The mammals are discussed species by species, with the taxonomic, historical, and biological data that are available. These are scanty in some cases, plentiful in others. Attention is given to interactions between species, changes in habits, responses to and effects on the new environment, and economic significance. There follows a section on "Some perspectives in Hawaiian mammalogy," dealing with such special topics as Hawaiian names for mammals, mammals in crafts and art, whales and dolphins, biological aspects of the rodents, diseases and parasites, current introductions, the fate of Kahoolawe, and the Leeward archipelago. It is surprising that, despite the limited fauna and the general lack of interest in it until recent years, the author has assembled in the last section a bibliography of 86 pages with 771 annotated references bearing on the subject. An adequate index completes this interesting and informative volume, published in observance of the 80th anniversary of the founding of the Bernice P. Bishop Museum in 1889.

RICHARD H. MANVILLE
Bureau of Sport Fisheries and Wildlife, Washington, D.C.

Sedimentary Compounds

Organic Geochemistry. Methods and Results. G. EGLINTON and M. T. J. MURPHY, Eds. Springer-Verlag, New York, 1969. xxiv + 828 pp., illus. $49.

Sedimentary rocks contain the earth's largest pool of organic compounds; 1 percent of a typical sediment consists of an immensely complex assemblage of compounds that reflect both earlier life and the slow but powerful chemical reactions in the subsurface. Organic geochemistry is the study of this material and the interpretation of its structure in terms of the processes that shaped it.

The size of the present book, the number of contributors, and the quality of the papers mirror the present state and the healthy growth of the field. Organic geochemistry has grown under three different stimuli: academic curiosity, petroleum research, and preparation for extraterrestrial sampling. Yet only two of the 31 chapters have been contributed by scientists in the oil industry. A large fraction of the industrial effort during a quarter century remains classified and lost to science.

The papers fall into four groups: on methods, on geological processes, on inventory of compounds, and on specific geological situations. The methods section emphasizes the modern tools, especially mass spectrometry. Some chapters could be more effective; the short section on gas chromatography is too elementary, with only two pages on geochemical use. Some statements are painfully misleading: "Pesticide grade solvents are contamination free" (p. 77).

The section on geological processes should be valuable for chemists entering the field; I regret that the vital chapter "Organic matter in sediments" was not expanded beyond a brief outline and five references. The inventory of compounds and the analysis of geological situations reflect the uneven penetration of the field by modern techniques; these are applied to small molecules but have had little impact on the study of humic acids, coal, and kerogen. The imbalance is great; we are ignorant about the structures of most sedimentary organic compounds.

Organic reactions in sediments are incredibly complex. A single biochemical may be converted into many thousands of different compounds. We will not understand the origin of oil, coal, and kerogen until we understand the reactions that occur in sediments. Yet, a single chapter of the book discusses some possible reactions, and the excellent subject index has no entries for equilibrium, mechanism, radical, or reaction.

We miss some subjects that might be covered in a future addition to this book: history and development of thoughts, areas of controversy, pitfalls in research and interpretation (meteorites!), trends and needs for future growth, links and contrasts between inorganic and organic geochemistry, and *applications*. Organic geochemistry does have applications, most obviously in petroleum exploration, and also in oceanography, public health, and pollution research, a subject that need not have been covered by a tendentious poem, as it is in this book.

On the whole this is an excellent book, a good reflection of the state of the art, in spite of three years' production time, and useful to students and specialists; but not an imaginative outlook into the future, and with a price tag that may limit the market.

MAX BLUMER
Woods Hole Oceanographic Institution, Woods Hole, Massachusetts

A Solid

Physics of Ice. Proceedings of an international symposium, Munich, Sept. 1968. NIKOLAUS RIEHL, BERNHARD BULLEMER, and HERMANN ENGELHARDT, Eds. Plenum, New York, 1969. xx + 644 pp., illus. $25.

Gränicher, in his review "Problems of the physics of ice," the first of the 56 papers in this volume, relates a story about the visit of a distinguished American scientist to his laboratory in Zurich. The visitor expressed astonishment that Gränicher had chosen to study ice, a substance about which surely everything is known. This volume effectively dispels that notion; it also catalogs in detail much of the recent work on the structure and properties of ice, and it emphasizes by means of several review articles the importance of achieving a thorough understanding of ice.

A group of eight papers covers the crystal structure and growth of ice. These papers remind us that ordinary ice I is only one of at least ten solid forms of H_2O. The others include the high pressure ices (II through IX) and the metastable cubic ice and vitreous ice that can be formed by condensing water vapor at low temperatures. Whalley, Hamilton, Kamb, Rabideau, and others summarize the structural conclusions that have emerged from their studies of x-ray and neutron diffraction, infrared and Raman spectroscopy, nuclear magnetic resonance, and dielectric and thermodynamic measurements. In all ices studied to date, each molecule is hydrogen bonded to four near (2.75 to 2.87 Å) neighbors. Within the limits of the measurements, individual H_2O molecules are not deformed from their dimensions in the vapor, though hydrogen bonds in some of the ices are deformed considerably from the nearly linear O-H. . .O bond in ice I. In ice IX the departure from linearity is as great as 15 degrees. The greater compactness of the high pressure ices is the result of the closer approach of non-hydrogen-bonded neighbors; this is achieved in most cases through the bending of hydrogen bonds. The ices differ in the degree of order of the orientations of the molecules. In ices II, VIII, and IX, the orientations have a long-range order, whereas in ices I, III, V, VI, VII, and cubic ice they are disordered.

A total of 21 papers are grouped under the headings Electrical Properties and Diffusion and Relaxation Phe-