Book Review

Principles of Radiation Shielding. By Arthur B. Chilton, J. Kenneth Shultis, and Richard E. Faw. Prentice-Hall, Inc., Englewood Cliffs, New Jersey (1984). $39.95.

The first thing that should be said about this attractive textbook is that it is a book on radiation *shielding*, not on radiation *transport*. It is written to be used in semester- and year-long courses in engineering schools, mostly for graduate students in nuclear engineering. The authors are themselves professional engineers, with long experience in both teaching and research in radiation shielding and transport.

As might be expected, therefore, the organization of this book as well as the selection of topics to be presented bears the stamp of joint familiarity with the requirements of students and the progress of research emphases over many years.

The second noteworthy aspect of this book is that it integrates several different shielding subfields which offer important contrasts. The largest set of earlier shielding books is focused on the requirements of nuclear reactors. This book aims to be more general, including shielding for various x-ray sources, particle accelerators, and various types of radioactive sources, as well as reactors. Because this emphasis, relatively new, is to some extent exploratory one needs to ask how well it succeeds. My general reaction is that the similarities in the physics and in the methods of approach are great enough to leave an impression after reading the book that these subtopics belong together, more or less as in this text. I think that this represents no small accomplishment by the authors. Whether this approach becomes standard probably depends on the extent to which nuclear engineering as an academic field of study effectively includes a much wider scope than that of reactor design for power generation. My impression is that the field has indeed a very broad scope, and that this type of text will be in common use.

While still addressing questions of organization, let me be more specific. The first five chapters (144 pp.) treat the ingredients of the subject, one by one: characterization of radiation fields and sources, basic interactions, radiation sources, and detector response functions. Chapters 6 through 9 (165 pp.) give special techniques and approaches to attenuation of photons and neutrons. Transport theory is succinctly presented in Chap. 10 (65 pp.), and Chap. 11 (42 pp.) is an important summary of the properties of shielding materials, with emphasis on radiation heating and damage. The six appendixes give data, both for applications and for problems. Note that Chaps. 10 and 11 are the only two chapters not accompanied by a set of problems for student exercises.

Omissions of consequence spell out lecture opportunities for teachers of this course: There is little historical perspective included. Nor are there descriptions of major shielding accomplishments, nor raw data for an identified real problem which has been solved. Thus structure and air shielding at Hiroshima and Nagasaki, the various weapons test problems, specific and existent reactor shielding designs and their performance, etc., are not to be found in this book and would, I expect, provide desirable subject matter for accompanying lectures. Similarly, there is little information on structure shielding against initial nuclear radiation from modern weapons or on problems of shielding against fallout gamma rays, despite the fact that one of the authors was co-author of a book on this subject (see p. 5). It is also likely that in the middle chapters the teacher will want to provide additional material to enable the students to develop more perspective on competing procedures.

Students who might consider taking this course early in their development of familiarity with radiation transport phenomena should be warned that there is an implicit requirement at this point which is made evident by placing the material on radiation transport very late in the book. In effect, Chaps. 10 and 11 constitute resource material for the earlier chapters. Students had better have some activity throughout the course that keeps them easily familiar with many general transport concepts; otherwise the many methods which constitute the middle chapters may prove indigestible. In this regard I am doubtful that a regular diet of the problems is sufficient.

This same feature has the advantageous aspect that this book makes an excellent reference for anyone concerned with the subject. It sharpened some hazy perceptions of several procedures for me; and I am sure that on more than one future occasion I will refer back to material in this book.

The referencing and identification of source publications appears to be rather good and to provide a starting point for further study of the literature.

The exposition is generally clear and concise. In reading through the book I did find many items or statements which provoked a question, a qualification, or possibly a disagreement with a statement as made. Many of these represent a difference of point of view, and the totality does not detract from a very sound text. I would encourage classes using this first edition to refer to the authors any such items which they do not resolve in class.

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July 3, 1984

About the Reviewer: Lew Spencer has long been a member of the staff of the Radiation Physics Division, Center for Radiation Research, National Bureau of Standards, where his current interests are in the theory of radiation penetration. Dr. Spencer has had extended experience in the academic world and received the Distinguished Service Award of the Office of Civil Defense. He completed his graduate studies at Northwestern University.