

BOOK REVIEWS

Chapman, N. A. and McKinley, I. G. *The Geological Disposal of Nuclear Waste*. John Wiley & Sons, Chichester, New York, Brisbane, Toronto and Singapore, 1987. xii + 280 pp. Price £34.95.

The start of drilling operations in late 1986 at four sites in England identified as possible dumps for low-level radioactive waste was bitterly opposed by local residents, and the resulting media publicity brought the whole question of radwaste disposal to the forefront of public awareness. The appearance of this book in early 1987 was thus very opportune, as it provides a wealth of relevant information, much in a form understandable by the 'intelligent layman'. Unfortunately, it has had little chance to influence debate as, even as the book was being reviewed, the UK Government abruptly dismissed the shallow-burial option, causing work on the four sites to be abandoned and the loss of an estimated £20 million-worth of R & D.

The book opens with a review of the nature of radioactivity and the principles of radiological protection, then describes how radioactive waste arises during the various stages of the nuclear fuel cycle. Processing of the waste to a form suitable for geological disposal is dealt with only briefly and thus readers of this journal expecting an extended discussion on the relative merits of SYNROC *vs.* borosilicate glass will be disappointed. Rates of production in the UK of both nuclear and non-nuclear wastes are tabulated, as are the radionuclides assumed to be present in the different waste forms. These introductory chapters close with a brief discussion on the principles of waste management and alternatives to deep geological disposal (could any responsible government condone—or even have considered seriously—disposal of high-level waste in solar orbit?).

In the main part of the book, a chapter dealing with the multi-barrier repository concept, and the geological hazards that the repository may encounter during its necessarily long lifetime, is followed by chapters describing research into processes which may occur in the 'near-field' (waste, engineered barriers and adjacent host rock) and the 'far-field' (extending to the Earth's surface and biosphere). These and the following chapter on field and laboratory measurement of radionuclide migration draw heavily on experimental and modelling studies of ground-water flow and chemistry in materials ranging from plastic clays to

fractured granites. Further chapters describe the construction and operation of a deep repository for long-lived wastes (a mainly theoretical description, although the authors stress that the technology and expertise for this already exist) and the shallow burial of low-activity wastes—a process that has been operating for 40 years. Conversion of all the data generated by studies of radionuclide mobilization and transport from the near-field to the biosphere and the likely risk to man is dealt with in the final chapters. This area is where most uncertainty exists: perhaps the only means of validating models is by investigation of natural analogues (e.g. radionuclide distribution in the Oklo fossil natural reactor, Gabon) and a number of these are described.

Appendices describe the International organizations involved in radwaste disposal, significant national research programmes into this (with the UK programme getting an appendix of its own), and the radwaste literature. Results of studies into radwaste disposal often appear in the 'grey area' of the scientific literature, for example open-file publications and end-of-project reports to government agencies. The book draws heavily on these, as can be seen from the extensive and up-to-date (to 1986) reference list.

This book has its drawbacks—it would have benefited from a more structured approach and more care in the selection and reproduction of illustrations. Some line drawings are excellent, others are poorly reproduced and one (Fig. 6.16) is so simplified as to be misleading. It is, however, essential reading. Scientific research into radwaste disposal cannot be divorced from Government policy as has been demonstrated a number of times recently in the UK. The problem will not go away, and a political decision to decommission nuclear power stations could change the rules overnight. Go out and buy this book and prepare yourselves for a future Great Debate!

D. J. MORGAN

Woolley, A. R. *Alkaline rocks and carbonatites of the World. Part 1: North and South America*. London (British Museum [Natural History]), 1987. 216 pp., 238 figs. Price £40.00.

Although alkaline rocks and carbonatites make up only a very small fraction of all igneous rocks, their