

sion should suffice to familiarize the student with some of the principal methods currently employed. From the viewpoint of a physics student, only the chapter on light scattering is disappointing, but this should not be accounted a significant deficiency in the book. This topic plays no important role in aerosol behavior, and the author's ostensible purpose for introducing it at all is for its role in atmospheric turbidity and aerosol measurement.

Illustrative examples are worked throughout the book, and each chapter has numerous homework problems plus a set of references to the original literature. In accordance with the author's interests, air-pollution aerosols are emphasized.

Smoke, Dust and Haze is the first published book on aerosols written primarily for classroom use. It was written explicitly for chemical- and environmental-engineering first-year-graduate students but could serve excellently as a physics course to introduce students to the nature of applied science. The subject matter is highly interdisciplinary, with applications of the theory frequently mentioned but never dwelt upon at length. Overall objectives of the field *vis-à-vis* applications are made clear while interrelating various physical phenomena via the general dynamical equation for aerosol behavior. The roles of this equation and its approximate solutions are delineated in the case of air-pollution studies.

This book can serve both physics students and research workers as a source of intrinsically interesting research topics in a relatively poorly understood physical domain. In many cases Friedlander quite explicitly points to gaps in the field that need elucidation, while in others it is clear that the simplicity of the treatment bespeaks the absence of detailed understanding of the phenomena. In other, currently emerging or untreated areas that are not mentioned, the reader often may assume quite correctly that considerable work remains to be done.

WILLIAM H. MARLOW

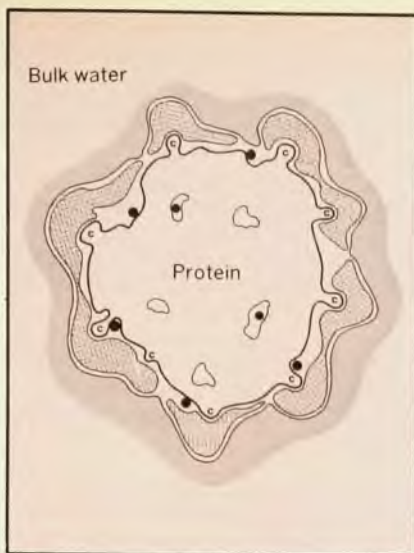
Department of Applied Science
Brookhaven National Laboratory
Upton, L.I., N.Y.

Intermolecular Interactions and Biomolecular Organization

A. J. Hopfinger

395 pp. Wiley-Interscience, New York, 1977. \$26.00

The organic molecules of biology interact with one another in distinctive and definite ways that are certainly an important part of the organization of a living system. The book's subject is still a complex one, because we do not yet feel confident of the



Protein-water organization. In this cross-sectional view of a globular protein, black dots represent rigidly bound molecules, and c's are charged side chains. The crosshatched areas indicate bound water, while gray marks the transition region. From the book.

unifying principles we could use to put order into our thinking. A fair amount of our present knowledge about intermolecular interactions is treated in this book, and the complexity is all too apparent. The surface conformations and the relationships between molecules are treated with confidence for those that can be dealt with; obviously there are many more, and the final realm of knowledge that may be needed to understand a living cell in these terms is staggeringly vast. It is so vast that one can not help wondering if this has to be the way.

The early part of the book deals with the interactions of a number of small molecules with themselves and with the solvent. The interaction of water with proteins is treated next, and this leads to the interactions of drug molecules with proteins. Three chapters on DNA follow, treating hydration, intercalation and complexes with synthetic basic polypeptides. Two chapters on polysaccharides and their derivatives and interactions are next. A chapter on ions and biological molecules introduces the subject of biomolecular aggregation and association, then a chapter on theories of interactions is followed by a discussion of ultrastructural organization, and a chapter on generalizations and speculations ends the book.

The author has undoubted competence in his field. One is truly impressed by the amount and the diversity of the information that he has brought together. It is very difficult for a physically minded life scientist to fail to find some topic of interest; indeed, several are to be expected. So for a reference book this volume is clearly valuable. It is also refreshing to find a book like this written by

one individual and thus characterized by the personal note.

On the negative side is the difficulty of reading the material. The writing is full of jargon, poorly defined sets of initials and sentences whose meaning one may only grasp after a second try. I found the book very hard to read, and thinking it must be my own obtuseness I consulted others—with no contradiction to my own impression. It is a real pity, because this is an area in which physicists may want to start to change their research area from more conventional physics to life-science physics. The book should have some appeal to such an individual, yet I doubt if very many will be able to make use of the very real expertise which has gone into putting it together. In particular the first chapter can "turn you off" fast. By determinedly ignoring this first chapter and reading ahead, I found the book to have real value.

If you are well up in the jargon of macromolecular physical studies, then this will be a most useful book; a lot of work went into it. If you are a physicist seeking to look at living systems as a change of interest, then I can not recommend it. In any event this is a sort of book that has a worthy place on library shelves, and a good many graduate students will find themselves working through specific parts of it.

ERNEST POLLARD

Department of Biophysics
Pennsylvania State University
University Park

book notes

The Uncertainty Principle and Foundations of Quantum Mechanics: A Fifty Years' Survey. W. C. Price, S. S. Chissick, eds. 572 pp. Wiley-Interscience, New York, 1977. \$42.00

This collection of 25 papers published as a tribute to the late Werner Heisenberg commemorates his formulation, in the spring of 1925, of quantum mechanics. "The discoverer of the quantum theory and the uncertainty principle," says Hans Matthöfer in his Foreword, "was required to leave the solid ground of classical physics. One of the most significant changes in our comprehension of the universe . . . was wrought by the departure from the determinacy of physical phenomena and by far deeper-reaching relativization of the law of causality." Heisenberg himself took part in the book's organization before his death last year, and the first paper in the volume is his "Remarks on the Origin of the Relations of Uncertainty," a personal recollection. This and the other contributions are grouped under four headings: "Quantum Uncertainty Description," "Measurement Theory," "Formal Quan-

tum Theory" and "Applied Quantum Mechanics." The book is heavy on equations and well provided with references; its readership will consist mainly of graduate students and faculty in theoretical physics.

Energy Technology Handbook. D. M. Considine, ed. 1857 pp. McGraw-Hill, New York, 1977. \$49.50

The hard work of hundreds of people went into the preparation of this rather imposing volume; the "inputs" of over 100 scientists and engineers are represented in the writing, and many more provided data and advice. Referring to fundamental technologies relevant to the sources, reserves, conversion, transportation, transmission, distribution and utilization of energy—as well as to the "energy/environmental interface"—Douglas M. Considine acknowledges it as obvious that "a single volume of reasonable length cannot accommodate all related technology." But the book's contributors surely have succeeded in covering a great deal of material in its nine chapters. Each of the chief topics—the technologies of coal, gas, petroleum, chemical fuels, nuclear energy, solar energy, geothermal energy and hydropower, plus trends in power technology—is broken down into many subtopics and minutely examined. Thousands of tables, illustrations and references supplement the main text. As a reference work, the *Energy Technology Handbook* should prove valuable not only to engineers and those in the physical sciences, but also to others caught up in the energy debate and in need of facts and figures.

Space Shuttle Missions of the 80's, Parts 1 and 2 (Advances in the Astronautical Sciences, Vol. 32—Proc. of 21st Annual Meeting of the American Astronautical Society, Denver, August 1976). W. J. Bursnall, G. W. Morgenthaler, G. E. Simonson, eds. 1308 pp. AAS, San Diego (Distributor: Univelt, P.O. Box 28130, San Diego, Calif. 92128), 1977. \$85.00

The theme of the meeting at which these papers were presented is given as "The Space Shuttle Transportation System is here. How can we maximize its use for the benefit of mankind?" Part 1 contains introductory discussions of the Space Shuttle Transportation System (Space Shuttle and Spacelab payloads, applications, missions and long-range capabilities), together with detailed treatment of the two chief near-term programs—the Space Telescope and the Atmospheres, Magnetospheres and Plasmas-in-Space package—for which the SSTs are to be used. The second volume consists of papers on the space-tug (or "interim upper stage") concept for boosting payloads beyond Shuttle orbit; on future payloads aimed at investigations in the physical sciences (including an ultraviolet-optical telescope, a cos-

mic-ray ionization spectrometer and an atmospheric x-ray emission experiment), life sciences, technology, communications and so forth; and on energy considerations relevant to the Shuttle effort. Several contributors consider the possibility of using the Shuttle as an aid in future planetary missions by NASA as well—not by actually sending the Shuttle itself to Mars or Saturn, of course, but by utilizing the SSTs to place heavy apparatus in near-earth orbit for assembly and launch from there. Space scientists and others who might wish to place an experiment in the Shuttle someday will find this book a thorough introduction to the whole SSTs program.

Essential Relativity: Special, General and Cosmological, 2nd edition. W. Rindler. 284 pp. Springer-Verlag, New York, 1977. \$29.80.

Wolfgang Rindler's *Essential Relativity* has long been considered one of the standard texts for undergraduate- and graduate-level courses in relativity theory; the author's modest disclaimer ("In retrospect, the first edition of this book now seems like a mere sketch for a book"), however sincere, has not been echoed by his peers. Both the basic purpose of the volume—"to make relativity come alive conceptually"—and the original organization of the material remain intact, but numerous revisions and additions have been worked in throughout the text. Three new sections—on Kruskal space, plane gravitational waves and linearized general relativity—provide a certain amount of needed updating, but Rindler has resisted the temptation to make his book encyclopedic at the expense of ready comprehension. Further exercises and appendices have also been added.

Future Facts: The Way Things Are Going to Work in the Future in Technology, Science, Medicine and Life. S. Rosen. 535 pp. Touchstone (Simon and Schuster), New York, 1976. \$5.95

It takes a certain amount of nerve, in the latter half of a century of dramatic technological change, to set down in black and white a set of serious predictions concerning what science holds in store for us. Stephen Rosen does precisely this, on a broad front but in considerable detail as well. The topics, or facts, with which Rosen deals—in brief one-to-two-page, illustrated essays—are "products, services, processes or ideas . . . that are . . . at least one year away from mass-market realization; . . . likely to 'succeed' after they appear; . . . probably important future influences on the average man-in-the-street . . . [and] . . . selected because they're probably 'interesting' to read about." The essays appear in separate chapters on health and medicine, power and energy, foods and crops, transportation, behavior and society, construction and materials, communication and in-

formation, business and work, play and pastime and environment. Physics-related topics, presented in layman's language, include "Rock Shattering with Accelerated Electrons" and "Telecommunications by 'Meson' Beams."

Physics, Patents, and Politics: A Biography of Charles Grafton Page. R. C. Post. 227 pp. Science History (Neale Watson), New York, 1977. \$15.95

This is the first full biography of Charles Page (1812–1868), a 19th-century American scientist and inventor and an intimate of Samuel F. B. Morse and Joseph Henry. Page, who was considered by some of his contemporaries to be on a par with Henry as an experimentalist, spent the late 1830's and 1840's investigating electromagnetism; he lived in or near the US capital during his last 30 years, during which he not only served as a patent examiner and obtained patents himself, but also became involved in political and financial controversies. Robert C. Post, a historian at the National Museum of History and Technology, holds that—though Page has fallen into obscurity—his life has "intrinsic interest"; moreover, Post says, "I propose to use him to look at some neglected aspects of science and technology, and at some of the interrelationships between scientists, inventors, politicians, and bureaucrats in mid-19th-century America." —FCB

new books

Particles, Nuclei and High-Energy Physics

An Introduction to Regge Theory and High Energy Physics (Cambridge Monographs on Mathematical Physics, Vol. 4). P. D. B. Collins. 445 pp. Cambridge U.P., New York, 1977. \$59.50

An Introduction to Controlled Thermonuclear Fusion. M. O. Hagler, M. Kristiansen. 188 pp. Lexington (D. C. Heath), Lexington, Mass., 1977. \$17.00

Quarks and Hadronic Structure. G. Morpurgo, ed. 318 pp. Plenum, New York, 1977. \$29.50

Quantum Mechanics of One- and Two-Electron Atoms. H. A. Bethe, E. E. Salpeter. 369 pp. Rosetta (Plenum), New York, 1977 (first edition, 1957). \$8.95

Atomic, Molecular and Chemical Physics

Atomic Physics, Vol. 5 (Proc. of the 5th Int. Conf., Berkeley, Calif., July 1976). R. Marrus, M. Prior, H. Shugart, eds. 573 pp. Plenum, New York, 1977. \$49.50

Semiempirical Methods of Electronic Structure Calculation, Parts A and B (Modern Theoretical Chemistry, Vols. 7 and 8). G. A. Segal, ed. 274 and 308 pp., respectively. Plenum, New York, 1977. \$39.50 each