concerned with liquid metal cooled reactor systems, due to the complication and expense involved. The six appendices give information on steam cycles, Mollier charts, elementary thermodynamics, and turbine characteristics which should be familiar to the well informed college junior majoring in mechanical engineering.

The monograph suffers from attempting to survey a large and important field in a few brief pages. When the author is dealing in a subject with which he is familiar, graphite moderated gas cooled reactors, his presentation is succinct although somewhat superficial. His presentation of steam cycle engineering situations outside the scope of this reactor system should be disregarded.

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Radiation Biophysics. By Howard L. Andrews. Prentice-Hall, Englewood Cliffs, New Jersey, 1961. 328 pp., 105 illustrations, $11.35.

Howard L. Andrews is author of other books and many articles about the biological effects of radiation. As Radiation Safety Officer, National Institutes of Health, and Executive Secretary of the Biological Effects of Atomic Radiation Committee, National Academy of Sciences, he is eminently qualified to write on the subject of radiation biophysics.

In his most recent book, *Radiation Biophysics* he offers a unified account of the physical principles, chemical action, and biological effects of ionizing radiation. Andrews begins with the structure of the atom and proceeds to discuss the various kinds of radiations and how they are produced, the interaction of radiation with matter, methods of dosimetry, chemical effects of radiation, effects on macromolecules, effects on cells, clinicopathological effects, and health protection. Problems and bibliographic references are included at the end of each chapter, and tables of useful physical constants and biological data are appended at the back of the book. Helpful diagrams, formulas, working graphs, and illustrative examples are used generously throughout, and the subjects covered are listed in an inclusive index.

The author's terse, lucid, and engaging style should make the book intelligible to a wide audience of nonspecialized readers. Since, however, none of the subjects is treated exhaustively, the volume should be more useful as a guide to students and others wishing to survey the field of radiation biophysics, than as a reference book for workers in radiobiology, radiology, health physics, and related disciplines. Nevertheless, an unusually broad range of questions is covered coherently and concisely, without sacrifice of objectivity or timeliness, and with creditable accuracy. One might only wish that the author's skill would be applied to an expanded treatment of the same material in later editions.

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Nuclear Reactor Theory. By J. J. Syrett. Simmons-Boardman, New York. 76 pp. $1.95.

This work is a very brief treatment of the subject of reactor theory originally published by Temple Press Limited in 1958 as one of several monographs on nuclear engineering. The material in this monograph was developed from lectures presented by the author to students of engineering and physics at the University of Manchester. The author is a member of the Reactor Division of the Atomic Energy Research Establishment, Harwell.

The expressed purpose of the monograph is to provide an outline of the physics of nuclear reactor design for the benefit of the nonspecialist in the field. It was the author's intent to achieve a light treatment at low cost. Knowledge of elementary calculus and nuclear physics is assumed. The treatment introduces the essential physical concepts and ideas by brief descriptions and discussion, with some use of mathematical analysis to develop the more complicated notions. Concepts and methods used in the reactor theory which were drawn from other areas of physics and analysis are introduced with a simple reference to a classical source.

The text includes chapters on: nuclear chain reactions, diffusion of thermal neutrons, slowing down of neutrons, the calculation of critical size, lattice calculations, reactor operation at power, and types of reactors and fuel cycles. The first four chapters (47 pages), in the order mentioned, are general treatments, with an occasional reference to the relevant properties of natural uranium and graphite systems. In the last three chapters, emphasis is placed on the detailed characteristics of heterogeneous, uranium-graphite, gas-cooled power reactors of the type developed for power stations in the United Kingdom. The individual chapters are divided into sections (varying from 5 to 15), some so brief as to consist of only a few sentences; thus, descriptive passages tend to be extremely short. Many working formulas (relevant to uranium-graphite systems) and recipes are reported.

Of these seven chapters the ones on diffusion and criticality are the most satisfactory. The ideas are developed systematically and the various sections are nicely related. The use of mathematical tools are prevalent here, and this aids in achieving continuity and completeness. The chapter on lattice calculations is very short and involves almost no analysis, including only a brief outline of some formulas developed from the old point of view (pre 1955). The chapter on slowing down is rather disappointing, perhaps because the analytical models used are not the most satisfactory. Many of the essential ideas, such as the asymptotic flux distribution and resonance absorption, could have been better developed by means of the continuous slowing-down model. The author chose, instead, a rather coarse treatment based on a one-group representation. The very briefest mention is made of more sophisticated models, such as two-group, Fermi-age, and multigroup, too brief to convey any important information. The concept of age and the use of the age parameter is entirely omitted. The last two chapters consist of a total of only ten pages and may be of value to persons with no knowledge of the field; but it is questionable, since about all that is accomplished is the introduction of the nomenclature and language.

The essential purpose of this monograph, in the opinion of the reviewer, is to provide a survey of the subject for the benefit of technicians not directly involved in the physics of nuclear reactor design. Perhaps it is aimed too at providing managers with a superficial knowledge of the field and a vocabulary. The only similar work to which this monograph might be compared is Soodak and Campbell's "Elementary Pile Theory," published by Wiley in 1950. Syrett's work is, of course, more up to date, both in data and viewpoint. Actually, it may well be considered an abbreviated version of Littler and Raffle's "Reactor Physics," published in 1955.

On the basis of the author's stated purpose, this work is perhaps a success, but a limited one. Limited, because it is concerned principally with the physics of heterogeneous, natural uranium–graphite power reactors. Consequently this monograph will enjoy at best a short-lived popularity. Its usefulness could have been greatly enhanced if the treatment of the subject had been broader. There are, after all, many other types of reactors, some with a considerable history of design and operating experience. Unfortunally, this criticism applies to other recent publications by the English nuclear technologists as well. The English have enjoyed a significant success with their uranium–graphite power reactor development program, and it is to be expected that their technical literature will reflect this experience, certainly through the publication of papers and reports. The reviewer questions, however, the incorporation of such material into a text (albeit a monograph), when the point of view is so restrictive. It is very apparent that this work, and the course from which it was developed, was intended to help train in rapid order a generation of nuclear technologists to design and operate the current model of the United Kingdom's power reactors.

For a survey work, the text is well written and shows understanding and style. The inclusion of so many recipes, however, detracts from its quality. If the purpose of the monograph is to provide a rough understanding of the subject, why then does it contain working formulas with dimensional constants? The implication is that the student with these results can now design a reactor for himself by simply inserting his own set of numbers. This is not in the best tradition of engineering education.

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Fast Reactor Cross Sections. By S. YIFTAH, D. OKRENT, AND P. A. MOLDAUER. Pergamon Press, New York, 1960. 130 pp., $5.00.

This work would have made a fine technical report, but it is hardly worth the delay, expense, and publicity involved in the publication of a hard-cover book. Technical books should really be reserved for discussions of more general principles, or at least the subject matter ought to be of widespread and long-lived usefulness.

This report presents fast reactor constants for a particular group structure and calculation scheme. The reasons for choosing certain values for the cross sections are well described, but the emphasis is clearly on what was done, rather than what is a good thing to do. As for usefulness, the conclusion is reached on the very last page that more precise measurements are needed since these constants fail to predict criticality. It is not that the above features should have, or ever could have, been changed to make the report a better book; it is simply that a technical report would have been the appropriate outlet for this project.

Unlike several of the books on nuclear energy issued by Pergamon Press lately, this volume contains much more than has been reported at the Geneva Conferences. Sixteen-group cross sections, ranging from 500 ev to 10 mev mostly in half lethargy intervals, are presented and discussed for 25 important nuclei from data collected up to March 1960. Preliminary comparisons with experimental reactor systems are also included.

While the results of this study are likely to be only of passing value, some of the techniques used in the art of "guesstimating" values are quite clever and presently very useful. For example, the fission cross section of Pu^{241} is taken to be that of U^{233} because their spins are equal and resonance parameters similar (the values have since been found to be about 10% too high when measured). Extensive theoretical calculations have been utilized to supplement the data. Many types of experimental tests, like sphere transmission measurements for fission spectrum neutrons were made, but probably because the cross sections are for fast reactors, no attention was paid to age experiments or resonance integrals. Success with reactor systems is a goal yet to be achieved, and no constants were adjusted by matching such data.

The book leaves an impression that progress in developing calculational techniques has varied inversely with the speed of reactor systems. Although "honest" constants at all energies have been tested in slow reactor systems for years, the authors of *Fast Reactor Cross Sections* describe