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.

Reactor Shielding for Nuclear Engineers

Editor	N. M. Schaeffer
Publisher	U.S. Atomic Energy Commission Office of Information Services (1973)
Pages	788
Price	$13.60
Reviewer	F. Eric Haskin

Reactor Shielding for Nuclear Engineers is intended to serve as a text for a two-semester sequence in reactor shielding at an advanced undergraduate or graduate level. In that the book does bring together under one cover a wealth of modern shielding concepts, methods, data, experiments, and designs, it should indeed prove valuable to students and practitioners alike. I recommend it both as a text and as a reference book for those engineers concerned with shielding design. Of course, as a first edition of a text with eight contributing authors, it suffers in places from a lack of uniformity, questionable emphasis, and plain old mistakes. The overall editorial effort is nonetheless to be commended.

The book is divided into ten chapters. Chapter 1 provides a brief, interesting history of reactor shielding and a guide to earlier texts and handbooks. I was pleased to find that Chap. 2, "Sources of Radiation," adequately treats differential distributions, flux and current, and directional characteristics. Similarly, Chap. 3, "Interactions of Radiation with Matter," covers cross-section concepts and radiation units in some depth. I was also pleased with Chap. 6, "Shield Attenuation Calculations," which discusses the practicality of applying the shield design methods introduced in Chap. 4, "Radiation Transport," and in Chap. 5, "Monte Carlo Methods for Radiation Transport." Chapter 7, "Albedos, Ducts, and Voids," basically incorporates the ORNL-RSIC-20, 21 publications into the book. Chapter 8, "Shield Heating, Air Transport, Shield Materials, and Shield Optimization," is (albeit for lack of space) too short to cover any of these topics in significant detail. For example, there is no discussion of heat transmission data or computational methods, nor are thermal stress analysis or criteria treated. Chapter 9, "Experimental Shielding," is entirely descriptive (e.g., not a single equation in the chapter) with specific facilities and experiments being discussed. Neither principles of experiment or detector design, nor analysis and interpretation of experimental data are treated in depth. Chapter 10, "Shield Design," is also descriptive (of Enrico Fermi, Dounreay, Agesta, Pathfinder, N. S. Savannah, and SNAP-10A). No commercial pressurized water reactors or gas-cooled reactors are discussed.

Extensive supplementary material is included in the text. Cited references are listed at the end of each chapter (20 to 70 per chapter). An extensive subject index and a separate author index are provided. Sixteen appendixes augment the text and set apart pertinent but lengthy tables and series of shielding graphs. To supplement Chap. 5 on Monte Carlo methods, appendixes on random number generators and a demonstration Monte Carlo program are included. It is noted that the prompt-fission gamma-ray spectra alluded to in Sec. 2.4.1 (b) fail to materialize in Appendix A. Only fission-product gamma-ray spectra are tabulated. Five to eight exercises are given at the ends of Chaps. 2 through 6, with solutions provided at the back of the book.

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 as an engineer in the Product Exploration Division of the Boeing Company and as a visiting assistant professor in the Nuclear Engineering Department at the University of Arizona. He is now involved with shield design as a senior engineer for Bechtel Associates Professional Corporation, Ann Arbor, Michigan.

Nuclear Energy: Its Physics and Its Social Challenge

Author	David Rittenhouse Inglis
Publisher	Addison-Wesley Publishing Co., Inc. (1973)
Pages	395
Price	$4.95 (paperback)
Reviewer	Richard M. Adams

Nuclear Energy: Its Physics and Its Social Challenge is a textbook—and a very unusual one. In the words of the author, "This volume attempts

to bring to the reader, and particularly to the reader who is youthful at least in spirit, a piercing glimpse into both the scientific and humanistic aspects of nuclear-energy problems, including the problems of nuclear weapons, from the point of view of a scientist who professes enough concern that he may be given heed."

The book is organized to provide the basis for understanding both the technical and the socio-political aspects of the problems presented by nuclear activities without demanding a prerequisite knowledge of either. Such an ambitious task might have led a lesser man to a superficial treatment of both. But, as a respected physicist and an incisive thinker and commentator on the social aspects of science, the author, David R. Inglis, writes with authority and clarity and has succeeded admirably in maintaining direction, depth, and balance.

The first three chapters ("Basic Physical Ideas," "Some Features of a Power Plant," and "Atoms, Molecules and Nuclei") present the basic physical principles necessary for later understanding of discussions of the chain reaction, fission products, reactor operation and safety problems, biological radiation damage, fusion, the bombs, etc. The basic scientific ideas are presented in a qualitative fashion, not to teach science, but to provide the background for weighing technical alternatives and for making sound social and political judgments.

The following six chapters deal with the new and unusual problems posed by the advent of nuclear energy. The chapter on nuclear reactors as a power source presents an elementary understanding of the various kinds of power reactors and how they operate, and concludes with a nicely balanced discussion of reactor accidents and reactor safety. Other possible power sources, including fusion and solar energy, are treated in another chapter in which the projected world energy demand and attendant social problems are discussed.

A chapter on the effects and uses of radioactive products is concerned generally with the potential biological effects of radioactive effluent. As would be expected, the Gofman-Tamplin and Sternglass controversies are discussed and both sides of the arguments are presented in a factual and dispassionate way.

The remaining chapters discuss the control of fissile materials and the potential dangers of diversion; nuclear weapons and how they work, and some of the assumptions underlying military planning; and constraints on the arms race. This latter chapter gives an excellent brief history of arms control negotiations leading to the partial test ban, the nonproliferation treaty, and the Strategic Arms Limitation Talks. It is really here that "the social challenge posed by the nuclear fire" is brought into focus.

In addition to the basic presentation in the nine chapters of the book, an abundance of supplementary material is presented in 18 appendixes. This format has the strong advantage of making available valuable additional information without diverting the reader's attention from the major themes.

Although there are a few errors of fact, a few typos, and a few places where greater editorial attention would have removed some ambiguities and contributed to the smoother flow of ideas, these flaws are minor and do not detract from the author's success in achieving the difficult meld of elementary technical understanding of complex devices and a balanced discussion of the social and political problems which these devices have introduced to the world.

Although a textbook designed for college students without a science background, this volume should be of interest to a larger audience concerned with the broad aspects of nuclear energy. In our concentration on the trees of developing a better fuel element, an improved control system, or a more reliable heat exchanger, it is well not to lose sight of the forest of problems having national and international implications which must be dealt with. The purpose of the book is not to preach—not to present one point of view. Rather, the problems associated with nuclear weapons and with nuclear power and its radioactive offal are posed in a concerned and thoughtful way.

As the author states, "An important part of the social challenge of nuclear energy is to reap the benefits of nuclear energy without undue harm." His book should go a long way toward providing the background necessary to make sound social and political decisions.

Richard M. Adams, who received his PhD in chemistry from the Illinois Institute of Technology in 1953, has been associated with nuclear energy activities for more than 25 years. He began his career as a chemist with the Metallurgical Laboratory at the University of Chicago and has continued with its successor, Argonne National Laboratory. For the past eight years he has served as assistant laboratory director.