

phone Laboratories, is to present a brief account of the Mössbauer effect itself as well as a survey of the numerous applications based on it. The book opens with a simple explanation of the nature of the recoil-free emission of gamma rays from nuclei and the resonant absorption of such gamma rays. Typical energy ranges and absorption cross-sections are quoted, and the remarkably small value of the line widths of zero-phonon gamma rays is stressed. There follows a short chapter describing the instrumentation necessary for the experimental realization of the effect.

Subsequent chapters discuss the relation between the Mössbauer effect and relativity, its use in determining the motion of lattice atoms, its value in the study of hyperfine structure and the magnetism of metals and alloys as well as its chemical applications. The ability it provides for a terrestrial measurement of the gravitational red shift is particularly fascinating. Application of the theory of the effect to the so-called thermal red shift has made possible a solution of the famous "twin" paradox of relativity that agrees with Einstein's result.

The book is well illustrated by carefully drawn diagrams, and there is an adequate bibliography. Those seeking a relatively brief and simple introduction will find the book of considerable value.

AQUEOUS SOLID STATE

STRUCTURE AND FUNCTION IN BIOLOGICAL MEMBRANES, VOLUME 2. By J. Lee Kavanau. 760 pp. Holden-Day, San Francisco, 1965. \$14.75.

by Joseph G. Hoffman

Until we know more about the rationale of the living process within cells, books like this will help us to assimilate the findings of experimental research and to make mental notes here and there about how the data might fit whatever general theory one imagines. Only in the past 15 years has exact physico-chemical information about submicroscopic events in

* * *

The reviewer is a professor of physics at the State University of New York at Buffalo.

cells become available. This book shows that there is but a beginning in our understanding. Living matter is unique, to say the least, and its very special properties have yet to be described in sufficient detail even to permit hypotheses about how life in the form of organisms can exist.

Kavanau has made a compilation of current knowledge about membranes because they seem to be central in the description of the spontaneous behavior of living things. The cytoplasm is a mesh of invaginated membranes that are at times invaginations of the cell wall and also evaginations of the nuclear envelope. The various bodies in the cytoplasm, such as the myeloid bodies in amoebae and the mitochondria in mammalian tissue cells, are fantastic geometries of invaginated and stratified membranes. The ingestion of food or liquid by a cell involves the engulfing of the external medium by a membrane. And it is almost commonplace to point to the exquisite specificity that many different membranes have in their permeabilities toward ions and molecules.

The special properties of membranes that seemingly violate the second law of thermodynamics arise in a state of matter that is neither solid nor liquid. Many and varied functions are described and documented as completely as possible in a subject whose literature is growing rapidly. The electron-microscope photographs, elaborate line drawings and careful descriptions give the reader a clear image of the truly astounding devices life has contrived at the submicroscopic level. It reminds one of Max Delbrück's remarks of 20 years ago that the more one sees of biological processes, the more astounding they become. While the author has assembled much data, he wisely refrains from theoretical interpretations of its meaning. In the present state of knowledge, comprehensive theories tend to be teleological.

Volume 2 is highly recommended to physicists who want a clear and thoroughly documented summary of current work about the aqueous solid state of living membranes. The format is excellent: there is a table of contents of Volumes 1 and 2, and an author and subject index.

BOOKS RECEIVED

ASTRONOMY & ASTROPHYSICS

Advances in Astronomy and Astrophysics, Volume 3. Zdeněk Kopal, ed. 391 pp. Academic, New York, 1965. \$14.00

Neighbors of the Earth. Planets, Comets, and the Debris of Space. Thornton Page and Lou Williams Page, eds. 336 pp. Macmillan, New York, 1965. \$7.95.

BIOPHYSICS & MEDICAL PHYSICS

Progress in Biocybernetics, Volume II. Norbert Wiener and J. P. Schädé, eds. 273 pp. Elsevier, New York, 1965. \$14.50.

A Symposium on Non-Heme Iron Proteins: Role in Energy Conversion. Anthony San Pietro, ed. 473 pp. Antioch Press, Yellow Springs, Ohio, 1965. \$12.50.

Ultrasonic Energy. Biological Investigations and Medical Applications. Elizabeth Kelly, ed. 387 pp. University of Illinois Press, Urbana, 1965. \$12.50.

CHEMISTRY & CHEMICAL PHYSICS

Stable Radicals. By Anatolii Leonidovich Buchachenko. Transl. from Russian by C. Nigel Turton and Tatiana I. Turton. 180 pp. Consultants Bureau, New York, 1965. \$15.00.

Inorganic Chemistry. Vol. 1. Principles and Non-Metals. By C. S. G. Phillips and R. J. P. Williams. 685 pp. Oxford University Press, Oxford and New York, 1965.

Treatise on Electrochemistry. (2nd ed.) By G. Kortüm. 637 pp. American Elsevier, New York, 1965. \$30.00.

Diamagnetism and the Chemical Bond. By Ya. G. Dorfman. Transl. from the Russian by Scripta Technica. 182 pp. American Elsevier, New York, 1965. \$10.00.

Oxidation of Metals. By Karl Hauffe. 452 pp. Plenum Press, New York, 1965. \$19.50.

Annual Review of Physical Chemistry, Volume 16. H. Eyring, ed. 584 pp. Annual Reviews, Palo Alto, Calif., 1965. \$8.50.

EXPERIMENTAL TECHNIQUES

Practical Vacuum Techniques. By William F. Brunner, Jr., and Thomas H. Batzer. 198 pp. Reinhold, New York, 1965. \$8.25.

Scintillation Counters in High Energy Physics. By Yu. K. Akimov. Transl. from Russian by Scripta Technica. Academic, New York, 1965. \$9.50.

High Energy Beam Optics. By Klaus G. Steffen. 211 pp. Interscience, New York, 1965. \$9.50.