

has been known for a long time. Algal starches have long been known, for example, to be very much the same substances as the starches of higher plants and the cell walls of many algae have been known to resemble those of higher plants in being based on cellulose associated with a wide variety of non- or para-crystalline polysaccharides based on sugars other than glucose. During the past decade or so a number of workers in various parts of the world have turned their attention to detailed chemical examination of algal polysaccharides, and this book, written by two authors of whom the senior author particularly is an outstanding authority, presents a comprehensive account of the present state of this study. The stimulus for this sudden expansion in our knowledge of marine algal polysaccharides undoubtedly springs from two sources: the increasing commercial utilization of these products of algal metabolism and an increasing tendency among plant physiologists to use the simpler algae as model systems as an aid to an understanding of higher plants. This book is unavoidable reading from either point of view. It does not pretend to deal exhaustively with many of the topics covered, but the reader is directed copiously to the relevant original literature listed at the end of each chapter. This makes it an easily read book, manageable in size, and yet an almost complete guide into all the current and immediate past literature of importance. It assumes in the reader some previous knowledge of organic and physical chemistry but this is offset to some extent by the second chapter in which detailed coverage is given of the modern methods of chemical structure determination with polysaccharides.

After a preliminary survey in the first chapter and the methodology of the following chapter, six chapters deal in turn with food storage, food reserve and structural polysaccharides, with alginic acid, sulphated polysaccharides and polysaccharides containing uronic acid and ester sulphate groups. A useful last chapter compares algal polysaccharides with both higher plant and animal polysaccharides.

This is a very useful and timely book. It is well presented, with a subject and author index, and I detected exceptionally few printing errors, none of them misleading. It is strongly recommended reading not only for phycologists but for plant physiologists in general and for all those involved in commercial exploitation of seaweeds.

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## AQUATIC MICRO-ORGANISMS

### Microbiology of Oceans and Estuaries

By E. J. Ferguson Wood. (Elsevier Oceanography Series.) Pp. xi + 319. (Amsterdam, London and New York: Elsevier Publishing Company, 1967.) 135s.

THERE is undoubtedly a need for a good textbook on marine and estuarine microbiology. The range of topics covered by Professor Wood in his recent book, *Microbiology of Oceans and Estuaries*, is well chosen and his writing is lucid. It is questionable whether the book will serve as a useful textbook, for it falls between two fires, being too general for the specialist and far too discursive for the beginner.

Many chapters and sections are welcome and well written; in particular are those dealing with microbial symbioses, fouling, corrosion, fish spoilage and geomicrobiology. They bring together under one cover a wide variety of information together with many of the personal observations and findings of the author. The parts of the book describing the inter-relationships between pH, redox potential and various chemical, biological and geo-biological events are generally interesting and useful. The description of the bacterial groups in the chapter on bacteria and fungi is clear and easily understood and will probably be useful to the student. In sharp contrast, his description of the phytoplankton groups is poor. The text of the section on the dinoflagellates is very difficult to understand and the accompanying illustrations give little help. In this chapter species and genera are referred to and even discussed at length, without their features being described to the reader. A person with limited prior knowledge of phytoplankton will gain little from this chapter. The quantitative aspect of marine production is given very curt treatment and the author's personal views on the subject are made very plain.

In summary, the book lacks the orderly presentation of information expected of a textbook and leans rather heavily on the personal observations and opinions of the author. In all fairness to Professor Wood it should be said that it is not easy to write a book on aquatic microbiology and probably impossible to write a good one. The price of the book is surprisingly high considering its size and that it is not lavishly illustrated.

P. J. LE B. WILLIAMS

## Physical Science

### NEW WAYS WITH ATOMIC LEVELS

#### Second Quantization and Atomic Spectroscopy

(G. H. Dieke Memorial Lectures.) By Brian R. Judd. Pp. viii + 61. (Baltimore, Md.: The Johns Hopkins Press; London: Oxford University Press, 1967.) \$5.95; 48s. net.

THIS little book is concerned with a different approach from the usual to the question of atomic energy levels. The usual method is to construct a suitable electronic wave function to represent the most important part of the complete wave function, and then to mix in with it wave functions for other "excited" configurations. The analysis is heavy, as anyone will soon admit who has struggled with the appropriate wave functions for rare earth configurations based on  $f^n$ . Professor Judd shows that the systematic use of creation and annihilation

operators can greatly reduce the labour. Moreover, because one configuration can be found from another (the basic one) by annihilating one electron and creating another in a different orbital, there is no need actually to set out explicit forms for these other configurational wave functions. The techniques of second quantization have not often been used in this way, but they throw light on the Racah formalism of fractional parentage, and are easily visualized in terms of Feynman-type graphs.

The present book is described as the lecture notes for a series of lectures at the Johns Hopkins University. The eight chapters are clearly set out, though they would be easier to read if they had been a little more extensive. They represent a significant advance in this field. Their only major defect—which rubs them out from all but libraries—is their cost. Forty-eight shillings for fifty-five pages and an index is ridiculous.

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