

BOOK REVIEWS

Selection of books for review is based on the editor's opinions regarding possible reader interest and on the availability of the book to the editor. Occasional selections may include books on topics somewhat peripheral to the subject matter ordinarily considered acceptable.



Reflections of a Physicist

Author Anatole Abragam
Publisher Oxford University Press, New York (1986)
Pages 159
Price \$22.95
Reviewer Mary G. White

The collection of essays by Anatole Abragam, entitled *Reflections of a Physicist*, contains not only remarks made by a remarkable scientist, but also a group of statements and questions concerning why the technical mechanics of science work the way they do. His purpose in the collection of these particular essays and papers was to respond to a colleague's suggestion; the documents are mostly general in nature for less technical readers. We should be most grateful for the publication of this collection. It is a powerful, small volume loaded with philosophical questions and provoking discussions on subjects such as the primary difference between fundamental and applied research being the "intent" of the work of the scientist, i.e., the choice of the problem to be addressed (whether the aim is to understand the laws of nature or eventually to produce a useful device); Big Science versus Little Science, including a discussion of the role of computers; issues concerning trusting scientists with the "management" of science; the vast publications explosion and problems created; questions related to whether scientific research should be a lifetime job; and other problems due to the rapid development of science. Also included in Abragam's book are his "sketches" of other physicists and two interesting documents he authored on NMR (nuclear magnetism), his special research field.

Abragam discusses the integration of physics in cultural and educational aspects of life, the requirement for training and talent in research, the use of French in scientific communication, whether science should be planned, and "more power to imagination" writings that are fascinating and enervating. One is at once profoundly respectful of his ideas and yet frustrated by how to relate to such suggestions and philosophies in the present-day funding arenas.

The general nature of most of the material in the volume makes it valuable reading for students and researchers of all scientific disciplines who are interested in the philosophical issues pertaining to scientific research and the role of certain physicists who have participated in extending the barriers of "known" science to new regions.

Mary G. White recently completed a 30-year career of federal service, most recently serving as technical measurements and quality assurance manager for the uranium mill tailings project of the U.S. Department of Energy (DOE). She also held positions as DOE program manager for the DOE Technical Measurements Center, the Grand Junction Remedial Action Program, and the Formerly Utilized Sites Remedial Action Program. She has served on national program Blue Ribbon advisory panels and has chaired DOE technical task forces. White recently was appointed a senior research associate in the nuclear and energy engineering department, University of Arizona, Tucson.

Radwaste '86, Proceedings Volume of a Conference on the Treatment and Containment of Radioactive Waste and Its Disposal in Arid Environments

Editor L. C. Ainslie
Publisher Atomic Energy Corporation of South Africa, Ltd., P.O. Box 582, Pretoria, 0001, Republic of South Africa (1986)
Pages 1043
Price \$25.00
Reviewer Konrad B. Krauskopf

This huge volume contains papers presented at South Africa's first international conference on the disposal of radioactive waste. The development of nuclear energy in South Africa has followed a sequence different from that in most countries; a general area for the disposal of waste was

selected about a decade ago, inhabitants of the area were consulted, and their acquiescence was obtained. Only then were exhaustive geological and geophysical surveys made to pinpoint a favorable site. All this was going on during the 8 years while the country's first nuclear reactor was under construction. Now that the reactor is operating and generating abundant low- and intermediate-level waste, the disposal site is ready to receive it. A specific site for high-level waste has yet to be chosen, but it seems likely that one will be found without great difficulty in the same disposal area. Thus, the South Africans feel that they have avoided the difficulties that have plagued so many countries, where the search for disposal sites began only after abundant waste already existed and after local opposition to the search had been fanned to fever heat.

The South Africans are understandably proud of their accomplishment, and one purpose of the Radwaste '86 Conference was to let the outside world know what they have learned about waste handling and waste disposal in an arid environment. Low-level waste generated at the Koeberg reactor site, 26 km north of Cape Town, is put into 200-l metal drums; intermediate-level waste (chiefly filters and resins from cleanup operations) is mixed with cement and immobilized in metal-lined concrete containers. The drums and containers are transported by truck to the disposal site at Vaalputs, 600 km north of Cape Town in Namaqualand. This is a semidesert region of subdued topography, underlain by Precambrian crystalline rocks of complex structure with a capping of tertiary and quaternary sediments. Disposal trenches for the low- and intermediate-level waste are being excavated in a tertiary silty clay on a flat drainage divide. High-level waste, in the form of spent-fuel rods, is at present accumulating in a water basin at Koeberg; studies are under way to locate a site for permanent disposal in the Precambrian rocks at Vaalputs. All these activities were described in many formal papers and in animated discussions at the conference.

A second purpose of the conference was to bring together scientists and engineers from other countries for a wide-ranging discussion of waste disposal problems. Visitors came from many parts of the world: 15 from the United States, 10 from Taiwan, 9 from the Federal Republic of Germany (FRG), 7 from France, and smaller numbers from eight other countries. Emphasis at the conference was on the management and disposal of low- and intermediate-level waste, as befitted the current chief concerns of the South African hosts, but high-level waste was touched on in a few papers.

The Proceedings Volume is a compilation of all the papers given in the 4 days of formal presentations. The papers are published just as they were submitted, with only minimal editing, so that they differ in format, kind of type, and quality of printing. They also differ, inevitably, in scientific and technical interest, but the overall standard is high.

About one-third of the papers deal with various aspects

of the South African waste management program. The geology of the Vaalputs area, little known before it was chosen for waste disposal, is described in great detail. Of particular interest is the reported finding of unusual rocks in the crystalline basement, including enderbite, norite, and kimberlite; these were examined carefully for possible mineral occurrences (of uranium, base-metal sulfides, and diamonds, respectively). Fortunately for the waste disposal enterprise, however, nothing of economic importance was found. Geophysical investigations of many kinds, important for the hydrological background and useful in identifying rocks and structures where the Precambrian is concealed, are presented together with a critique of their usefulness and their weaknesses. One paper describes the experimental trenches constructed to test the drainage characteristics of the silty clay at the disposal site, the relative advantages of different slopes for the trench walls, and the suitability of various mixtures for trench capping material. Another gives details of procedures used in preparing waste for shipment and in testing the containers for their ability to survive accidents. A paper on high-level waste outlines plans for constructing an air-cooled facility for storing casks of spent-fuel rods, as a supplement to or substitute for the present water basin. Altogether the South African papers give a vivid picture of a complex decade-long operation, carried to a successful conclusion for low- and intermediate-level waste and now directed to finding a way for safely managing spent-fuel rods.

Papers from other countries present a kaleidoscopic review of current work on waste disposal elsewhere. Examples include a paper from the FRG on plans for disposal at Asse and the Konrad mine, another from the FRG on compaction, incineration, and packaging of intermediate-level waste, two papers from Taiwan on locating disposal sites in that country, one from France on minimizing the amount of solid waste from a reactor, and two from the United States on dry storage of spent fuel and on the design of caps for low-level waste trenches. The coverage is spotty, but the volume provides a good overall view of current thinking about low- and intermediate-level waste.

Included with the book is a large geologic map (1:25 000) of the Vaalputs area, together with inset maps showing results of the radiometric and aeromagnetic surveys. The volume and the maps are an important addition to the waste disposal literature.

Konrad B. Krauskopf is a retired professor of geochemistry in the Department of Geology at Stanford University. He has served on various panels and committees on topics relating to radioactive waste and reactor safety, including the National Academy of Sciences Board on Radioactive Waste Management, of which he was chairman for four years. He is now on an advisory panel for the Waste Isolation Pilot Plant in New Mexico.