melting points above 1000°F published between 1940 and 1957. The sources of data used were: (a) Chemical Abstracts, (b) Ceramic Abstracts, (c) Metallurgical Abstracts, (d) Nuclear Science Abstracts, and (e) Armed Services Technical Information Agency (ASTIA).

The physical properties listed include density, melting point, latent heat of fusion, latent heat of vaporization, latent heat of sublimation, specific heat, thermal conductivity, thermal diffusivity, emissivity, reflectivity, linear thermal expansion, vapor pressure, and electrical resistivity. The first five properties are given as point functions at standard temperature and pressure, while the remaining properties are given as a function of temperature. The most probable values of the first five properties are collected on a single page for each element with the sources of these data on the reverse side of the page. The remaining properties are plotted individually, one to a page for each element, with reference data on the reverse side, with the exception of the thermal diffusivity for which no data are given in this volume. Reference data include names of principal investigators, a reference to the bibliography in Volume 5, and information relating to material composition and test methods. This volume, as well as the others in the series, is designed to be expansible so that additional or revised data sheets may be added. Additional data sheets will be published when available.

This book is a valuable reference on physical properties of the elements and should serve to eliminate much of the searching often required to obtain properties data. The indexing system permits the desired property of a given element to be easily located. The units in which the properties are quoted are clearly indicated and conversion factors for the physical properties, except for electrical resistivity, are included in the front of the volume. The "reference information" sheets contain most of the information the user would want in addition to the data points on the opposite side of the page. However, it would be convenient if a bibliography were included in each volume. It would also be helpful if conversion factors for electrical resistivity were given.

ROBERT I. STROUGH
Development Engineer
Pratt and Whitney Aircraft
Middletown, Connecticut

[*Editor's Note: Dr. Strough is the Development Engineer in charge of reactor development at the Connecticut Aircraft Nuclear Engine Laboratory operated by Pratt and Whitney Aircraft for the Atomic Energy Commission. He has, for the past ten years, been responsible for the technical direction of the aircraft nuclear propulsion reactor development work at Pratt and Whitney Aircraft.*]

1960 Nuclear Data Tables. Part 1. Consistent Set of Energies Liberated in Nuclear Reactions Targets in the Mass Region $A \leq 66$. By F. EVERLING, L. A. KOENIG, J. H. E. MATTAUCH, AND A. H. WAPSTRA. U. S. Government Printing Office, Washington 25, D. C., February, 1961. 214 + xvi pp., $1.50.

Part 2. Consistent Set of Energies Liberated in Nuclear Reactions Targets in the Mass Region $67 \leq A \leq 199$. By L. A. KOENIG, J. H. E. MATTAUCH, AND A. H. WAPSTRA. U. S. Government Printing Office, Washington 25, D. C., February, 1961. 456 + xii pp., $2.75.

The user of these two volumes has at his finger tips a happy blending of two strong European schools of nuclear systematics. Mattauch, the leading European mass spectroscopist, and Wapstra, well known for his work on decay schemes of radioactive nuclei, both have prepared tables of systematized nuclear data in the past. Each of the 670 pages in these two volumes is a self-explanatory tabulation, for a single nuclide, of the energy liberations (Q-values) in up to 63 low energy nuclear reactions that can be produced on it by γ-rays, neutrons, protons, deuterons, tritons, He^3, and α-particles. In addition, each page gives the mass of the nuclide in the form of its "mass excess," in micromass units and in kilovolts, both on the scale that makes $O^{16} = 16$ exactly, and on the newer advantageous scale that makes $C^{12} = 12$ exactly.

Each page is a reproduction of a print-out from a digital data-processing machine which computed masses to give a best least-squares fit to experimentally measured values of: (a) mass spectrometric data, (b) nuclear reaction Q-values, and (c) beta and alpha disintegration energies. The Introductions contain eight illuminating diagrams indicating the nature of and interconnections among the input data. The manner of computation is described in considerable detail; but the choice of input data is left unexplained, except for a promised publication by the same authors in *Nuclear Physics.* If that promised publication was the brief paper, "Relative Nuclidic Masses," by Everling *et al.* that appeared in 1960 (*Nuclear Phys.* **18,** 529), the promise made in the Introduction was not kept; for that paper does *not* give a "full account" of the input data. However the reputations of Mattauch and Wapstra guarantee that the choices were as good or better than any that could have been made in 1958 and 1959 when the input data were "frozen" for this computation. Some more light on the input data, and on the whole process of preparation of the final tables, is to be found in the first few papers and in the discussions following them in the *Proceedings of the International Conference on Nuclidic Masses* at McMaster University, Hamilton, Ontario, Sept. 12–16, 1960 (H. E. Duckworth, editor, University of Toronto Press, 1960).

The open style and large size of print on the page is easy to read; but the two volumes could have been compressed into one half their size if conventional type setting (and its added possibility of errors!) had been used. The user may be momentarily disturbed at finding the pages arranged in order of A first, Z second. Thus all nuclides of a given mass number are adjacent to each other, following the custom of the Nuclear Data Project of the National Academy of Sciences, National Research Council. He may be more permanently upset at finding that there are no pages corresponding to a number of nuclides; for example, there are none whatever for mass 101. These are nuclides about which no quantitative energetics information is known, and these tables do not attempt more than a summary of what has been measured. He may finally wonder why the tables confine themselves to masses under 200. No explanation for this is given; possibly the authors feel that the Berkeley work on the heaviest nuclides (Ashby and Catron, Tables of Nuclear Reaction Q-Values, UCRL-5419, 1959) is sufficient for present purposes.

For those who use reaction Q-values or need authoritative mass values, these two volumes are a very helpful reference work indeed.

John R. Stehn
Sigma Center
Brookhaven National Laboratory,
Upton, Long Island, New York

[*Editor's Note: John R. Stehn has compiled nuclear data at the Knolls Atomic Power Laboratory for the General Electric Chart of the Nuclides. He now is head of the Neutron Cross Section Compilation Group at the Sigma Center in the Brookhaven National Laboratory.*]

Reactor Handbook, Vol. I: Materials, 2nd ed., revised. Edited by C. R. Tipton, Jr. Interscience, New York, 1207 pp., $35.60.

As pointed out in the preface to this book, a staggering amount of materials data has been accumulated in the course of reactor development. The editor, the editorial review board, and the authors are to be commended for the judicious selection of information and for the organization of the presentation.

The book is organized along the lines of the functional utilization of the materials within a reactor. Following a general section, one section is devoted to each major category, i.e., fuel materials, cladding and structural materials, control materials, moderator (and reflector) materials, coolant materials, and shielding materials. A natural outgrowth of this categorization is the inclusion of gases and liquids as "materials." One might criticize this decision if the book is thought of simply as a "Materials Handbook," but as it is actually the "Materials Volume" of a "Reactor Handbook," one is forced to admit that it would be difficult to find a better place for this important information. The data provided on liquids and gases are those that are useful to engineers associated with reactors and it is convenient to have them brought together.

On the other hand, it seems unnecessary to have included chapters on "Health, Safety, and Accountability," "D_2O-H_2O Separation," and "Zirconium-Hafnium Separation."

The editor also points out in the preface his realization that interest in the field may shift from one area of technology to another, making the compiler's task doubly difficult. The subject matter of this book is, in general, current to about the spring of 1958, and since that time many changes in interest actually have occurred. Some items given emphasis in the book are no longer of importance, while others which are given very brief mention are now of great importance. For example, the chapter on ceramics which includes UO_2, UO_2-ThO_2, UO_2-PuO_2, UO_2 in graphite, and UC_2 in graphite is covered in only twelve pages; the uranium carbides are given one small paragraph in the chapter on carbides and cermets and not even a sentence in the chapter on ceramics. This type of defect is unavoidable in a compendium which naturally takes so long to publish and when it relates to such a fast moving area as nuclear energy.

On the whole, the book is an invaluable reference work. In addition to the well-written text, there are almost one thousand tabulations of data and over one thousand figures. Many phase diagrams are included and there are also thirty pages of references to selected binary phase diagrams of interest to the nuclear field. No metallurgical library can be considered complete without this volume.

R. Carson Dalzell
U. S. Atomic Energy Commission
Washington, D. C.

[*Editor's Note: Dr. R. Carson Dalzell is assistant to the director of the Division of Reactor Development of the U. S. Atomic Energy Commission. He completed his Sc.D. degree at Harvard in 1929 and worked for some time at the American Smelting and Refining Co. and Revere Copper and Brass Inc. He joined the AEC in 1950 and in 1956 was made chief of the Engineering Development Branch. In his present position he is technical coordinator of military and maritime reactor programs. Dr. Dalzell is the AEC representative on the Nuclear Standards Board of the American Standards Association and is a member of the U. S. delegation to meetings of the International Standards Organization's Nuclear Committee. He is the past chairman of the ASME's Nuclear Engineering Division and is an active member of nuclear metallurgical committees of ASME, ASM, and ASTM.*]

Nuclear Reactor Shielding. By J. R. Harrison. Simmons-Boardman, New York, 1958. $2.75.

This small book (68 pages) is intended in the words of the author "to provide an introduction to the principles and practice of reactor shielding . . . to provide a short survey of the subject." It is intended for students and nonspecialists who wish a general, broad picture of reactor shielding technology.

The first chapter is concerned with defining the problem, introducing the definition of flux, cross section, and current, and defining the units of radiation intensity and dose.

The second chapter concerns gamma ray attenuation. The various reactor sources are identified, the important gamma interaction processes with matter are discussed and the techniques of performing attenuation calculations are explained.

The third chapter performs the same function for neutrons. Chapter four enters into a discussion of shield design for pure gamma or neutron sources and outlines the procedures for designing a stationary reactor shield. Some of the important ideas associated with the design of light weight mobile shields are also discussed. Chapter five considers miscellaneous topics such as angular distributions, neutron streaming through ducts, and coolant activation.

Generally speaking the author is successful in reaching his goals. As a consequence, however, the treatment of most topics other than gamma ray attenuation is rather superficial. This is especially true in the latter portions of the book where mobile reactor shields, ducts, etc., are touched upon.

It would have been better, in this reviewer's opinion, to have deleted all reference to mobile reactor shields from this book. The inexperienced reader may well conclude that the simple calculational techniques discussed are adequate for the design problem. Such was not the case in 1958 and in fact shield physicists and engineers are only now learning to handle such matters as secondary gamma ray production and shield heating with any degree of confidence.