been engaged primarily in radiochemical research and applications and has published numerous papers in the field of radiochemistry. He was one of the principal radiochemists at the Western Division of Tracerlab from 1948 to 1955, and at the Emeryville Research Center of the Shell Development Company from 1955 to 1962. He joined General Atomic in 1962 as a member of the Activation Analysis Research and Applications Group.

Mr. Lukens has extensive experience in activation analysis, fission product radiochemistry, radiotracer studies, radiochromatography, luminescence, and liquid scintillation counting. He is co-author, with L. J. Beaufait, Jr., of the two volume Handbook of Radiochemical Analysis, *and, with J. Kohl and R. D. Zentner, of the book* Radioisotopes Application Engineering.

Heat Exchanger Design. By A. P. Fraas and M. N. Ozisik, John Wiley & Sons, N.Y. (1965), 379 pp.,$17.50.

The optimum design of heat exchangers is based on both the application of theories and practical considerations such as selection, fabrication, installation, cost estimation, and testing. Generally speaking, valuable information gained through practical experience in the design and operation of heat exchangers cannot be found in an ordinary heat-transfer text. This book attempts to bridge the gap between design theory and practice for a wide variety of heat-exchange equipment. In preparing this book, the authors have drawn extensively on their experience in special applications of heat-exchanger technology. Their intended purpose, which is " . . . to help practicing engineers apply their formal backgrounds in fluid flow and heat transfer to the practical problems posed by the design, selection, testing, or installation of many sorts of heat exchangers," has been fulfilled.

The first half of the book presents the basic principles and analytical techniques applicable to virtually all types of heat-exchanger design work. In general, these subjects are discussed with little mathematical rigor. In the chapter on heat transmission and fluid flow, for instance, only the most fundamental concepts and theories are summarized strictly from the point of view of practical application. The authors state that the reader is presumed to be familiar with a basic text such as Jackob's *Heat Transfer*. For more detailed or advanced treatment of the theory of heat exchangers, therefore, readers must consult such a text. The authors treat two specific subjects, boiling heat transfer and flow distribution, in separate chapters. In these chapters, a good deal of space is devoted to discussing problems associated with two-phase flow, flow stability under boiling conditions, and to the analysis of the causes and ill effects of poor flow distribution such as hot spots in nuclear reactors. Both the theory of static-stability analysis and calculational procedures for predicting pressure drop for boiling with preheating and superheating are covered. This material can seldom be found in an existing heat-transfer text. The reader interested in structural matters should be familiar with design standards such as those prepared by the Tubular Exchanger Manufacturers Association (TEMA) and the American Society of Mechanical Engineers (ASME). Indeed, the book does not treat the subject area of structural analysis in great depth and one would need to refer to other books and papers, some of which are referenced in the book. Thus, the book does not serve as a design manual, but does supplement the existing reference material by calling attention to, and outlining the solution of, many problems that are encountered in the design of heat exchangers.

The major content of the second half of the book amounts to a discussion of the application of design techniques and practical considerations to general classes of heat-exchange equipment such as liquid-liquid exchangers, liquid-gas exchangers, gas-gas exchangers, boilers, condensers, and cooling towers. Within these general classes of equipment, the characteristics of a great variety of conventional, as well as special-purpose heat exchangers, are presented with the emphasis on variety. Informative illustrations are given in all sections of the book including photographs of typical heat exchangers, boiling and condensing flow, and various elements of heat-transfer matrices.

A handbook section of over 100 pages is included and contains a rather complete collection of tables and charts that are essential to heat-exchanger design work. Especially useful to the reader is the inclusion of data on material properties at temperature extremes.

The book is well organized and well written and will be useful to those who are involved in the design, fabrication, or operation of heat-exchange equipment.

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About the Reviewers: Dr. Hsu is a graduate of the National Taiwan University and of the University of Houston; he completed his graduate studies at Houston in 1962 immediately before joining the staff at Brookhaven. He is a member of the Heat Transfer Group of the Nuclear Engineering Department and is the author of a number of papers in the field of heat and mass transfer.

Mr. Hoffman has been engaged in the design and engineering analysis of liquid-metal systems components and of advanced reactor concepts at Brookhaven since 1956 and is now in the Mechanical Engineering Design Group. He is an engineering graduate of New York University.

Organic Coolant Summary Report. R. F. Makens, Editor, 465 pages, $7.80, United States Atomic Energy Commission (December 1964).

The *Organic Coolant Summary Report* was prepared in late 1964 to present a summary of the results of the development work carried out by the USAEC since 1955 on various aspects of organic coolant technology. It is designed to serve research and development staffs who desire to become better acquainted with the current status of work performed or being done with organic coolants, the areas requiring further investigation, and the areas where the problems are reasonably well solved. The report is directed to scientists and engineers not necessarily familiar with organic coolant characteristics and their uses.

The book consists of 465 pages of well referenced material covering the organic reactor concept, the properties of unirradiated and irradiated organics, coolant reclamation, improved organic coolants, film formation on heat transfer surfaces, dosimetry, coolant chemistry, and various analytical methods for measurement of physical and chemical properties. It is a compilation of articles by various contributors from Atomics International, Phillips Petroleum, California Research Corporation, and Combustion Engineering, reporting on work done at these laboratories as well as at other laboratories. Much of the work described has not been generally accessible before. In many instances, information found only in internal reports of the contractors is presented for the first time.

There is a rather complete and comprehensive chapter describing problems of film formation on heat transfer surfaces. This is the greatest problem remaining to be solved before organic reactors really can come into their own. In recent years, interest has shifted from the use of organic liquids as a coolant and moderator to coolant only, where fouling may, therefore, be less serious. New coolant types are also discussed and the means for obtaining and maintaining better coolant-impurity control.

Editor Makens and his editorial advisory committee consisting of C. A. Trilling, R. O. Bolt, J. C. Hillyer, and R. T. Keen have done a very commendable job in compiling the information about organic liquids and organic reactors. The book is recommended as an excellent reference work to all scientists and engineers who have an interest in this field.

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March 31, 1966

About the Reviewer: Mr. Weisner is an engineering graduate of the University of California at Berkeley and has been associated with Atomics International since 1950, where he has worked on various types of landbased and space reactors. He was chief project engineer for the Piqua Nuclear Power Facility.

The Propagation of Gamma Quanta in Matter. By O. I. Leipunskii, B. V. Novozhilov, and V. N. Sakharov, Pergamon Press, Long Island City, N.Y., 200 pp.,$15.00.

This Russian monograph, edited by Spinney, Butler, and Sykes and translated by Prasenjit Basu, bears the publication date 1965. The Russian original was published in 1960 and summarizes the literature as of about January, 1959. It is a little over 200 pages in length.

The organization of the material follows a standard pattern: The first chapter introduces basic concepts of radiation sources, gamma-ray interactions, flux and current, dose, buildup factor, etc. The second chapter summarizes penetration theory. The third chapter, which is almost half the book, presents and interprets data for different configurations. The appendixes give supplementary tables of attenuation coefficients (due to Gladys Grodstein), the exponential integral function, and one additional problem which didn't quite fit anywhere else.

The style of presentation is direct and terse; the authors do not often elaborate on, or qualify, the assertions made. The mathematical level is not deep, nor are mathematical questions and niceties considered. The theory in the second chapter concentrates most directly on moment theory. But the authors include an approach to Monte Carlo which I greatly appreciate: They take a simple problem and work through a case history completely as by desk computer, identifying each random number and each reference graph in turn.

All in all, the book seems to be essentially a series of lectures on gamma-ray penetration to students in an introductory graduate course in shielding, to give the students an initial orientation on what has been done and by whom, and how things stand. There are no problems. I don't think it would make a good text, but I do think that students would appreciate it as supplementary reading and reference material. Like most introductory presentations, it is apt to lead students to feel that matters are simpler, more complete, and more permanently fixed than they really are.

As a reference book for professional physicists and nuclear engineers, the book has a place, but with limitations. Its greatest advantage is as a summary of Russian literature prior to 1959. It will also have some use as a handy compilation of penetration data, though this application becomes more limited as better data are produced.

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March 23, 1966

About the Reviewer: Lew Spencer is professor of physics at Ottawa University (Kansas) presently on leave at the National Bureau of Standards. He is chairman of the Advisory Committee on Civil Defense of the National Academy of Sciences, and received the Distinguished Service Award of the Office of Civil and Defense Mobilization in 1960. Dr. Spencer completed his graduate studies at Northwestern in 1948, was at the NBS until 1957, and has been on the NBS staff part time since then. His primary interest is in the theory of radiation penetration and diffusion.