NUCLEAR SCIENCE AND ENGINEERING: 22, 125-127 (1965)

Book Reviews

Environmental Radioactivity. By Merril Eisenbud. McGraw-Hill Book Company, Inc., New York-San Francisco (1963), 430 pp, $12.50.

This book will be valuable reading for any scientist, engineer, medical man or administrator involved with radioactive materials. It could serve as a basic text for a course in a radiological health or nuclear engineering curriculum. The book is primarily concerned with the behavior of radioactive materials in the environment, and the author disclaims any intent to cover health physics or radioactive waste technology. Nevertheless, there are significant sections which do treat important aspects of both of these fields very adequately for most purposes.

Part I discusses radiation effects on man in a powerful chapter concerning the biological aspects of radiation protection. Here the evolution of the maximum permissible dose concept is presented; the result is a lucid description of a subject which usually seems complex and confusing. Appendices to the chapter are concerned with the functions and interrelationships of ICRP, NCRP, Federal Radiation Council and other similar advisory or regulatory bodies.

Physical and biological transport mechanisms are discussed in Part II. Concerning atmospheric transport, the standard equations for determining downwind ground-level concentrations are presented in forms useful without complex mathematics. In a similar way, the impaction of dust on surfaces and the deposition of particulates are considered. In the same chapter are examples of calculations of dose from radioactive emitters in the atmosphere—dose from a passing cloud, thyroid dose from inhaled radioiodine, external gamma dose from a ground deposit and lung dose. Regarding the aquatic environment, mixing of the oceans, of coastal waters, in estuaries and in rivers are topics treated, and the effects on distribution of contaminants are discussed. In considering food chains, the emphasis is placed on the herbage-milk-bone sequence.

Part III considers the sources of environmental radioactivity. The chapter on natural radioactivity is particularly well done; in addition to the usual tables of the natural series, one finds such descriptive material as geochemical data, occurrences in rocks, waters, foods and man, and environmental radiation levels in principal U. S. cities.

Another chapter in the section describes operations from mines to fabricated fuel and the related opportunities for environmental contamination. The chapter on reactors discusses simply the fundamental aspects of reactor design and reactor physics, the common reactor types and their normal and accidental effluents and the CFR reactor-site-location criteria. An interesting chapter on the aerospace utilization of radioisotopes considers satellite auxiliary nuclear power and the various types of risks of environmental contamination from such uses. While no detailed treatment of fuel reprocessing is attempted, the most important processes are mentioned, and the Savannah River Plant is used as an example to illustrate problems in the control of radioisotopes in such installations. A chapter on radioactive waste management outlines the subject, gives estimates of the amounts of fission products generated to date and to arise in the future and highlights the problems of waste storage and disposal.

Undoubtedly the most significant chapters are those concerned with the phenomena of local fallout and worldwide fallout from nuclear explosions. Curves of fission product yields, methods used in the prediction of fallout patterns in the U. S. and methods of dosage calculations are given together with discussion of the possible effects of nuclear attack and some of the problems of recovery therefrom. The behavior of individual radionuclides produced in weapons tests is described with emphasis on Sr^{90}, Sr^{89}, Cs^{137}, C^{14}, Pu^{239} and I^{131} situations.

In Part IV the author considers major accidental releases of radioactive material to the environment and some of the major accidents which have occurred in the field of nuclear energy to date. In each case he considers the history of the event, the medical investigations, the exposures received, the environmental survey and decontamination procedures and the lessons learned. The book closes with chapters on methods of environ-

mental surveillance with consideration of equipment for studying ground, water and atmospheric conditions.

The author's long and varied experience in the field has allowed him to choose those topics of most value to a wide group of readers. The book is firmly packed with useful information, nicely tabulated or illustrated with well-chosen tables and graphs, and the topics are clearly explained. There is a good selection of references to the literature but the book is not dependent for its usefulness as a literature survey. It should have considerable lasting value.

D. W. Pearce

Battelle-Northwest
Pacific Northwest Laboratory
P. O. Box 999
Richland, Washington 99352

Received January 19, 1965

About the Reviewer: After teaching and doing research for the Manhattan District at Purdue University, D. W. Pearce joined the General Electric Company at Hanford in 1947. Here he was Manager, Biophysics, and Manager, Chemical Effluents Technology. He served as Director of the Division of Health, Safety and Waste Disposal at the International Atomic Energy Agency, Vienna, during 1961-1963, returned to G. E. at Hanford as Consulting Scientist in the Chemical Laboratory and is now Senior Research Associate there with Battelle Northwest Laboratory.

Concise Dictionary of Atomics. Edited by Alfred del Vecchio. Philosophical Library, New York City. 262 pages, $6.00.

The *Concise Dictionary of Atomics* is designed to explain the vocabulary of the atomics energy program to students and newcomers to the field. From A for argon to Zr for zirconium, the author has assembled some two- or three-thousand definitions of scientific, medical and historical terms used in the AEC programs. In addition brief biographies are given of well-known nuclear scientists, as well as descriptions of the most important organizations sponsoring nuclear research.

Certainly the author has done a very comprehensive job of assembling information about the program. Thus one can find that "crud" is slang for an undesirable impurity in a process, a "daraf" is a unit of elastance which is obtained by spelling farad backwards, "anaphase" is the third stage of mitosis in cell division, etc. The author appears to have done a good job of covering chemical and physical terms, with engineering and medical terms not quite so well represented.

The chief criticism this reviewer has is in the handling of the mathematical definitions. Evidently the publisher has had little experience with scientific publications, and numerous errors appear in the mathematical equations and formulas. For example, the Laplacian operator is written Δ^2 rather than the more customary ∇^2, the equation for the (α,n) reaction is wrong, the symbol for frequency is written v instead of ν, the de Broglie equation has a square root upside down, u is used for absorption coefficient instead of μ, and several of the equations are rather poorly set up. In view of the very limited amount of mathematical material which is included, it might have been better to eliminate it entirely rather than to do such a poor job with it.

In summary, the book can be recommended for nontechnical personnel who are associated with the atomic energy program such as those in administration, secretarial staff, newspaper reporters and in general anyone who has to work with scientific personnel. The book might be of limited value to those who are first starting to study the technical features of atomic energy, but the experienced engineer or scientist will probably find the definitions too general to be of much value to him.

R. Stephenson

The University of Connecticut
Storrs, Connecticut
06268

Received December 14, 1964

About the Reviewer: Dr. Richard Stephenson was in the engineering division of the Oak Ridge National Laboratory from 1950 to 1954, during which time he performed shielding experiments and wrote a book, Introduction to Nuclear Engineering.

He was at New York University from 1954 to 1957, was a Fulbright Professor at the Vienna Institute of Technology 1957-1958, and has been a professor of nuclear engineering at the University of Connecticut since 1958.

Nuclear Power Systems. By C. D. Gregg King. The MacMillan Co., New York, N. Y., (1964). 480 pages. $13.00.

Published as an introductory text, *Nuclear Power Systems* serves this purpose admirably. It is comprehensive, well-organized, well-written