REFLECTIONS
of a
PHYSICIST

by P. W. BRIDGMAN

NEW ENLARGED EDITION

This collection comprises the bulk of the non-technical writings of Dr. Bridgman, including ten papers here added to the first edition of 1950. The topics range over a considerable field, but there is a certain unity in the treatment in that the "operational" approach is used throughout. It is this approach which has made possible the success of modern physics in meeting revolutionary new physical situations. The present collection may be regarded as an extension of the operational approach to problems in other fields than physics.

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I—*General Points of View*

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complete account of the facts and the underlying explanations, though the parts where quantum mechanical arguments cannot be avoided make difficult reading. The third section, on special topics and applications, treats neutron physics, nuclear fission, nuclear energy sources, electromagnetic accelerators, and isotopes. This section (including the problems) would seem a considerable help in showing the engineer how to apply the basic ideas. The book also includes a reduced copy of the G.-E. Chart of the Nuclides.

To summarize, the book gives a thorough introductory account of nuclear physics and some important applications. It should prove extremely valuable to the nuclear engineer, and could also properly serve as an introductory course for the physicist.

Fundamental Formulas of Physics. Edited by Donald H. Menzel. 765 pp. Prentice-Hall, Inc., New York, 1955. $8.00. *Reviewed by Louis Weinberg, Hughes Research and Development Laboratories.*

Fundamental Formulas of Physics is a collection of formulas presented in thirty-one chapters which vary in length from a maximum of 106 pages for the chapter on mathematics to 5 to 10 pages for chapters on such subjects as electronics, nomograms, the physical constants, and meteorology. Some of the other fields included in the book are classical mechanics, electromagnetic theory, the special and general theories of relativity, hydrodynamics and aerodynamics, boundary value problems, acoustics, quantum mechanics, and solid-state physics. The chapters are for the most part written by outstanding men in the respective fields, some of whom merely list their formulas whereas others include explanatory material.

A wealth of material is represented by this collection of formulas which, as stated in the preface, is intended primarily as a reference and guide for research physicists, chemists, and engineers. In the opinion of this reviewer, the book has limited appeal for engineers; whether it will achieve wide circulation among physicists only time will tell. With the passage of time it will be possible to evaluate more fully some of the factors that determine whether a book of this type lives or dies or remains moribund all its life; such factors are the choice of material, the freedom from error, the ease with which the book can be used, the cross-referencing in chapters that cover overlapping material, and the quality of the index. In a sampling on all these points in accordance with the personal experience (and prejudices) of the reviewer the book does not come off well.

For example, the discussions of the Fourier and Laplace transforms follow each other and together cover less than a page. If lack of space was a restriction, surely the elementary formulas on trigonometric functions and integral calculus could have been omitted without diminishing the value of the book; this part of the handbook field is solidly held by the standard books by Burington, Peirce, and Dwight. Then, again, Hilbert transforms are

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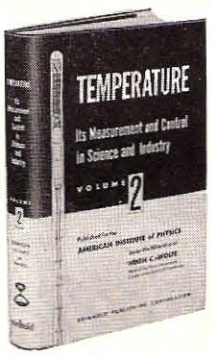

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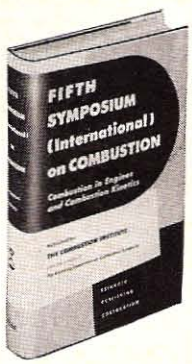

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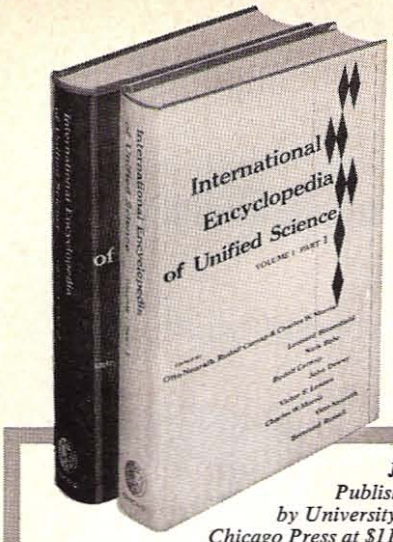

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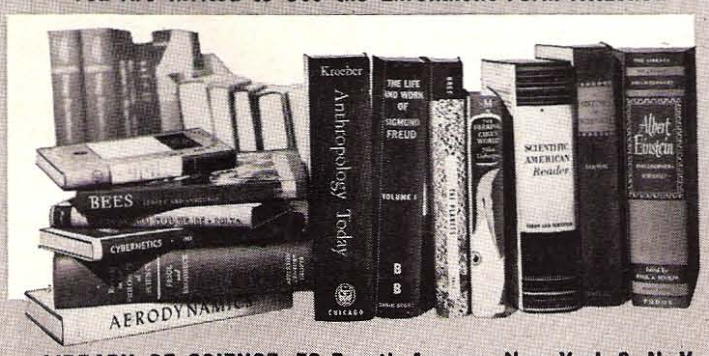

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omitted entirely, and analytic functions, unquestionably of ever-increasing importance to the physicist and engineer, are allotted only three pages. In the discussion of vector analysis and in the treatment of the Laplace and Helmholtz equations that occurs in many chapters; this reviewer would have liked a listing of the divergence and curl and the particular solutions of the equations for ten or more coordinate systems rather than only for the conventional systems like the rectangular and the cylindrical; in fact, if space is again a restriction, the conventional systems, which are easily found in many texts, could well have been replaced by less familiar ones.

In regard to errors the reviewer decided to determine the number of consecutive pages that he had to check through before he found the first error; alas, page 1, Eq. 2 contains a plus sign that should be a minus. Then, browsing, he found another error on page 7, paragraph 2.7, Eq. 1. These errors are minor compared to other errors or ambiguities that the reviewer came across. For example, he believes a wrong impression may be created by paragraphs 4.4 and 4.5 on pages 328–329, where it is stated that direct current circuit analysis is based on Kirchhoff's rules (isn't alternating current circuit analysis also based on these rules?) and the transient solution is only evaluated for the alternating current case, almost leading to the implication that a dc excitation will cause no transient. Also, while circuits are being discussed, we may ask why the instantaneous current is represented by a lower case i whereas the instantaneous voltage is represented by the upper case E. More serious still is the statement on page 244: "any linear, homogeneous, differential equation can be solved by the method of separation of variables". Is this true?

The index and cross-referencing could be improved. For example, though adjoint operators are discussed, the index does not include the term "adjoint". Under "self-adjoint" page 256 is listed but not page 255 or page 100, and there is no cross reference on page 255 or 256 to page 100. "Coordinate systems" does not appear in the index; if one thinks instead of "curvilinear coordinates" one finds pages 44 and 246 referred to but no reference to pages 347 and 348. On page 87 the same matrix is called an inverse matrix and a reciprocal matrix, neither of which terms is listed in the index.

Finally the reviewer would like to make a plea for more intelligent (and accurate) publisher's blurbs. The jacket description incorrectly states there are twenty-six sections and lists them, leaving out the last five. (This could confuse some reviewers no end; a review that came to this reviewer's attention stated there were twenty-six sections, with the remainder of the review also parroting the blurb.) The jacket blurb further states that the "derivatives for the formulas have been omitted". Isn't "derivations" the better word? Finally, the blurb speaks about the "compromise between the so-called classical point of view and the extremely modern viewpoint" and then gives the mks system as an example of the extremely modern viewpoint(!).

But as stated previously there is a wealth of material in the book. If its faults are as minor as most of those cited and if they are corrected, the book may still prove valuable to some physicists.

Metals Reference Book (Revised Second Edition). Volumes I & II. Edited by Colin J. Smithells. 984 pp. (Butterworths, England) Interscience Publishers, Inc., New York, 1955. $25.00 per set. *Reviewed by Cyril S. Smith, Institute for the Study of Metals.*

The appearance of a second edition of Smithells' *Metals Reference Book* is of more than routine interest. The book reflects the new character of metallurgy strongly and includes a great deal of physics. On the desk of a solid-state physicist it is likely to supplant all other handbooks. There are, to be sure, parts dealing with the practical art of metallurgy that will be unused, but there is no better quick reference for the structure, thermodynamic constants, and general physical properties of metallic materials. There are entirely new sections dealing with friction and internal friction, and with the properties of molten salts and their mixtures. The diffusion chapter is a most useful and up-to-date source of data and literature references, while the table of crystal structure of intermetallic phases, including the metalloid compounds, is without parallel. Those who are making peaceful uses of the atom will find a convenient and complete table of isotopes with their decay characteristics and thermal neutron capture cross sections. The constitution diagrams of innumerable alloy systems are reproduced (unfortunately on a variable scale) and there are tables for immediate conversion between atomic and weight percentages in any binary system.

The critical reader may deplore that the articles are unsigned, but a little detective work on the list of contributors will suggest the authorship of the various sections and give a feeling of confidence. It is unfortunate also that it is not uniform practice throughout the book to cite references for the data quoted, for a handbook should serve partially as a guide to the literature. The typography is good. The relatively open format contrasts pleasantly with the congestion of most reference books, even though it has resulted in a thousand pages which have to be bound in two volumes.

Inventories of Apparatus and Materials for Teaching Science; Volume III, Technical Colleges; Part 4, **Electrical Engineering.** Published by Unesco. 147 pp. Columbia University Press, New York, 1954. Paperbound $2.75. *Reviewed by Ira M. Freeman, Rutgers University.*

This volume is part of a series of such inventories covering the teaching of science subjects at various levels from primary grades through technical schools and universities. The portions published to the present time are: Vol. I, Primary, Secondary and Vocational