José G. Martín is a professor of nuclear and energy engineering at the University of Lowell in Lowell, Massachusetts. He studied at Mississippi State University and the University of Wisconsin, and was granted his PhD degree from the latter in 1971. He taught at the Instituto Politécnico Nacional in Mexico City and at the Instituto Militar de Engenharia in Rio de Janeiro, Brazil, before joining the faculty at Lowell in 1975. He also acted as consultant for Los Alamos National Laboratories, Oak Ridge National Laboratory, and the Nuclear Regulatory Commission before joining the International Energy Agency's Small Solar Power Systems Project in Almería, Spain, under the sponsorship of Sandia National Laboratories. On leave from his academic duties at the University of Lowell, he is now senior evaluator for the international test and evaluation team for that project.

Planning for Rare Events: Nuclear Accident Preparedness and Management (IIASA Proceedings Series, Vol. 14)

Editor	John W. Lathrop
Publisher	Pergamon Press, Incorporated, Elmsford, New York (1981)
Pages	268
Price	$30.00
Reviewer	Gerald A. Schlapper

The International Institute for Applied Systems Analysis (IIASA) is a nongovernmental research institution founded to enable scientists of the 17 participating countries to work together to solve common problems. Recognizing the need for an appraisal of the special problems of accident management of rare events, like nuclear accidents, a workshop was proposed to bring together people who are involved in maintaining preparedness in the member countries. The IIASA Proceedings Series (of which this book is a volume) was established to ensure that the results of these workshops are distributed to a large audience. This volume contains 21 papers along with a discussion of the themes that emerged during the presentations.

Participants in the program included operators, regulators, emergency management groups, and representatives of local, state, and national governments. The presentations and comparisons are based on each nation's current accident management plans. The papers in general are not oriented toward analysis of what went wrong at Three Mile Island but emphasize international experience in accident planning.

Topics discussed range from problems in maintaining preparedness to concerns over liability. Workshop participants are key individuals in their countries and areas of responsibility, and thus their statements are noteworthy, even though it is indicated that the opinions expressed are those of the authors and not necessarily those of their employers or governments. The viewpoints presented are quite diverse, and these differences are clearly expressed. The need for variation in planning due to institutional differences is evident. One must remember when reading this volume that while the U.S. representatives could and did discuss the successes and failures of emergency planning at Three Mile Island, representatives of other nations discussed in theory how their plans would work.

It is noted by various authors that planning for nuclear accidents can be seriously degraded by basing plans on past accidents or hypothetical events where the situation is known. The central problem is that uncertain plant status, meteorological conditions, and other factors make it much more difficult during a real accident to predict possible radiation exposure of the public. The complications inherent in a risk-benefit analysis of a decision to implement countermeasures are discussed. Factors such as accidental loss of life during an unnecessary evacuation, mental stress, and financial penalties are addressed. The need for good communications between the technical staff, government agencies, and the public is emphasized.

The editor is to be commended for the organization of the presentations. Following a brief introduction, points that were discussed during workshop sessions are outlined. This section primarily addresses unresolved problems of emergency planning and convinces the reader to look for more detailed information in the technical papers that follow. The formal technical papers are divided into four areas: perspectives of the accident at Three Mile Island, international perspectives in emergency planning, broad historical and legal issues associated with nuclear power, and technical aspects of nuclear accident management.

This workshop was held in January 1980, and obviously emergency planning is not "standing still" in the United States. Some of the concerns that are noted have already been addressed by regulations and/or standards. However, the majority of the text material is still current. This volume should be on the recommended reading list for those involved with emergency planning and accident management.

While on the staff of the University of Missouri Research Reactor, Gerald A. Schlapper was involved with the Operational Health Physics Program. He also served as a research fellow in the nuclear medicine department of the Harry S. Truman Veterans Administration Hospital. In January 1981, Dr. Schlapper joined the faculty of the Radiological Health Engineering Program of the nuclear engineering department at Texas A&M University. He also serves on the consulting faculty in the Nuclear, Biological, and Chemical Protection Branch of the U.S. Army Academy of Health Sciences.

Nuclear Fuel Cycle Optimization (Methods and Modelling Techniques)

Author	P. Silvennoinen
Publisher	Pergamon Press, Incorporated, Elmsford, New York (1982)
Pages	138
Price	$25.00
Reviewer	Nicholas Tsoulfanidis

This relatively small book (114 pp. text) should be useful to practicing nuclear engineers, especially those who

are involved in nuclear fuel strategies and their relationship to nuclear nonproliferation. The role of the book as a text for a nuclear fuel cycle course would be limited, however, to that of a supplement. The book complements *Reactor Core Fuel Management* written by the same author.

Chapter 1, entitled "Nuclear Fuel Cycle," provides a very brief overview of the nuclear fuel cycle. I do not agree with the author when he subtracts enriched fuel (P) from uranium feed (F) to obtain savings of natural uranium (p. 12, Eq. 1.18). Natural uranium and enriched uranium cannot be subtracted because they are related: $F = FF \times P$, where FF = feed factor. I liked Chap. 2 most of all. It provides a very lucid analysis of "Uranium Supply and Demand." Chapter 3, a "Basic Model of the LWR Fuel Cycle," gives me difficulty with its computer-type notation. Equations 3.26 and 3.28 should be multiplied by the factor $1/y_2$.

"Resolution of Uncertainties" (Chap. 4) presents a method of obtaining the probability density function for any cost component of the fuel cycle. Although the methodology is standard, it is the first time, to my knowledge, that it is presented in a text on nuclear fuel.

Chapter 5, entitled "Assessment of Proliferation Risks," describes a method of obtaining the value of relative proliferation risks. It is a very nice theory, but in practice, other criteria are used for nonproliferation issues.

"Multigoal Optimization," Chap. 6, takes into account, in addition to economic, other criteria as well, when optimization is attempted. It is a difficult if not impossible task, since the economic criteria are the prime concern of the utility, and other objectives, such as nonproliferation, will have to be imposed by the government through the regulatory process.

Chapters 7 and 8 present fuel cycle models that utilize plutonium in a symbiotic world of light water reactor (LWR)/fast breeder reactor and LWR/high-temperature gas-cooled reactor. Not surprisingly, the results of the single case study mentioned show that a nuclear power industry with only LWRs will be costlier than either of the other two combinations. Of course, the reader should remember that, depending on the assumptions used, one could arrive at a different conclusion.

I like the inclusion of the last chapter (Chap. 9) entitled "Interface with Energy Strategy." Although a single utility will never be concerned with global energy strategies, a nuclear fuel analyst working for a national or, in particular, international agency should be aware of the limitations of our planet. Since nuclear power has an international character, much more than the other modes of generating electricity, problems of supply and demand of uranium and of nuclear services will have to be discussed at the international level. My only hope is that the uranium suppliers behave more rationally and the world does not have to cope with an OUEC in addition to OPEC!

Nicholas Tsoulfanidis is professor and chairman of the nuclear engineering department at the University of Missouri-Rolla. His undergraduate training in physics was at the University of Athens, Greece, followed by graduate studies in nuclear engineering at the University of Illinois. Dr. Tsoulfanidis's research areas are radiation transport and nuclear fuel cycle. He is the author of a book, Measurement and Detection of Radiation, *published in 1982, and of many technical papers.*

Natural Radiation Environment

Editors	K. G. Vohra, U. C. Mishra, K. C. Pillai, and S. Sadaswan
Publisher	John Wiley & Sons, Incorporated, Somerset, New Jersey (1982)
Pages	689
Price	$49.95
Reviewer	Gerald A. Schlapper

This publication contains papers presented at the Second Special Symposium on the Natural Radiation Environment held at Bombay, India, in January 1981. Invited and contributed papers address the topics of high natural background radiation areas, environmental natural radioactivity, measurement techniques, technologically enhanced natural radiation, the indoor radiation environment, radon and daughter products in ambient air, and applications in geosciences. The majority of the papers deal with high interest areas, such as areas having high background levels, current thought regarding indoor radon exposure, and detailed questions relative to technologically enhanced natural radiation. The presentations answer many commonly asked questions and also highlight those areas where additional research is justified.

The symposium was sponsored by the Indian Department of Atomic Energy and the Indian Association for Radiation Protection. Countries other than India were well represented at the conference and this is reflected in the fact that a majority of the papers are authored by attendees from abroad. Four invited talks and eight review lectures serve to inform the reader and allow one to better understand the other 82 contributed papers. The editors of this volume, which contains over 650 pages of text, note that it was necessary to reduce the length of some of the presentations. They have done an admirable job of editing. The papers presented contain a wealth of figures and tables to enhance understanding.

This volume can serve as a reference for those who are attempting to educate the common man on the effects of low levels of radiation exposure. Exposures from nuclear power plants are compared with those due to natural sources. A fine example of the presentations is the review paper by Adams, which examines and updates the threshold hypothesis and clearly emphasizes one of the most important aspects of radiation protection efforts: that specialists in this area have a responsibility to accurately describe radiation environments and to report findings in terms that cannot be misunderstood. The problem of making decisions with imperfect and possibly conflicting data bases is addressed in this and other papers from the symposium.

This book provides a wealth of interesting reading. The division of the volume by area of interest allows one to selectively review the data presented. Rather complete references are provided for each paper, and questions asked of the authors are also included. These discussions provide additional insight into problems experienced by the researchers. A panel discussion recorded at the end of the text summarizes the presentations and points out areas