various processes either in the monograph or in one of the references given in the bibliography at the end of the chapter.

Chapter 4 is a fairly complete and self-contained exposition of the theory of ideal and square cascades. Some attention is given to cascade optimization, but time-dependent cascade behavior, which is important for cascade control, is only treated briefly in a discussion of the equilibrium time of a cascade. The theory developed in this chapter is used repeatedly in the discussion of the specific isotope separation processes that make up the remaining chapters of the monograph.

Chapters 5 through 13 present detailed discussions of specific isotope separation processes that currently are, or have been, used for the large-scale production of isotopes. The processes covered in these chapters are gaseous diffusion, centrifugation, hydrogen distillation, electrolysis, exchange-reaction, and electromagnetic separation. These chapters are the core of the monograph. Within the limits of security classification, they present a reasonably complete description of the status of each process based on information available through about 1972. Each chapter includes a summary of the physical and chemical principles underlying the technique, a discussion of unique engineering problems associated with each process, a description of plant size equipment and plant operation, and, where possible, a study of the economic factors that help dictate plant design. The information provided in these sections of the monograph would normally be accessible to a reader only by searching and surveying a wide variety of publications, some of which are not readily available in the usual library collection.

As an illustration of the coverage provided in Chaps. 5 through 13, consider Chap. 5, which deals with the gaseous diffusion process for the production of uranium enriched in ^{235}U from naturally occurring uranium, which contains ~0.7% ^{235}U. The chapter begins with a presentation of a theory of flow through porous barriers under conditions pertinent to the gaseous diffusion process. This is followed by a brief presentation of the various ways in which a gaseous diffusion stage can be operated and of the arrangement of stages in a cascade. After mentioning some of the particular materials problems encountered in the process, the chapter continues with a discussion of the factors governing the choice of operating conditions of a plant, plant construction features and operating problems, and a description of production plants currently in operation. The chapter ends with a presentation of the economics of the gaseous diffusion process.

Chapters 6 through 13 are organized in a fashion similar to Chap. 5, although not all of them are as complete. Lack of completeness, when it occurs, can almost always be attributed to the inaccessibility of information due to security classification or to the fact that the detailed physics describing the process is not completely known. Each of these last chapters is followed by an excellent categorized bibliography, which can guide the reader who is interested in further details.

To meet the energy needs of the world in the coming decades, it is anticipated that new plants for uranium enrichment will be needed starting in the mid or late 1980's. This fact makes the publication of this monograph particularly timely. For those interested in large-scale isotope enrichment, the monograph provides a useful source of information concerning the techniques and problems associated with this field.

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About the Reviewer: Abraham S. Berman is a professor in the Department of Aerospace Engineering and Mechanics at the University of Minnesota. His interest in isotope separation dates from the war years, when he was a member of the research staff of the Manhattan Project's SAM laboratories and of the Oak Ridge Gaseous Diffusion Plant. Dr. Berman's undergraduate training was at the College of the City of New York, followed by a graduate degree from Ohio State. He presently serves on advisory committees to the centrifugation project.

Modern Formulas for Statics and Dynamics: A Stress and Strain Approach. By Walter D. Pilkey and Pin Yu Chang. McGraw-Hill Book Company, New York (1978). 418 pp. $18.50.

The stated purpose of this book is to fill the gap between handbook formulas and large-scale, general-purpose computer programs. Clearly, the book is successful in achieving that goal. As an extension of handbook formulas to include more complex situations that are amenable to batch and/or remote-terminal computer solutions, this book should find wide acceptance among practicing design engineers.

Each chapter is well organized, incorporating a logical presentation of subject matter. The first part of a typical chapter outlines the basic applicable formulas. Tables usually follow that contain, for example, geometric properties, loading functions, initial parameters, transfer matrices, and natural frequencies. The tables are easy to read and follow, a fact that contributes significantly to the success of the book. The layout and organization of the tables will be of great benefit to the engineer who must work rapidly and have access to information with a minimum of effort.

Many of the formulas listed in the tables are in a ready-to-use format, as one would find in the typical sort of engineering handbook. Others, where more complex geometries are involved, are presented in conjunction with the transfer matrix method, and additional formulas incorporate finite element procedures. The presentation of these latter two methods is made more convenient by noting the pertinent computer programs that are available and how these programs can be obtained by the engineer.

The book is applications oriented, so that there is no real attempt at development of the formulas presented. However, for a given situation, e.g., simple and complex beams, the tables clearly show the appropriate modifications that are necessary as the specific application changes, so that extensive background (and/or review) in the area should not be necessary for an engineer with some design experience. For those readers who feel a review would be helpful, reasonably extensive reference material is provided.

The tables include transfer matrices for numerous situations that a designer could be expected to encounter. As a further aid, an appendix is provided that outlines several techniques for deriving transfer matrices. The authors recognize that use of the transfer matrix method can, in some cases, be hindered by numerical difficulties. A second appendix is provided that outlines the use of the Riccati transformation, in combination with the transfer matrix, in overcoming these difficulties.

There are several solved illustrative examples in each section of the book. Should the user have his own computer program available, these examples will allow him to verify the accuracy of his program. Furthermore, the examples would be of benefit to the engineer seeking to refresh his background in the area by doing practice problems. The particular computer

program used by the authors in a specific example is typically noted.

Some of the example problems in each chapter are solved in SI units, and others employ English units. A point is made of the fact that the variables in the tables and the computer routines are not assigned inherent units. The potential user is given the very important reminder to employ a consistent set of units in his calculations and computer program imputs.

As noted previously, although numerous loading situations and geometries are treated, there is very little development presented. This is certainly in keeping with the objective of the book, namely, to make it as useful as possible for the practicing design engineer needing easy access to material that will enable him to solve a particular problem in the shortest amount of time and, significantly, within a limited budget. This particular orientation, however, would seem to limit the book's usefulness as a basic textbook in lower-level design engineering courses. Students in such courses would presumably lack the depth of background required to use Pilkey and Chang's book most effectively. It would appear that a more appropriate use of the book in a sequence of courses would be as a supplementary text at the advanced undergraduate and graduate levels, where the students would have already established a reasonable level of background knowledge in the subject matter. Where the lecture content is especially rich, this volume would probably suffice as the main text in an advanced course.

The unusually wide variety of structures, geometries, and loading situations examined makes *Modern Formulas for Statics and Dynamics* a useful and necessary addition to any engineering library.

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About the Reviewer: Robert Zerwekh, an associate professor of mechanical engineering at the University of Kansas, received his academic training, largely in metallurgy, from the University of Missouri-Rolla and, at graduate level, from the University of Illinois and Iowa State University. Dr. Zerwekh's teaching is currently in metallurgy and materials science, thermodynamics, and fluid mechanics. His research interests are in properties of solids, plastic deformation, and solid-state phase transformations.

Basic Nuclear Engineering. By K. S. Ram. Halsted Press (a division of John Wiley & Sons, Inc.), New York (1977). 221 pp. $9.75.

Basic Nuclear Engineering is a very compact textbook about the size of a regular *Reader's Digest*. The author, K. S. Ram, formerly of the University of Cincinnati, is now at the Indian Institute of Technology, Kanpur. The book is unique in other ways; Dr. Ramanna, Director of the Bhabha Atomic Research Center, notes in the Foreword that "... [the book] fills a long felt need for a book by an Indian author on this subject." If my limited knowledge of the nuclear program in India is correct (the *Nuclear News* World List of Nuclear Power Plants), there are two boiling water reactors (Tarapur) and one pressurized heavy water reactor (PHWR) (RAPP.1) operating, with five additional PHWRs under construction. Professor Ram has keyed his text to the CANDU-type reactor to the extent that essentially all of the examples and problems related to power reactors consider this concept.

The organization of the chapters is traditional, with a review of nuclear physics and radioactive decay, followed by neutron reactions, slowing down, four-factor formula, etc. The emphasis on heavy water systems at times leaves one with the feeling that he is reading from Glasstone and Edlund or one of the other very early texts, where a great deal of emphasis was placed on natural uranium and graphite. Here, of course, emphasis is on heavy water rather than graphite. In later chapters, the headings are sometimes confusing. Chapter 10, "Design Considerations of Control Requirements," is a discussion of control materials, a brief introduction to control requirements for a power reactor, and then the traditional control rod worth calculations for a central rod in a cylindrical reactor and a cruciform rod. Chapter 11, "Heat Transfer Problems in Reactor Engineering," treats only the primary side of the plant; nowhere in the book is the entire nuclear plant described or discussed. Chapter 13, "Shielding," is more nearly "Radiation Protection."

Few nuclear engineering textbooks devote more than a paragraph to thermal stresses, but in *Basic Nuclear Engineering*, Chap. 12 is devoted to this topic. The author considers primarily the pellet and cladding, but includes a final section on thermal cycling of components in general. Chapter 14, "Fuel Cycles," has a particularly interesting section on the use of axial fuel movement to obtain uniform burnup. This concept is applicable only to systems with on-line refueling (e.g., CANDU) and is not discussed in most U.S. textbooks. There is no material presented on instrumentation, safety, accident evaluation, or licensing. The latter three topics have become so crucial for successful nuclear plant evolution that even a textbook on "basics" should include some mention of these areas.

The author has elected to omit tables of nuclear data usually presented in an appendix, and his bibliography is very limited and in some instances refers to articles or reports not generally available.

In the past few years, several excellent new or revised textbooks have been published for the advanced undergraduate and first-year graduate level. Since *Basic Nuclear Engineering* has been prepared so specifically for the Indian nuclear program, it has severe limitations when it is considered for students in the U.S. Of course, basics are basics, but there are essentially no examples or problems included on light water reactors. Adoptions in the U.S. market will be hampered by the omission of so much material that is important to the U.S. nuclear program.

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