BOOK REVIEWS

Potts, P. J. *A Handbook of Silicate Rock Analysis.* Glasgow (Blackie) 1987. x+622 pp., 531 figs. Price £128.

Many new books on silicate analysis have been published in recent years—but this monumental contribution is different to anything to date. It attempts to provide a comprehensive coverage of all the major analytical techniques now in common usage for silicate rocks. For one author to write such a book as this is indeed a remarkable achievement. The book is clear, concise and authoritative and the techniques covered benefit from the uniformity of style attained by a single author. The scope of the book is such that it should be useful not only to those directly involved in the day to day analysis of geological samples, but also those seeking an overview of the different analytical methods.

A genuine and successful effort has been made in the book to evaluate all the techniques now practised for silicate analysis. Thus the classical (gravimetric) methods are not overlooked, and the 'rapid' methods of analysis, developed some 20 years ago (using largely colorimetric/photometric techniques) are presented in adequate detail. The bulk of the book however is occupied with accounts of modern instrumental methods of elemental analysis. There are excellent chapters on atomic absorption, inductively coupled plasma spectrometry and X-ray fluorescence spectrometry (wavelength and energy dispersive). Full details of the principles and practice of the various techniques are presented in these chapters. For many readers these will be definitive accounts, with full references to the more recently published material. Detailed analytical 'recipes' are not usually given, but otherwise the coverage for all these important techniques cannot be faulted.

A major difficulty any author faces in a book of this nature is what to include and what to exclude; no way can all prejudices be accommodated. Electron analysis is covered fully and there are also short but useful accounts of the 'Other microbeam and surface analysis techniques' (ion probe, laser microprobe, particle-induced X-ray emission, electron spectroscopy for chemical analysis and transmission electron microscopy). Neutron activation analysis and mass spectrometry (thermal ionization and gas source) techniques are well represented. Overall, the balance between techniques, and the evaluation of the potential advantages and disadvantages of the methods are the very best that could be attained with present knowledge.

It is not possible in a brief review of a book such as this to do justice to the breadth and scope of the text. There are very many other useful topics included (chapters on ion selective electrodes, ion exchange separation techniques, gold and platinum group analysis, spark source and inductively coupled plasma mass spectrometry). Of real use to practising analysts are the chapters on 'Concepts in analytical chemistry' and 'Optical spectrometry: principles and instrumentation', providing answers to many fundamental questions.

This fine book is well written and presented, with only a few errors. It certainly deserves to succeed. It is by far the most important book published in silicate analysis in recent years, well ahead of any potential rivals.

J. N. WALSH

Thornton, I. and Howarth, R. J., eds. *Applied Geochemistry in the 1980s.* London (Graham and Trotman Ltd), 1986. xiv + 347 pp., 50 maps. Price £38.00.

This book is a collection of 15 review papers [M.A. 87M/2922–2936] presented at a 2 day meeting as a tribute to the pioneering efforts of Professor J. S. Webb in applied geochemistry. The papers cover geochemical exploration in various continental and oceanic environments, analytical techniques, data processing, animal and human health and pollution—an impressive range of subjects which collectively give a valuable overview of the subject. It is generally well written and clearly illustrated and the case histories have been thoughtfully selected. Because of this and the good bibliographies at the end of each paper, the book is also a useful introduction to the subject for students and professionals. Resisting the temptation of a good novel I read much of it during a long plane journey and felt it was time well spent.

Since most current exploration is devoted to precious metals and PGEs, a chapter on gold exploration (I. Nichol) is particularly appropriate. Basic theory, including the vital issue of sample representivity, is discussed in some detail and is followed by an outline of gold distribution in soils,

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-