The sections on numerical methods are skimpy but what they do contain is certainly worth reading. This reviewer was very much impressed with the section on multigroup slowing-down equations for highly absorbing media.

Some of the material on numerical methods is new; some is old but not well known in the United States. One may cite, as an example, a Russian relaxation method which leads to a diagonal mesh sweep in two-dimensional problems. Apparently much work has been done on this method in Russia, work which seems to have been overlooked in this country.

Discounting its flaws, which we have belabored here, Marchuk's book deserves a wide audience. Nevertheless this reviewer still hopes that Marchuk will give us, some day, the book he promised in his introduction.

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(About the Author: In 1954 Dr. Gelbard received his Ph.D in physics from the University of Chicago. Since that time he has specialized in the development of numerical methods for the solution of reactor physics problems. Gelbard is now Vice Chairman of the R. M. and C. Division of the American Nuclear Society.)

Plasmas and Controlled Fusion. By DAVID J. ROSE AND MELVILLE CLARK, JR. MIT Press and Wiley, New York, 1961. 493 pp., $10.75.

The authors of this book are MIT professors with a background in teaching, research, and engineering applications of plasma physics. The book developed from their graduate classes for students of mixed background in physical sciences and engineering.

The book contains 493 printed pages. This includes a table of contents, and assorted appendices on notation and conversion of units. There are 200 illustrations and 209 specific references. The printing is superior and there are very few typographical errors.

The display of literary prowess in the introduction is apparently not intended to discourage engineers. This is a book with a mission. The authors have triumphantly written all equations in mks rationalized units and "wish all other systems a speedy trip to oblivion." The authors are to be congratulated on the tenacity with which they have labored to change the units employed in the original papers over to the mks rationalized system.

The content of the book is very ambitious. It attempts to cover the older aspects of ionization phenomena as well as the more recent developments in plasma physics. In addition there are three chapters on fusion devices and two chapters on fusion reactor energy economics. Consequently the depth of penetration of each subject is not impressive. A "once over lightly" treatment of almost every aspect can be found. There is however little discussion of the foundations of the subject. One can learn about some applications, but not much about the applicability of descriptions based, for example, on the hydromagnetic equations or the dynamics of single particles moving in an assigned field. The Vlasov equations do not make an appearance in the book at all which is a little surprising in view of the fact that most modern plasma physics is based on these equations. It is of course difficult to discuss the validity of the hydromagnetic equations or single particle pictures without reference to the Vlasov equations. It would be even more difficult to discuss the velocity-space microinstabilities so that this important aspect of the subject is neglected completely.

The discussion of fusion devices includes linear, toroidal, and θ-pinches, mirror machines, DCX, and OGRA, the Astron and the Stellarator. It is reasonably up-to-date and includes many of the highlights of the experimental results to date. It is descriptive rather than critical. After reading about the experiments one does not have a very good idea about the degree of disparity between theory and experiment that currently exists.

More lucid presentations and more comprehensive treatments of most of the subjects considered can usually be found in other textbooks currently available. However, a textbook with broad coverage that does not presume a substantial foundation in classical physics and mathematics is certainly lacking at this time. The authors have done a creditable task of surveying the current literature and expressing it in a form that should be digestible to someone with an engineering education that includes a reasonable basis in mathematics and classical physics.

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(About the Reviewer: Norman Rostoker is Assistant Manager of the joint General Atomic-Texas Atomic Energy Research Foundation fusion project, General Atomic, San Diego, California. He was Supervisor of Theoretical Physics, Armour Research Foundation from 1953 to 1956. He received his B.S. degree in engineering physics, his M.S. in applied mathematics from the University of Toronto, and his D. Sc. in physics from Carnegie Institute of Technology.)

Reactors of the World—Second Series. Simmons-Boardman, New York, 1961. 28 pp., 26 illustrations, $3.50.

The second series of "Reactors of the World" presents drawings and data sheets on 13 reactors of various types and national origins. As with the first series, these data sheets have been extracted from the reactor descriptions presented from time to time in the British journal, *Nuclear Engineering*. Those of us who are accustomed to reading this journal have been impressed by the fine detail of the diagrams accompanying the reactor descriptions.

The reactor systems presented in the second series include the British reactors Pluto (heavy water, materials testing), Merlin (light water, research), Hinkley Point (carbon dioxide cooled, power), Zenith (zero power, experimental); the U. S. OMRE (organic, experimental) and N.S. Savannah (pressurized water, propulsion) reactors; the French G-1 (air cooled, production) and G-2 (carbon dioxide cooled, production and power) reactors; the Canadian NRU (heavy water, materials testing) reactor; the Belgian BR-3 (pressurized water, power experiment); the Norwegian Halden (heavy water, experimental); and the Italian Latina (carbon dioxide cooled, power) reactor.

The national distribution of reactors is much improved over the gross preference for British designs, which was apparent in the first series of "Reactors of the World." However, a better national distribution is certainly required to justify the international title.

Three of the reactor systems, Dragon, BR-3, and the Savannah, are presented as foldouts of large size (19 in. by 29 in.) which are suitable for framing with their excellent detail and contrasting color schemes. Apparently the book is designed to facilitate easy removal of the single sheet reactor descriptions since the binding consists of only staples although there is an incongruous hard cover which one would expect with a more permanent type of binding.

The listing of reactor data leaves much to be desired. As in most such compilations, the data is usually of little importance to the serious reactor designer. No reference is made to the quality of data, viz., whether the presented data is empirical or calculated. Cross comparisons also become difficult because of a lack of uniform data presentation. In this reviewer's opinion, there is little justification for the separate publication of this compilation outside of the previously mentioned advantage of possibly framing a reactor illustration.

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(About the Reviewer: Edward D. Jordan is Associate Professor of Nuclear Engineering and Director of the Nuclear Engineering program at The Catholic University of America, where he directs research in reactor design, and the engineering uses of radiation. Prior to joining the University he was with the AEC Civilian Power Reactor Evaluation Group.)

Introduction to Nuclear Engineering. By RAYMOND L. MURRAY. *Prentice-Hall*, Englewood Cliffs, New Jersey. 384 pp. $12.00.

Those acquainted with Dr. Murray's first edition (first printing March, 1954) are aware that it was one of the first texts available that covered subject matter, properly arranged, (at that time) to be called an introduction to nuclear engineering.

Dr. Murray is well qualified to author this book. He and Dr. Beck designed and literally built the first reactor on a U.S.A. campus. Their water boiler at North Carolina State led the parade of University reactors. Dr. Murray's physics background plus his experience as a consultant on many types of reactors puts him on the somewhat exclusive list of those who have both a good theoretical knowledge and practical experience.

I have used his first edition as a text for senior level, nuclear students for six semesters. I selected Murray's book after making a thorough check of all available texts. I found it to be at the proper level for this use and it had the best coverage of material for an introductory course. My students had a prerequisite nuclear physics course that prepared them for this text and, in fact, reduced the importance of the first two chapters. The first two chapters provided a good review, however, and was useful. I am glad to see this material retained in the second edition.

As of 1960, some sections of his first edition were becoming dated, other new texts were available, and after seven printings it was becoming obvious that Dr. Murray's book needed updating.

In the second edition, Dr. Murray not only updated his book, but took advantage of the opportunity to rewrite the text and consolidate related chapters to give better continuity. More comprehensive treatment has been given such subjects as particle accelerators, fuel costs, properties of new materials, shielding analysis, reactor experiments, isotope use, direct conversion, ion propulsion of space vehicles, and thermonuclear devices.

The content is well organized and covers the subjects that I consider well chosen for an introductory text. These subjects include a one-group model reactor analysis and design, various reactor concepts, fuel production, reactor operation, reactor materials, heat transfer and fluid flow, health physics, shielding, detectors, controls, isotope uses, kilowatt generation, nuclear propulsion and fusion, plus a good appendix on reactor theory for those who desire to go farther into reactor theory. The details of the book including binding, paper quality, printing and index are very well done.

Old Chapter 12 covering application of theory from other chapters to the design of a liquid metal cooled reactor was deleted. While it would be helpful to the student to have the material retained in the second edition, the author chose to delete the chapter. This released 28 pages for new material without increasing the bulk of the book. Other appropriate deletions include old Chapter 7, the water boiler and swimming pool reactors; and old Chapter 20, building heating.

Important additions include an up-to-date Chapter 5 covering reactor concepts, such as: PWR, sodium graphite; EBWR, homogeneous reactor and the fast breeder and EBR. Fig. 5.5 is the EBR, not Enrico Fermi, as captioned. The addition of the build-up factor discussion in the shielding section is very desirable.

The book is well illustrated with 17 major illustrations and 123 charts and sketches. Arithmetical examples worked out in detail in the chapter text help the student understand the application of the theory.

The problem sets at the end of each chapter in the first edition left much to be desired. In the new edition, the problems have been improved by the addition of new problems and revision of the old problems. A manual of problem solutions is available which will be helpful to instructors.

It was a mistake to devote an entire page to table 3.1, uranium prices, in the second edition. These prices have changed since the book was published and the book is already dated. Increasing the price of the book to $12.00 makes it a little expensive for an introductory text. However, in my opinion, it is worth it, and I like it for a classroom text and a reference for advanced junior and senior college level students.

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(About the Reviewer: Glen Schoessow received his M.S. degree in engineering from Purdue in 1933. He began his career in nuclear engineering starting with the Brookhaven reactor modification in 1947. Since that time he has accumulated experience in the submarine program, power reactors, and research reactors. Since 1958 he has been teaching graduate courses and the undergraduate course mentioned above, directing research, and operating the reactor in the Nuclear Engineering Dept. at the University of Florida.)