

Physics Course, a suitable tome on elementary thermodynamics would be needed as a supplement.

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Nuclear structure

LANDOLT-BORNSTEIN, NUMERICAL DATA AND FUNCTIONAL RELATIONSHIPS IN SCIENCE AND TECHNOLOGY. NEW SERIES, GROUP 1, VOL. 2: NUCLEAR RADII. BY H. R. Collard, L. R. B. Elton, R. Hofstadter. 54 pp. Springer-Verlag, Berlin, 1967. \$9.50

by JAMES O'CONNELL

Robert Hofstadter, the 1961 Nobel Laureate in physics, H. R. Collard, known for the experimental determination of the form factors of tritium and helium-3, and L. R. B. Elton, author of the book *Nuclear Sizes*, have put together a critical compilation of nuclear radii and associated material. An introductory text, in English and German in parallel columns, precedes a group of tables and graphs and references to the literature.

Hofstadter and Collard review charge radii and form factors and magnetic radii as determined by elastic-electron scattering. For each element several parameters are listed, such as root-mean-square radii, type of distribution, half-density radii and skin thickness. Following the tables an element-by-element discussion gives a

short summary of the present status of interpretation. A table of commonly used charge-density functions together with their form factors is reproduced from the Hofstadter and Herman book *High-Energy Electron Scattering Tables*.

Elton's compilation is of data on charge distributions derived from sources other than electron scattering, mainly on the measurement of x rays from mu-mesic atoms. The tabular data are energies of the 2p to 1s and higher transitions, equivalent uniform radii, optical, mu-mesic and x-ray isotope shifts and quadrupole interactions.

H. Schopper, editor of the Landolt-Börnstein series in nuclear physics and technology, is to be congratulated on this timely addition to the series. Everyone interested in nuclear structure will want access to the basic facts contained in this book.

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James O'Connell works on the study of nuclear structure and reactions with photons and electrons at the Center for Radiation Research at the National Bureau of Standards, Washington, D. C.

Evolution of the atomic concept

THE ATOMISTS (1805-1933). By Sir Basil Schonland. 198 pp. Oxford Univ. Press, London, 1968. \$5.60

by BRUCE LINDSAY

The success of physics has depended in large measure on the appropriateness

and all-embracing character of its concepts. One of the most successful of all physical ideas has been that of the atom. Arising in the mists of antiquity and suffering many vicissitudes through the ages, with many prominent scientists as late as the end of the 19th century denying its necessity, the concept has in our time achieved such a preëminence that the "reality" of atoms is now taken for granted by all.

The story of the evolution of the atomic concept is one of the most fascinating ones in the history of physics. Sir Basil Schonland is a well known geophysicist, authority on atmospheric electricity and former professor at universities in South Africa, as well as former director of the United Kingdom Atomic Energy Research Establishment at Harwell. He has restricted his brief and popular account to the period extending from the inauguration of the atomic idea in chemistry by John Dalton and his contemporaries in the early years of the 19th century to the end of the first third of the twentieth century after quantum mechanics was well established and contemporary nuclear physics had started on its spectacular career. Schonland has packed the story of four generations of atomists into the short space of about 200 pages. This feat has demanded considerable selectivity that will inevitably please some and displease others. Thus the rise of the chemical atom and the various phenomena of electrolysis receive rather full coverage, though the very important and influential 19th-century development of the molecular theory of gases rates much



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less attention. Maxwell's electromagnetic theory of light is explored rather thoroughly to do justice to optical spectra, but the equally important story of the introduction of Planck's quantum point of view, which resulted from the need to account for the observed distribution of energy in the radiation spectrum of a black body, is dismissed in a few pages.

The author places laudable emphasis on the isolation of the negative electron by J. J. Thomson in the last decade of the 19th century, but the positive electron of Dirac is mentioned only in a line or two in an appendix. By far the most attractive and appealing feature of the book is the lengthy account of the discovery and exploitation of radioactivity and the invention of the nuclear-atom model. In general the author deals more successfully with the story of experimental discoveries than with the account of theoretical developments. His story of Rutherford's long and toilsome struggle towards the concept of the nuclear atom is highly satisfying, but his account of Bohr's construction of the quantum

theory of atomic structure scarcely does justice to the ingenuity of Bohr's fundamental ideas.

The popular character of the book is exemplified by the almost complete absence of mathematical details. The style is relaxed and chatty and should favorably appeal to the general reader. Because the volume covers such an interesting range of topics in generally attractive fashion, it is a pity that it is marred by many errors of detail. There are at least nine misspellings; several dates are incorrect, and there are numerous statements that are misleading. Use of the book for reference is materially handicapped by the restriction of the index to proper names with no specific references to the achievements of the persons mentioned.

In spite of these unfortunate infelicities this is a very readable book on one of the most fascinating chapters in the history of physics.

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The reviewer is Hazard Professor of Physics at Brown University and is interested in the history of physics.

Completing a classical trilogy

ELECTRICITY AND MATTER. By Norman Feather. 532 pp. Edinburgh Univ. Press, Chicago, 1968. \$6.95

by IRA M. FREEMAN

Electricity and Matter, together with the same author's recent *Mass, Length and Time* and *Vibrations and Waves*, constitute a trilogy on classical physics. The volume under review can be appraised more effectively by giving some background on the character and purpose of all three books.

Feather addresses himself to "anyone who, at this time, and with good reason, is looking for an answer to the question: 'What is physics all about?'" He subscribes to the belief that "a carefully told story, starting at the beginning, is likely to be more satisfying to any serious questioner, whatever his specialty, than the most colorful fairy tale of television and nuclear energy could possibly be. Even though much of the story must remain untold, I believe he will still find satisfaction in it."

The author realizes his program in an admirable way. His presentation is scholarly, urbane and unhurried; it is much more interesting than that of

some of the slick, dehumanized textbooks now available. By restricting the treatment to fundamentals, space has been provided for penetrating and original discussions of some sticky matters that are often glossed over. In addition he gives the historical background of important physics concepts a due measure of recognition. To the reader who has had to be content with the mere snippets of historical and biographical information (and misinformation) that represent the concession some writers make to the origins of their subject, the present books provide an agreeable surprise. How many of our students are apt to recall, for example, that it was Joseph Priestly who first inferred the necessity of an inverse-square law for electrostatics by considering the absence of force within a conducting shell, or that Hans Oersted originally looked to the *heating* of a current-carrying conductor as the source of the magnetic effect?

The three-volume set is organized along somewhat traditional British design and does not constitute a textbook in the American sense, because there are no worked out examples, problem and question sets. Calculus does not



KARPLUS ON PHYSICS

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Robert Karplus

University of California, Berkeley

The author of this new text utilizes a unique *model approach*, focusing on the way scientists continually invent, test, and refine or discard models that yield an understanding of physical phenomena. Karplus exposes as models the approximations we use every day to understand these phenomena; he successfully relates scientific theories and models to the student's experience. He emphasizes the tentative nature of all scientific explanations using a minimum of mathematics so that the non-science student is engaged on historical and philosophical levels to question all physical phenomena around him.

The student benefits from the introduction of interaction systems and energy concepts early in the text. The first theory developed extensively is Huygens' geometrical wave theory. Newtonian mechanics is treated toward the end of the book. This means that the student is not immediately confronted with discouraging algebra and abstractions.

INTRODUCTORY PHYSICS: A Model Approach is written for one-semester courses (with some selection of topics) or for two-semester courses (expanded with readings from the extensive bibliography). Approximately 500 pages. Due April 22.

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