

Some of the mathematical treatments also seemed complicated even to workers in this laboratory who had previously translated equivalent treatments into working computer programmes, although it must be admitted that there are many books which are much worse in this respect. The book seems rightly aimed at theoretical

chemists, intending to introduce them to the biological applications and significance of their work.

In the last analysis, it is a book I would be glad to own.

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Electrical properties of biological cells

Impedance Measurements in Biological Cells. By O. F. Schanne and E. R. P. Ceretti. Pp. 430. (Wiley-Interscience: New York and Chichester, UK, 1978.) £21.20.

THERE exist two major schools of thought about the measurement of the electrical properties of biological cells. One owes its origin to a physicomathematical approach using the concept of impedance. Typically, this involves investigating the response of the cell to a wide range of frequencies followed by an attempt to model the response physically with an electrical equivalent circuit. The second school has typically been more interested in measuring the membrane resistance and in relating this to the physicochemical mechanisms determining the membrane permeability to ions. This has usually involved measuring the response to step changes of potential or current. Of course, the two approaches are complementary but it is nevertheless true to say that in the past the two schools have sometimes been far apart; even when they have come together on the same problem the interpretations have retained characteristic differences. I myself think that this is exemplified by the major difference between the approaches of Cole and of Hodgkin and Huxley to the analysis of the squid nerve fibre. The same properties of the cell lead Cole to represent the cell as behaving like an inductance, whereas Hodgkin and Huxley represented the inductance by a time dependent permeability change. A trivial difference in one sense, as the representations are equivalent. A major difference from an heuristic viewpoint since one's choice of representation does determine what one thinks is worth doing in future experimentation.

The authors of this book are well aware of this difference of approach; indeed they refer to the need to "show that the results obtained by the two groups complement each other". The book begins with a valuable treatment of the experimental and theoretical methods employed. This is followed by sections on impedance measurements in nerves, in muscles, in epithelia and on

cell suspensions. In the process, a vast amount of an even vaster literature is reviewed. My major criticism of the book is that the attempt to show that the results obtained by the two groups complement each other is not very well sustained. Many parts of the later chapters are simply reviews written largely in terms of the outlook of the original authors. My second criticism is that this review of the literature does not extend much beyond 1972 in many chapters.

Anyone who has written a book of

Techniques of centrifugation

Centrifugal Separations in Molecular and Cell Biology. Edited by G. D. Birnie and D. Rickwood. Pp.327. (Butterworths: London and Boston, 1978.) £14; \$28.

THIS book is concerned mainly with work that is done using preparative rotors. It proceeds from the theoretical background to consider in turn rate-zonal centrifugation, separations in zonal rotors, and isopycnic centrifugation.

The main chapter on theory acknowledges the antipathy of some biologists towards mathematics by relegating some sections to an appendix. In other chapters considerable use is made of simplified equations to illustrate principles, and even those who have not followed the derivations are encouraged to avail themselves of the resultant expressions much as they might do the time shown on an electronic watch. The design of their experiments, often an art as much as a science, may thereby be improved. Those practitioners who feel, for financial or other reasons, that their machines ought to have a shorter working week and higher payload, may benefit substantially from such considerations. Theory properly applied enables extra information, such as sedimentation coefficients, to be obtained from preparative experiments, but the authors wisely include a caution about the importance and sometimes difficulty of maintaining adequate temperature control.

this size and extent will readily understand the problems but, whether these are primarily those of the authors or publishers, the reader should be warned that he cannot expect the treatment of certain areas to be very up-to-date. There are many examples of this. Thus, in the section on passive properties of cardiac muscle, the important work of Mobley and Page in 1972 is included, but the equally important contribution of Hellam and Studt in 1974 is omitted. In the section on skeletal muscle, Costantin's work up to 1970 is included but not his 1973 work with Taylor, nor his valuable 1975 review. I cannot therefore imagine that many private buyers will find the book sufficiently useful to justify buying it, but as a library volume for reference purposes, it may still be worth considering.

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The chapter on isopycnic systems emphasises the advantages of fixed angle rotors. Although it mentions lipoproteins specifically, it fails to draw attention to the satisfactory separations of glycoproteins that have been achieved with this technique. Ancillary equipment receives some attention, but the survey of types of gradient-forming devices does not mention the versatile apparatus of Hegenauer *et al.* The percipient reader will notice a few blemishes, but these are rarely misleading. In chapter 2, η is used in the conventional way for viscosity, but in later chapters symbolises refractive index. Equations 6.7 and 6.8 were first derived by Ifft *et al.* in 1961, not 1970. In chapter 8 in several places the "e" is omitted from "Weiss". The most intriguing observation is "esoteric" on p189, a term that invites adoption by anyone who can muster a credible claim. Though the chapter on analytical ultracentrifugation is strictly within the scope of the title of the book, readers interested in these matters will probably seek a more specialised text. Where repetition occurs, its objective seems to be to make each chapter fairly self-contained.

This volume is well-written, is full of practical tips, and has concentrated from diverse sources a collection of tables on the characteristics of many types of biological particles, macromolecules, gradient materials, rotors and tubes. It will afford something of value to even the most experienced worker.

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