this country working and teaching in the field, because of the universal pertinency of its treatment of the subject. It is, in addition, quite complete for its size; the coverage is well-organized and up-to-date and has a consistent and suitable depth.

After a descriptive introductory chapter, there are five 8- to 10-page chapters that give the fundamental equations for the topics of heat transfer to a moving medium; hydrodynamics; turbulence; boundary conditions; dimensional analysis and similitude. These chapters are concise but give the significant material—for instance, the last one shows the derivation of dimensionless ratios from the differential equations as well as from Buckingham's theory. The first of the longer chapters, VII, integrates the steady-state equations, including fins and heat generation, and has an excellent table of two- and three-dimensional conduction cases. Chapter VIII covers transient conduction and provides a full set of temperature-response curves for step and ramp changes with slabs, cylinders and spheres. Chapter IX starts convective heat transfer with detailed conventional descriptions of boundary layers and turbulence, and Chapter X gives the integrated results for laminar and turbulent flow at high and low Prandtl numbers. The next four chapters cover incompressible boundary layers, gases at high velocity or high vacuum, and natural convection. Chapters XV and XVI describe condensation in detail, including free-falling and high-velocity, liquid jets, and XVII and XVIII cover boiling and critical heat fluxes. Chapters on radiation from solids, gases, flames and furnaces, on heat-plus-mass transfer, and on mean temperature difference in heat exchangers, complete the book.

The above listing shows the coverage but not the detail. Frequently, novel treatments, results, or conclusions, which have not been generally known here because they were never translated or previously emphasized, will be found in the developments of conventional topics. The clarity and continuity of the presentation, developing from fundamentals to applications and to the analysis of empirical results, is particularly noteworthy.

On the other hand, there are departures from U.S. practice that will make this book somewhat less convenient to use here. Although there is a Table of Contents with the titles of the 21 chapters and 172 sections, there is no alphabetized index. The equations are photocopied from the Soviet edition, and in casual use may be somewhat inconvenient to transliterate (e.g. k is used for the overall coefficient U, α for h, F for heat transfer area A, γ for density ρ, A for the heat equivalent J, w for velocity u, etc.). All page numbers are missing from the bibliography, which may be a drawback in ordering photocopies or checking in books. Other references to significant data or conclusions are frequently by the author's name alone, without the publication or date. However, they would have appreciably lengthened the volume and, since the reader will be favorably impressed as to its reliability, a balance of factors might well justify their omission.

It is only natural for a book written in and for Russia that some 90% of the bibliography consists of Russian authors. For the U.S. specialist this will be no serious inconvenience—quite the contrary, it will provide him with an invaluable listing and coordination of the Soviet work in a form that can conveniently complement his own bibliographies. The printing and English are excellent, and typographical errata are practically nonexistent.

In summary, Professor Kutateladze's book will be a useful addition to the library of anyone in research, development or teaching in heat transfer or related fields. The editor, translator and publisher, as well as the author, deserve our congratulations on their venture.

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About the Reviewer: Charles F. Bonilla is professor in the Chemical Engineering Department and Nuclear Engineering Division at Columbia University. He has coauthored or edited various books in the field of nuclear heat transfer, including Nuclear Engineering, Nuclear Engineering Handbook, *the* AEC Reactor Handbook, *2nd Ed., and the forthcoming* AEC Fast Reactor Handbook. *He is currently Heat Transfer Editor of the new international journal,* Nuclear Structural Engineering, *and Director of the AEC Heat Transfer Facility at Columbia.*

Inorganic Ion Exchangers. By C. B. Amphlett. Elsevier Publishing Company, Amsterdam, London and New York. (1964) 141 pages, 36 drawings and index. $6.50.

Although inorganic ion exchangers were the vehicle that brought the phenomenon of ion exchange to chemists' notice more than a century ago, the bulk of industrial applications have been based on organic ion-exchange resins. Nevertheless, soil scientists have always maintained an active interest in inorganic ion exchangers, ion exchange in the clay minerals being one of the chief factors determining soil fertility. Recently, soil scientists, ecologists and health physicists have become interested in ion exchange in soils because of its importance in the disposal of radioactive wastes in the ground. But the main reason for the recent resurgence of interest in inorganic ion-exchange materials is their greater resistance to high temperature and ionizing radiation compared with their organic counterparts. These features make them suitable for such applications as the treatment of radioactive waste liquids and the deionization of the hot water in the cooling loops of pressurized-water reactors.

To meet the growing need for information excited by these new applications, C. B. Amphlett, a distinguished scientist and a world-renowned authority on ion exchange, has summarized in his monograph *Inorganic Ion Exchangers* most of what is known about these materials. He has divided his book into five chapters. The first is a short introductory chapter containing a brief historical sketch of ion exchange and a short discussion of a miscellany of inorganic exchangers. The remaining four chapters are devoted to the four main classes of inorganic ion-exchange materials: the clay minerals; the zeolites; the heteropolyacid salts; and the hydrous oxides, zirconium phosphate, and related materials. The discussions of each of these classes follow the same general pattern with minor variations according to the special properties of the particular exchanger being discussed (e.g. the ionic sieve action of the zeolites or the swelling of some of the clay minerals). The discussion begins with consideration of the relation of structure to ion-exchange behavior. Following that there is a discussion of ion-exchange equilibria with particular attention being paid to the existence of well-defined affinity series. Many exchange isotherms are shown and analyzed for thermodynamic data, and the book contains several tables of equilibrium constants, free energies and heats of exchange. Some of the isotherms also show peculiarities which are related to structural features of the exchanger, e.g. the isotherms of the thallous-sodium, thallous-silver, and silver-sodium exchange on Linde Sieve 4A. Finally, there is usually a short discussion of the kinetics of exchange.

According to the author, the book is intended not as an exhaustive survey of inorganic ion exchangers but rather "as a guide to the present state of the subject." As a guide it is outstanding, conveying, as it does, the basic facts about inorganic ion exchangers in a well-organized and easily understood manner.

To me a scientific book is a tool, and to be a good one it must be easy to use. Ease of use in a book is determined by the presence of such things as an extensive index, a descriptive table of contents, complete references, clearly drawn and labeled figures, and useful and informative tables. Amphlett's book is more than satisfactory in all these regards. Two additional features that make the book easy to read are a summary of the symbols used in the text and a notation on each right-hand page telling on which page the current references may be found. Finally, the prose is forceful and direct, the 'good mother English' that Charles Darwin recommended in scientific composition.

I recommend this book highly and count it as a valuable addition to the literature of ion exchange.

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About the Reviewer: Lawrence Dresner has been a physicist at the Oak Ridge National Laboratory since 1954. His work, until recently, has been in the fields of reactor and nuclear physics. He is currently working on the problem of purifying salt water.

Effects of Radiation on Materials and Components. Edited by J. F. Kircher and R. E. Bowman. Reinhold, New York, (1964). 690 pp., $22.50.

This book is a condensed summary of information on the radiation-induced changes in materials, components and equipment exposed or operated in a nuclear radiation environment. The stated objective is to draw together much of the engineering data generated under various nuclear programs of the last several years; much of this information has been previously available only through government agency or contractor reports. Throughout the book, emphasis is placed on those aspects of radiation effects that are important in engineering applications, i.e. the physical and mechanical property changes of materials, the performance changes of components, and the radiation intensities or dosages that produce these changes. Accordingly the book will be of interest principally to those concerned with the study, design and performance of equipment for reactor, hot-cell and space radiation environments.

The contents include several chapters on individual categories of materials and two devoted specifically to semiconductor devices and electronic components. Introductory chapters which will be particularly welcomed by many engineers cover basic concepts of radiation damage and dosimetry. Interactions of gamma rays, electrons and neutrons with matter are briefly described together with the general types of reactions leading to damage in different categories of materials. Dosimetry definitions, units and measurements