

glaring and intolerable environmental ills resulting from industrialization and growth. Oddly enough, the same is true, though with variations, in the Soviet Union, a political system that has always touted the virtues of a rationally planned economy yet in which a dozen years ago the word conservation was scarcely considered appropriate to the official lexicon. As Goldman points out, there are now plenty of laws on the books in the Soviet Union dealing with the environment but the existence of these laws has tended to delude Soviet policy makers. (We must assume, for want of first-hand information, that U.S. policy makers do not so delude themselves.) Some Soviet authorities, he believes, have been lulled into thinking that the mere passage of highly desirable laws is all that is necessary to induce compliance and bring the difficulties under control. There are, indeed, violations in the Soviet Union and the laws are only weakly enforced. Since the laws have not worked, the Soviet regime has simply passed more laws. Goldman concludes—and this conclusion may come as a shocker to those Americans who insist that the solution lies in an exercise of power at the center—that the very concentration of power in the hands of the Moscow regime has been a major factor in the development of Soviet environmental problems. Not only does this reviewer agree, but he would go further and suggest that the tempos of Soviet industrialization, which were established with the five- and seven-year plans, together with the expansionist agricultural policies have compounded the difficulties. In any case, it is hard to say flatly whether the Soviet Union is better off or worse off than the United States in its attempts to resolve the environmental problems that have arisen.

Goldman's study is a first-class synthesis. Pryde's is more classic in organization and more detailed. After a survey of the conservation movement in Russia from Tsarist times to the revolution, Pryde provides in a systematic way a well-documented account of the problems that have arisen in the use of soil resources, fisheries and wildlife, timber and mineral resources, and water. His discussion of the *zapovedniki* (nature preserves) is useful. His concluding chapters, dealing with environmental quality, the question of population growth, and prospects for the future, raise questions that need to

be treated at greater length. His conclusion that the Soviet experience provides no panaceas for the universally encountered problems related to natural resource development and conservation will come as no surprise to the Soviet Russia watcher.

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Actuopaleontology

Ecology and Palaeoecology of Marine Environments. WILHELM SCHÄFER. Translated from the German edition (1962) by Irmgard Oertel. G. Y. Craig, Ed. University of Chicago Press, Chicago, 1972. xiv, 568 pp. + plates. \$25.

This book, easily the best of its kind, is a real contribution to shallow-water marine paleontology and biology. The book was originally published as *Aktuo-Paläontologie nach Studien in der Nordsee*, and the English title is something of a misnomer. But the contents of the book are nonetheless striking and valuable, and this English version brings to the forefront a classic work that heretofore could be appreciated properly only by readers fluent in German. The breadth and significance of its coverage had been sadly overlooked by hosts of American students, teachers, and researchers.

The present version is not only a translation but also a new edition; the original text and illustrations have been revised slightly, and several references have been added. Focus remains mainly upon the North Sea, but a wealth of examples and conclusions given here apply equally to other seas and to the fossil record. The writing is clear and credible, and the illustrations are tremendous.

In essence, the book is a practitioner's synthesis of 45 years of work by numerous marine biologists and geologists at Wilhelmshaven, Germany. The marine institute there, a part of Senckenbergische Naturforschende Gesellschaft, is a venerable pioneer in many aspects of marine science, as illustrated aptly by this volume.

Schäfer has written more for geologists than for biologists, but marine biologists will benefit substantially from the abundant data on animal distributions, habitat adaptations, functional morphology, behavior, and various other aspects of autecology. Sections on synecology are more conspicuously pale-

ontologic in application but are nonetheless valuable.

The ecology of present-day organisms is of fundamental importance in paleoecological interpretations, of course, but equally valuable is this book's unusually broad coverage of taphonomy—the study of the death, disintegration, burial, and potential preservation of organisms as fossils. This aspect of marine research has in general been sorely neglected, but the evaluation of taphonomic processes is in fact prerequisite to the unraveling of ancient animal-habitat relationships represented in the fossil record.

Also unique is the book's extensive treatment of ichnology—the study of tracks, trails, burrows, borings, and other signs of activity by animals. Such traces were once considered mostly as academic curiosities; but more recent work—notably the present volume—shows that both biologists and paleontologists may learn a great deal about animal adaptations through studying these traces. In addition, such traces may constitute the only fossil record of numerous soft-bodied invertebrates, and the requisite animal activities are important as sedimentologic agents.

In short, I highly commend this book to anyone interested in shallow-water benthic ecology, paleoecology, and sedimentology, or in the reconstruction of ancient depositional environments. Indeed, one now wonders how we ever did without it.

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Induction of Immune Response

Immunogenicity. FELIX BOREK, Ed. North-Holland, Amsterdam, and Elsevier, New York, 1972. xxii, 584 pp., illus. \$37.50. *Frontiers of Biology*, vol. 25.

This book is intended to discuss the various factors that can determine and affect immunogenicity. The function of antigen is broadly conceived, and the book not only enumerates the chemico-physical requirements for immunogenicity but also deals with the role of the dose, route of administration, and adjuvants in the initiation of and the determination of the type of immune response. With respect to the host, the immunocompetent system is discussed in terms of the effect on its functioning of such factors as the genetic makeup

of the organism, hormonal activity, anti-metabolites, and diet ingredients.

Some basic requirements for immunogenicity are assumed. These include the presence of specific (antibody-like) receptors on antigen-reactive cells, functional differentiation between various types of immunocompetent cells, cooperation between cells to trigger the immune response, and the involvement of a carrier. It is also assumed that "one cell produces only one immunoglobulin." Unfortunately, the possibility of the existence of a certain multipotential cell and step in the development of the immune response is not discussed.

It is interesting to mention some of the conclusions arrived at in the book. It is considered that probably all macromolecules can elicit antibody formation if given in the proper dose and schedule (chapter 1). This conception implies a great variety in the responsiveness of the immunocompetent system. It is claimed that the induction of antibody response or tolerance is directly related to the number of cell receptors. It is stated that the relative importance of molecular size and shape of antigens in determining immunogenicity varies greatly from one antigen to another (chapter 2). The dose and route of antigen administration determine not only immunogenicity but also the type of immune response elicited, that is, humoral versus cellular, affinity, and type of antibodies (chapter 3).

In connection with the action mechanism of adjuvants, it is of interest to mention the concept of "built-in" adjuvanticity for the antigen carrier and the possible action of adjuvants as surface-active agents and labilizers of lysosomal membranes (chapter 4).

Various hypotheses are proposed concerning the role of macrophages and cell cooperation in the induction of the immune response. The most appealing for the authors is that of the antigen functions as an inducer of protein biosynthesis (chapter 10).

The ability of histocompatibility antigens to provoke proliferation of immunocytes is postulated to be of utmost importance in determining the immune response of the host toward tumor cells. The possibility that some of the human lymphomas and leukemias are monoclonal, as are cases of multiple myelomatosis, is considered worthy of further investigation (chapter 16).

The book contains detailed chapters on various particulate antigens and on

the evolution of immunological potential. The last chapter is devoted to some interesting predictions on the role of immunology in the future. In conclusion, the book fills a need in bringing together detailed information on factors governing immunogenicity.

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Membrane Biophysics

Biophysics and Physiology of Excitable Membranes. WILLIAM J. ADELMAN, JR., Ed. Van Nostrand Reinhold, New York, 1971. xvi, 516 pp., illus. \$24.50.

This book, based on a series of lectures to summer trainees at Woods Hole, should be in the library of every person with a serious interest in excitable membranes. The book's uniqueness among publications in this field lies partly in the variety of approaches to understanding membrane excitability it presents and partly in the clearly conscious effort that is made throughout to pass on information that will be useful to a beginning investigator. Perhaps the epitome of this effort is a full FORTRAN IV computer program for simulating the squid axon via the Hodgkin-Huxley model.

It should be noted that the 18 contributors to this volume were free to expound from their own points of view. The reader who has been working on membranes will automatically adjust for this, but the student who is using the book as an introduction should be warned not to be dismayed by differing viewpoints elsewhere in the literature, or in fact in this book, as when in the chapter beginning on page 379 he encounters a model of excitability that he has been warned to consider "suspect" on page 139. But that's all right, as long as he understands that his task is not to choose sides but to synthesize some more comprehensive picture from the most significant work that has been done—and on balance this book is an excellent representation of that work.

However, I would have liked there to be just one extra chapter somehow placing this body of work in the larger context of physiology. If the sum total of all the work of this volume's contributors and the people they cite were merely to understand resting and action potentials in the nerve axon,

then this would indeed be a great deal of effort for not much profit. Although there are a few references to other preparations, the student will not get from this book any idea of the extent to which its subject matter has been extended to help develop concepts of function at the membrane level for such things as receptors, synapses, and muscles. This is a crotchet of mine, but it seems to me that to keep reminding students of such perspectives is one of the things that makes the difference between training them to be scientists and training them to be technicians. Besides, the extension to other membranes of the electrophysiology that has been developed for the axon is a lively research endeavor, of which students should be made aware. But the lack of such a chapter does not detract from what the book is—namely, the best available survey, at a level of detail suitable for a beginning or ongoing researcher in the field, of the variety of techniques that are being brought to bear on the problem of understanding membrane excitability.

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Crystal Structures

The Crystal Chemistry and Physics of Metals and Alloys. W. B. PEARSON. Wiley-Interscience, New York, 1972. xx, 806 pp., illus. \$34.95. Wiley Series on the Science and Technology of Materials.

W. B. Pearson is already well known for his two-volume *Handbook of Lattice Spacings and Structures of Metals*. Those volumes, which are a compilation of the structures formed by various alloy phases, are nicely complemented by the present volume, which is both a systematic description of the more than 600 crystal structures found in metals and a critical review of theoretical work on the problem of structural stability.

Most of the structures are described in terms of the stacking of close-packed layers. This system has the considerable advantage over those based only on crystal symmetry that structural similarities and differences are unambiguously exposed. (It is possible for two compounds belonging to the same space group, having the same site-set occupation, with values of free atomic