BOOK REVIEWS

Selection of books for review is based on the editors' opinions regarding possible reader interest and on the availability of the book to the editors. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.

MOSTLY OLD HAT

Title The Theory of Neutron Slowing Down in Nuclear Reactors

Authors Joel H. Ferziger and P. F. Zweifel

Publisher The M.I.T. Press, 1967

Pages x + 307

Price $13.50

Reviewer Noel Corngold

There is no doubt that the moderation of neutrons is important to the neutron chain reaction, or that the "classical" theory of the process has been quite thoroughly worked out in journal articles and reviews, and has been presented adequately in several text-books. Now we are presented with a book devoted entirely to the theory of slowing down. We find the classical material once again; we are hurried past Placzek functions, NRIA, the Rational Approximation, the First Fundamental Theorem, and all that. Since the book is based upon an eight-year-old manuscript, one encounters none of the recent refinements of these by now commonplace ideas. New material? There is no discussion of inelastic CM scattering, which is important to fast reactor systems, or of thermalization, which is important to thermal systems.

Why was the book published? We shall hurry past that question to point out that there are sections which merit attention. The transformation of scattering cross-sections is treated in considerable detail, and there is a section on numerical methods in which the reader is exposed to the ideas current in the 1950's. The latter is rather interesting; some of the discussion about practical calculation bears the mark of hard experience. It is characteristic that the computational scheme, THERMOS, which is very much in fashion today, receives one sentence, and a misleading one at that.

One does not have the impression that much care was expended upon the literary aspects of the book. Page 1 begins with a grammatical blunder, and a rapid reading finds "polynominal" on p. 189, "Plazcek" on p. 71, an erroneous reference on p. 142. We learn of "expanding functions," and are told to "adjointize" equations. Then, we are treated to sentences like, "Consequently, the limitations of the system, either decrease in reactivity or metallurgical limits, will be reached rather quickly in terms of total energy production by a core over its lifetime..." Got it? If not, consider that MIT Press surely employs copy editors. Consider, too, that both authors are "top-drawer" physicists. Their work should elicit a better review; their colleagues and their readers deserve better treatment. We shall look forward to it—next time.

For the past year Professor Noel Corngold has been with the Division of Engineering and Applied Science at the California Institute of Technology. Prior to that, he spent 15 years at Brookhaven National Laboratory, becoming leader of the Theoretical Reactor Physics Group. He is well known for his work in neutron transport theory and neutron thermalization. His PhD (Harvard, 1954) is in physics.

NEW AND IMPORTANT

Title Radiation Dosimetry, 2nd ed., Vol. II

Editors Frank H. Attix and William C. Roesch

Publisher Academic Press, 1967

Pages xviii + 462

Price $20.00

Reviewer Nathaniel F. Barr

In large part, the effects produced as a result of the interaction of ionizing radiation with matter are consequences of the absorption and degradation of energy, and the amount of energy absorbed in irradiated material is a quantity frequently sought in the interpretation of physical, biological, and chemical effects produced by ionizing radiation. The amount of energy absorbed may be obtained, in principle, either by the application of known laws of interaction between the radiation field and matter, or by direct experimental determination. However, it is frequently difficult to characterize the radiation field, and direct measurement of energy absorbed in the irradiated sample is always difficult and usually impossible. Since the turn of the century, numerous techniques for measuring absorbed dose indirectly have been developed by groups studying a variety of radiation effects. A number of these are now highly developed and include complex instrumentation, elaborate physical theory, and highly specialized jargon. New techniques are constantly being developed.

Instruments for, and instrumental methods of, measuring absorbed dose are discussed in eight authoratative articles in this, the first of a three volume set entitled *Radiation Dosimetry*. Volume I, *Fundamentals*, is to be published in a few months, and Volume III, *Sources, Fields, Measurements and Applications*, is promised toward the end of the year.

Individual chapters, authored by distinguished authorities, are, for the most part, carefully prepared and give rather complete coverage of recent advances. One will find somewhere in the collection a description of all established dosimetric techniques, and the editors have kept overlap to a minimum. The index is complete and carefully prepared. Typographic errors are few, but more numerous than this reviewer expected to find in a volume worked over by these editors.

In spite of these strong points, this is a collection of essays and shows it in unevenness in style and approach from chapter to chapter. It is by no means a book to be read from cover to cover in a sitting or two. The treatment of specific physical principles underlying each topic varies greatly from chapter to chapter, from short, with pithy references to where to look further, in the case of Dudley's "Dosimetry With Photographic Emulsions" and Emery's "Geiger-Mueller and Proportional Counters," to expansive and detailed in Boag's "Ionization Chambers," to shallow and incomplete in Ramm's "Scintillation Detectors."

Even as a reference work it is of limited utility standing alone, because elements necessary for understanding have been excised from each chapter to be included in Volume I. Professor Boag's excellent chapter provides a thorough description of how ionization chambers are built and how they work, but gives no indication of how they might be used to measure absorbed dose. This fragmentation is a problem throughout, but less important in the remaining chapters. There are, however, extensive cross references, and the appearance of companion volumes will relieve, if not rectify, this difficulty.

"Hine & Brownell" has come to mean a shop-worn blue volume entitled *Radiation Dosimetry* that has served for a decade as primer for novitiate radiation effects workers and "Hoyle" in inter- and intra-laboratory discussions. Perhaps the most valid way of evaluating this fragment of a complete work is in terms of corresponding parts of Hine & Brownell.

Six of the eight chapters in the present work cover subjects presented in the first edition of Hine & Brownell. All are substantially improved by inclusion of reference to and discussion of new work. Each bibliography contains a surprisingly high percentage of references to work since 1954. More than two thirds of the references in Dudley's chapter "Dosimetry With Photographic Emulsions" are to reports appearing since publication of the first edition. This chapter, excellent in the first edition, is better in the second, and Fricke and Hart's "Chemical Dosimetry" substantially improves on the discussion of this subject in the first edition.

The two new chapters, Fowler's "Solid State Electrical Conductivity Dosimeters" and Fowler and Attix's "Solid State Integrating Dosimeters," treat systems that have developed exceedingly rapidly over the last ten years. In each case the presentations are lucid and remarkably complete in their coverage of the variety of systems, ranging from bits of glass to candy wrappers, embraced by these new topics. Particularly admirable is Fowler and Attix's attempt to evaluate potential value and pitfalls of each system.

The minimum requirement for a new edition of a valued work is revision to include new and important knowledge. Volume II, *Instrumentation*, succeeds admirably in this. The complete new edition will have 33 chapters, 15 more than the first, and if follow-on volumes succeed as well as the first, this long-awaited revision of a most important and useful work will be a very welcome addition.

Nathaniel F. Barr, now Technical Advisor to the AEC's Assistant General Manager for Research and Development, was until recently with the AEC's Division of Biology and Medicine, where he was responsible for research programs in radiation physics, health physics, and instrumentation. He has taught biophysics at Cornell, and has done research in radiation chemistry and dosimetry at Brookhaven National Laboratory, Sloan-Kettering Institute, and Columbia University, where he also received his PhD (physical chemistry) and taught chemistry.

RADIOISOTOPE APPLICATIONS

Title The Technical Applications of Radioactivity, Vol. I

Authors E. Broda and T. Schonfeld

Publisher Pergamon Press, 1966, First English Edition

Pages xvi + 353

Price $15.00

Reviewer H. R. Lukens

This volume presents many facts concerning radioisotopes and their uses. Hundreds of significant industrial applications, well indexed, are described, and an excellent bibliography is included with each chapter. Radiation processing and the uses of radiation absorption and scattering in measurement and control are topics reserved for a subsequent volume.

The text does not treat radioisotopes, radioisotope measurement, radiochemistry, nor any of the multitudinous applications in depth, and there is a minimum of mathematical formulae. Thus, its use as a primary instructive volume on the subject of radioisotopes and their applications is impaired. For example, although mixing studies with radioisotopes are referred to many times, many of the various pertinent experimental data are omitted, and the mathematical considerations of mixing are not given. Again, whereas gamma-ray spectrometry is discussed, the reduction of gamma-ray spectrometry data is not treated.

There are numerous instances where specific information could have been afforded. For example, whereas liquid scintillation counting is mentioned, no liquid scintillation recipes are given, no quenching agents other than oxygen are cited, and typical scintillator efficiencies are not listed. Such omissions require the reader to turn to other texts for practical information.