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.

Nuclear Radiation Physics

Authors	Ralph E. Lapp and Howard L. Andrews
Publisher	Prentice-Hall, Inc. (1972)
Pages	447
Price	$18.95
Reviewer	Eric Haskin

This fourth edition, like the previous editions of *Nuclear Radiation Physics* is designed as a text for introductory undergraduate courses in nuclear science. The scope of the book is indeed large, encompassing radiation detectors, quantum theory, atomic and nuclear structure, radiations and their interactions with matter, charged particle accelerators, fission reactors, fusion, space radiation, and the transuranium elements. The presentation is as nonmathematical as possible; however, a basic physics sequence and calculus through ordinary differential equations would be required prerequisites for complete coverage.

This edition of the text differs from the previous editions in both content and order of presentation. Material on health physics and reactor economics has been eliminated in order to make room for material on space radiation and the transuranium elements. The chapters on radiation detectors now come at the beginning of the text. More problems have been added at the ends of the chapters—some with answers given.

One would expect the fourth edition of a text to be well organized with few conceptual or technical errors. Unfortunately, this is not the case here. The book is scattered into twenty-one chapters, each containing from six to fifteen subsections. There is a frequent tendency to digress; for example, a chapter entitled "Classical Mechanics, Relativity, and Quantum Theory" contains subsections devoted to "Natural Isotopic Abundance" and "Isotope Separation." There are many errors; a few will illustrate. In Sec. 3.10 the band gap in semiconductors is referred to as the width of the conduction band. In Sec. 4.12 we are informed that the "velocity" of light is independent of its direction of propagation—an interesting property for a vector! On p. 128 a typographical error implies that the element lead, $Z = 82$, has five isotones. Actually, there are seven stable isotones at $N = 82$, Fig. 7-2 being out of date.

The authors have made a commendable attempt to introduce many concepts of current nuclear science and technology without getting bogged down in theoretical detail. Naturally some topics are glossed over; however, for the most part the discussions presented are pertinent, interesting, and understandable. For an instructor willing to organize, fill in the details, and watch out for the mistakes, the book might make a good text for a broad survey course. Those wishing to quickly refresh their memories with respect to the topics covered might also find the book useful.

Eric Haskin (PhD, nuclear engineering, Kansas State University, 1971) is the author of technical papers in the fields of radiation chemistry, activation analysis, and nuclear by-product management. He has worked in the Product Exploration Division of the Boeing Company and is currently a visiting assistant professor in the Nuclear Engineering Department at the University of Arizona.

Irradiation Effects in Fissile Materials, Vol. 6

Authors	J. Leteurtre and Y. Quéré
Publisher	North-Holland Publishing Company; American Elsevier Publishing Company, Inc.
Pages	128
Price	$15.50
Reviewer	Richard E. Faw

The authors of *Irradiation Effects in Fissile Materials* are located at the Centre d'Etudes Nucléaires, Fontenay-aux-Roses, France. This book is Vol. 6 in the series *Defects in Crystalline Solids*, edited by S. Amelinckx, R. Gevers, and J. Nihoul of the Studiecentrum voor kernenergie, Mol, and the University of Antwerpen, Belgium. As might be

expected, the content and style of the book reflect the European vantage points of the authors and editors.

The book is divided into six chapters. The first five chapters are devoted to direct radiation damage effects in fissile materials. Chapter 6 is devoted to the secondary effect of swelling.

Chapter 1 is a refreshing "Reminder of the Generalities" concerning fuel burnup, energy release and partition in fission, energy dissipation, and displacement cascades. Chapters 2 and 3, constituting the main thrust of the book, cover radiation damage to α-uranium. Chapter 2 is devoted to radiation effects at high burnup, i.e., under conditions of point-defect saturation. Chapter 3 covers initial stages of radiation damage, i.e., those effects having to do with point defects. Discussed in both Chaps. 2 and 3 is the recently discovered decrease in the rate of instantaneous radiation-induced growth with increase in burnup. Chapter 4 is a very brief discussion of fission damage in uranium compounds, including the carbide and various oxides. Chapter 5 is devoted to a discussion of self-irradiation in plutonium and the absence of satisfactory explanations for the observed effects. Chapter 6, entitled "Some By-Products of Irradiation in Fissile Materials," constitutes the secondary thrust of the book. It covers the effects of the presence of fission products on the physical properties of fuels; this chapter also contains a particularly thorough discussion of the transport of gaseous fission products in fuels.

The quality of the printing and of the presentation of the figures and the many plates is excellent. The same cannot be said for the writing style and mechanics. Early chapters of the book are marred by distracting errors and jarring idioms. Either the authors (editors and proofreaders) improved or the reviewer became more tolerant, for the final chapters of the book seemed to be much more easily read.

Three-fourths of the literature citations are for materials published in 1968 or earlier. One-fourth of the literature cited is in report form (mostly reports of French institutions) or in the categories "private communication" and "to be published." There are some instances of ambiguous citations.

Study of this book would benefit those persons seeking an understanding of basic knowledge, theoretical and experimental, on the subject of radiation damage to uranium metal. The authors give only very brief attention to plutonium and to alloys and oxides of uranium and plutonium. The book will have little influence on nuclear reactor fuel fabrication or management. That is not the purpose of the book, for, in the words of the authors, the purpose is ". . . focusing our blurred image of radiation damage in fissile materials, with the hope that it will initiate some new experiments in order to improve our knowledge on this topic."

Richard E. Faw is professor and head of the Nuclear Engineering Department at Kansas State University where he has worked primarily in the areas of radiation protection and radiation effects on materials. His education was at the University of Cincinnati (BS) and the University of Minnesota (PhD).

Nuclear Power Plant Systems and Equipment

Author	Kenneth C. Lish
Publisher	Industrial Press, Inc.
Pages	183
Price	$17.50
Reviewer	C. K. Anderson

Almost exclusively the industrial and academic development of nuclear power plants has focused on the reactor core and the primary system. While this attention has resulted in a significant number of important improvements in these areas, the so-called balance-of-plant, which encompasses 60 to 70% of the total cost of a nuclear power plant, has remained relatively constant. Perhaps there is no potential for further improvement in the design of secondary systems, but I rather doubt it. Instead, the problem may be more attributable to the lack of understanding of the unique problems associated with nuclear power plant systems and to the wide gap in the industry-wide attention to these problems.

Unfortunately, Kenneth C. Lish's book, *Nuclear Power Plant Systems and Equipment*, spans only a very small part of this gap. On the positive side, Mr. Lish's book adequately presents the atmosphere in which the plant designer must function. The attention to AEC jurisdictions and organizations and to the many code regulations and criteria are particularly noteworthy and should benefit a novice designer.

Basically, however, the book is a compendium of partially organized facts which only infrequently give the reader any insight into the basis for the design or the reasons why something is done as it is. For this reason, the book will not be very useful for motivating design improvements. For the same reason, the long-term usefulness of this book will wane as the facts change—some of which has already occurred with the advent of the BWR/6 and with practical design experience with the HTGR. Essentially, this book is a two-year-old "material list" of power plant equipment which will satisfy the needs of neither the industry nor many of its members.

The style of the book amplifies the above conclusions. The very superficial treatment of nuclear history and reactor design concepts contained in the first four chapters tends to bore readers having nuclear experience and offers no real help to non-nuclear personnel. The organizational choppiness and the heavy technical jargon do not encourage the reader to continue. The occasional error, as in the reference to Fig. 6-1 (p. 25) which does not exist, or the over simplified statements, such as "fast neutrons have to be moderated or slowed down into thermal neutrons to participate in the fissioning process" (p. 2), only serve to detract further from the usefulness of this book.

Practically speaking, however, *Nuclear Power Plant Systems and Equipment* will probably sell by virtue of its title alone because there is a clear need for reference sources on this subject. My own approach to this book was quite enthusiastic, but it was not until Chap. 5 that my initial enthusiasm was even vaguely justified.

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