

coverage of each compound, although brief, is good, but I noted important gaps. For example, the enzymatic methylation of thioinosinate and the antiviral activity of 9- $\beta$ -D-arabinofuranosyladenine are not mentioned. The discussion of such subjects as selective toxicity is not very penetrating, and certain statements are actually misleading. For example, the author states that the de novo purine biosynthetic pathway appears to be operative in all organisms so far studied. It is, in fact, known that parasites in general do not have this biosynthetic capacity.

This book may be of use as an introductory text for graduate students, but it cannot compare favorably with the recent book by M. Earl Balis entitled *Antagonists and Nucleic Acid*, which covers the same subject matter more thoroughly and with more insight.

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## Aquatic Pathology

**Principal Diseases of Marine Fish and Shellfish.** CARL J. SINDERMAN. Academic Press, New York, 1970. xii, 372 pp., illus. \$17.50.

This book serves a dual purpose: as the first attempt to summarize in one volume the pertinent information on diseases of marine fish, mollusks, and crustaceans, it is a useful reference for the specialist in each of these fields; equally important, it should be read by everyone involved with marine fish and shellfish management as an introduction to the role of disease in wild and cultivated stocks. The fact that it is not exhaustively detailed may subject it to some criticism by the specialist, but the lack of detail is the very reason it will hold the attention of other readers. As the author points out in the introduction of the chapter on diseases of marine fishes, his approach is to present examples of significant diseases, concentrating on those that have received adequate attention and including a wide spectrum of pathogens and parasites. The coverage is adequate for both fish and shellfish.

Sindermann recognizes, in contrast to many authors, that such a selection process results in the omission or inadequate consideration of much literature. Further, there is a natural tendency to choose examples with which

the author is best acquainted, frequently from his own or his colleagues' research. The reader, if he has published in the field, is inclined to fault the author for neglecting his (the reader's) contributions. A number of such omissions stung the reviewer as he read this volume, as they probably will other researchers. If one refrains from nit-picking and objectively considers the overall contribution, however, it is clear that the author has succeeded enviably in digesting a voluminous literature into a concise and readable summary. This is no surprise, for Sindermann has previously demonstrated an aptitude for the preparation of outstanding review papers.

The chapters on internal defense mechanisms in marine animals, the relation of human diseases to diseases of marine animals, the role of disease in marine populations, and future studies of diseases in the marine environment are particularly timely and are subjects usually ignored in books on fish disease. In these chapters Sindermann brings out important facets of the role of disease in fishery population dynamics that are not usually considered by those engaged in fishery management. The chapter on internal defense mechanisms is, again, a departure from previous texts, particularly with the inclusion of germane material not specifically related to infectious disease. Finally, attention is focused on the importance of disease studies, both diagnosis and treatment, to accompany the development of more intensive marine aquaculture.

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## Organelles and Energy

**Membranes of Mitochondria and Chloroplasts.** EFRAIM RACKER, Ed. Van Nostrand Reinhold, New York, 1970. xiv, 322 pp., illus. \$17.50. American Chemical Society Monograph No. 165.

One of the most interesting aspects of research on biological membranes involves the relationship between membrane structure and energy-trapping mechanisms of the cell. The field is particularly exciting at present because a number of alternative hypotheses of membrane structure and function are

available for testing. For instance, two general models have been proposed for the organization of lipids and proteins in membranes. One suggests that most of the lipid is present as a bilayer in the center of the membranes. Protein would be attached to the membrane surface, with little interaction between protein molecules and lipid hydrocarbon chains. The other proposes that there is in fact considerable interaction between lipid chains and protein. Some of the protein would therefore be integrated into the interior structure of the membrane. A variation of the latter places most of the protein in the membrane interior in the form of functional lipoprotein subunits.

A number of alternative hypotheses are also available to account for various membrane functions, particularly transport phenomena and energy-trapping mechanisms. The central question of energy trapping concerns the manner in which synthesis of high energy chemical bonds is coupled to electron transfer events in the inner membranes of mitochondria and chloroplasts. In past years it has been thought that coupling must occur entirely through a chemical mechanism. A recent alternative, the chemiosmotic hypothesis, proposes that the initial event is the formation of an electrochemical proton gradient across the coupling membrane whose energy is utilized to drive an equilibrium toward adenosine triphosphate synthesis.

A third area of interest is the question of enzyme localization within membranes. With modern techniques of cell fractionation it is possible to ask whether specific enzymes of mitochondria are in the inner or outer membranes. Since different laboratories report different sites of localization, this has been a subject of considerable controversy. We may also ask how organelles are synthesized within cells. Are mitochondrial components under nuclear control, or do mitochondria have their own genetic information?

*Membranes of Mitochondria and Chloroplasts* is a collection of seven review chapters by investigators who have made significant contributions to this field. The authors address themselves directly to the questions outlined above. They attempt to evaluate the various conflicting hypotheses and to offer their own conclusions. For instance, a chapter by Efraim Racker provides a clear discussion of the limitations of the chemical and chemiosmotic coupling hypotheses, and concludes that