using large type and including several drawings, the authors touch on essentially everything from the early spherical atom to subnuclear particles, mentioning types of accelerators as well as cosmic rays and fusion enroute. In fact, only some 40 pages, or less than half the book, are devoted to the subnuclear particles (really the results of current high-energy experiments) that are usually considered as inhabiting the "subnuclear zoo"; this section also includes discussion of the "unknown." The nonmathematical treatment is at approximately the level of a lecture (or so) given to high school students, preferably those interested in physics.

Accepting the rather vague and unspecified "ground rules" that seem to apply to semipopular treatments such as this, the book is technically adequate, having no gross errors or inaccuracies beyond what might be acceptable in leaving a generally correct impression. However, this reviewer does find it somewhat disturbing to read that "fermions are particles affected by forces" and "bosons are particles that carry forces," even as it is recognized that these statements rather crudely express an interpretation of certain observations. Furthermore, a statement that "a quantum number is a measurement of some characteristic of the particle—charge for example" is a little more inclusive definition than may be desirable. Unfortunately, the authors do not indicate as clearly as might be desirable that many of their "facts" concerning particles really reflect interpretations based on current theories, about which there are currently some differences of opinion. At the level of their approach, however, this is probably just as well.

Overall, this reviewer had difficulty in evaluating the purpose of the book or in describing an audience to which it might be directed, other than the original comment above. It attempts so much and its treatment is thus necessarily so broad that clarifying details are obviously not included. Similarly, the descriptions and explanations given in nonquantitative terms suffer from the corresponding necessary imprecision of both analysis and language. On the other hand, its coverage is remarkably good. Thus, although a case might be made for its inclusion in a high school or college library for rather casual reading, it cannot be recommended as a book one would like to obtain for reference or even to reread. It would certainly be rather inappropriate and of little use to someone with prior knowledge in the general field.

Hugh F. Henry has been head of the Physics Department of DePauw University since 1961. Prior to that time, his responsibilities at the Oak Ridge Gaseous Diffusion Plant included those of criticality safety and health physics. His publications in these general fields include the book Fundamentals of Radiation Protection, *which was published by Wiley Interscience in 1969. He spent a sabbatical leave during 1968-1969 at the National Reactor Testing Station in Idaho Falls, and spent a similar leave during 1975-1976, with his time divided between the National Radiological Protection Board and the U.K. Atomic Energy Research Establishment, both at Harwell, England. He is a member of the U.S.A. Standards Institute (USASI) Committee on Radiation Protection and has been a U.S. delegate to meetings of the International Standards Organization (ISO) in this field.*

Pulse Radiolysis

Author Max S. Matheson and Leon M. Dorfman

Publisher American Chemical Society (1969)

Pages 202

Price $8.50 paper; $14.75 hardback

Reviewer James B. Smathers

I was quite taken back when asked in 1978 to review a book written in 1967 and copyrighted in 1969. After reading through the book, though, I realized that indeed no mistake had taken place. What was an excellent review of the state-of-the-art in 1967 has become a well-written introductory treatment of the area of pulse radiolysis. The material is presented in a clear, concise manner and lends itself to be used as an introductory text on the subject. The obvious deficiency of references that extend only through 1968 is a detraction, the magnitude of which readers will have to determine for themselves.

Chapters 1 through 4 consider radiation sources, detection systems, and dosimetry. The dating of the book is particularly evident in these sections. Chapter 5 treats kinetics nicely. Chapters 6 through 9 treat aqueous systems, hydrated electrons, organic systems, and gaseous systems in turn.

In summary, the book, a paperback American Chemical Society monograph, is considered a worthy library addition for anyone interested in a basic background in pulse radiolysis.

J. B. Smathers (PhD, University of Maryland, 1967) is presently professor and head of bioengineering and professor of nuclear engineering at Texas A&M University. His experience includes eight years in research reaction utilization and nine years in the biomedical applications of nuclear energy.

Nuclear Methods in Mineral Exploration and Production

Editor Jerome G. Morse

Publisher Elsevier Scientific Publishing Company (1977)

Pages 280

Price $39.95

Reviewer William C. Peters

This book will appeal to scientists and engineers interested in applications of nuclear technology to the exploration, development, and processing of energy and nonenergy minerals. One of the Elsevier series, "Developments in Economic Geology," this book provides an overview of nuclear techniques that lend themselves to the rapid detection and identification of naturally occurring elements and minerals in field outcrops, mines, drill holes,

and laboratory samples. The general subject has also been treated in two volumes, entitled *Nuclear Techniques and Mineral Resources,* published by the International Atomic Energy Agency (1969, 1971), but the present book is more comprehensive and more current.

Written for an interdisciplinary readership, the book contains fairly rigorous and detailed explanations of the aspects in nuclear theory involved with each technique. For geologists and engineers who may lack a strong background in nuclear science, an appendix on the fundamentals of atomic and nuclear physics is provided.

Major sections of the book deal with the measurement of gamma radioactivity from natural radioelements, with the use of x-ray analysis in mineral exploration, and with radioactivation methods of logging drill holes for solid minerals and petroleum. One chapter, on a topic not represented in the book title, describes the use of x-ray fluorescence geochemical analysis in investigations on the surface of Mars. Another chapter, also containing information outside the main thrust of the book, deals with the use of nuclear explosions in creating reservoir and canal excavations as well as in stimulating the recovery of oil and gas from impermeable formations.

The editor is deputy director of the Colorado Energy Research Institute and an adjunct professor of physics at the Colorado School of Mines. Authorship of individual chapters has been drawn from scientists and engineers associated with North American universities and geophysical firms and associated with the U.S. Geological Survey. As in most books involving multiple contributors, there is some repetition among chapters and among lists of references. On the whole, however, the book is well organized and well written. The information is supported by ample charts and tables, and there is a general index that permits the entire book to be of use as a reference work.

William C. Peters (PhD, geology, University of Colorado) is professor of mining and geologic engineering at the University of Arizona, where he teaches mining geology and mineral exploration. Prior to his academic appointment, he was chief geologist at the Bingham Canyon Copper Mine, Utah, and exploration geologist for FMC Corporation. He has engaged in uranium exploration throughout the western U.S., in North Africa, and West Africa. He has lectured on exploration geology at several European universities and is the author of more than 30 technical publications.

The Thermal-Hydraulics of a Boiling Water Nuclear Reactor

Authors R. T. Lahey and F. J. Moody

Publisher American Nuclear Society (1978)

Pages 433

Price $41.95

Reviewer F. G. Hammitt

This American Nuclear Society monograph will make a most excellent and useful addition to the bookshelves of both practicing nuclear engineers and nuclear engineering students interested in the power reactor field. As the title implies, it is pertinent particularly to the boiling water reactor (BWR) field, and well summarizes the technical information applicable thereto. It is well written by two highly experienced practitioners in that field and provides a thoroughly authoritative treatment of the existing technology.

The coverage is very broad, but particularly emphasizes such thermal-hydraulic aspects as two-phase flow, rather than the nucleonics parameters, and hence it should be of most value to engineers engaged in that field. The treatment of these aspects is sufficiently basic so that useful application can be made to fields other than BWRs. The treatment of boiling and other two-phase flow phenomena is especially strong. While no new data are presented, the drawing together of comprehensive information from numerous already published papers will be highly useful to those working in these fields, as will be the copious reference lists with each chapter. Hence, the book is most strongly recommended to the nuclear engineers and students active in, or wishing to learn about, these fields.

F. G. Hammitt is heavily engaged in multiphase flow research as professor-in-charge of the Cavitation and Multiphase Flow Laboratory, Mechanical Engineering Department, University of Michigan, Ann Arbor, and is the author of over 200 papers and articles, mostly in that field. For several years in the past, he served as a professor in the Nuclear Engineering Department at the same university, and now teaches a graduate course covering large nuclear power plants. Prior to serving at the University of Michigan, he accrued approximately ten years of industrial experience, mostly in fluid flow and heat transfer. He is a member of the American Nuclear Society, a fellow of the American Society of Mechanical Engineers and of the Institute of Mechanical Engineers (Great Britain), as well as a co-author of Cavitation *(McGraw-Hill Book Company, 1970).*

Radiation Exposure from Consumer Products and Miscellaneous Sources

Publisher National Council on Radiation Protection and Measurements (1977)

Pages 80

Price $4.00

Reviewer Gordon Dunning

The ever-expanding use of consumer products that emit radiation has focused attention on the need for better information and possibly additional regulatory action. National Council on Radiation Protection and Measurements (NCRP) Report No. 56, *Radiation Exposure from Consumer Products and Miscellaneous Sources,* compiled by the NCRP Scientific Committee 28 on Radiation Exposure from Consumer Products, addresses itself to the first of these needs and should be of significant assistance to those concerned with regulations.

As stated in the introduction to this report, ". . . The