requirements, environmental effects, and the risk of diversion of nuclear materials. It is well written, nicely laid out, and supplemented with tables and schematics, and compiles into a single volume useful information on design and process characteristics of most of the reactors in use or contemplated for the near future.

As its title implies, the book is intended as a general guide rather than a detailed, exhaustive reference work. The author's stated purpose was to describe reactors as they exist and "to indicate the basic forms that nuclear systems may take in the future." Background information on reactor safety, alternative fuel cycles, waste disposal, and design compromises is also included. The book should be helpful to all those–students, faculty, and informed citizenry alike–who are interested in having at their disposal a basic guide to nuclear systems. It was not intended and would not serve well as a textbook, but might be very useful to students both in courses on energy systems and in introductory and advanced nuclear engineering courses. As a reference, it provides a collection of reactor system data and schematics that is usually found only in a less consistent form and in widely scattered reports.

Three Mile Island occurred after the book was published in 1979. Although developments since that time are therefore not included, the timing may have been a blessing in disguise. As it stands, safety issues are given a prominent position and a balanced treatment. If it had been written later, however, the temptation to discuss TMI to the exclusion of other safety dimensions may have been too strong to overcome.

While it is not particularly colorful, the author's writing is clear and informative and the small number of errors–both in factual material and in proofreading–shows an appreciation for quality and attention to detail. Some may not share Dr. Nero's fondness for parenthetical comments or quotation marks to explain or set off rather common terms, but this is a minor point.

Selection of the range and type of material to be included, always difficult in developing a general guide, is good, with a nice balance between the quantitative, the illustrative, and the narrative. There are four main sections: A General Introduction to Nuclear Reactors; Commercial Nuclear Reactors; Uranium Resources, Advanced Fuel Cycles, and Nuclear Materials; and Advanced Reactor Systems–Breeders, Near-Breeders, and What-Not. Appendixes include sections on abbreviations and units, nuclear physics data, characteristics of nuclear materials, energy conversion systems, nuclear criticality and control, and the nuclear fuel cycle. A glossary of terms is also provided. Fusion and fission-fusion systems are mentioned, but only briefly.

In summary, *A Guidebook to Nuclear Reactors* is a nonpolemic, informative book, intelligently conceived and written. It succeeds admirably in achieving its objectives and, given the rate at which nuclear reactor systems are evolving, should be useful for many years.

Kermit Garlid is professor of nuclear engineering and chemical engineering at the University of Washington in Seattle. In recent years he has also served as associate and acting dean of the University's College of Engineering, and has been a senior visiting scientist at laboratories and universities in Norway, Germany, and Switzerland. His principal research interests are in nuclear fuel cycles and nuclear reactor safety.

Hazardous Waste Management

Author	J. Jeffrey Peirce and P. Aarne Vesilind
Publisher	Butterworths, Woburn, Massachusetts (1981)
Pages	186
Price	$29.95
Reviewer	A. Keith Furr

This book represents the material presented at a conference on hazardous waste management that took place at Franklin Pierce College in August 1980. It is interesting to note the ideas that were presented at that time and compare them to the developments that have taken place since. I enjoyed reading the book but I do not believe it will be of any great value to those for which it is purported to be published, namely, engineers in various work situations.

The book is divided into three sections: Problems in Hazardous Waste Management, Technological Inputs to the Management Process, and Case Studies in the Management of Hazardous Waste.

Much of the first section is concerned with presenting and interpreting the terms of the Resource Conservation and Recovery Act and does so adequately. However, much of the material is available from Environmental Protection Agency publications. The paper in this section by George W. Pearsall, "Decision-Making in Hazardous Waste Disposal," was, I felt, unusually well done and provocative. The author first discusses the preliminaries to the final stage, the decision of "what to do?" These initial stages consist of identification of the problems, value judgment, hazard assessment, and determination of options. These areas were well developed. However, it is the discussion of the decision-making process that represents the really significant contribution of this paper. In this section, he describes ethical decision-making strategies. In his concluding paragraphs, the author raises the question of what value is a knowledge of these ethical considerations and I felt he answered himself very well. "I think the principal purpose of such knowledge is to sensitize the decision-maker to the values underlying his/her decisions." As I read this section, I recognized myself and many of the individuals with whom I work. It was enlightening.

The second portion of the book comes closest to meeting the stated purpose of the book. Basically it consisted of papers presented by various individuals involved in disposal operations and covers incineration technology, landfill siting, design, monitoring, and management. It touches briefly on some of the economic and political issues as well. A brief description of the super fund is included in this section but there have been a number of legislative changes in this area. The last section consists of three case histories involving hazardous waste, although in fact the last of these really is a description of an industrial accident, resulting in contamination of the environment. Although interesting and, indirectly, providing information as to the procedures to be followed when hazardous materials are found to pose a risk to the public, I did not feel that the information to be gleaned from this section justified taking up 40% of the book.

My biggest disappointment in this book and, I must admit, with the prevalent attitude of most of those working in the hazardous waste field, is the stress on after-the-fact approaches. I would very much like to see more stress on reduction of generation of waste. It is in this area where I believe innovative ideas and concepts are most needed.

I do not recommend this book. The title, *Hazardous Waste Management,* implies more than it contains.

Dr. A. Keith Furr is director of the Office of Health and Safety Regulatory Programs at Virginia Polytechnic Institute and State University and professor of nuclear engineering. He has been involved in radiation safety and health physics for many years. In 1975, he was appointed to his present position and asked to develop a comprehensive safety and health program for the university. This office was subsequently charged with the mission of developing a hazardous material management program. The program that was created, in addition to waste management, is concerned also with procurement, utilization, medical surveillance, and emergency response capability. He has also published more than 50 papers in the area of the role of trace elements in the environment.

Heat Exchangers—Thermal-Hydraulic Fundamentals and Design

Editors	S. Kakac, A. E. Bergles, and F. Mayinger
Publisher	Hemisphere Publishing Corporation, New York (1981)
Pages	1131
Price	$95.00
Reviewer	Karl Hornyik

This volume is the third of a series published in conjunction with the North Atlantic Treaty Organization (NATO) Advanced Study Institutes held biannually since 1976. It contains a total of 50 papers covering the material presented at the last institute along with a selection of research reports. The authors of individual contributions indeed represent an international elite in this field; their contributions are of high quality and represent the state of the art. The contents are ordered into the following broad topics: Thermal-Hydraulic Fundamentals (Single-Phase and Two-Phase), Radiative Heat Transfer in Heat Exchangers, Heat Exchanger Design, Advanced Surface Selection and Performance, Operational Considerations, Problems and Prospects.

The objectives of the papers are quite evenly distributed over the following categories: broad overviews, fundamentals, special topics, and recent advances. In general, a high level of background is required for the reader to benefit from the presentations, even from those dealing with fundamental aspects.

For the reviewer, it was refreshing to see a truly international effort with authors representing 11 different countries from both the western and the eastern hemispheres. This is intensified by the comprehensive bibliographies given with most papers, again covering the international scene. All papers are written in English, although in some cases foreign language syndromes are noticeable. It is probably beyond the means of the American editor to assume a stronger role in achieving smoother translations and the knowledgeable reader can be expected to improve on certain formulations as he works his way through the details.

The variety of topics reflects the variety of phenomena encountered in heat exchangers as well as the variety of applications found in industry. Phenomena discussed include those caused by nonconventional geometries, fluidized beds, heat transfer when using multicomponent mixtures, film evaporation and condensation, and others. Applications addressed in this volume include some rather special cases such as desalination, off-shore heat exchangers, geothermal plants, and nuclear power plants. Operational problems include tube vibration, fouling and corrosion, and instabilities. The methods for design and analysis employed by individual authors cover the entire spectrum from closed analytic solutions of simplified models to finite difference representations and finite element representations. As expected, there is a rather extensive coverage of correlations used for computing heat transfer and pressure drop under a great variety of conditions.

The reader with a strong interest in nuclear technology perhaps will find that his field has not received sufficient attention. Nuclear power plant steam generators are discussed in a generic manner only, and some of the special problems associated with nuclear plant steam generator operation and analysis are hardly mentioned. The same is true for cooling towers, although it can be argued that they do not belong to heat exchangers. However, the specialist reader is virtually guaranteed his compensation by finding alternate and new methods and points of view that will broaden his horizon and stimulate his work.

This volume cannot be recommended as a class text, simply because it contains more material than could be covered in a class on any topic and of any normal duration. However, it will be valuable as resource to the instructor preparing his class notes. Its real value is for the researcher who seeks to get into the field or wants to broaden his background, as well as for the practicing engineer who wants to review the state of the art. Complemented by the volumes of the preceding NATO Advanced Study Institutes, it presents as complete and current a treatment of this broad subject as one is likely to find on any comparable topic.

Karl Hornyik is associate professor of nuclear engineering at Oregon State University. Previous professional engagements include a position as research associate at the Gesellschaft für Kernforschung, Karlsruhe, Federal Republic of Germany, and as assistant professor at Virginia Polytechnic Institute, Blacksburg, Virginia. His current research includes the steady state and transient analysis of nuclear steam supply systems for light water reactors with an emphasis on thermal-hydraulic phenomena. He has been associated with the Nuclear Safety Division of the Electric Power Research Institute through several summer appointments and with Gesellschaft für Reaktorsicherheit, Garching, Federal Republic of Germany, where he spent a sabbatical leave in 1979-1980. His MS and PhD degrees are in nuclear engineering and were received in 1961 and 1965 from the University of Illinois.