

Part IV (the largest) is the most important part of the book and deals with 25 host species and their varieties. Some idea of the comprehensive nature of the treatment provided may be gauged by the section on emerald. The inclusions in stones from Brazil (several localities), Habachthal, Ajmer, Colombia (several mines), Lake Manyara, Mozambique, Pakistan, Sandawana, Transvaal, Urals, Zambia are all described and usually with several different photographs for each locality. Each photograph is provided with a concise description of the various inclusions and details of the type of lighting and the magnification. Ruby, sapphire and other important commercial gemstones are given comparable treatment and there is a very fine section on treated corundums. This part and the following Part V will be of crucial importance to the practising gemmologist.

Part V (88 pages) deals with the inclusions of man-made stones. It opens with a short review of the development of the various methods of gemstone synthesis and discusses the use of the terms imitation, artificial and synthetic. Over 40 photographs are used to illustrate inclusions in a wide variety of glasses. Synthetic emeralds (50 photographs) receive full treatment and photographs of several types, such as Lennix, Biron and Regency-created are included. Synthetic ruby (90 photographs) is described and figured comprehensively and includes details of the latest Knischka, Kasha and Ramaura types. Synthetic sapphires of various colours are also illustrated very fully.

Part VI (15 pages)—the 'concluding thoughts'—includes a geological timetable, a glossary of scientific expressions used, an extensive bibliography and a list of works cited. A very welcome addition to this volume is the provision of an index.

This *magnum opus* is exactly that. The provision of some 1400 photographs and descriptions could be confusing, but here they have been logically arranged and a good contents list and index provided. The book is not just beautiful, it is also a comprehensive laboratory manual for those (most gemmologists!) who do not have access to the enormous range of natural stones from numerous localities or the range of very clever fakes which are now produced. Criticisms can be few, the reviewer (and some of his friends) find the outer cover disappointing in its near monochrome appearance, and the page margins somewhat ungenerous for the superb contents. It is to be hoped the binding will stand up to the very hard usage that many copies will receive. At £110 (in London) the book is expensive, but this is understandable when one considers the very extensive use of colour and the superb reproduction. The reviewer recommends buying the book first and affording it afterwards. It

is the ideal gift for the gemmologist, jeweller, mineralogist, geologist (or anyone else for that matter) who has everything else.

E. A. JOBBINS

Milnes, A. G. *Geology and Radwaste*. London and Orlando (Academic Press), 1985. xvi + 328 pp., 97 figs. Price: Cloth £50.00, Paper £36.95.

At a time when the philosophical, political and technical problems associated with the management and disposal of waste material which emits ionizing radiation are very much in the public eye, an up-to-date source-book would seem most welcome. This book attempts to cover the whole range of geological factors which must be considered in the establishment of selection criteria for the identification of the safest disposal system for the various forms of radioactive waste (radwaste) while interspersing a degree of philosophical discussion of the role that earth scientists are being required to play in an involved economic-political game.

The book, which contains fifteen chapters, is divided into three parts. The first of these, comprising two chapters, deals with the various sources of radwaste and the physico-chemical characteristics of both high-level and low-level forms, followed by an over-view of the options available for their containment or dispersal in, hopefully, safe disposal systems.

The second, and by far the largest, part of the book is concerned with the inter-relationships of those geological processes active at or near the Earth's surface and within the crust, which are considered relevant to the selection of radwaste repositories and the assessment of their long-term stability. Successive chapters deal with the general composition of the Earth's crust, geological time, surface processes (biogeochemical aspects, denudation, and deposition), sedimentary rocks, volcanic processes, natural and synthetic crystalline rocks, physical processes in the upper crust, fluid-rock interaction, ocean processes and, finally, climatic change and continental glaciation. Throughout this section, examples of radwaste management or disposal are interjected within the systematic review as illustrations of the effects of the various processes on the waste or repository.

The final part, entitled 'Applications', again consists of only two chapters. The first discusses predictive modelling of the behaviour of radionuclides in the natural environment in relation to the selection of criteria for safe disposal. The final chapter gives some specific examples of repositories and, concluding in a more philosophical vein,

emphasizes the necessarily reiterative nature of the problem in which the data needed to produce a convincing predictive performance model can be obtained effectively only after a disposal site has been selected and put into use.

For the professional earth scientist, the value of this book will depend largely on his own familiarity with the field. For many, the treatment will be too superficial—in the concluding remarks to nine out of fifteen chapters the author either acknowledges the discussion, survey or review to be short or brief, or refers to the content as ‘some aspects’, ‘these few examples’, or ‘briefly illustrated’. As with many publications dealing with topical issues or areas of rapidly evolving science (and, in this case, politics), there are inevitable entries which are already dated. Perhaps most marked in this respect is the discussion of the ultimate problem of disposal—a shut-down reactor. Here, the enormity of the problem and costs involved in the repair and clean-up at Three Mile Island have been spectacularly superseded by Chernobyl. From the geological point of view, much of the book is, in effect, a condensed textbook of earth science and the somewhat selective approach at times results in what seems to be disproportionate attention to some topics and inadequate treatment of others. For example, while Pleistocene climatic changes are afforded five pages of text, the most important and complex subject of groundwater geochemistry is dealt with in only four. Again, in considering the importance of research on natural analogues, the significance of detailed studies of uranium veins and their host-rocks is stressed, but no attempt made to review the large amount of pertinent mineralogical and

geochemical data that have emerged in recent years.

However, the author does not intend this book for the specialist but for a much wider group of readers with ‘some scientific education and interest in environmental problems’. The author accepts that his treatment is, of necessity, selective but his aim is to provide a broad review of factual data, often poorly understood or mis-interpreted in public debate, which form the basis of the problems associated with radwaste disposal. In the attempt to develop a more popularised style, the writer has introduced some expressions which may seem somewhat simplistic (for example, volcanoes are likened to chimneys in the Earth’s crust). At the same time, it seems to this reviewer that much of the geology is dealt with too briefly to be adequately understood by the complete layman (albeit a scientifically aware one).

To attempt to compile so many relevant factors, many of which are interdependent, into coordinated text without omission or reiteration is a difficult task. This book does contain quite an impressive amount of review material, presented in a generally readable and well-illustrated form and should go some way towards achieving the author’s declared objectives. An index and a very comprehensive contents list allow ready search as a source-book. As indicated above, however, the specialist may find detail lacking and that his attention would be better directed to the large number of recent symposia proceedings and other compilations published by the international organizations.

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