PhD in nuclear engineering from Iowa State University. He taught for four years in the Physics Department at the University of Tulsa, and for the past eight years he has been on the faculty of Idaho State University. His experiences have varied, from being a consultant to City Service Oil Company to working as a visiting scientist with Argonne National Laboratory. He has also been associated with the space program through National Aeronautics and Space Administration programs conducted at Stanford University. His present interests are in the fields of fast reactor physics and fast breeder reactor safety.

Safeguards Against Nuclear Proliferation

Author	Benjamin Sanders
Publishers	The MIT Press
Pages	114
Price	$14.95
Reviewer	Manuel A. Kanter

Safeguards Against Nuclear Proliferation is a short, well-written background volume concerned with the activities of the International Atomic Energy Agency (IAEA) in the safeguarding of nuclear material. The author outlines the major considerations that shape the safeguards in force today. The book will be quite useful to interested members of the nuclear community because the issues and some of the documentation are very well presented in a very short 114 pages.

It is interesting that the authorship is disclosed only in the last paragraph of the preface. The cover page indicates that the book is simply a monograph by the Stockholm International Peace Research Institute. I would suppose that the intention is that the contents of the book speak for themselves. However, it is a pity that the excellent qualifications of the author, Benjamin Sanders, are not brought to the attention of the reader.

It is my observation that many of the discussions on this subject that one hears in corridors at meetings and sees in the editorial columns of the press show a remarkable ignorance of the fact that international safeguards are circumscribed by international agreements. They are limited by considerations of national sovereignty and, in general, cannot be approached from a unilateral point of view. The IAEA is often criticized as if its limitations were self-imposed. A reading of this book will quickly show that the IAEA is a creature of its member nations and will give the reader a quite clear idea of the limitations those members have placed upon it.

In 57 pages, the text gives a short history of safeguards, lays out the basic issues involved in coming to the present international safeguards, details the present application of safeguards by the IAEA, gives finances and statistics of the IAEA, and briefly discusses future developments. This is supplemented by an additional 57 pages of appendix material giving the full text of the major IAEA documents that are not generally known except by those within the safeguards and arms control community.

The major shortcoming of the volume lies in the chapter on applications. Not enough material is presented to allow for any significant assessment of the efficacy of IAEA safeguards. The reader would have been well served by the inclusion in the appendix of either actual or model safeguards subsidiary arrangements, so that the extent of the application of safeguards would be known to the reader. In addition, some discussion of the actual inspection effort would be helpful in this regard.

In conclusion, I believe the book can easily be read in an evening. It would be an evening well spent by those in the nuclear community who have an interest in this very current topic.

Manuel A. Kanter (a graduate of Northeastern University and the Illinois Institute of Technology) has been a member of the staff of the Argonne National Laboratory (ANL) since 1946. A physical chemist, he spent the first 22 of those years at ANL in basic research with materials in the nuclear fuel cycle. In 1968, he became director of the training program in safeguards at the ANL Center for Educational Affairs, a program that in its five years of operation has trained over 300 participants from industry and government, both foreign and domestic.

Since January of 1976, he has been the director of the nuclear power courses that the Center is presenting for managers and engineers of developing countries in a cooperative program of the International Atomic Energy Agency (IAEA) and the Government of the U.S. Kanter is education chairman of the Institute of Nuclear Materials Management and a member of the American Nuclear Society and the American Physical Society. He has served as a consultant and senior officer with the IAEA in the area of safeguards training.

Thermodynamics of Linear Transport Processes

Author	Marjan Ribarič
Publisher	Slovene Academy of Sciences and Arts (1975)
Pages	158
Reviewer	Paul Nelson

This monograph is philosophically similar to, and substantially based upon, the earlier two-volume work, *Functional-Analytic Concepts and Structures of Neutron Transport Theory*, from the same author and publisher. Consequently, the present review should be read in conjunction with the review by Larsen of the earlier monograph.[1]

The basic language of this monograph is modern functional analysis in a Banach-space context. The viewpoint is that of linear input-output analysis for bodies of finite size ("black boxes"), as contrasted to the much more prevalent field-theoretical approach in which the starting point concerns behavior within infinitesimal bodies. The aim is to formulate input-output hypotheses that appropriately reproduce the qualitative aspects of thermodynamic behavior. To paraphrase a comment from the cited earlier work, the author seems more interested in analyzing physical inferences of thermodynamicists than in

analyzing the actual operation of thermodynamic systems.

I suspect that the emphasis on qualitative results and the black-box approach places this monograph substantially outside the range of interest of the vast majority of the readers of *Nuclear Technology*. For the remaining minority, there follows a brief description of the contents.

Section a (pp. 1-16) is an introduction in which basic assumptions, terminology, and notation are formulated. To maintain consonance with the earlier work, reference is made to "neutrons" flowing between bodies, although "energy" would seem more appropriate in a thermodynamic context. Section b (pp. 17-34) is primarily concerned with establishing existence and basic properties of a quantity labeled "neutron content." A certain generalization of the principle of detailed balancing plays a major role in establishing the equilibrium properties of this quantity. In Sec. c (pp. 35-51), appropriate versions of the zeroth and first laws of thermodynamics are formulated, and the volume of a body is introduced as the neutron content at equilibrium with some standard body. Section d (pp. 52-99) is concerned with formulations of entropy and the second law. Finally, Sec. e (pp. 100-131) is devoted to the derivation of a generalized diffusion equation. The more substantial mathematical proofs are collected in an appendix (pp. 132-149).

These works of Ribarič constitute a monumental effort to open scientific territory that was essentially previously unexplored. As such, they should be judged ultimately on their success in stimulating further related efforts, rather than on the narrow and conventional grounds of detailed accuracy, utility, and current interest. The reviewer therefore declines to attempt a judgment that, even more than most, appropriately belongs to posterity. Suffice it to say that the profound technical complexities of this work make it unlikely that any such ultimate success will be soon attained. This is substantiated by the apparent difficulties the author encountered in obtaining a suitable prepublication review. On the other hand, there does seem to be here a potentially rich source of problems for the researcher willing and able to penetrate the essential and stylistic difficulties associated with reading and comprehending this monograph. In particular, the tasks of building a bridge between the classical field-theoretic approach and the input-output viewpoint, and of finding suitable substitutes for those assumptions of Ribarič not substantiated by this bridge (e.g., the compactness assumption discussed by Larsen[1]), strike this reviewer as quite intriguing.

Paul Nelson has been professor of mathematics at Texas Tech University since 1972. From 1965 to 1972 he was associated with the Mathematics Division of the Oak Ridge National Laboratory, as an applications programmer, research staff member, and coordinator of mathematical research. His research interests include neutron transport (theory and computation) and numerical solution of two-point boundary-value problems, particularly by the technique of invariant imbedding. He has authored or coauthored over 35 research articles and technical reports.

REFERENCE

1. EDWARD LARSEN, "Review of *Functional-Analytic Concepts and Structures of Neutron Transport Theory*," *Nucl. Sci. Eng.*, **58**, 105 (1975).