and the probable somatic and genetic effects of radiation exposure from the nuclear industry. Opponents of nuclear energy would no doubt find the treatment of the problems much too optimistic, but the authors have done an excellent job of presenting the data in a straightforward, scientific manner that places the dangers of nuclear energy in context with other radiation exposures (mainly natural and medical) and other types of hazards. Although they don't belabor the point, they include data that suggest possible beneficial effects of small radiation doses (e.g., decreased malignant mortality rates in U.S. states that have higher natural radiation levels). One shortcoming in this regard is that specific sources of information are rarely indicated. It would, for example, be interesting to know the source of a statement that an estimated "28 persons per day die in New York by excessive SO_2 emissions."

The chapter on synthetic elements is quite interesting and provides a good review of the principles and clever experimental methods (e.g., recoil collection methods) that were vital to the discoveries and useful in other areas. Discoveries of the transuranium elements and the completing claims of Berkeley and Flerov's group in the Soviet Union for elements 102 and above are extensively discussed, but a curious omission is the incorrect discovery of nobelium (Z = 102) by scientists at the Nobel Institute with collaborators from Argonne and Harwell.

In view of the emphasis on uses of nuclear chemistry, the treatments of nuclear analytical methods and medical diagnoses with tagged molecules are surprisingly brief relative to their widespread uses. During the middle 1960s, experimental nuclear chemistry underwent a revolution caused by introduction of lithium-drifted germanium [Ge(Li)] gamma-ray detectors, which have much better resolution than the NaI crystals they replaced. Their initial impact was in fundamental studies, especially nuclear spectroscopy, where they provided energies reliable to 0.1 keV and often revealed dozens of transitions that were not resolvable with NaI. The germanium revolution quickly influenced applications, especially activation analysis, in which the superior resolution allows one to observe gamma rays of up to 40 elements in complex irradiated samples. Even tracer applications are affected, as one can often use many gamma-emitting isotopes simultaneously and resolve them with germanium detectors. Despite the great impact on Ge(Li) detectors on the field, Choppin and Rydberg have treated them very briefly. For example, they use a NaI spectrum to illustrate the features of gamma-ray spectra instead of using Ge(Li), which would show the features more clearly.

The coverage of fundamental nuclear concepts is disappointing—far from up to date and without great depth. The chapter on nuclear structure, for example, handles the shell model rather well, the rotational model of deformed nuclei briefly, and the vibrations and coupling of quasiparticles in spherical nuclei not at all. Although beta decay and fission have been more the "property" of nuclear chemists than physicists, neither subject is dealt with in great detail. While the basic portions of the text may be adequate for students who wish merely to apply existing nuclear methods to their particular problems, they would not provide the grounding needed to allow the students to advance the state of the art.

The book is written at a level that should be understandable by the intended users. Its organization is generally good, except that detection methods are not discussed until Chap. 17, which follows radiation effects on biological systems. The book is very large and could have been improved by judicious editing of side issues. Although obvious errors are rare, there are occasional oversimplifications, e.g., that the $1/v$ law for neutron cross sections arises just from the wavelength of the neutron without reference to resonances. The 14 appendixes contain a large store of information of value to students, including a chart of the nuclides.

In summary, although Choppin and Rydberg's treatment of fundamentals is weak, their book should serve quite well as a text for courses designed strictly for users of nuclear methods, being so complete that students will keep and consult it long after the course is over.

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About the Reviewer: Glen Gordon is professor of chemistry at the University of Maryland, where he has been a member of the staff since 1969, following teaching and research responsibilities at the Massachusetts Institute of Technology. He has served as advisor to the Electric Power Research Institute, and the Oak Ridge and Livermore national laboratories. Dr. Gordon's current research interests are in nuclear analytical methods, atmospheric particulate matter, and the use of trace elements in biological systems. His graduate studies were at the University of California, Berkeley.

Two-Phase Flow and Heat Transfer in the Power and Process Industries. By A. E. Bergles, J. G. Collier, J. M. Delhaye, G. F. Hewitt, and F. Mayinger. Hemisphere Publishing Corporation, Washington, D.C. (1981). 707 pp. $55.00.

The dramatic growth of interest and research activities in two-phase flow and heat transfer in recent years is best demonstrated by the sudden appearance of numerous conference sessions, symposia, and workshops, as well as books and proceedings devoted to this subject. Although the subject has a broad application base in various power and process industries, much of the recent impetus has been provided by the thermal-hydraulic aspects of nuclear reactor safety. The rapidly expanding literature on the subject, however, makes it a formidable task to present a mature, cohesive, and comprehensive treatment in a single volume by a single author. The present book represents a gallant effort to fulfill such a need.

The book is an outgrowth of lecture notes prepared earlier for a sequence of short courses on two-phase flow and heat transfer by the five authors, all of whom are well-recognized leaders in the field. It contains a strong international flavor as the authors consist of one American (AEB), two Englishmen (JGC and GFH), one Frenchman (JMD), and one German (FM). As compared to other treatises on the same subject, this book is unique in its relatively broad and up-to-date coverage ranging from fundamental analysis and mechanisms to practical plant design and operational safety. It even includes, as the last chapter (Chap. 24) of the book, an excellent review of the historical developments in two-phase flow and heat transfer since its inception.

The book starts with five chapters on two-phase flow fundamentals including flow patterns, basic equations, frictional pressure drops, singular pressure drops, and annular flow. Chapters 6 through 12 concern two-phase heat transfer covering pool boiling, forced convective boiling, burnout, post-dryout heat transfer, heat transfer in condensation, and heat transfer augmentation. System aspects such as instabilities, scaling, and instrumentation are discussed in Chaps. 13 through 16. The next seven chapters deal with practical problems as applied to process and power industries including plant design and safety.

In a book with five authors of different country origins, it is inevitable to find certain unevenness in the depth of coverage and style of presentation in various chapters. There also exists some duplication from individual authors' previous treatises on the related subjects, although their work has been updated. These shortcomings, as well as the book's photo-offset production, are greatly outweighted, however, by the many exceptional qualities of this book, particularly its comprehensiveness and timeliness. This book should prove to be an excellent and useful reference to a wide spectrum of readers, students, researchers, and practitioners alike in the broad field of two-phase flow and heat transfer.

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