Book Reviews

Textbook of Physics. R. Kronig, Ed. In collaboration with J. de Boer, H. C. Burger, P. H. van Cittert, C. J. Gorter, A. C. S. van Heel, P. van der Leeden, and G. J. Sizoo, with biographical notes and tables by J. Korringa. Interscience, New York; Pergamon, London, 1954. xiv + 855 pp. Illus. $10.

The original edition of this book was written during World War II to satisfy the need for a textbook in the Dutch language that would cover the entire field of physics. Since the book was the result of the combined efforts of outstanding men in creative research, it is not surprising that it was an exceptionally clear, concise, and accurate exposition of undergraduate physics. The book was received enthusiastically, a third printing was necessary after only 4 years, and the authors were therefore encouraged to prepare an English translation. This comprehensive survey of physics has thus become available to a much larger number of students.

Textbook of Physics is divided into 12 principal sections and concludes with 30 pages of interesting biographical notes and a table of natural constants, both prepared by Korringa. The first five sections present the phenomenological parts of physics. The introduction (22 pp.) by Kronig contains a brief, well-written summary of the mathematical tools of physics. The section on mechanics (113 pp.) by Van der Leeden covers the conventional material on dynamics of particles and rigid bodies in a rigorous condensed treatment (63 pp.). The remainder is allocated about equally to gravitation, elasticity, and fluids. The following section on vibration and waves (51 pp.) by the same author is about evenly divided between the theory of vibration and the mechanism of wave propagation. Several topics of this section, such as forced vibrations of a damped system and group velocity in wave propagation, are more advanced in nature and, hence, are presented in small type.

The fourth section on electrodynamics (153 pp.) by Sizoo is an excellent treatment beginning with the simple concepts of charge, current, and voltage, and leading logically into the more advanced concepts of electric and magnetic fields, alternating currents, electromagnetic waves, and theory of relativity. A summary, which compares the formulas for the electric field with those for the magnetic field, at the end of the section has especially great pedagogic value. The fifth section on physical optics (88 pp.) by Van Cittert is a fairly standard treatment of interference, diffraction, and polarization phenomena.

The next three sections present the atomistic parts of physics. Section six on atomic structure (50 pp.) by Kronig discusses cathode rays, radioactivity, Bohr's postulates (but not Bohr theory), light quanta, and matter waves. Line spectra, x-ray spectra, and band spectra are introduced in a logical fashion by a short discussion of quantum mechanics. The treatment of the interaction between radiation and atoms (4 pp.) and nuclear physics (5 pp.) are unfortunately brief. Section seven on atomic theory of heat (70 pp.) by de Boer covers kinetic theory (*including transport phenomena*), crystal structure, specific heat of solids, and the theory of radiation. Section eight on atomic electricity (45 pp.) by Gorter is principally a short account of electric conduction in solids, liquids, and gases. Several topics in solid-state physics (dielectric polarization, semiconductors, and magnetic properties of solids) are discussed but all too briefly. Less than two pages is devoted to semiconductors.

The last four sections are appropriately placed at the end of the book in order to avoid disturbing the continuity of the major portion. Section nine on thermodynamics (74 pp.) by de Boer covers much of the standard material given in an introductory course in the subject. Section ten on electric instruments (35 pp.) by Gorter and section eleven on optical instruments (68 pp.) by Van Heel are particularly valuable as reference material. The final section on medical physics (41 pp.), by Burger is something really new in a textbook of this sort and is therefore particularly welcome, especially to students in biology or biophysics.

As a textbook this volume is impressive in many respects. The subjects are treated so rigorously and coherently that a student will not have to unlearn any material if he continues his studies in physics. It is beautifully printed. Typographic errors are practically nonexistent. The rationalized mks system is used exclusively throughout the book. The principal weakness from a teacher's point of view is the complete absence of problems and the almost complete absence of illustrative numerical examples.

Textbook of Physics has many excellent features that make it an outstanding reference work as well as a textbook. In particular, one might mention the numerous more advanced topics printed in small type, the many subjects of specialized interest marked by asterisks, the lists of books recommended for further study (at the end of each section), and the biographical material. It would indeed be a valuable addition to the bookshelf of any serious student of science.

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Modern Aspects of Electrochemistry. J. O'M. Bockris, Ed. With the assistance of B. E. Conway. "Modern Aspects Series of Chemistry," No. 1. F. C. Tompkins, Ed. Academic Press, New York; Butterworths, London, 1954. x + 344 pp. Illus. $6.80.

This is the first of a series of books to be published on the modern aspects of chemistry, and it deals with five topics in the field of electrochemistry. It is hoped that this book will not be the sole one in electrochemistry. Although the topics, discussed by experts in the fields, are well done and timely, they cover a restricted area in electrochemistry.

The editors have compiled an interesting reference book, which should prove valuable to the specialist and to those with fundamental backgrounds but not actively engaged in electrochemistry. The topics, are presented somewhat in the nature of reviews in five chapters: "Physical chemistry of synthetic polyelectrolytes," H. Eisenberg and R. M. Fuoss; "Ionic solvation," B. E. Conway and J. O'M. Bockris; "Equilibrium properties of electrified interphases," R. Parsons; "Electrode kinetics," J. O'M. Bockris; and "Electrochemical properties of nerve and muscle," W. F. Floyd.

Eisenberg and Fuoss give a good discourse for the expert on the modern advances made in the physical chemistry of synthetic polyelectrolytes. Although it contains much that is electrochemistry, it includes discussions, undoubtedly essential, on the structure of polyelectrolytes as found from colligative, surface, and hydrodynamic properties, and in this sense deviates from Bockris' definition of electrochemistry as given in his preface.

Conway and Bockris emphasize once again the difficulties encountered in obtaining unequivocal values for the degree of solvation of ions and discuss at

length the various methods used to obtain hydration numbers and the reasons the various methods do not give concordant results. They appear to accept the thesis of "primary" and "secondary" solvation and the concept that values of "secondary solvation" are dependent on the method used in their determination.

Parsons gives an outline of recent attempts to evaluate the electric potential of interfaces, devoting a large portion to the concepts of Lange. Parsons clearly points out wherein various theories fail to represent experimental observations and where necessary evidence for a hypothesis is lacking.

Bockris, in a systematic manner, outlines recent concepts regarding the kinetics of electrode reactions. His chapter is highly mathematical. He presents, in an interesting way, modern aspects on polyelectrodes, sonic electrode kinetics, and photo-electrode kinetics.

Floyd presents a most enjoyable discussion of the electrochemistry of nerves and muscles. His chapter can be followed readily by those not engaged in electrophysiology. It is well illustrated and gives emphasis to chemical aspects.

An extensive bibliography is included with each chapter. Most readers will find this book well worth while. It should be read by those who are engaged in or who contemplate work in electrochemistry.

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La Cybernétique. Du cerveau humain aux cerveaux artificiels. Paul Cossa. Collection, Evolution des Sciences. Masson, Paris, 1955. 98 pp. Illus. Paper, F. 525.

This little book, by a neurologist, is written in a sprightly and popular style and betrays no indications that the author is the least bit overawed by the claims of enthusiastic cyberneticists. Its nine chapters touch on the origin of cybernetics (following the introduction of Wiener's *Cybernetics* and, so, underestimating the contribution of early work in communication engineering, process control industries, and the like), models of vital behavior, feedback, the mechanical "animals" of Grey Walter, Albert Ducrocq, and the homeostat of Ashby (referred to generally as "les petits monstres") electronic calculators (numerical and logical) and translators (dubbed "les grandes monstres"), the information concept and entropy, aspects of the new industrial revolution implied by automation, and finally whether machines can think, learn, or create, and similar metaphysical considerations.

Cossa has done an excellent job of popularization without becoming sloppy in his treatment of concepts that are not always elementary. The only bone I would pick with him concerns the opinions expressed on what machines cannot do. It is no real limitation on machine behavior to say that a machine can do only what its creator designs it to do, for it is not inconsistent with science to view man himself, exhibited by the author as not so limited, as a creature that can do only what his Creator designed him to do! To say that a machine cannot create, perform a critical function, or learn is mere rhetoric without an operational specification of what these words mean. I find it more plausible to believe that (i) what can be specified operationally can be realized in principle in a machine, and (ii) insofar as the mechanistic viewpoint is valid in biology, admitting creativity, and so forth, in man, it implies the same for the machine. Of course, no machine can do these things now, but denial of the possibility of it ever doing so seems unjustifiable.

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The Chemistry of Petroleum Hydrocarbons. vol. I. Benjamin T. Brooks, Cecil E. Boord, Stewart S. Kurtz, Jr., and Louis Schmerling, Eds. Reinhold, New York, 1954. viii + 646 pp. Illus. $18.

This volume of *The Chemistry of Petroleum Hydrocarbons* has been written by 60 outstanding chemists who have spent the major portion of their lives in this field. They have concentrated in 646 pages the chemistry of a field of hydrocarbons that bears an intimate relationship to the 8-million-barrels daily production of petroleum which plays such a highly important role in our economic life, our welfare, and the defense of our nation. Many of these experts are in the petroleum industry.

The scope of this volume covers mainly scientific fundamentals. There are 21 chapters: "Hydrocarbons in Natural Gases," by D. T. McRoberts (United Gas Co.) and T. W. Legatski (Phillips Petroleum Co.); "Hydrocarbons in Gasolines, Kerosenes, Gas Oils and Lubricating Oils," by A. N. Sachanen (Socony-Vacuum Oil Co.); "Composition of Petroleum Waxes," by B. T. Brooks (consultant, New York); "Types of Crude Petroleum," by W. A. Cruse (Mellon Institute of Industrial Research); "The Composition of Shale Oils," by H. N. Thorne and J. S. Ball (U.S. Bureau of Mines); "Origin of Petroleums," by B. T. Brooks (consultant, New York); "Extractive and Azeotropic Distillations," by C. S. Carlson (Standard Oil Development Co.); "Separation of Aromatics by Selective Absorption," by A. E. Hirschler (Sun Oil Co.); "Principles of Solvent Extraction," by A. W. Francis and W. H. King (Socony-Vacuum Oil Co.); "Separation of Paraffins by Urea and Thiourea," by R. L. McLaughlin (Mellon Institute of Industrial Research); "Physical Properties and Hydrocarbon Structure," by S. S. Kurtz, Jr. (Sun Oil Co.); "Ultraviolet Spectra of Hydrocarbons," by W. Priestley and B. F. Dudenbostle (Standard Oil Development Co.); "Molecular Structure and Spectroscopic Data," by E. J. Rosenbaum (Sun Oil Co.); "Analytical Applications of Infrared and Raman Spectroscopy," by H. M. Tenney (Esso Standard Oil Co. of Louisiana); "Mass Spectroscopy of Hydrocarbons," by W. S. Young (Atlantic Refining Co.); "Analysis and Composition of the Heavier Petroleum Fractions," by K. Van Nes (Royal Dutch Shell Co., Amsterdam); "Preparation of Pure Paraffins and Olefins," by B. T. Brooks (consultant, New York); "Syntheses of Low Molecular Weight Alicyclic Hydrocarbons," by J. M. Derfer (Ohio State University); "Syntheses of Low Molecular Weight Aromatic Hydrocarbons," by J. M. Derfer (Ohio State University); "Syntheses of High Molecular Weight Hydrocarbons," by R. W. Schiessler and R. L. McLaughlin (Pennsylvania State University); "The Fischer-Tropsch Process," by H. H. Storch (U.S. Bureau of Mines).

After studying this book I have come to the conclusion that no one in the oil industry who has to do with hydrocarbons in oil can afford to be without it. It is a handbook of knowledge on a subject that has been long overdue.

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International Review of Cytology. vol. III. G. H. Bourne and J. F. Danielli, Eds. Academic Press, New York, 1954. 530 pp. Illus. $9.50.

Subjects reviewed in this volume include nutrition of animal cells; karyometric studies on cells in tissue culture; properties of urethane and its action on mitosis; composition, and structure of giant chromosomes; chromosomes in mammalian somatic cells; enzymes in isolated nuclei; differential centrifugation of homogenates; enzymatic aspects of embryonic differentiation; azo dye methods in enzymatic histochemistry; transparent chamber methods; the mast cell; elastic tissues; and composition of the nerve cell. All are by outstanding authors—Weymouth, Bucher, Cornman, Alfert, Beatty, Dounce, De Duve and Berthet, Gustafson, Pearse, Williams, As-