

By far the most important revision of the book is the incorporation of the newly assembled data into the encyclopaedic list of Quaternary fossil records of each taxon. This section is preceded by a list of the sites and references to publications from which information has been gleaned—a list in which one can detect a degree of selectivity in operation. Space is used more economically than in the first edition, for no longer are the locations listed for all occurrences of the commoner fossils. Instead records are represented as frequency histograms in the various subdivisions of the Quaternary. Godwin retains his standard I–VIII zonation system for the Late-Devensian and Flandrian and it is difficult to see how else he could provide a systematic framework for the arrangement of plant records. A full discussion of the radiocarbon dates associated with these zones, however, would have proved most valuable. It is now known that many of the changes in pollen assemblages which are used as a basis for the Godwin zonation system are not synchronous (with the possible exception of the zone VIIa/VIIb boundary) across



the country. But since the system has been widely used in the zonation of published pollen diagrams up to the time of the preparation of this book, it does provide the most obvious and widely understood method of presenting the data.

Godwin rightly claims that the fossil history of our flora provides a factual basis for the understanding of plant distribution patterns. It is also true that developments since 1956 have gone some of the way to-

wards the unravelling of phytogeographical problems. The science is, nevertheless, still in its infancy and the scope for new ideas and methods is immense. New techniques are now being brought to bear on palaeoecological studies, many of which have been borrowed from related disciplines; these could provide new insights as well as new information concerning the history of the British Flora. Meanwhile this book presents a full and authoritative account of the present position of this subject.

If this edition is indeed the product of a successional process, it should not be regarded as the climax. Although the body of information contained within the book is impressive, it should be looked on as a progress report rather than as a concluding statement. The reeds are growing taller and the ground is almost firm enough to walk on, but the process of accretion will continue and may soon result in some profound and unexpected developments. Production rates are such that we may need a third edition before another twenty years have elapsed and I, for one, look forward to it.

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Valuable source of limnological data

A Treatise on Limnology. Vol. 3: Limnological Botany. By G. Evelyn Hutchinson. Pp x+660. (Wiley-Interscience: New York and London, February 1976.) \$33.30; £16.75.

In his preface Hutchinson promises the remaining limnological data he has assembled in smaller segments. Yet this third volume on limnological botany encompasses only chapters 27–32 and is 660 pages packed with information, but virtually excluding work on rivers. As readers of the previous two volumes will know his scholarship is impressive and his search of the literature most thorough from sixteenth century herbals of Dodoens to publications of 1974. As usual an index of lakes and of genera and species is included.

The first 70 pages are devoted to the rooted cryptogams which in lakes comprise only the Charophyceae and Bryophyta. These are relatively neglected components of the aquatic flora and the author has had to quote extensively from a few major works. Nevertheless he has highlighted several relatively unstudied aspects and problems—for example, the confused taxonomic situation in the Charophyceae, the need for greater ecological data on occur-

rence, zonation, germination of oospores, and so on. In passing, the odours produced by organic compounds in *Chara* and the larvicidal effects of Charophytes on mosquitoes are brought to our attention. The relationship between distribution in different water types and depth zonation of both Charophytes and Bryophytes is dealt with; but as Hutchinson comments on p. 63 most published records say little about ecology, and experimental studies especially of aquatic Bryophytes are scarce.

The next 438 pages are devoted to aquatic tracheophytes, a few of which are Pteridophytes *sensu lato*; but most are Angiosperms, of which 51 genera of Dicotyledones and 65 Monocotyledones occur in water. In the second chapter these are figured, and their distribution and life forms described. Although interesting, much of this purely botanical information will be of slight interest to limnologists—particularly the numerous categories of life forms culminating in a seven-page table. The third chapter concerning the biological characteristics of aquatic plants is a mine of information, including photosynthesis, carbon sources, heterophylly, development of aerenchyma (including figures of an Eocene aquatic fern) seed germination, pollination and dispersal (including that of the well known *Elodea*).

The fourth chapter concerns the up-

take of nutrients, the chemical composition of the plant tissue and the distribution of the plants in relation to the chemical composition of the water. A large amount of data is assembled in this chapter, which forms the most comprehensive survey to date. The data on many chemical elements in water will be of interest, for example, to students of pollution. There then follows a chapter devoted to the depth distribution of macrophytes, the macrophytic flora of lakes selected from many regions, and a summary of the associations found in lakes based on phytosociological studies.

Finally the algal benthos in the widest sense (of all the algae, and briefly the lichens) associated with underwater surfaces) is summarised in a more adequate manner than in any other text, although here there is still a lack of data due to neglect of these communities in favour of the more easily studied plankton. The number of genera involved is very large and Hutchinson has not been able to survey these as comprehensively as those of the other freshwater associations.

There are only a few misprints, especially of authors names and some cross indexing without the page numbers. But otherwise this book is produced to the same high standard as the preceding volumes and alongside these it will remain an invaluable source for many years.

F. E. Round