Book Reviews

Atoms and People. Ralph E. Lapp. Harper, New York, 1956. 304 pp. $4.

Facing the Atomic Future. E. W. Titterton. Macmillan, London; St. Martin's Press, New York, 1956. 379 pp. Illus. + plates. $5.

These two timely books deal with the history of the development of nuclear energy and, more important, with its social, moral, and political implications. Both authors are nuclear scientists and, as men of integrity and good will, are profoundly impressed by the fact that nuclear power for war is a stark reality, while practical and economic nuclear power for peaceful uses is still in the future.

Lapp's book provides the vivid reading of a novel and is as difficult to lay down as a novel would be. Step by step, Lapp traces the story of the development of the theory of the chain reaction, the first pile, the first bomb, and finally the complete family of nuclear weapons. Having served in the Pentagon as an adviser for the Defense Department, Lapp writes intimately, and often most critically, of political maneuverings in the unfolding story of nuclear energy.

Titterton's volume is less easy to read but covers in a scholarly and more detailed way the same story. As an Australian, Titterton discusses at every step the specific implications for his own country. Tables, formulas and graphs abound in the book, and there are a number of pertinent photographic illustrations.

Both authors devote space to thermonuclear reactions, not only as agents of destruction, but as possible sources of industrial power. Both men are impressed with the urgent need for the development of an adequate civil defense. Both discuss in detail the possibilities and limitations of diverse nuclear machines as sources of industrial power, stressing the hazards, the economic feasibility, and the difficulties as well as the hopes along these lines. Both books are concerned with the increasingly critical problem of the safe disposal of atomic wastes.

Both authors end their books with careful, thought-provoking discussions of the social and ethical problems raised by the availability of nuclear energy. A dilemma has in fact been created, on the one hand by man's increasing faith in his capacity to expand his technologic and scientific horizons, and on the other by his mounting skepticism in regard to his ability to solve the resulting social problems. It would be indeed tragically ironic if the same thermonuclear reactions which, by taking place in the sun, make possible our very existence on this earth should, through our own social bungling, lead to our extinction. Scientists in all fields will do well to give thoughtful consideration to both of these books.

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Transport and Accumulation in Biological Systems. E. J. Harris. Academic Press, New York; Butterworths, London, 1956. 291 pp. Illus.+plates. $7.80.

The increasing emphasis currently being given to solute transfer studies in biological systems is doubtless the result of a recognition that such processes are as basic to our understanding of cell function as are those biochemical reactions more directly concerned with metabolism. For this reason, this book should be especially welcomed by workers who desire a comprehensive survey of the rather large number of papers on ion and molecule transport that have appeared in recent years. The scope of this book is perhaps best given by mentioning the number of pages devoted to particular aspects of the problem: membrane structure and penetration (14), the distribution and movements of water (41), the distribution of ions (31), blood cells (47), amphibian skins (15), muscle (15), mitochondria (4), ion movement in various tissues (32), nonmyelinated nerve (26), medullated nerve (26), plant cells and yeast (12).

A useful introduction to the ways by which both molecules and ions may be expected to move in membranes is given in a rather thorough treatment of the physical chemistry of osmotic processes and ion diffusion. The following chapters consider transport, both passive and active, in a variety of cells. Emphasis is on recent publications that deal with measured unidirectional tracer fluxes and also on red blood cell studies, a field of special interest to the author; this does not necessarily mean that our understanding of active transport in these cells is better than it is for others, rather the reverse because the additional complication of an enormously rapid anion transfer, as compared with cation transfer rates, surely makes the analysis of the membrane more complex.

The discussion of many of the points concerned with the experimental data is generally quite critical, and the author refrains from presenting a particular point of view; indeed the subject matter is hardly amenable to a comprehensive or general treatment, for present-day characterization of the processes that drive ions against electrochemical gradients can be described only as mysterious. On the other hand, tremendous progress has been made in ascertaining the relationships that must exist between ion movements and membrane potential, as the elegant work of the Cambridge physiologists shows. Emphasis has been properly given by the author to the fact that recent experimental evidence can be interpreted as showing that tracers do not measure true fluxes in the presence of a net flux across the membrane; it may be questioned whether this effect can exist for water movement across the membrane, as Harris suggests, but this is one of the few points where one might take issue with the treatment in a book that I warmly recommend.

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Introduction to Electronic Analogue Computers. C. A. A. Wass. McGraw-Hill, New York; Pergamon, London, 1955. x + 237 pp. Illus. $6.50.

The author of this book has done an excellent job of presenting the basic principles of analog computation. It is recommended for the reader who is interested in a general survey of electronic analog computation methods and techniques as well as for the beginner entering the computer field. The book sticks to basic principles rather than going into the details required by those who have a serious interest in designing and building computers.

The subject matter is essentially limited to electronic analog computers; other types, such as network analyzers, mechanical devices, and electromechan-

ical equipment are only briefly mentioned. Analog and digital computers are compared, and their relative merits for different applications are discussed. Errors in computation owing to limited gain, grid current, drift and nonideal components in operational amplifiers are covered in some detail. The use of the analog computer as a simulator is emphasized, and examples are given of its application in many fields, including aircraft dynamics, ballistics, electron motion, and spring suspension systems. The description of British analog computer equipment is of interest to Americans, who for the most part are unfamiliar with this equipment. The terminology and symbolism are British, which differ considerably from American usage.

Readers interested in more advanced treatments of the subject of analog computation should supplement reading of this book by reference to such textbooks as *Electronic Analog Computers* by Korn and Korn, or *Analog Computer Techniques* by Johnson. These books use terminology and symbolism current in the United States, describe American-made equipment, and go into much more detail concerning design and application.

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Gmelins Handbuch der Anorganischen Chemie. System No. 28. *Calcium*. pt. B, sec. 1. Technology. Verlag Chemie, Weinheim/Bergstrasse, ed. 8, 1955. 264 pp. Illus. DM 147.

This book is another volume in the highly respected Gmelin series of reference handbooks in inorganic chemistry and is concerned with the technology of calcium and compounds of calcium. The many desirable characteristics of previous volumes are continued in this one. It is stated that the literature through 1949 is completely covered, but a number of references as late as 1953 are found in the body of the text. The German text is simple and easily readable. A detailed table of contents is furnished at the beginning of the volume. At the beginning of each section (corresponding generally to a given compound) is given a series of general references on that particular substance. Insofar as I can judge, the volume attains something near completeness in its coverage and is well prepared. It should be valuable to any worker in this field and to any chemistry reference library.

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Radiation Dosimetry. Gerald J. Hine and Gordon L. Brownell, Eds. Academic Press, New York, 1956. 932 pp. Illus. $22.

Having set up a system of units, it is in general a simple matter for one to measure the quantity or rate of flow of solids, liquids or gases. This is not the situation in the measurement of radiation, an intangible entity which early in its history was believed by some to represent a fourth state of matter. The flux of radiation penetrates the molecular structure of matter, causing excitation and ionization, and at higher energies also interacts with the nuclei, altering the fundamental identity of the component atoms. The absorption of energy and the effectiveness in producing chemical and biological change is highly dependent on the nature and kinetic energy of the incident radiation and on the chemical composition and state of the absorbing medium. Hence, it is not surprising that an extensive treatise can be written devoted to a single facet of radiation research. Indeed, this comprehensive work on radiation dosage will be welcomed, not only by practicing radiologists, but also by the host of investigators concerned with radiation effects in nonliving structures such as plastics and metals exposed to the dense flux of radiation produced by nuclear reactors.

The present volume edited by G. J. Hine and G. L. Brownell is a result of the collaborative efforts of 22 contributors who are well known in their respective fields of specialization. The book is organized into three main sections dealing with the fundamental principles of dosimetry, radiation detectors, and the dosimetry of radiation fields. The first section is devoted to a thorough discussion of radiation units, the interaction of electromagnetic and corpuscular particles with matter, and the biological effects of radiation on normal and malignant tissues. The treatment centers on the derivation of basic relationships and is supplemented by numerous tables and charts of experimental data.

The book makes no reference to the more recently discovered fundamental particles and ignores the existence of well-established particles such as the μ- and the π-mesons which are produced in copious number by the larger accelerators. Likewise, the treatment of heavy charged particles stops with the alpha particle, and only brief mention is made of stripped nuclei, such as carbon, or the fission fragments, without adequate discussion of the biological effectiveness of the energy liberated along the trajectory of these massive projectiles.

About 400 pages are devoted to a close scrunity of radiation detectors and their calibration. This section of the book not only contains excellent descriptions of the more familiar methods of charged particle instrumentation but also has large chapters devoted to photographic techniques, scintillation counters, chemical radiation indicators and dosimetry by microcalorimetric methods. The several chapters are extensively documented, but the references are chiefly to American and English sources. With a wealth of declassified material to choose from, this tendency to accentuate the American and British work is understandable, but in doing so many important European contributions have been neglected. Thus, the chapter on calorimetry makes no mention of the extensive contributions of the Polish school of investigators on the use of microcalorimetric techniques in the measurement of the heat liberated by small radioactive sources. Neither does it refer to an excellent summary of this work available in the English textbook *Microcalorimetry* by W. Swietoslawski.

The third section is devoted to the production of radiation by accelerators and teleisotope sources. It is written largely from the viewpoint of the practicing radiologist. It is concerned with the evaluation of depth dose arising from the impingement of external beams of radiation and tissue dosages arising from internally administered radioisotopes. An outstanding feature of these chapters is the lucid exposition of the methods for computing the dosage to specific areas under treatment, providing the reader with sample calculations and additional references to the medical literature. Radiation physicists will also be grateful for the inclusion of an extensive table giving the weight and composition of the organs of a standard man, and for recipes for simulating the chemical composition of normal tissue.

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Enzymes: Units of Biological Structure and Function. Henry Ford Hospital International Symposium. Oliver H. Gaebler, Ed. Academic Press, New York, 1956. 624 pp. Illus. $12.

The fourth symposium of the Henry Ford Hospital was held in Detroit, 1–3 Nov. 1955. The symposium volume contains 27 formal papers with discussions and two special lectures [see *Science* **123**, 149 (1956) for a detailed report of the meeting]. The symposium was not concerned primarily with the classical interest of enzymology, the properties of isolated biocatalysts, but rather considered the enzyme in relation to the function