

conversion of energy. Research on the fuel cell is described, but with optimism more restrained than that of Harvard Business School authors who predicted that fuel-cell locomotives will displace Diesel locomotives within eight years.

Physical Electronics. By G. F. Alfrey. 220 pp. Van Nostrand, Princeton, N. J., 1964. \$8.50.

Reviewed by L. Marton, National Bureau of Standards.

Reviewing a book is sometimes greatly facilitated by clear and concise statements of the author himself, indicating for whom the book is written and why the book is written. Direct quotations, therefore, are perhaps the best mirror against which to judge the performance of the author. In Dr. Alfrey's book, there are several such clear statements which I would like to quote directly, starting with one from his preface: "This book is an attempt to provide a concise and coherent introduction to the physical principles governing the operation of electronic devices. It is written for electrical engineers and for physicists who are interested in the way the principles of their subject are applied; pressure on the syllabus not uncommonly pushes this aspect beyond the reach of formal instruction." A little further in the preface he outlines two limitations of his book, "The first, relatively trivial, is that many topics of potential interest have to be excluded. . . . The second limitation is more serious. The treatment is largely qualitative and it will no doubt be possible to read the book and yet be defeated by a relatively simple problem, without having acquired that feel for the numerical magnitudes of the quantities concerned which is rightly regarded as an essential part of the scientist's intellectual equipment." At the end of his preface he adds, "I hope that it may continue to serve the reader in his more advanced studies as a kind of guide book relating his work to other aspects of a wide and expanding field."

I would like to add one more quotation from the text. On page 193, the author says, "The book discusses in the main those matters of electrical

engineering which follow directly from the physical properties of the electron." In many respects the author succeeds quite well in satisfying his own criteria. The treatment is quite concise, perhaps in some respects too concise to provide the basic training for electrical-engineering and applied-physics undergraduates. I do not know what the differences are between British and American curricula for these types of studies. If I were to teach the subject to electrical-engineering or applied-physics undergraduates, I might want to include a little more detail on many of the physical phases, and then perhaps make the treatment a little more mathematical than descriptive. Also, the definition of physical electronics, in my mind at least, covers more operations involving free electrons than the more solid-state aspects of electronic conduction in solids and in particular, in semiconductors. Chapters 12 and 13, on magnetic properties of matter and on dielectric materials, may be definitely excluded from the way I view physical electronics. The other chapters, which I would maintain are, Electrons in Atoms, Forces between Atoms, Emission of Electrons from Solids, Electron Optics, The Control of Electron Current in a Vacuum, Electrical Conduction in Gases, Gaseous Plasma, Electrical Noise, and Molecular Amplification.

The author starts out with a definition of the scope of electronics which I rather like because it is old-fashioned and it is in definite disagreement with the application of the word "electronics" to all kinds of high-frequency phenomena. The style of the book is extremely readable, in many places even almost florid—for instance, when he calls a process of measurement "intolerably clumsy" (page 63) or the first attempts toward advanced theory of solids, "heroism pushed to the extremes of folly" (page 119). There are places where I would be inclined to disagree with the author: for instance, at the beginning of Chapter 8 where he apologizes for including in his book a discussion of gaseous plasma, saying that gaseous plasma is an unfamiliar state under normal terrestrial conditions but is widespread in

nature once one moves away from the earth's surface. I don't believe any apology is needed. I am inclined to disagree also with a certain number of historical statements, such as, on page 18, where according to the author, "The nature of the rays was a matter of widespread speculation, but the only tangible idea that was put forward was a suggestion that the rays consisted of charged particles." The author is talking here about the nature of cathode rays and their interpretation during the second half of the last century and neglects to mention that for several decades there was a marked controversy between British and German physicists. The British represented the corpuscular idea whereas the Germans were definitely in favor of the wave concept.

There are a few minor items which I would have preferred not to discuss. I would say that there is a definite lack of good proofreading in the book. The number of misprints is far from negligible. Not many of them mar the text, but if the name of Mosotti is consistently spelled Misotti, it indicates a little deeper defect than just bad proofreading.

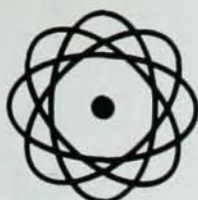
In spite of the minor defects, I do recommend the book as a good concise introduction into the subject of physical electronics.

Moderne Probleme der Metallphysik. A. Seeger, ed. Vol. 1, Fehlstellen, Plastizität, Strahlenschädigung und Elektronen-Theorie. 445 pp. Springer-Verlag, Berlin and New York, 1965. \$14.75.

Reviewed by Walter G. Mayer, Georgetown University.

Some time ago a meeting held in Stuttgart was concerned with modern topics of metal physics related to solid-state physics. The authors, most of whom are with the Technische Hochschule or the Max-Planck-Institut in Stuttgart, have rewritten and considerably enlarged their papers given during that meeting and have collected them in two volumes.

As the title indicates, the first volume deals with imperfections, plasticity, radiation damage, and electron theory of metals. Although it is assumed that the reader has a certain amount of general background information, the authors make an effort



BERKELEY PHYSICS COURSE AND LABORATORY

Volume 1: MECHANICS

By CHARLES KITTEL and WALTER D. KNIGHT, both of the University of California, Berkeley; and MALVIN A. RUDERMAN, New York University.

This text is the first of five volumes comprising the Berkeley Physics Course, planned by an inter-university committee at the University of California, Berkeley, as a two-year college physics curriculum for students majoring in science and engineering.

The specific objectives of the committee were to introduce coherently into an elementary curriculum the ideas of special relativity, quantum physics, and statistical physics. The resulting course is designed for all students who have had a physics course in high school and are taking calculus concurrently.

The approach used in *Mechanics* differs from other textbooks in several respects. The consequences of the special theory of relativity are developed in detail; the motion of charged particles in electric and magnetic fields have been emphasized; elementary mechanics is presented so that paths are seen leading to other parts of physics, astronomy, geophysics, and in part to chemistry.

Available in September

Volume 11: ELECTRICITY AND MAGNETISM

By EDWARD PURCELL, Harvard University.

LABORATORY PHYSICS

Parts A & B

Compiled by ALAN M. PORTIS, University of California, Berkeley.

This laboratory was developed in the Department of Physics at the University of California, Berkeley and is an accompaniment to the Berkeley Physics Course. It is the intention of both the laboratory and the course "to make an elementary college course and laboratory which reflect vigorously the revolutions in physics of the last hundred years."

Part A is designed for the first semester of introductory physics for science and engineering students. It presents the elementary ideas of physics in a spirit that well represents their role in current research. Oriented toward discovery rather than technique, it requires equipment that is simple and inexpensive.

The selection and presentation of material in Part B has been made for students who have already completed Part A, and makes reference to material included in the earlier volume. Part B of the laboratory extends the synthesis of laboratory experience in electronics with classroom study of analytical mechanics. Where Part A was largely limited to the study of single elements: the free particle, the damped particle, and the oscillator, Part B directs the students' attention to coupled oscillators, periodic structures, and ultimately, to propagation in continuous media. The discussion of transistors follows the good example of the Semiconductor Electronics Education Committee (SEEC).

Send for examination copies today

McGRAW-HILL



BOOK COMPANY

330 WEST 42ND STREET, NEW YORK, N. Y. 10036

PHYSICISTS and ENGINEERS

Interesting

Opportunities for

Physicists and

Engineers to

participate in

the design and

development of

High Energy Particle

Accelerators and

related devices

Send Complete Resume
including salary requirements to
DR. G. K. GREEN

Chairman, Accelerator Dept.
Box 103

BROOKHAVEN NATIONAL LABORATORY

ASSOCIATED UNIVERSITIES, INC.
UPTON, L.I., N.Y.

An Equal Opportunity Employer

PHYSICIST or CHEMIST

OPPORTUNITY IN
HEALTH PHYSICS
AT PRINCETON UNIV.

Princeton is now extensively engaged in research activities involving radiation. The University's Health Physics Group provides radiation protection services to these activities including the recently commissioned high current 3 GEV proton accelerator. A recent science college graduate is being sought as an addition to our Health Physics Staff.

POSITION: A general knowledge of health physics and radiation safety practices is preferred with some knowledge of radiation surveys, smear tests, air and water sampling analysis, film badges and related administrative work.

Work in suburban Princeton area. Unusual benefits include 4 weeks vacation, tuition loan program with loan forgiving feature and generous retirement plan.

Write to: A. C. Allen

P. O. Box 682, Princeton, N. J.

An Equal Opportunity Employer

PHYSICISTS-SCIENTISTS

KEY PERSONNEL is a National organization devoted exclusively to the selective search for competent careerists among the technical disciplines.

Working closely with clients Coast to Coast, it is our policy to provide a professional service to scientists and engineers, that is ethical, knowledgeable and confidential. Our service is designed to provide YOU with a convenient focal point from which to explore, easily and efficiently, the numerous career opportunities existing anywhere in the U. S.

Our service to you—the individual scientist or engineer—is WITHOUT COST since our search fees are assumed by our organizational clients, who are Industrial, Defense and non-profit organizations engaged in the advancement of the state-of-the-art.

We are currently searching to fill a broad spectrum of positions from semi-junior to General Manager across the entire continent.

If you would like to explore for yourself, our unique approach, write for our confidential summary form or forward a copy of your current résumé as soon as possible:

John F. Wallace
Executive Vice President



KEY PERSONNEL CORP.

218 Tower Bldg.

Baltimore 2, Md.

to discuss general ideas before dealing with more sophisticated aspects of their topics. The first chapter (E. Kröner) gives a review of dislocations and a résumé of an approximation approach to the continuum theory. The third chapter (H. Kronmüller) presents a very extensive treatment of the theory of plastic deformation, preceded by an experimentally oriented chapter (R. Berner and H. Kronmüller) on plastic deformation of single crystals, particularly fcc and hexagonal metals. This well-illustrated section can be considered a continuation of the chapter on crystal plasticity in volume VII/2 of the *Handbuch*. The fourth chapter (S. Mader) discusses interesting aspects of electron-microscopy techniques for the investigation of dislocations, and the fifth (J. Diehl) concentrates on a discussion of imperfections and radiation damage. Here, as well as in the last section (H. Bross), on electron theory of metals, one finds good balance between introductory subjects and less known, sometimes new material.

Interesting features of the book are that it contains a relatively large number of unpublished results and that the authors are not afraid to discuss problems still in the speculative stage. The healthy mixture of well-established and new ideas, together with an extensive bibliography, makes this volume a fine reference book and a guide for future research in metal physics.

Structure of Matter. By Wolfgang Finkelburg. 511 pp. (Springer-Verlag, Berlin) Academic, New York, 1964. \$14.50.

Reviewed by William F. Meggers, National Bureau of Standards.

First published in 1948 under the title *Einführung in die Atomphysik*, the book by Wolfgang Finkelburg has undergone numerous revisions and printings in three languages. This English version, excepting the title, is almost a verbatim translation of the 9th/10th German edition, also printed in 1964. Incidentally, both books are octavo, 10 point, but the 552 pages of the German printing are reduced to 511 in English!

"This book deals comprehensively with our present-day knowledge of the

structure of matter from elementary particles to solids. It has been written for students of physics, chemistry, biology, and engineering." (Preface.) It contains seven chapters: Introduction; Atoms, Ions, Electrons, Atomic Nuclei, Photons; Atomic Spectra and Atomic Structure; Quantum Mechanics; Physics of Atomic Nuclei and Elementary Particles; Molecular Physics; Solid-State Physics from the Atomistic Point of View; and a subject index. The chapters end with lists of pertinent literature, exclusively books (encyclopedias, treatises, text books, monographs, etc.), no periodical papers. Apropos, the only sins of commission or omission found so far are on page 147 where three volumes of *Atomic Energy Levels* by C. E. Moore, listed in the German printing, are reduced to two in this English translation, and on page 210 where the two-volume treatise on *Quantum Theory of Atomic Structure* by J. C. Slater (McGraw-Hill, 1960) is omitted. For the first time, four to eleven perplexing problems (without answers) have been added to each chapter of this English edition which will surely make it more challenging and interesting to students and teachers.

Structure of Matter presents in relatively small space a surprising survey of apparatus, experiments, observations, measurements, theories, models, quantum interpretation of spectra, wave-mechanical treatment of atomic systems, radioactivity, elementary particles, atoms, ions, molecules, crystals, nuclear bombs, and reactors, even including such esoteric subjects as acausality, complementarity, indeterminacy, magic numbers, and philosophical reflections. No doubt some physicists will find the quantum-mechanics chapter inadequate; some chemists will point out that there are thousands of times as many kinds of molecules as of atoms, and some mechanical engineers may not appreciate quantum mechanics. The only reference to biology is via DNA molecules. "The author's aim has been to provide the reader with the grounding essential to a true understanding of this vast sphere of science which during the past few decades has led to so great a change of our fundamental concepts of nature and which

Mathematicians and Physical Scientists

interested in a career that will use their specialties and also afford them the opportunity to widen their experience in multidisciplinary projects will find a stimulating atmosphere in the Center for Naval Analyses.

A division of The Franklin Institute, CNA is a private scientific organization engaged in short- to long-range planning and in operations analysis and research for the United States Navy. The results of its studies are submitted to Navy planners and decision-makers for their guidance.

Staff members at CNA, applying the special knowledge of their own particular fields in a team approach to problem solving, help produce studies of broad scope and paramount usefulness to the Navy.

To a few qualified physical scientists and mathematicians, CNA offers an opportunity for stimulating work on projects of immediate importance to the security of the nation.

For further information, write:

Director
THE CENTER FOR NAVAL ANALYSES
Department PT
1401 Wilson Blvd.,
Arlington, Va. 22209

CNA
CENTER FOR NAVAL ANALYSES
OF THE FRANKLIN INSTITUTE

OEG • OPERATIONS EVALUATION GROUP
INS • INSTITUTE OF NAVAL STUDIES
NAWAG • NAVAL WARFARE ANALYSIS GROUP
An equal opportunity employer