best served by this benign commentary.

In the first major section of volume 1 the biogenesis and nature of biological membranes are discussed, with attention being drawn to necessary modifications of the simple bimolecular leaflet idea. Inadequacies of existing models are carefully brought out with documentation from recent investigations. Additional vigor is lent this theme by a competent chapter relating the properties of black lipid films to living membranes. Also of interest here is the chapter by Irving Klotz dealing with the state of water as a molecular environment.

In the three chapters of section 2, on theoretical aspects of transport phenomena, the general principles of irreversible thermodynamics are developed and then applied to active transport, isotope fluxes, and oxidative phosphorylation. Coupling between transport and chemical reactions is expounded in a chapter by Peter Mitchell. Since the theoretical physical-chemical relationships among active ion fluxes, passive ion fluxes, metabolic processes, and membrane potentials are, to say the least, unclear in the minds of some, the lucid discussion in this portion of the book will be as salutary for established membrane physiologists as it will be challenging, if not a bit perplexing, for the novice.

The final subdivision of volume 1 deals with mechanisms of active transport. This section characterizes sodium-potassium-activated adenosine triphosphatase and provides a prodigious description of the occurrence and properties of this enzyme as it exists in a wide variety of cells and tissues. P. C. Caldwell presents and astutely criticizes pertinent models for sodium-potassium transport. Also offered in this section is a chapter discussing sodium-, potassium-, and chloride-linked electrogenic pumps found in a number of cells and tissues. Coupling between transport of organic molecules and ions is described by H. N. Christensen. This well-documented discussion of data concerning amino acid transport systems might have been enhanced by the addition of a diagrammatic representation embodying this erudite author's view of ion-coupled organic molecular transport. Hexose transport and the bifunctional mobile carrier concept are not specifically treated. This omission seems inconsistent with the editor's otherwise sapient choice of subject matter.

The second volume constitutes a well-organized compendium of ion movements and the physiologic roles of ions in tissues, cells, and organelles. Its first section is a group of seven chapters dealing respectively with skeletal muscle, smooth muscle, heart muscle, nerve, brain, red blood cells, and liver. These chapters generally consist of a discussion of morphology, where it is relevant, followed by a consideration of the localization, transport, and physiological role of major cations such as sodium, potassium, calcium, and magnesium. In some cases chloride, bicarbonate, and other anions are also evaluated. The chapters are consistently good and timely. Especially refreshing are the spicy critical comments of P. J. Goodford in the presentation on smooth muscle and the fine treatment by R. M. Marchbanks of brain metabolism and ion transport. Subdivision 2 of the volume offers two interesting chapters describing ion-related phenomena in mitochondrial and nuclear membranes. In general some portions of volume 2 appear a bit verbose, and their didactic value might have been enhanced by more liberal use of figures and diagrams.

The third and final volume of the series begins with an analysis of ions and complex tissues. Its first section consists of six chapters specifically concerned with frog skin and toad bladder, renal tubules, intestine and gall bladder, gastric mucosa, cochlea, and ciliary processes. As in volume 2 the chapters generally start with morphologic considerations. They are especially well endowed with electron micrographs and excellent drawings. In discussing the involvement of major cations and anions in the function of given tissues these chapters maintain uniform high quality and are not only informative but pleasurable to read. One of the numerous highlights of this section is the fine offering by J. G. Forte concerning hydrochloric acid secretion by gastric mucosa.

Subdivision 2 of volume 3 consists of a single chapter in which D. A. T. Dick treats water transfer in cells and organelles and some physiologic correlates of this flow. Of particular value to many readers will be the well-developed discussion of the mechanisms by which water traverses biological membranes.

As a finale to the series, section 3 takes up more integrative aspects of membrane transport. The first chapter of this division explores the relationship between active transport and other processes such as cellular metabolism, maintenance of cell volume, sugar and amino acid transport, and the secretory functions of various tissues. One chapter addresses itself to the ionic requirements of protein biosynthesis. Hormonal regulation of ion transport is discussed by E. E. Bittar, who gives an especially interesting account of the sodium-related actions of vasopressin, insulin, and aldosterone.

Subsection 4 of the last volume consists of a single unit summarizing the properties of the cell surface. In this rewarding chapter D. Gingell develops the concept of the transducer action of surface potentials. With respect to this point he presents arguments favoring the idea that changes in surface potentials are involved in biological phenomena such as pinocytosis, contractile responses at the surface of amphibian eggs, and transformation of Naegleria.

Perhaps the best way to characterize this book might be to quote the editor's description of it as "an attempt to deal with notable advances that have already been made and to treat the subject both systematically and critically." In my opinion this goal is successfully achieved.

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Statistics for Geneticists

Probability Models and Statistical Methods in Genetics. REGINA C. ELANDT-JOHNSON. Wiley, New York, 1971. xx, 592 pp., illus. $24.95. Wiley Series in Applied Probability and Statistics.

In this lengthy book Elandt-Johnson introduces the elements of statistics and probability theory and applies them to various models arising in qualitative genetics. The book is meant to be self-contained and suitable for geneticists with little or no statistical background. The chapters on genetic models cover such topics as equilibrium models in panmictic populations, joint distribution of relatives, inbreeding, and natural selection and mutation in natural populations. The statistical chapters cover most of the standard theory of estimation and hypothesis testing, the applications including allele frequency estimation with a special section on human blood groups, detection of linkage, segregation ratios, and histocom-

patibility testing. The discussion of the last of these is an original development based, in the main, on the author's own work.

As a group the chapters on genetic models are weaker than those dealing with statistics. Some of the discussion is extremely tedious (for example, on the distribution of relatives), the tendency being toward very technical and exhaustive developments rather than toward elegant and intuitively appealing ones. There are numerous misprints, even in definitions, and a fair sprinkling of incorrect statements. In the discussion of stable equilibria under natural selection, for example, the definition given of a stable point is overly restrictive so that the argument that local maxima on the mean fitness surface correspond to stable points is fallacious.

In the statistical chapters, the writing is clear and those results which are not justified mathematically are made plausible through intuitive arguments. Certain applications of these statistics are not included, however, perhaps the most unfortunate omission being the estimation of selection coefficients and of linkage disequilibrium with multiple alleles.

This book will prove most useful to geneticists who are already familiar with the probabilistic models of their subject and who want to learn statistical procedures related to these models. A shortened version, without the sections on genetic models, would be desirable in view of the prohibitive cost of the present version and the weakness of these sections.

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Geochemistry

Principles of Chemical Sedimentology. ROBERT A. BERNER. McGraw-Hill, New York, 1971. xvi, 240 pp., illus. $14.50. McGraw-Hill International Series in the Earth and Planetary Sciences.

Many of us will be happy that Berner has taken time off from his research to summarize his work and to present some new ideas to his colleagues. For the practicing scientist and the advanced student of low-temperature geochemistry, *Principles of Chemical Sedimentology* is required reading.

Most of the topics covered in the book are those that Berner has investigated and published in recent years. This is the great strength and, at the same time, a weakness of the book. For the many important topics that Berner has investigated the book offers a ready source of ideas and information. On the other hand, one cannot go to the book for a general treatment of the broader world of chemical sedimentology. To obtain a more balanced treatment of the subject, one should use Berner's book in conjunction with two other fairly recent books, *Evolution of Sedimentary Rocks* by R. M. Garrels and F. T. Mackenzie (Norton) and *Geochemistry of Sediments* by E. T. Degens (Prentice-Hall).

Principles of Chemical Sedimentology is not for beginners. A good background in physical chemistry is a necessity for appreciation of the book. The generalist, even the generalist in sedimentology, will find the going tough. For the person who has the background and interest, however, the book will suggest powerful and perhaps unfamiliar approaches to many interesting problems.

The book carries the unique signature of Berner in the treatment of the principles of kinetics. Using elementary expressions as points of beginning, he is able to predict and test the rates of such processes as mass transfer through compacting sediments, growth of concretions, nucleation and dissolution of crystals, and diagenesis of organics. In this respect he continues to pioneer in the application of the principles of kinetics to geochemistry.

A few sections of the book are outstanding for their balance, clarity, and content. Examples include the chapters entitled "Diagenetic processes" and "Formation and alteration of silica and clay minerals." Other sections, however, leave a great deal to be desired. For example, the chapter on evaporites is only 12 pages long, which is not enough space to even describe the many interesting problems in this area. Similarly, the chapter entitled "Diagenesis of Ca-Mg carbonates" fails to treat the possibility of diagenesis of carbonates and dolomitization by groundwater in the shallow subsurface, despite the fact that much interesting work has been published on this subject in recent years. In sharp contrast, a fine discussion of the deep diagenesis of clay minerals in the Gulf Coast is presented in the section on silica and clays. In light of Berner's interest over the years in the diagenesis of iron minerals, it is surprising to find that there is no treatment of Precambrian banded iron formations.

I wish Berner had omitted most of the brief section on elementary thermodynamics. At this level I think the space could have been more profitably devoted to other topics of chemical sedimentology. Some of his choices and conventions will tend to confuse rather than enlighten the beginning student. For example, he carries the symbology of partial molal quantities into his tables of thermodynamic data, without an adequate explanation. And his choice of standard state, made with minimal discussion, leads to an expression for the pressure coefficient of the equilibrium constant that is in conflict with expressions in the standard book *Solutions, Minerals, and Equilibria* by R. M. Garrels and C. L. Christ (Harper and Row). Although the book carries a publication date of 1971, the tables of thermodynamic data do not include reference to the standard compilation of 1968 by R. A. Robie and D. R. Waldbaum (*U.S. Geol. Surv. Bull. 1259*).

Typographical errors are few and trivial, and the publishers and author have done a first-class job of production.

Anyone who is particularly interested in low-temperature geochemistry should have *Principles of Chemical Sedimentology* in his office, and teachers of introductory courses in geochemistry will want to assign a few of the chapters to their students. The book could also serve as a guide for discussion in advanced seminars.

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Books Received

Abyss. The Deep Sea and the Creatures That Live in It. C. P. Idyll. Crowell, New York, ed. 2, 1971. xx, 428 pp., illus. $7.95.

Adaptation and Diversity. Natural History and the Mathematics of Evolution. Egbert Giles Leigh, Jr. Freeman, Cooper, San Francisco, 1971. 288 pp., illus. $7.75.

Biophysical Properties of the Skin. Harry R. Elden, Ed. Wiley-Interscience, New York, 1971. x, 646 pp., illus. $35. A Treatise of Skin, vol. 1.

Capacity Measurement in Petroleum Refining. A Process Analysis to the Joint Product Case. James M. Griffin. Heath Lexington, Lexington, Mass., 1971. xvi, 172 pp., illus. $20.

Cleaning and Preserving Minerals. Rich-

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