Radiochemical Survey of the Elements. Principle Characteristics and Applications of the Elements and their Isotopes. By M. Haïssinsky and J. P. Adloff. American Elsevier Publishing Company, New York (1965). 177 pp. $12.00.

This book presents nuclear, chemical, and physical data for each of the 104 elements in alphabetical order. The information varies from 7-½ pages for uranium to ⅓ page for lawrencium. Radionuclear properties are emphasized and include natural and artificial radioisotopes, typical nuclear reactions, cross sections, preparation of principal radioisotopes, and typical applications of these isotopes.

Generally the translation from French is good. An exception may be the second sentence in the introduction... "In fact, apart from about twenty elements all the isotopes of which are radioactive, all the remaining members of the periodic table possess several radioactive isotopes, natural or which have been produced in the laboratory."

Much of the information presented in the book in narrative form would be more effectively given in tables. In fact, these data are already available to all scientists in various periodic charts, especially those with nuclear data. The history of elements and their general chemical and physical data are also available in several chemical handbooks.

There are several errors as the authors predicted. Californium-252 does not emit 3×10^9 n/(sec g) as stated, but rather 2.4×10^{12} n/(sec g). Haïssinsky and Adloff also include data called either tolerance doses or maximum admissible doses of radioisotopes. These data appear to be taken from the 1951 International Committee of Radiation Protection recommendations. They are now badly outdated and differ in many cases by several fold from current recommended values for air, water, and whole-body burdens. Furthermore, maximum permissible concentrations for uranium are transposed.

Although all statements in a book of this type cannot be referenced, some general references for each element might be included. There is no reference to the maximum permissible concentrations or to any other data in the book.

The exact intended audience for the book is not given by the authors. Certainly most of the information is already available to scientists and students in wall charts and handbooks. More specialized or recent data may be in error as already indicated. Haïssensky and Adloff indicate they intend "to paint a portrait of each element," but 177 pages allow only vignettes.

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E. I. Du Pont
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April 21, 1966

About the Reviewer: Mr. Butler holds a masters degree in chemistry from the University of South Carolina and has been engaged in radiochemical research since 1954 at the Savannah River Laboratory operated by Du Pont for the USAEC. His work has been in the separation and analysis of actinides, a part of his general interest in the analysis of trace nuclides in biological and environmental samples.

Nuclear Techniques in Analytical Chemistry. By Alfred J. Moses, International Series of Monographs on Analytical Chemistry, Vol. 20 (1965). 142 pp., $6.50.

Analytical chemistry has been advanced by, among other things, the development and application of nuclear techniques of great versatility, sensitivity, and dynamic range. Such techniques have gained acceptance by practicing chemists, and are being incorporated in chemistry course work from lower division to the graduate level. Although a number of books and review articles have treated the subject, the book *Nuclear Techniques in Analytical Chemistry*, by A. J. Moses, can serve as a short introduction to the subject.

The book consists of 10 chapters and 6 appendixes. The text is included in just 110 pages abundantly interspersed with tables and figures; thus, the entire book can be read easily at one sitting. The chapters are not even in quality, although most of them are well done.

The first chapter, a terse discussion on handling radioactivity safely, provides an awkward beginning. In the absence of a preliminary discussion of radioisotopes and their decay, the burden of definitions is too great for reasonably easy comprehension by a reader new to the subject. Furthermore, some terms are not defined until later chapters (e.g., half-life, decay scheme), and several important factors are omitted. For example, the list of rules governing laboratory practices does not include the necessity for monitoring of personnel.

The second chapter, which covers instruments, sources, and instrumentation is less terse, more readable, and reasonably informative within the space allotted. The reader may still experience some difficulty due to the abbreviated treatment afforded material that is new to him; this effect, however, is ameliorated in subsequent chapters.

The last 8 chapters are the better part of the book in terms of subject treatment and readability. They discuss the measurement of natural radioactivity, activation analysis, scattering and absorption techniques, radiometric techniques, the use of exchange reactions, age-dating, and several miscellaneous techniques. These chapters serve to indicate the scope of nuclear methods.

Despite the incorporation of some useful laboratory procedures, the reader should not expect the material to be treated in sufficient depth to allow direct applicability of these techniques. This is not the author's purpose, and references are given to more detailed works.

The power of the analytical techniques are not adequately described. Figures depicting those elements that can be detected at a level of 10 ppm with 10^9 n (at 14 MeV)/(cm^2 sec) and at a level of 100 ppm with 10^9 thermal n/(cm^2 sec) are given. Also, tables indicating isotopic yields to be obtained from the elements under defined conditions of irradiation are given. However, the associated analytical sensitivities, which in some cases are less than 10^{-12} g, are not discussed. Several examples of the sensitivity of radiometric techniques are given; but the relationship between specific activity and sensitivity is not explained.

Despite the inadequacies that are apparent, the reviewer must emphasize that the author has achieved his purpose, which is to acquaint the analytical chemist with nuclear techniques. It is quite likely that a more detailed and lengthy book would not serve this purpose as well.

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May 12, 1966

About the Reviewer: Mr. Dick Lukens graduated from the University of California in 1945. Since that time he has

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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March 14, 1966

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