

example, of Wickerham in 1951) remain subjects of debate. Likewise it will surprise many to have it recalled that the recognition of the alternation of generations in yeasts goes back only to 1935, that the concept of "sexual" mating types followed little more than twenty years ago and that the comparatively little that is known of yeast genetics is even more recent.

With its wealth of newly co-ordinated information the few quite unimportant errors can be disregarded. They are more than compensated by a number of appendices including a useful listing of genera and diagnoses. It is slightly regrettable that no original papers are cited though a list of probably all the major monographs of the field will to a large extent meet this need indirectly.

A. H. COOK

LICHENS FOR STUDENTS

The Biology of Lichens

(Contemporary Biology.) By Mason E. Hale, Jun. Pp. viii+176. (London: Edward Arnold (Publishers), Ltd., 1967.) 42s. net boards; 21s. net paper.

THIS is a good book. It is an eminently successful account of lichens for the student. Although it does not aim to be an encyclopaedic work of scholarship, its coverage of the literature is remarkably good, and the clarity with which it is written is outstanding. Its scope is wide: it deals with the fundamental aspects of the morphology, reproduction, ecology and classification of lichens, and lays particular emphasis on the subjects of symbiosis, physiology and chemical taxonomy.

The most valuable quality of this book is the excellent way it deals with those aspects of the biology of lichens which are almost always misunderstood by students. The wealth of fascinating problems concerning reproduction of lichens is presented very clearly. In discussing concepts of symbiosis, Dr Hale gives very lucid explanations of what various authors have had in mind, but stresses our continuing ignorance of the nature of the lichen symbiosis. A section on the physiological relationships of the symbionts begins with the excellent statement: "Dialectic arguments about symbiosis are no substitute for experimental proof". At first glance, the chapter on the chemistry of lichens may seem to require more knowledge of organic chemistry than should be expected of a biology student. It is written, however, with superb clarity, and is an essential precursor to the succeeding chapter on chemical taxonomy, the best in the whole book.

As in any book, there are some small errors. I am embarrassed to be credited on page 61 with a comparison of rates of $^{14}\text{CO}_2$ fixation between *Trebouxia* and *Chlorella*: this work was actually carried out by Cecil Fox. Drew's studies of *Peltigera polydactyla* mentioned on page 59 showed that glucose is converted to mannitol in the algal layer, not the medulla, during photosynthesis. Some of the plates are poor, and 1D, 1E and 6B look more like objects from outer space than algal cells and soredia. In the next edition, the printers really must try to make the fifteen labels on plate twelve more legible.

I found the chapter on ecology the least stimulating. I am most sorry that Ried's (1963) work on zonation of lichens was omitted, because I believe this to be the best and most thorough piece of physiological ecology carried out on lichens, and I feel it deserves a whole section in a book of this kind. In dealing with atmospheric pollution, it is a pity to find no mention of Gilbert's work on the Newcastle area, because this provides better direct evidence than most other ecological studies of the effects of sulphur dioxide on lichen distribution.

But despite such criticisms, which are the sort that one specialist can always make about another, this book is to be highly recommended.

D. C. SMITH

USING THE LIGHT

Primary Productivity in Aquatic Environments

Edited by Charles R. Goldman. (Proceedings of an I.B.P. PF Symposium, Pallanza, Italy, April 26-May 1, 1965.) Pp. 464. (Berkeley and Los Angeles: University of California Press; London: Cambridge University Press, 1966.) \$7; 56s. net.

THIS volume is neither a recipe-book methodology nor a simple collection of research papers. Most of the contributions have a strong emphasis on the methods employed in production research and their potential sources of error, or on their underlying philosophy. Presumably the intention is to give examples of how freshwater productivity data can be obtained so that participants in the International Biological Programme can follow, modify or develop these examples.

Three examples from the twenty-seven contributions indicate the sort of topics and their treatment. Jorgensen and Steemann-Nielsen discuss the ways in which planktonic algae adapt themselves to factors such as temperature and light intensity, primarily by varying the concentrations of photosynthetic pigments and various enzymes. This is obviously important to anyone wishing to extrapolate from experimental data to the field situation.

Fogg and Watt discuss the release of glycolic acid as an extracellular product of photosynthesis by phytoplankton. The amounts released can be quite significant, more so in oligotrophic than eutrophic waters, and especially in surface waters at high light intensities. This is a potential source of error in the use of the radiocarbon method for estimating photosynthesis.

Margalef contributes a stimulating paper on the relationship between primary production and community structure in phytoplankton communities. This emphasizes the importance of (and therefore the need to measure) community structure either as some index of species composition, or as a simple pigment ratio.

Other important topics discussed include mechanisms of photosynthesis, the factors limiting primary production in natural phytoplankton populations, the importance of planktonic bacteria, production by higher plants in aquatic environments, the value of standing crop data in estimating primary production and the comparison of seasonal and spatial variation in phytoplankton populations and production rates in a temperate and a tropical lake.

Each paper has an abstract and a reference list and the whole volume is well edited and produced. The instigation and speedy publication of well-designed conferences will clearly be an important function of IBP and it has got off to a good start.

P. J. NEWBOULD

POTTED MAMMALS

Recent Mammals of the World

A Synopsis of Families. Edited by Sydney Anderson and J. Knox Jones, jun. Pp. viii+453. (New York: The Ronald Press Company, 1967.) \$12.50.

THIS book is the culmination of a series of check lists or bench books compiled for their own use by a succession of graduate students and staff members of the University of Kansas. It began as long ago as 1953 when the contributors prepared an outline of each order and family of living mammals; this proved so useful that it was improved and extended in 1959, and then further revised and expanded with the assistance of mammalogists in other institutions to form the present volume. As the editors say, the final result reflects a commendable degree of teamwork on the part of all contributors in writing to agreed standards of objectivity and conciseness.