

have a very comprehensive account of the history of biochemistry that will also guide him or her to recent work by historians on the history of physiology and biochemistry.

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Control of Insect Pests

Theory and Practice of Biological Control. C. B. HUFFAKER and P. S. MESSENGER, Eds. Academic Press, New York, 1976. xxii, 788 pp., illus. \$42.50.

This is the third major book on biological control that has been written or master-minded since the middle 1960's by researchers at the University of California. Like the other major books, it is a many-authored volume, and a galaxy of world experts have contributed chapters. Virtually all of the book is concerned with insect pest control by natural enemies. The book also briefly introduces other, wider aspects of the biological control of insect pests, including control by host-plant resistance, cultural controls, and control by autocidal methods as well as integrated control. Only one 14-page chapter discusses the very important subject of the biological control of plant pathogens, and there is no treatment of other subjects, such as the direct biological control of animal pathogens. To call such a book *Theory and Practice of Biological Control* perpetuates the myth that disciplines other than entomology have relatively little to offer to the theory and practice of biological control.

For the entomologist, the book provides a valuable updating of general information on biological control but does not offer much that is new in the way of philosophy or exciting ideas. Thus, except for a valuable chapter by Hagen and others on "The biology and impact of predators," those on philosophy, scope, theory, and empirical bases for biological control are mostly shorter versions of stimulating and provocative chapters on these topics in the two previous major books (*Biological Control*, C. B. Huffaker, Ed., Plenum, 1971, and *Biological Control of Insect Pests and Weeds*, P. de Bach, Ed., Chapman and Hall, 1964). Opportunities have been missed; it would be more valuable, for example, to critically examine the future role of biological control in relation to the vital topic of integrated control (which is discussed in chapter 27) than to deal with integrated control, as the book does,

mostly in terms of its independent components.

The book is certainly a tribute to the outstanding work done by entomological protagonists of biological control since it all began in California in the late 1800's, and it also provides evidence of successes in the last 20 years, demonstrating the continued importance of the biological control of pest insects by natural enemies. However, the philosophy and practice of biological control have remained little changed for several decades. The emphasis in the present book on success stories and the absence of critical analyses of inadequacies or apparent failures suggests that the protagonists of biological control still feel they have to defend or at least to vindicate their approach. Yet few people would disagree that biological control is fundamental to the rational control of most insect pests as well as of many other kinds of pests and diseases. We still need an objective analysis of the role of biological control, including appraisals of its strength and limitations and, in particular, some fresh approaches in biological control research. This will be the task of the new generation of young scientists dedicated to this field of endeavor both in California and elsewhere.

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Toxic Effects

Biological Reactive Intermediates. Formation, Toxicity, and Inactivation. Proceedings of a conference, Turku, Finland, July 1975. DAVID J. JOLLOU, JAMES J. KOCSIS, ROBERT SNYDER, and HARRI VAINIO, Eds. Plenum, New York, 1977. xii, 514 pp., illus. \$49.50.

This book presents one of the more intriguing phenomena of toxicity, the production of highly reactive intermediates as a result of attempts by the body to inactivate and rid itself of foreign chemicals. When these intermediates react with critical cellular components, the biochemical lesion produced can cause toxicity in the form of morphological and physiological changes. These are most often seen as cancer and organ damage. This collection of papers comes from an international symposium at which most of the major laboratories studying reactive intermediates were represented. Although several books dealing with specific aspects of reactive intermediates have appeared recently, this is the most

comprehensive volume available. The coverage, however, varies immensely from chapter to chapter; some chapters are comprehensive reviews of a topic, whereas others deal with very narrow and specific experimental problems. Despite the shortcomings of such a format, the whole is very readable, and the reader is made aware that, despite the seeming completeness of the background information, there are many problems that need to be solved.

The book is divided into seven sections, although the subjects covered in each seem somewhat arbitrarily assigned. The discussions that took place at the symposium are not reported verbatim, but the summaries retain some of the spontaneity characteristic of a scientific meeting.

An excellent start to the book is provided by a section on the role of covalent binding in toxicity and carcinogenesis. In this section, one chapter by Gillette deals with theory and others, by Miller and Miller and by Jollow and Smith, use specific experimental examples to illustrate general concepts. In the section Formation of Reactive Intermediates, the comprehensive coverage in the contributions by Ullrich on the oxidation mechanisms, Schenkman *et al.* on the induction of aryl hydrocarbon hydroxylase, and Gelboin *et al.* on the metabolism of benzopyrene is particularly noteworthy. Similarly, in the section Inactivation of Reactive Intermediates the chapters by Oesch *et al.* on epoxide hydratase and Jerina and Bend on glutathione *S*-transferases and elsewhere in the book the chapters by Sims on polycyclic hydrocarbon epoxides and Brookes on the role of covalent binding in carcinogenicity provide excellent backgrounds to aid in the understanding of chapters concerned with more specific problems of individual drugs and foreign compounds. The chapter by Högberg on the use of hepatocytes in a toxicity study provides some exposure to a model system for which there is great potential. Two chapters, one by Conney *et al.* linking reactive metabolites with mutagenicity and carcinogenicity and the other by Regan documenting cellular repair mechanisms, remind the reader that a demonstrable detrimental change resulting from the initial binding event, not the binding of a reactive intermediate to a cellular constituent, is the true indicator of toxicity.

Overall, the volume blends past problems and the way they were solved with present problems and the way they are being attacked to form an overview of reactive intermediate toxicology that will

be useful for many years to toxicologists, pharmacologists, biochemists, and any other scientists who are interested in the interaction between an organism and its potentially hostile environment.

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Layered Structures

Structural Chemistry of Layer-Type Phases. F. HULLIGER. F. Lévy, Ed. Reidel, Boston, 1977. x, 392 pp., illus. \$39.50. *Physics and Chemistry of Materials with Layered Structures*, vol. 5.

Layered compounds have structures similar to those of mica or graphite, in which sheets of strongly bonded atoms are stacked on top of each other and held together only by weak forces. The anisotropy of the bonding produces easy cleavage parallel to the layers and "quasi-two-dimensional" physical properties. This book reviews all the known inorganic layered structures, with an emphasis on the chemical bonding responsible for the overall structure. It begins with a general discussion of the possible layered structures that can be obtained by connecting anion polyhedra with coordination numbers 3 through 9. The remainder of the book clearly illustrates these possibilities with the known layered structures. This presentation is enhanced by the liberal use of easy-to-understand figures and about 200 tables of crystallographic data. The author includes some discussion of intercalation compounds, compounds in which a variety of atoms or molecules have been inserted between the layers. Many of these intercalation compounds are not strictly layered compounds because their layers are more strongly bonded together by the inserted species. Discussion of them is important, however, because direct chemical control of physical properties by intercalation is possible. For example, some compounds that are electric insulators become metallic conductors after the intercalation of metal atoms such as lithium.

The book will be of interest to an expanding audience because of the recent recognition that the two-dimensional structures have unusual physical properties. In addition to the historical interest in clays (layered silicates) and the use of some layered compounds as lubricants (primarily molybdenum disulfide), certain layered compounds are of current technological interest for their use as electrodes in high-energy density bat-

teries and as chemical catalysts. The unusual electronic properties of layered compounds, deriving partly from the two-dimensional nature of the chemical bonding, have also been the object of active and expanding scientific study. Hulliger has succeeded in presenting a clear and timely discussion (with more than 1000 references) of the crystal chemistry of layered compounds.

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Effects of Oil Spills

Fate and Effects of Petroleum Hydrocarbons in Marine Ecosystems and Organisms. Proceedings of a symposium, Seattle, Nov. 1976. DOUGLAS A. WOLFE, Ed. Pergamon, New York, 1977. xx, 478 pp., illus. \$40.

Concomitant with increased petroleum exploration and production in offshore waters and increased petroleum transport on the oceans, there has been increased concern over the fate and effects of spilled petroleum in marine environments. The symposium that resulted in this book is one of several held each year in the United States as part of the response to the concern. As originally conceived, the focus of the meeting was to have been cold-water environments, but the papers actually presented were of much broader scope.

The book is arranged in three sections corresponding to the main divisions of the symposium. The first section is composed of 11 summary review papers, and the second contains 34 research reports. The final section is a transcript of a panel discussion of research needs. Although the contents of the sections are somewhat predictable, there are some pleasant surprises.

Most of the review papers are done well, and a few are excellent. The paper by D. G. Shaw, which gives a useful overview of the processes that play a role in the distribution and dispersion of petroleum hydrocarbons in water, is the first of its kind I have seen. J. W. Anderson discusses some of the effects on individual organisms of long-term exposure to low, sublethal levels of petroleum in laboratory studies. There is little question that these effects are significant. On a broader level, A. D. Michael summarizes the effects of petroleum on organisms that have been observed in field studies of marine communities and populations. This is perhaps the direction more studies should take. All the review papers contain valuable information and

should be read by everyone concerned with the effects of petroleum on the marine biosphere.

The same cannot be said of the research reports. Their quality ranges from excellent to marginal, and most are of narrow scope, probably useful only to specialists doing work similar to that reported. It is probable, however, that much of the information in the reports will not appear elsewhere, and for this reason researchers may find parts of the section quite important.

The real value of the book lies in the third section, Panel Discussion on Research Needs. Although the topic is the future direction of investigations of the impact of petroleum contamination on the oceans, the thoughts expressed in the discussion are equally applicable to almost any sort of environmental perturbation, be it chemical or physical. The section should be read by all environmental scientists, administrators, and policy-makers.

In his review paper Michael offers an opinion that might best summarize the panel discussion, the book, and the entire subject: "There is perhaps a tendency to assume we know a good deal about oil spills now since there is a considerable volume of literature. . . . I hold the view that we still have much to learn about the consequences of spills and would prefer to see fewer, more comprehensive studies, rather than the perpetuating [of] cursory overviews which do not enhance our understanding." This book contains examples of both the good and the bad in current oil pollution research, and it also goes a long way toward identifying the directions future efforts should take.

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Adjuvant Therapy of Cancer. Proceedings of a conference, Tucson, Ariz., Mar. 1977. Sydney E. Salmon and Stephen E. Jones, Eds. North-Holland, Amsterdam, 1977 (U.S. distributor, Elsevier, New York). xii, 646 pp., illus. \$53.95.

(Continued on page 1072)