest to plant biochemists than to botanists, but they make it clear that recent advances in the chemical analysis of plant substances are likely to uncover a whole new series of taxonomic characters. At present, these characters appear to be more useful in demonstrating relationships or lack of relationships between families than in distinguishing individual species. On the basis of chemical evidence, Callitrichaceae, Hippuridaceae and Plantaginaceae may all be closely related to the Scrophulariaceae, while there may be grounds for dividing Cyperaceae into two families, based on the Scirpoideae and Caricoideae.

The book consists of ten chapters by experts on various aspects of plant biochemistry, physiology and chemotaxonomy. Botanists will find food for thought in the general reviews of Erdtman and Hegnauer, and in the provocative article on Monocotyledonous plants by Bate-Smith. There is a chapter on the metabolism of cinnamic acid in fungi, but no review of the recent developments in chemotaxonomy of lichens. An interesting paper by Galston, based on detailed studies of etiolated pea seedlings, suggests that flavonoids may have important physiological functions and are not simply waste products of metabolism.

This book is well produced and not very expensive by modern standards. I did not notice many misprints, but was surprised to learn that *Hymenophyllum* is in the Pittosporaceae (p. 124). It should be consulted by all professional taxonomists who are interested in phylogeny.

H. J. M. Bowen

An Introduction to Plant Taxonomy. C. Jeffrey. Pp. vi +128. J. & A. Churchill Ltd., London. 1968. Price £1. 4s. 0d.

In this book the author has set out to provide a true beginner's introduction to the classification of plants, demanding of his readers an absolute minimum of pre-knowledge of technical terms and procedures. The first two chapters explain the practical necessity for classification in very general terms and outline the concept of relationships at varying levels of affinity. In chapters 3 and 4, we are introduced to the hierarchy of units used in classification and a brief review is given of biological factors such as reproductive isolation and hybridisation in relation to speciation. In chapter 5, the theoretical problems involved in the formal processes of naming plants are explained, while in chapter 6 the practical problems experienced in using keys and other aids to identification are discussed. The book concludes with chapters on the principal current systems for classification at higher levels and an attempt to place the taxonomist in his context in society.

As an explanation to the student and the interested layman of the kind of work that takes place in a major institute of taxonomic research, such as the herbarium at Kew where the author is himself employed, this book is certainly a major success. The clear picture it presents of modern work in the more traditional fields of systematics should be of real value to the student, and it can be specially recommended to the amateur botanist and the gardeners who frequently wonder why 'they' keep changing the names of familiar plants.

On the debit side, we find that while subjects like keys and the rules of nomenclature are excellently considered, little or no mention is made of the 'modern' tools of taxonomy such as statistics, genetics, cytology and phytochemistry. This is a great

pity, as I fear it may cause lecturers to underestimate the excellent qualities of this book, when considering texts to commend to their students. In this respect, one is reminded of the author's recent review of a publication covering a rather similar field. On that occasion Mr Jeffrey criticised the other author's excessive preoccupation with the more exotic manifestations of current work. In his own book, however, he has failed to range far enough into the frontier regions of modern research.

There are a number of quite pleasing, though sometimes rather naive line drawings. The artist seems more at home among the plants than the animals; thus the supposedly human baby in plate 17 seems to have a head of hair and facial 'stubble' worthy of a grown man! Several of the photographic illustrations are very poorly reproduced and some of them merit serious criticism on other counts. Thus while plate 1 does indeed show an excellently prepared and documented herbarium specimen, plate 2, which claims to demonstrate 'the housing of specimens in a modern herbarium' actually illustrates Kew cabinets of 1932 vintage. Surely, even in a subject with its roots as firmly in the past as systematic botany, 1932 can hardly be regarded as modern. It would not have been difficult to obtain a photograph of cabinets embodying the advantages that have become available through modern manufacturing techniques. Plates 4 to 6 illustrate three very dismal specimens of members of the *Cucurbitaceae*. While this choice, together with the special problems they illustrate, doubtless stems from the author's interest in and consequent expert knowledge of this family, I am sure that it should have been possible to illustrate the topics so well discussed in the text with some more attractive and better collected specimens. These pictures are scarcely likely to improve the image of taxonomic botany, which I take to have been one of the author's intentions in writing this book.

While these criticisms have been quite severely stated, it is hoped that they will not mask a genuine admiration for this very worthwhile introduction to a subject at present poorly equipped with elementary texts.

J. F. M. CANNON

Plant Anatomy: Experiment and Interpretation. Part I. Cells and Tissues. Elizabeth G. Cutter. Pp. vii + 168 with 83 figures. Edward Arnold, London. 1969. Price £2. 8s. 0d.

Another book has been published on Plant Anatomy. One's first reaction is to ask if it is really necessary. This question is soon answered in the affirmative by a rapid glance through Elizabeth Cutter's book *Plant Anatomy: Experiment and Interpretation.* Any lingering doubts are completely dispelled on a closer reading. The author has set out to link results of experimental work with classical, descriptive anatomy, in as far as such experimental data are available. This has proved a most instructive exercise, and the book should encourage others to carry out research into some of the many problems which remain to be answered. Indeed, it is refreshing to have a text book on plant anatomy which does not give the impression that everything has been done already (probably in Germany in the late 19th century!).

Whether used as an introductory text by the advanced student or interested layman or read by comparative anatomists, this book is sure to prove of value and interest.

The presentation of the text is clear and concise, and the illustrations are ample. By an obvious slip, *Robinia* is described as having a non-storied cambium (fig. 11.1). Apart from this, very few mistakes of any consequence have been noted.

This is the first volume of two, and deals with cells and tissues. I look forward to seeing volume 2, on organs.

D. F. CUTLER

Field Natural History—A Guide to Ecology. Alfred Leutscher. Pp. 248 + 83 text figures. G. Bell & Sons Ltd., London. 1969. Price £3. 0s. 0d.

The number of ecology books that have come from the publishing houses in recent years has increased. The majority of these, however, has been college and university

textbooks, usually of a high standard but often too advanced for the amateur naturalist—certainly so if he be only at the beginning of his interest in this discipline. Those written especially for his use have been fewer in number and most have fallen far short of providing him with the wide, yet reasonably deep, background to the subject that he needs.

Alfred Leutscher now provides a book with the right requirements, the text of which bears his unmistakable stamp of conciseness and clarity that has become polished and perfected with his years as Chief Guide Lecturer to members of the public visiting the British Museum (Natural History).

The author has arranged his text-matter in three parts. In the first, which is headed 'The Organism and its Environment', he describes under four sub-headings the form and function of both animals and plants, how they have evolved, the nature of soils and rocks, and the ecological factors of their environment. In Part 2 (which to my mind has been extremely well written) all the major habitats found within the British Isles are described. Lastly, Part 3 is entitled 'Field Work' in which, for most of the projects suggested, Mr Leutscher has drawn upon his broad experience of survey work in Epping Forest, near his home.

Nowadays it is unusual for a book of this kind to be published without at least some coloured photographs. In fact there is a tendency for authors to lean somewhat heavily on such illustrations, often to bolster up what is in fact the inadequacy of their own text. This is not so with Mr Leutscher, for throughout his book the 80-odd figures drawn by himself (some, albeit, better executed than others) succeed well in complementing what he has written.

Some useful appendices follow the main text, covering such diverse topics as instructions for making plaster casts of animal footprints or cleaning a skeleton, a list of Epping Forest fungi, guidance on making an herbarium, packing and sending animals by post, and measuring the height of a tree!

Eight pages giving a bibliography (listing works mostly still in print) and a useful address list of societies round off what is an excellent book for the botanist, zoologist or general naturalist seeking ecological guidance and well worth the sixty shillings asked.

E. W. GROVES

Synökologische Studie der Waldgesellschaften auf Amphibolitgestein. Vegetace ČSSR A3. M. Husová. Pp. 188. Czechoslovak Academy of Sciences, Prague. 1968. Price Kčs 36,00.

This is one of an extensive series of volumes on the vegetation of Czechoslovakia. It deals with a vegetation type that is little represented in Britain—semi-natural woodland on base-rich, non-calcareous rock. An account is given of one particular hilly area in south-west Bohemia, long known for its species-richness—the Branžovský hvozd. The major bedrock is a slowly-weathering amphibolite (a metamorphic rock with hornblende and plagioclase as major constituents); it has a high content of calcium and magnesium. There are several dominant tree species, of which *Tilia platyphyllos* is perhaps the most interesting. Many of the woods are developed on screes with ranker soils; flatter areas have eutrophic *braunerde*. Comparisons are made with woodland on nearby siliceous rocks with oligotrophic *braunerde*. The account contains many physical and chemical analyses of soils, extensive phytosociological accounts of the major associations, some data on the activities of soil micro-organisms and comments on the role of molluscs in making calcareous soil-horizons over base-rich but non-calcareous rocks. There are discussions of the classification of the associations in the Zürich-Montpellier system and of the effects of amphibolite on the composition and growth of the vegetation. The top soil on amphibolite has a pH of 4.7–7.0 (mostly 5.0–6.0); the amounts of exchangeable cations

per unit dry weight vary enormously with the humus content. Calcifuges such as *Calluna*, *Vaccinium* and *Deschampsia flexuosa* are almost completely absent. Many calcicoles are present, e.g. *Daphne mezereum*, *Inula conyza*, *Polygonatum odoratum*, *Rhamnus catharticus* and *Viola hirta*. The author goes some way to explaining the absences and occurrences of these species but much remains to be established. She incidentally gives us ideas on what our forests on base-rich rocks might have been like before they were destroyed and the *Tilia* spp. in particular lost (*cf.* Pigott, C. D. (1969). The status of *Tilia cordata* and *T. platyphyllos* on the Derbyshire limestone. *J. Ecol.*, **57**: 491–504). Altogether there is much in this attractively produced book to interest the British botanist.

P. J. GRUBB

Flora of Derbyshire. Edited by A. R. Clapham. Pp. 382 with a coloured frontispiece, 8 plates and 7 pages of maps. County Borough of Derby Museum and Art Gallery, 1969. Price £2. 5s. 0d.

This *Flora*, which was started by a committee of 13 in 1949, is a welcome contribution to our knowledge of this floristically particularly interesting county. The previous Flora (Linton 1903) was of a standard far beyond many of its date, and so, as is noted in the Introduction, '. . . it is perhaps not difficult to understand why his *Flora of Derbyshire* has been neither revised nor replaced in all the sixty-five years since it appeared.' Linton's *Flora* had, however, become sadly outdated, as is indicated by the addition of 135 species and hybrids (excluding *Rubus* and *Hieracium*) in the new Flora. Of these only 29 have reasonable claim to be regarded as 'native', but *Aceras anthropophorum*, *Anagallis minima*, *Aphanes microcarpa*, *Galeopsis bifida*, *Hymenophyllum wilsonii* and *Vaccinium* ×*intermedium* are particularly gratifying additions. On the debit side, however, 55 species (including 26 which may have been native) have not been refound in recent years, and others (e.g. *Huperzia selago*, *Ranunculus arvensis*) appear to have declined in numbers.

Polemonium caeruleum provides the coloured frontispiece (photograph by Mr R. H. Hall), and precedes six introductory chapters (Introduction, Geology, Geomorphology, Climate, Vegetation, and Geographical Distribution) which give a useful body of background information to the *Flora*. The Introduction itself summarises botanical studies in the county since 1903 and includes a biographical account of Dr E. Drabble. A more complete list of contributors would have been welcomed here as an acknowledgement particularly to the many amateurs who have sent lists of species into the committee over many years.

The chapter on Geology is excellent as a geological account but much of the data is hardly pertinent to flowering plants: not many species have distributions correlated with particular fossil facies of the Coal Measures! It is also perhaps unfortunate that relatively little attention is given to the superficial deposits which are so much more important in this context. A map of the 'drift' as well as the solid geology would have been valuable. The list of references is rather incomplete and the omission of Edwards & Trotter (1954), Ford & Mason (1967) and Bradley & Ford (1968) are particularly unfortunate for anyone wishing to learn more about the geology of the county. The section on Geomorphology is better but again suffers from a tendency to irrelevancy. The inclusion of a map of the river systems is a particularly welcome feature. The *Flora* was very fortunate in securing the services of Professor A. Garnett for the chapter on Climate, and her thoroughness makes this a useful reference work for biologists and meteorologists alike. One does, however, wonder whether the citing of month by month figures of air pollution for only *one* year was necessary. Such figures are so variable that mean values calculated over the last 3–4 years might have been of more significance. The observation that '. . . some farmers record the unduly rapid corrosion of fences and farming implements, even in the heart of the High Peak . . .' (p. 31) should not pass underemphasised, and it is interesting that the distribution of

lichens in the county (see Hawksworth 1969) correlates with the view of high air pollution in non-urban as well as urban areas.

The chapter on Vegetation, by Dr T. T. Elkington, bears testimony to the tradition of plant ecologists at Sheffield University, and will be particularly valuable for future generations as it includes 84 detailed Habitat Studies. The use of some approximately quantitative scale rather than the categories 'abundant', 'frequent', 'occasional' and 'rare' might have been an improvement here and one is struck by the very few records of bryophytes and lichens in the lists, although these appear to be very important constituents of the vegetation on some mor and rendzina soils. It is also regrettable that there is no easily readable summary of the vegetation types and that the amateur must still look to Hall (1962), pp. 69–95 for an introduction to the county of this type. The phytosociological classification of the vegetation of the limestone dales by Shimwell (1968a, 1969) might also have been referred to, at least in passing. Dr Elkington also prepared the chapter on Geographical Distribution, which is particularly good. Maps of representative species in the county are printed adjacent to ones of the same species from the *Atlas of the British Flora*. Although only 17 species are treated in this way, they were evidently very carefully selected and admirably suited to this type of presentation which renders the chapter much more informative than the pages of small intra-county distribution maps which have swelled several recent county Floras.

Having, on page 96, reached the end of the introductory chapters one cannot help feeling that at least some of this space might have been better employed: no discussion of the effects growth, and extent of urbanisation and industrialisation is given, and some indication of built-up areas on one of the seven maps of the county included would have been helpful to those unfamiliar with the county. It is also rather surprising that no chemical analyses or classification of soil-types is given, although most of the data needed for this has been published by Bridges (1966); that there is no data on agriculture and forestry; no information on the extent of woodland; and no bibliography. The only papers cited are those specifically referred to in the introductory chapters and a list of Drabble's scattered works. Data included in the *Biological Flora of the British Isles*, and other papers (e.g. Anderson 1965; Mills 1969; Shimwell 1968b) would have been a useful continuation of the annotated bibliography given by Linton (1903).

The *Flora* itself is based on the 10 km square divisions of the National Grid, and localities are given only for species which are not regarded as 'common'. One locality in each 10 km square is given for 'less common' species, and full lists are given for 'rare' ones. Beneath the data on each species '*Linton*:' followed by a list of localities appears. A comparison with Linton (1903) shows that these are localities given by Linton in which the species has *not* been refound, and that they are not a complete list of Linton's sites as may at first appear. Linton did, after all, know more than one locality for *Pinus sylvestris*! 1 km or 10 km square grid references are given after every locality name, which is perhaps rather unnecessary for sites which only fall in 1 km square. An appendix with localities and *six* figure references might have been an improvement. The citing of four figure references together with the punctuation system adopted leads to some ambiguities: e.g. 'Fenny Bentley to Bradbourne 1950, 1850, Black Rocks 2955' (p. 345)—if one does not appreciate that dates are generally omitted!

For the bulk of the records there is no indication when between 1903 and 1969 they were made. Thus *Hypericum elodes* is stated to be 'perhaps extinct' (p. 141) although an undated 'recent' record is given. It would also have been helpful to know who determined the specimens, where the herbarium sheets supporting them are, what herbaria have been searched, and what records are based only on published sources. It seems that if the master set of record cards housed in Derby Borough Museum and Art Gallery is lost or damaged, much valuable information particularly interesting to the specialist might be completely lost. These deficiencies render this section scien-

tifically of a lesser standard than that set in the recent Floras of Berkshire (Bowen, 1968) and Norfolk (Petch & Swann 1968).

The nomenclature is stated to follow that of *Flora Europaea* yet, for example, the genus *Lycopodium* is retained and the genera *Huperzia*, *Diphasium* and *Lepidotis* are not mentioned.

A summary of numbers of species reported from each 10 km square would have been valuable, and perhaps have emphasised underworked areas. One cannot avoid the impression that the coverage of the county for critical taxa, especially in the lowland areas, is not as complete as it might have been. This is indicated by the long lists of localities of *Rubus* species given by Linton in which they have not been refound; and the ease with which one can add new 10 km square records for species (e.g. *Geranium dissectum* SK 358518, 1965, *Hawksworth*; *Potentilla anglica*, SK 358512, 1964–1966, *Hawksworth*; *P.* ×*suberecta*, SK 358512, 1966, *Hawksworth* **LTR**). In the limestone areas also, some substrates have been underworked, such as peat pockets (e.g. *Blechnum spicant*, *Eriophorum angustifolium*, *Molinia coerulea* at SK 180650, 1968, *Shimwell*), gritstone inliers (e.g. Stanton Moor) and chalybeate springs (e.g. *Lotus uliginosus*, *Viola palustris* at SK 216635, 1968, *Shimwell*). Dr D. W. Shimwell also reports that *Gagea lutea* still occurs at Meadow Place Wood and in the Bradford Valley where it was reported by Linton (1903), although no post-1903 records are given from these sites in the new *Flora*.

The introduced species included appear to have been rather arbitrarily selected, and one wonders why, when *Abies alba* is included, *Larix decidua* and *Picea sitchensis* are not.

A good feature is the 16 splendid monochrome photographs which were mainly provided by Mr R. H. Hall, one of the foremost amateur botanists to have worked in the county.

Printing and proof reading errors are inevitable in a book of this length, and are no more numerous than to be expected. Letters of the wrong fount are the most frequent error of this type, except for the omission of distributional data from Linton (1903) for some species. We are not told whether *Arabis caucasica*, *Draba muralis* or *Ilex aquilifolium*, for example, were found by Linton or not, and it is therefore often necessary to use both Floras in conjunction to obtain a picture of the history of a particular species in the county.

The binding and covers are good, and this *Flora* is an essential addition to the shelves of any botanist interested in the county. It is perhaps unfortunate that more fieldwork was not done, that herbaria were not searched, more botanists consulted, and that some indication of the dates of records was not given, but, if all these points had been adequately attended to (and the introductory chapters amended), then this badly needed *Flora* might not have appeared for several more years. At least we now have a fairly comprehensive account of the flora of this county which will provide a basis for the future studies of both amateur and professional alike for many years to come.

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D. L. HAWKSWORTH

Plant Breeding. W. J. C. Lawrence. Pp. 56. Studies in Biology no. 12. Edward Arnold (Publishers) Ltd., London. Price 14s. 0d. (boards), 8s. 6d. (paper).

This study of Plant Breeding is one of a series of publications sponsored by the Biological Education Committee with an educational purpose based on a biological theme and dealing with a rapidly developing discipline of utmost importance to man's survival.

The text is set out in a concise and logical manner beginning with the earliest and unconscious influences of primitive man in his development of cultivated plants from weedy species and culminating in the enormous impacts of present-day manipulation of genetics and selection in plant breeding and crop improvement. A final plea is made by the author for the future of plant breeding and he emphasises the need for broadening the genetic basis for breeding work and maintaining a much more adequate gene pool for commercial food crops than has been done in the past. The dangers of narrow selection methods and lack of variability are strongly emphasised and their consequences for the future world food problem are pointed out.

Chapters on Breeding Aims, Breeding Methods and Breeding Principles are clearly and concisely sectionalised and material under each sub-heading is written in an interesting and informative manner, with due regard shown for the agricultural economic applications which are so much a part of plant breeding today. A nice balance is maintained between principles and practice as indeed is desirable in a subject where, as the author intimates, broad principles have been neglected in the past.

Although the book deals with a somewhat specialised and applied aspect of genetics, all the principles of cytogenetics and hybridisation are involved and this is clearly an introductory treatment of plant breeding for the more advanced student and the teacher who are already conversant with the elements of such disciplines. Indeed there is no definitive list of technical terms used, although many are defined in the text.

Illustrations are for the most part kept simple and often self-explanatory and hence are effective in emphasising points in the text. Happily, the author has avoided complex numerical data with which the student might be overwhelmed and confounded. Obviously the aim throughout the book has been to maintain simplicity as far as possible and he has for the most part been successful in making this material easily assimilable by the non-specialist.

This is an adequately illustrated and generally acceptable little book of reasonable value at the price of 14/-, which should not be too hard on the pocket of most students of biology.

C. J. MARCHANT

Developmental Plant Anatomy. Alan Gemmell. Pp. iv + 60.
Plant Symbiosis. George D. Scott. Pp. iv + 58.
Fungal Parasitism. Brian J. Deverall. Pp. iv + 57.
All Edward Arnold, London. 1969. Price 14s. (boards), 8s. 6d. (paper).

These latest volumes in the Institute of Biology's series 'Studies in Biology' continue to uphold the reputation that the series has earned for dealing with biological topics

in a concise and contemporary way for use in schools and elementary university courses. Each of them gives, in relatively few pages, a sound introduction to the subject and brings the reader up to date with modern views and discoveries, in each case citing recent literature.

N. K. B. ROBSON

The History of British Vegetation. Winifred Pennington (Mrs T. G. Tutin). Pp. viii+ 152, with 30 plates + 32 text figures. The English Universities Press Ltd., London. 1969. Price £1. 8s. 0d.

Dr Pennington is to be congratulated upon her *History of British Vegetation*, in which a great deal of ground is covered in what she calls a small book. It has grown out of a course given to students in the University of Leicester and is offered 'as an introduction to those two great classics of British botany, Professor Harry Godwin's *History of the British Flora*, and the late Sir Arthur Tansley's *The British Islands and their Vegetation*'. If the book must be called an introduction, it is an impressive and comprehensive one, dealing with a subject of great biogeographical interest and significance.

'All history must begin somewhere', says Dr Pennington and in chapter 1 she carries the reader back into the mists of antiquity some 60,000,000 years ago, when, in early Tertiary times, the vegetation of south Britain was not unlike that of the Indo-Malayan region of today. By the end of the Tertiary period, however, in the Upper Pliocene, the picture had altered profoundly from that shown in Plate 1, a reconstruction of the landscape in London Clay times. While no plant fossils of Pliocene age have been found in Britain, there is evidence from Continental sources in support of the view that the flora of Britain during this period was rather similar to that of the present day. At the opening of the Quaternary there were comparatively few genera not now represented in the flora of Europe. But further changes were on the way.

Our modern flora is essentially a small outlying portion of the European flora, but its history has been remarkedly varied throughout the Pleistocene and indeed throughout the whole of the Quaternary. Several chapters of Dr Pennington's book are devoted to an account of the changing nature of flora and changing pattern of vegetation during the Pleistocene period, including not only stratigraphical detail but also an examination of the factors involved in these changes. Glacial and interglacial episodes are covered in Chapters 2, 3 and 4, and it becomes apparent that the last Full-glacial period is of particular interest from the historical point of view. The so-called 'Arctic Beds' of the Lea Valley and Barnwell Station in Hertfordshire, which belong to this period, have furnished plant remains suggesting a vegetation rather resembling grass-sedge tundra, devoid of trees apart from dwarf willows and arctic birch, and including a significant number of other arctic-alpine species. Of these two fossil floras, that of the Barnwell Station Beds is the more recent and is dated 17,550 B.C.

Then followed the Late-glacial period which is equally interesting and suggestive in its floristic history. To the deposits and sediments of this and later periods the modern technique of pollen analysis has been applied, while the radiocarbon method of dating has provided reliable information about the age of the deposits. The period is divided into the three pollen Zones I, II and III, Zone II being the relatively short and mild Allerød interstadial. While the zones show noticeable differences in flora and vegetation, it is clearly established that, in general, the flora of Late-glacial times was a relatively rich one, including not only arctic-alpine plants such as *Dryas octopetala, Salix herbacea, Empetrum nigrum* and *Betula nana*, but also tree birches, at least during the Allerød phase, together with many other species now found in open habitats and commonly referred to as weeds or ruderal plants.

This Late-glacial flora was largely disrupted and many of its members restricted

in range by the pressure of events during the following Post-glacial period, the transition to which is recorded between Zones III and IV around 8000 B.C. The change was marked by a pronounced amelioration of the climate and the rise in temperature, along with increasing stabilisation of soils, permitted the growth and relatively rapid spread of trees and shrubs, birch being one of the pioneers, followed by pine, hazel, elm, oak, ash, alder and lime. The climatic optimum was reached about 3000 B.C. when mixed deciduous forest occupied much of the country, ascending to at least 2,500 ft, although over a large part of Scotland mixed forest was probably replaced by birch and pine. Whatever the maximum extent of forest in the British Isles when it reached its 'climatic climax', little of it was to survive. A deterioration of the climate contributed to the decline of forest, but other complex factors were involved, edaphic and biotic, and not least of all was man's onslaught on the natural resources of the country.

In Chapters 5–9 Dr Pennington traces these Post-glacial changes in considerable detail and stresses the anthropogenic factor. She makes use of Blytt and Sernander's subdivisions of the period into Pre-Boreal, Boreal, Atlantic, Sub-Boreal and Sub-Atlantic. These divisions are not only related to pollen zones, but correlations with archaeological periods are clearly indicated. Interest will be aroused by the author's reference to the Boreal-Atlantic transition, at about 5500 B.C. as one of the most significant horizons in the history of British vegetation. 'Not only does it mark what appears to have been one of the most pronounced of the Post-glacial climatic shifts, but it marks the last occasion on which most plants could disperse into Britain by natural processes. The flora at this time represents the true 'native flora', and subsequent additions to the flora fall into two categories—a very small group which have a natural dispersal mechanism capable of leaping sea barriers, and a rather large group of plants which, on all available evidence, appear to have been introduced by man, deliberately or accidentally.' Generations of botanists have repeatedly discussed such questions and I am reminded of the verdict of one of them. In an essay on the origin of the flora of Perthshire written in 1891, Buchanan White had this to say: 'If indigenous means, as it really does, aboriginal or autochthonous, we have no indigenous plants.' In the light of present knowledge this may now be regarded as an extreme view, although the complete extermination of our flora during the last ice age was postulated by several earlier writers.

The influence of man on flora and vegetation in Britain can be traced as far back as early Neolithic times, about 3000 B.C., when he commenced the process of forest destruction by axe or fire or both. The impact of different human cultures has continued with varying intensity to the present day, and while Dr Pennington's book is not immediately concerned with the composition of our modern flora or with the status of its members, it contains frequent references bearing upon these matters, a large number of plants being referred to specifically.

Existing vegetation is dealt with briefly in Chapters 10 and 11, the former being devoted to plant communities of dry land—forests, grasslands, heaths and coastal habitats, while the latter is concerned with wetlands, such as fen, moor and bog. Different examples are cited from different parts of the country and the approach is again historical. Pine and birch have been in Britain for more than 9,000 years, and in marked contrast to this beech is a relatively recent immigrant, its pollen having been found only in Zone VIII, from about 500 B.C. onwards. The growth and extension of blanket peat can be traced, at least on the Pennines, to the beginning of the Atlantic period, when Britain became separated from the Continental mainland about 5500 B.C. and when the climate probably became more markedly oceanic.

A good deal of British vegetation can be described as oceanic and is well represented in Ireland and elsewhere. References to Irish vegetation and Irish plants are numerous, including the problematic 'Lusitanian' element, and although the history of the group is uncertain it is suggested that it may have migrated into south-west Ireland in early Post-glacial times along oceanic coastal fringes now submerged. I doubt if

all its members shared the same history, but evidence from fossil remains of the plants is still incomplete.

The final chapter of Dr Pennington's book is devoted mainly to a few plants which are essentially 'Highland' and their present distribution is shown in maps reproduced from *Atlas of the British Flora*. They are mostly arctic-alpine, and in view of their history within the British area, they may well be called glacial relic species. It would have added greatly to the interest of the maps had they shown also the known fossil records of these same species from glacial or other deposits. In addition to the maps and other text figures, the book is well illustrated by numerous photographs, although a few of these are a little lacking in definition. References to literature take the form of a list of books and published papers for 'Further Reading' arranged in sections, but a few references in the text do not appear in the list. At least I could not find them and their omission may be intentional.

It may be only a coincidence that this book has appeared when European Conservation Year was about to begin. All who claim the need for conservation will find much to contemplate and the opponents of conservation should take heed of the message which the book has to tell. To British botanists with an interest in history, be they taxonomists or ecologists or both, the book will make an immediate appeal. It is well produced and at 28 shillings is not expensive.

J. R. MATTHEWS

Waldgesellschaften des mitteleuropäischen Gebirgsraumes nordlich der Alpen. F. K. Hartman and G. Jahn. Pp. 636; 37 tables + 2 maps in separate cover. Gustav Fischer, Stuttgart. 1967. Price DM. 148.

This work summarises a very large amount of information on the floristic composition of the forests of the mountainous regions of central Europe north of the Alps. It consists essentially of two series of tables with detailed explanations, a set of tables presenting nearly 1,300 original floristic analyses, principally by Prof. Hartman, from a wide variety of forest types, and a set of constancy tables summarising the available floristic information (from the authors' own data and the published work of many other phytosociologists) on central European forests. The area covered extends from the Jura, Vosges and Ardennes to Lower Austria and the Sudeten region, and from the hills of Lower Saxony to the Alps. A large proportion of the data are from western Germany.

The methods of collection and presentation of the data follow the usual Braun-Blanquet lines. The authors have been at pains to relate their vegetation units to altitudinal zonation and, in general, each table embraces a group of physiognomically and ecologically related associations, often differentiated geographically. Indeed, the broad geographical comparison and integration of the data is one of the most valuable features of this book. Detailed soil analyses (pH, exchangeable Ca, Mg, K, citric acid-soluble phosphate, loss on ignition, mechanical analysis, etc., often from several horizons in the profile) are given from representative sites from most of the original tables. The text volume concludes with a 39 page bibliography, an index of plant communities and a list of Polish and Czech equivalents of place-names.

This volume is to be followed by two further volumes, which will deal with ecological questions and applications to forestry and land-use.

M. C. F. PROCTOR

The Evolution and Classification of Flowering Plants. Arthur Cronquist. Pp. xii + 396. Nelson, London. 1968. Price £2. 5s. 0d.

The appearance of another system of Angiosperm classification in the wake of those recently published by Hutchinson, Takhtajan, Thorne (in outline only as yet) and others at once indicates that an agreed classification of the Angiosperms is still a

distant goal and emphasises the peculiar fascination that the inter-relationships of this group of plants have held for systematic botanists. The first reaction to a new system is inevitably 'How does it stand in relation to the well-known ones?', to which the reply in this case must be that it is not revolutionary, but builds a new superstructure on an old foundation. Dr Cronquist has based his system on that of Bessey which, in turn, was intended to express the Bentham & Hooker classification in evolutionary terms. He has attempted 'to develop a general system of Angiosperms compatible with presently available information, and to put that system in a proper theoretical frame of reference'. The available information includes some that has not previously been incorporated into a general system, such as the sequence of stamen development, the distribution of floral nectaries and the number of ovule integuments, and the whole is treated from a frankly evolutionary standpoint. Among recently published systems, the present one most closely resembles that of Takhtajan; and this similarity 'reflects a community of interest and outlook, bolstered by a mutual exchange of views over the past ten years'. The Takhtajan and Cronquist systems are not identical, however: Cronquist admits to being less of a splitter than Takhtajan.

The author prefaces the account of his system by three chapters which may be regarded as a sort of 'credo', as they contain the principles and arguments that he has employed in working out his system. The first one, 'Taxonomic Principles', indicates that he believes in the existence of a Natural System, based on multiple correlation and reflecting evolutionary relationships—a belief that is not fashionable in some quarters today. Among several interesting concepts that are discussed, one may mention 'The monophyletic requirement' and 'Parallelism' as particularly noteworthy. Cronquist admits that a completely monophyletic system is probably unattainable, so that taxonomy 'can provide only a somewhat muddy reflection of evolution'. He regards evolutionary parallelism as a help to taxonomic work rather than a hindrance (the usual view), because it tends to indicate relationship, and from this principle develops a telling argument in favour of mutation pressure (orthogenesis) rather than natural selection as the cause of the evolution of major group characters in the Angiosperms.

In the second chapter, 'The Origin of the Angiosperms', Cronquist dismisses the Pinicae and Gneticae as possible Angiosperm ancestors, leaving only the Cycadicae as contenders for that title. Within the Cycadicae only the pteridosperms (Lyginopteridales) appear to be suitable for further consideration. Having selected the pteridosperms by a process of elimination, he however baulks at 'going the whole hog' by fixing specifically on the Glossopteridae, as some authors have done recently, but merely refers to the idea as 'interesting'.

The third chapter is devoted to a comprehensive review of 'The Evolution of Characters', dealing first with the concept of primitive characters, then with the characters which, in the author's opinion, primitive angiosperms must have possessed, and finally tackling the vexed question of how to interpret evolutionary trends. In contrast to some modern workers, Cronquist does not regard such interpretation as a hopeless task. Unlike those who stress the dangers of either constructing imaginary trends or misinterpreting real ones by 'starting at the wrong place', he regards the recognition of evolutionary trends as a legitimate and helpful taxonomic exercise, but points out that many trends seem to be the result of 'genetic predisposition' rather than natural selection.

Not all the interpretations of primitive characters and the directions suggested for trends will meet with unanimous approval, but all are cogently argued and worthy of consideration. However, while it is understandable that Cronquist should be lukewarm to a rival theory of Angiosperm evolution such as the Gonophyll Theory, it is hardly sufficient to dismiss it in a sentence as something that may possibly result in modified concepts in the future. The facts on which that theory is based merit serious consideration now. The rest of the book consists of an outline of the system, with keys to the subclasses, orders and families that are meant to be conceptual aids rather than

means of identification, as well as discussions of relationships and explanations of details of the system that make fascinating reading. Useful bibliographies are provided for each order.

Cronquist makes much of the direction of stamen maturation in the flower, using this character to distinguish his Subclass Rosidae (centripetal stamens) from the Subclasses Caryophyllidae and Dilleniidae (centrifugal stamens). Leins (1964), however, has shown that the direction of maturation depends on the side of the androecial primordium on which the stamens arise. If they arise on the outer side, development is centrifugal, if on the inside, then it is centripetal. This observation suggests that the direction of maturation is not such a fundamental character as it would appear, because a trend towards perigyny or epigyny (as in the Rosales and Myrtales) could result in a change from centrifugal to centripetal development. Thus, if the sequence of stamen development is the crucial fact in allocating a family to one or other subclass (as it appears to be in separating the Myrtaceae (Rosidae) from the Lecithydaceae (Dilleniidae)), then perhaps too much weight has been placed on this one character.

In several places Cronquist refers to grouping of stamens and the occurrence of stamen trunks as constituting an intermediate stage in the reduction from numerous to few stamens, refuting both the Telome Theory (in which the stamen groups are regarded as primitive) and the Dédoublement Theory (in which they are regarded as multiplications of single stamens). He is certainly wrong to interpret the trends in the androecium of *Hypericum* in this way, and would find it difficult to give a satisfactory explanation of androecial trends in some other taxa, e.g. the Malvales.

Despite the occurrence of several such statements and assumptions which appear to be unwarranted, this is a most attractive book and should be read by all who are interested in Angiosperm taxonomy, in particular those who wish to discover how modern developments in morphology, cytology, embryology, etc. can be accommodated in the system. Apart from an annoyingly large number of misprints and a few omissions (e.g. the footnote on p. 8 and definitions of 'introrse' and 'extrorse' from the glossary), it is well produced and, at 55/-, not expensive by modern standards.

REFERENCE

LEINS, P. (1964). Das zentripetale und zentrifugale Androecium. *Ber. dt. bot. Ges.*, 77: 22–26.

N. K. B. ROBSON

Plant Variation and Evolution. David Briggs and Max Walters. Pp. 256 + 22 colour plates + 61 figures. World University Library. Weidenfeld & Nicolson, London. 1969. Price £1. 15s. cased; 18s. paper.

This is a most attractive book, elegantly written and beautifully produced.

It starts with the history of the study of plant variation and taxonomy, followed by an account of the beginnings of quantitative descriptive methods and elementary biometry. Mendelian genetics is outlined, again from a historical point of view, and is brought up to date with an account of modern ideas about population genetics and natural selection.

The various breeding systems found in plants are discussed, and this is followed by a chapter on definitions of species, and one on infraspecific variation and its adaptive significance. The distinction between gradual and abrupt speciation is emphasised, and finally the complications due to polyploidy and hybridisation are discussed.

There are two continuing themes throughout the book. One is the historical background of the topic under discussion, and the other is its significance in the study of evolution. Most of the text is concerned with clear exposition rather than with controversy, but where there is any doubt about the proper interpretation of any particular

piece of data this is always pointed out, and the impression given is one of fair and balanced discussion.

I applaud the authors' courage in pre-empting the term 'species' for taxonomic use, in the interests of clarity. Geneticists in the habit of maintaining that the breeding unit is the only true species are asked to make do with 'hologamodeme'. One can only hope that this clear and impartial account of the relation between the two will help to keep the temperature down.

One of the striking features of the book is the consistent use of the Deme terminology of Gilmour, Gregor and Heslop-Harrison. This attempt is successful because it concentrates on the more useful and clearly defined terms such as gamodeme, topodeme and cytodeme. The avoidance of this terminology by the majority of authors may well be due to the difficulty of using such terms as genoecodeme with precision, and in particular with the impossibility of incorporating continuous variability into the system.

The only criticism which could perhaps be made about the authors' use of these terms concerns gamodeme, in the sense of the mendelian population of the geneticist. It is used consistently in this sense, and there is even a section on 'The delimitation of gamodemes', but the extreme difficulty of defining the extent of gene flow which occurs in the wild is not faced, particularly in the case of semi-continuous distributions throughout which genes presumably move slowly but continuously over considerable distances. There must be very many situations where to refer to gamodemes at all is pure optimism, and to use the term routinely is perhaps to imply a simpler situation than really exists.

A wide range of pertinent examples is quoted in support of the ideas put forward. Sometimes the quotation is very brief, occasionally it is in the form of a diagram alone, and one or two authors may feel that their work has been condensed out of all recognition. On the other hand full references are given, and I could find no obvious case where extreme brevity had led to positive misrepresentation. This may well be the best way to stimulate the intelligent student to read further. This is an excellent students' book. It could be recommended even to advanced students of botany as a safeguard against gaps in their understanding.

D. A. WILKINS