glacial overburden, humus, stream sediments and heavy mineral concentrates.

The role of regional stream sediment geochemistry in the detection of mineral deposits is reviewed by Plant *et al.* with respect to northern Scotland. Examples are given of stratabound mineralization in the middle Dalradian, granite and porphyry style mineralization of Caledonian age and mineralization in the post orogenic ORS basins. The value of integrating geochemical and geological data via interactive computer graphics to develop models of mineralisation is stressed. Unfortunately some of the figures in this paper are of poor quality. Viewing *et al.* discuss the use of stream sediment and lithogeochemical data in the granitic terrain of Zimbabwe. The data are useful in locating mineral deposits, agricultural planning and identifying levels of urban and industrial pollution. An antipodean perspective on geochemical exploration is provided by R. H. Mazzucchelli who explains the special problems posed by deep lateritic weathering and aeolian sands. An intriguing solution to the latter is the use of termitaries to locate mineralized bedrock.

The shallow marine environment (P. A. Smith) is covered by sections on placer exploration, bedrock mineralization, phosphorites and modern submarine exhalative activity around Santorini. Exploration for deep-sea mineral deposits (D. S. Cronan) includes metalliferous sediments and polymetallic sulphides forming at midocean ridges and island arcs, manganese nodules and Co-rich manganese encrustations. A section on the genesis of the last two is also provided.

An especially useful review of computing in applied geochemistry is given by R. J. Howarth and R. G. Garrett who discuss sampling and search, laboratory quality control, statistical analysis, mapping and future developments. In the last context it is reassuring to be told that geochemists will not be replaced by interpreting machines in the foreseeable future!

Analytical techniques are covered in varying detail. P. E. Croft gives a brief description of the role of the consulting laboratory and the main instrumental methods. Readers will appreciate a topical and informative review of the technique and future role of ICPAES (M. Thompson). Vapour geochemistry as an exploration technique for both mineral and energy resources is discussed by Meyer *et al.* with interesting examples from three oil-fields and a Cu–Zn-bearing skarn deposit in the western USA. Although the technique clearly has some potential, a serious drawback is that the controls on gas dispersion are still poorly understood.

The relationship between geochemistry and human health (R. G. Crounse) is examined by considering one element, selenium, in detail. Selenium is now known to be essential to human health and deficiencies and excesses are linked to heart, hair, nail and skin abnormalities. Deficiencies may even be responsible for some cancers. Correlations between geochemistry and animal health are also well documented and G. Lewis discusses the effects of Cu, Co, Se and vitamin E deficiencies in cattle and sheep.

In a detailed chapter on environmental health and pollution (Thornton *et al.*) we are informed that large areas of the UK have been contaminated by metalliferous mining and smelting. Examples are given of Cu, As, Sn pollution in SW England and Pb, Zn, and Cd pollution mainly in areas of Pb, Zn mineralization such as the Mendips and Pennines. Nevertheless crop plants and livestock can in general be farmed successfully due to various physical and biological barriers restricting metal uptake. Also discussed are the effects of metal contaminants on soil bacteria, contamination of water resources and urban pollution in the form of house dust. A comprehensive account of the potential and problems in using shellfish as geochemical indicators in the marine environment is given by A. Darracott. Studies of oysters in UK estuaries show evidence of heavy metal (Cu and Cd) pollution whereas oysters from a S. African coastal lagoon show no evidence of pollution.

G. J. S. Govett reviews the achievements of exploration geochemistry and discusses its future role in mineral exploration. The rapid growth on the subject is shown by 95% of the literature having appeared in the last 30 years. According to Govett 'The great challenges . . . are to develop techniques capable of detecting concealed mineralization and to improve the capability of discriminating between true and false anomalies'. These aims will require a major research effort involving extra funding and more theoretical exploration geochemists. Government and Industry please note!

C. M. RICE

Saggerson, E. P. *A Handbook of Minerals under the Microscope.* Pietermaritsburg (University of Natal Press), 1986. x + 54 pp., 81 photos. Price S.A.R. 19·50.

This is a 50 page ring-bound booklet for students to be used in laboratory classes for optical mineralogy. It is divided into two parts. The first part under the title of Mineral Properties consists of definitions of various terms used in mineralogy followed by a very brief treatment of relief, birefringence, determination of optic sign and, in the case of biaxial minerals, estimation of size of 2V. Optical orienta-

tion diagrams are described and there follows a table occupying three pages in which minerals are listed according to whether they are isotropic, uniaxial positive and negative and biaxial positive and negative. Relief is indicated by the following symbols −M, −L, L, M, H, VH and E. The ranges of refractive indices covered by these symbols have been defined on a previous page e.g. M represents 1.60–1.70.

Most of the space in these tables is occupied by columns indicating the possible colours exhibited by the mineral but nowhere is it stated that these colours may be either in thin section or in hand specimen, e.g. cordierite is described as colourless, yellow, green, blue or purple-lilac—these colours must refer to hand specimens, while arfvedsonite has almost the same list of colours and here they are likely to refer to colours as seen in thin section: kyanite is described as colourless or grey so this must be in thin section.

Part II is entitled Mineral Groups and here the commonest rock-forming mineral groups are dealt with in a very condensed and largely tabular form. Some of the data in these tables are more useful than others; for example the relationship between birefringence and composition in the plagioclase feldspar series cannot be of much diagnostic value especially as it varies with structural state as well as composition. There is an observation that sanidine may show anomalous interference colours but this is no more frequent in sanidine than in anorthoclases or high-temperature plagioclases. Many of the references in this section are to secondary or tertiary sources but this is becoming increasingly common nowadays.

Among the useful features of this booklet are the photomicrographs of minerals in thin section many of which the student may recognize immediately; others are less convincing.

One might form the impression that the booklet is designed for students who have no intention of studying geology for more than one year, so that buying this book will save the expense of more detailed text-books. This is not the author's intention since he writes in the introduction 'The student is strongly advised, however, to study a standard and authoritative text, not only for additional data but to verify initial mineral recognition.' The aim is to speed up mineral recognition so that the student has time to 'study the textural relations that are important clues to the problem of rock genesis'. The author has greater faith than the reviewer in the information which can be obtained from textures in our present state of knowledge: the aim is however one to be encouraged.

W. S. MacKenzie

Brunton, C. H. C., Besterman, T. P., and Cooper, J. A., eds. *Guidelines for the curation of geological material.* Geological Society Miscellaneous Paper 17, 1985. 192 pp., 40 figs. Price: with binder, £19.50; without binder, £17.00.

These *Guidelines* are a series of contributions by curators of geological material. The subject matter covered is divided into five sections; Acquisition (12 pp.), Documentation (66 pp.), Preservation (36 pp.), Occupational Hazards (8 pp.), and Uses of Collections (21 pp.). The book is produced in a loose-leaf form, the intention evidently being to revise individual sections from time to time.

Although much of the subject matter spans the whole range of geological material, considerable attention is given to the specific requirements of those handling and documenting mineralogical and petrological specimens. In the Occupational Hazards section there is a useful contribution on the regulations for the safe storage and handling of radioactive specimens, one of the areas in which clarification is most frequently sought from mineralogical curators.

The book makes a useful contribution to the documentation, handling and uses of geological collections, although, surprisingly, there is no coverage of one topic currently of widespread interest—the computer-based storage and retrieval of specimen data. Nevertheless the book should be of considerable interest to those concerned with the preservation of geological material, whether from an exhibition standpoint, or from a concern that research material should be preserved for the benefit of future workers.

A. M. Clark

Roonwal, G. S. *The Indian Ocean: Exploitable Mineral and Petroleum Resources.* Berlin, Heidelberg and New York (Springer-Verlag), 1986. xvi + 198 pp., 63 figs. Price DM 128.00.

The appearance of this small volume of just under two hundred pages coincides with an upsurge of interest in the geology of the Indian Ocean. The British research vessel *Charles Darwin* has been operating there since August 1986 and in May 1987 the Ocean Drilling Program vessel *Joides Resolution* began an 18 month programme of scientific ocean drilling.

After introductory chapters covering mineral resources, the origin and development of the Indian Ocean and marine exploration techniques, the bulk of the book is divided into chapters on each of the major types of marine deposit which can be considered as mineral resources: placer deposits, phosphorite, ferromanganese nodules and encrustations,