

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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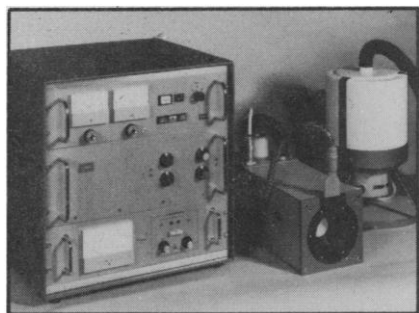
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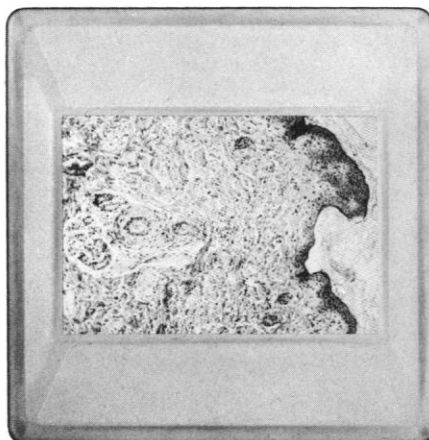
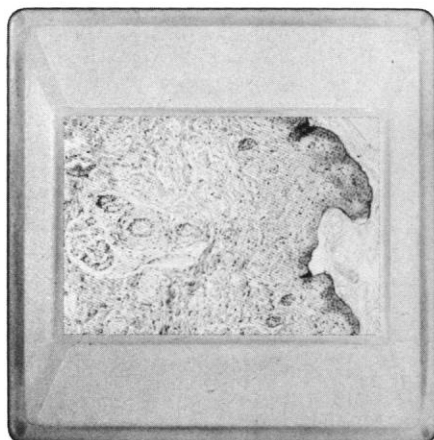
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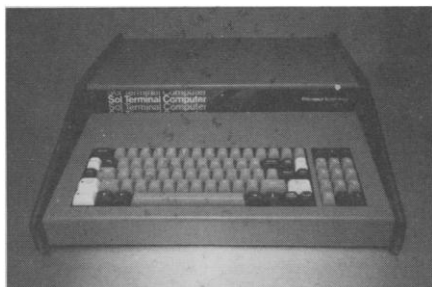
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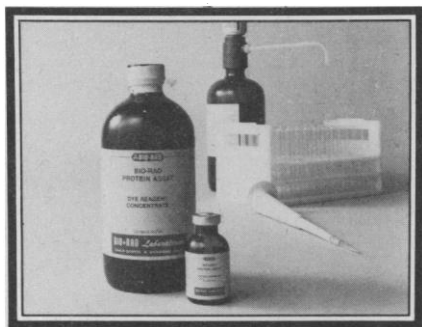


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<sup>1</sup>Bradford, M. M., *Anal. Biochem.*, **72**, 248 (1976).

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