Eng., **32**, 280, 1968) applies equally well to the revised edition.

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About the Reviewer: C. L. Tien is a professor of mechanical engineering and chairman of the Thermal Systems Division at the University of California at Berkeley. He received his BS degree from the National Taiwan University, MME from the University of Louisville, and MA and PhD from Princeton University. His main research interest lies in the various areas of heat transfer.

Nuclear Heat Transport. By M. M. El-Wakil. International Textbook Company (1971). 502 pp. $16.50.

This book is one of two contemporary volumes by the same author which, taken together, represent an expansion of his earlier book *Nuclear Power Engineering*, published in 1962. The companion volume titled *Nuclear Energy Conversion* takes over where the present one leaves off. The present volume covers a wide range of subject matter. The first three chapters cover the topics of nuclear and reactor physics, while the fourth treats the conversion of the energy sources in fission and radioactivity to heat. The rest of the book is devoted to the problems of transferring that heat to the reactor coolant and then transporting it from the reactor to the energy-conversion system.

The material in the four introductory chapters is presented in a concise and simplified form, which makes it a quick and useful reference for the thermal engineer who is more concerned with the heat transfer than the reactor physics. It is also helpful for the engineering student who has not had a course in reactor physics and who uses the book as a text in a nuclear heat transfer course. The essential features of reactor physics are covered in appropriately simplified form for a text book on heat transfer, with many useful equations, quantities, and graphs given. However, the condensed nature of those chapters occasionally leads to hard going for the reader unfamiliar with reactor physics. Also, there are a few parenthetical statements that may be misleading, because the author was unable to qualify them, for lack of space. These are minor complaints, however; taken as a whole, the four-chapter section is well written, moves along at a competent pace, and contains a good deal of handy reference material. In this section, a substantial list of references is given, among them being BNL-325, the classic Brookhaven reference on cross sections. However, to the chagrin of the present reviewers, it is credited to the Argonne National Laboratory.

Chapters 5 through 8 deal with the general problem of heat conduction in reactor fuel elements. The material is presented in a logical order, starting with the treatment of the more simple one-dimensional steady-state cases and ending with the more difficult two-dimensional, complex-geometry, unsteady-state cases. The theory is presented clearly, derivations of basic heat transfer equations are given, and practical methods of solution are detailed; but (with the exception of that in Chap. 6) most of the material is little different from that found in published heat transfer texts.

Chapters 9 and 10 cover the problems of single-phase convective heat transfer, the former dealing with ordinary fluids, and the latter with liquid metals. In the opinion of the present reviewers, the overall quality of the presentations in these chapters (particularly Chap. 10) does not keep pace with that in Chaps. 5 through 8. For example, the treatments of the hydrodynamics and thermal-entry problems and that of the effect of axial variation of wall heat flux in Chap. 9 are both limited and out of date.

The descriptive introductory material in Chap. 10—dealing with the neutron-absorption capacity, induced radioactivity, and transport properties of liquid metals, and their compatibility with materials of construction—is considered to be quite adequate for such a book. It is covered in eight and one-half pages. However, the five-and-one-half-page treatment of the heat transfer characteristics of, and correlation for, liquid metals is entirely too short, considering the importance of sodium-cooled reactors in the present and future American power pictures. Only ten lines of text are devoted to the paramount topic of heat transfer to liquid metals flowing longitudinally through rod bundles, while there is almost enough material in the open literature on this topic to make a volume all by itself. On the other hand, seven pages were devoted to the heat transfer characteristics of liquid-metal reactor fuels and ten pages to liquid-metal pumps—too much, in the opinion of the present reviewers.

In Chap. 11, a very extensive subject—Heat Transfer with Change in Phase—is covered in just 32 pages. Such a short treatment permits touching the high spots only. Both boiling and condensation heat transfer are discussed, with boiling taking about 80% of the space. The pool boiling and forced-convection boiling topics are discussed together. It would have been better to separate them, for in their thermal-hydrodynamic behaviors they are quite different. Also, the reviewers felt that the information in this chapter could have been more up to date.

Chapter 12, on two-phase flow, is felt to be one of the better chapters. The subject matter is well organized and the presentation is up to date and sufficiently extensive for a book of this type. Chapter 13 is a very readable discussion of the general principles underlying and practical approaches to the thermal-hydrodynamic design of nuclear reactor cores; finally, Chap. 14 treats some of the special topics encountered in the design of boiling-reactor cores.

The Preface to the book states that it was written primarily as a text for senior and graduate students in engineering, chemistry, and physics, but also for the practicing engineer. It should serve quite well as a college text; but the reviewers are of the opinion that the practicing (or design) engineer would be well advised to supplement it with additional, more up-to-date material found in monographs and the engineering journals. Probably a better approach would have been to write the book for seniors and graduate students in engineering only who would have already had a course in heat transfer. This would have allowed the author to eliminate much of the elementary material and replace it with more advanced, up-to-date material, which would have also made the book more useful to the design engineer.

The book contains a few statements of fact which the reviewers, for one reason or another, considered either confusing or misleading. Among these are: (a) "A reactor with a negative temperature coefficient is inherently safe," p. 67; (b) the discussion of void coefficients, p. 70; (c) the low-valued after-heat curves, pp. 96 and 97; (d) the friction-factor information for annuli and rod bundles, p. 234; (e) the explanation of enhanced heat transfer rates with nucleate boiling, pp. 298 and 304; (f) the reason why heat transfer coefficients tend to be high with an axially increasing wall heat flux, p. 252; (g) the reason why heat transfer coefficients for heavy metals are lower than those for alkali metals, pp. 269 and 270; and (h) the description of bubble growth, pp. 294 and 295. However, these are minor criticisms.

Generally speaking, the book is well written, the English is clear, the coverage is broad, the extensive use of headings and subheadings is helpful, the wide use of illustrative figures and worked-out examples is very beneficial, and the various tables of information in the appendices are convenient for the reader. It should creditably fulfill the purpose for which it was written.

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About the Reviewers: O. E. Dwyer, leader of the Heat Transfer Research Group at Brookhaven, has published extensively in the field of liquid-metal heat transfer. An ANS Fellow, he is technical chairman of the 1971 International Heat Transfer Seminar held in Yugoslavia in September on the subject of liquid-metal heat transfer.

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Corrigendum

J. T. MIHALCZO, "New Method for Measurement of the Effective Fraction of Delayed Neutrons from Fission," *Nucl. Sci. Eng.*, **46**, 147 (1971).

The discussion of the method as presented was restricted to the performance of both types of measurements of the correlated counts at exactly the same fission rate. This restriction is unnecessary since the product AE is the ratio of the correlated counts per californium fission in the randomly pulsed neutron measurement to the correlated counts per detector count in the Rossi-α measurement. Since the theory of the Rossi-α measurement as presented applies to fission chains whose initiators are distributed on the fundamental mode, the Rossi-α measurement should be performed at a fission rate such that the chains initiated directly by neutrons from californium fission are a small part of the total fission rate or should be performed with the californium source removed.

In Eq. (5) R was omitted from the denominator of the intermediate quantity.