BOOK REVIEWS

Pattrick, R. A. D. and Polya, D. A. (eds.) *Mineralization in the British Isles*. London (Chapman & Hall), 1993, xii + 499 pp. Price £49.95.

The British Isles host some of the world's classic ore provinces of which the Cornubian tin–tungsten province and the Pennine lead–zinc–fluorite–baryte province are but two examples. In this book, after an introductory chapter by the editors on the mineralization and geological evolution of the British Isles, there are chapters dealing with eight provinces, each being described by the active research workers in the area. Where possible, descriptions and models of geology, mineralisation and ore genesis are placed in context by comparisons with other metallogenic provinces around the world.

The stratiform mineralisation in the Dalradian of Scotland is described by A. J. Hall, who demonstrates the existence of two main styles: an earlier barium–rich mineralisation typified by the Aberfeldy mineralisation, and a later more variable Cu, Zn, Pb and Ni sulphide mineralisation lacking Ba and typified by the mionor mineralisation in the Tyndrum area and Meall Mor. Mineralisation associated with Caledonian intrusive activity is summarised by C. M. Rice, including the Coed-y-Brenin Cu deposit, the Unst Cr and platinum-group-elements ophiolite sequence, the granite-related W-Sn-Mo mineralisation as exemplified by Carrock Fell and Leinster areas, and the volcanic/subvolcanic-hosted Au–Ag-base metal deposits of Lagalochan and Rhynie. The Dollgellau gold-belt of North Wales is covered by T. J. Shepherd and S. H. Bottrell who ascribe the localisation of the ore shoots to interaction between ore fluids and the graphitic shales, leading to methane and nitrogen enrichment and the precipitation of gold. The Zn–Pb deposits of fairly recent discovery in the Irish Midlands are described by C. J. Andrew who demonstrates that mineralisation was initiated isochronously across the orefield in the Courceyan stage of the Lower Carboniferous, contemporaneously with the onset of extensional tectonism.

The mineralisation associated with the Cornubian batholith is reviewed in detail by D. H. M. Alderton. Although known mainly for its production of Sn and Cu, this region produces other metals, such as Fe, Pb, As, Mn, Zn, W, U and Ag, as well as kaolinite, baryte and fluorite. The high heat producing character of the granites ensured that convective circulation and associated hydrothermal activity continued long after main-stage activity. A variety of fluids was incorporated into the circulation system, resulting in a range of mineral deposits, commonly in cross-course faults. Iron and U were probably derived from the kaolinisation of granites, Pb–Zn–Ba–F mineralisation from basinal brines expelled from compacting Permo-Triassic red bed sediments and U–Co–Ni–As–Bi mineralisation from the lamprophyres and alkaline volcanic rocks. Worldwide comparisons are made.

The lead–zinc–fluorite–baryte deposits of the Pennines, North Wales and the Mendips are described by R. A. Ixer and D. J. Vaughan, the former being considered as three separate orefields—the Alston Block, the Askrigg Block and the Peak District. Comparisons are made with Mississippi Valley-type deposits. A distinctive feature of the Pennine ores is the importance of fluorite. The evidence of fluid inclusions, stable isotopes and the well-defined regional zonation suggest a mixing model to be the most appropriate; possibly basinal brines carried Pb, Zn, Ba and F (partially derived from the granites) which then reacted with H_2S-rich fluids or organo-sulphur compounds in the Carboniferous limestones.

The Cumbrian hematite deposits (now virtually abandoned) are described by T. J. Shepherd and D. C. Goldring. The deposition of the hematite is linked to the mixing of oxidizing groundwaters with warm, relatively reducing hypersaline brines (90–120 °C) beneath the Permo-Triassic cover. An overview of the sedimentary iron-ore resources of Britain is given by T. Young, these ores having played a unique role in the industrial revolution despite being of rather low Fe and relatively high P content.

The great strengths of this book lie in the many clear maps and diagrams and even more in the very extensive full references given at the end of each chapter. It will be a valuable source of information for all students and research workers

keen to keep up-to-date with recent developments.

R. A. HOWIE

Robinson, P. C. and Bradbury, S. *Qualitative Polarized-Light Microscopy*. (Royal Microscopical Society Microscopy Handbook 09). Oxford (Oxford University Press), 1992. vi + 122 pp. Price £13.95.

The principles governing the interaction of light with crystalline media have long been understood and text-books dealing with the microscopic examination of minerals and other crystalline substances usually contain sections devoted to them. This book, therefore, follows a well-trodden path and is distinctive first by reason of its final chapter on differential interference contrast microscopy which has becomed an increasingly important contrast-enhancement technique in applied microscopy, and second because of the emphasis that is laid throughout on practical exercises designed to supplement and reinforce the theory.

The book begins by explaining the basic concepts of light, and of interference and polarisation before commenting in some detail on the effects produced by the passage of monochromatic and white plane-polarised light through uniaxial and biaxial substances. The formation of interference colours is described and there are useful descriptions of retardation plates and compensators and their use.

Attention focuses almost exclusively on orthoscopic examination; conoscopic examination is but briefly mentioned and only in connection with uniaxial substances. The authors explain that this lies beyond the scope of the book but this is a pity, for mineralogists and others who routinely need to interpret interference figures will have to look elsewhere for information.

The polarizing microscope is described in detail and it is good to see space devoted to the use and adjustment of the instrument, and clear instructions are given for achieving Köhler illumination.

There are chapters on singly and doubly refracting media and on observations in plane-polarized light, and on observations between crossed polars and the relationships between optical path difference and interference.

The book concludes with a clear explanation of the principles of the differential interference contrast microscope in both the reflected light and transmitted light mode, together with an assessment of the advantages and disadvantages of the method.

Each chapter concludes with a few suggestions for further reading and with carefully selected practical exercises which are clearly based on extensive teaching experience. There is also a useful glossary and the book is illustrated with clear diagrams. The student starting to use polarized-light microscopy will find this a valuable aid.

A. C. BISHOP

Wagner, G. and Van Den Haute, P. *Fission-Track Dating*. Dordrecht (Kluwer Academic Publishers) 1992. 285 pp. Price £57.00.

Fission tracks, or trails of radiation damage, are produced within many mineral species at a more or less constant rate throughout geological time, as a result of the spontaneous fission of ^{238}U. The occurrence of such tracks has been known for around a hundred years, but it is only in the past few decades that their geochronological potential has been recognised.

From a knowledge of the U content, the decay constant, and of the number of tracks, it should be possible to calculate the age of crystallisation. However, in apatite grains, the most commonly used mineral in fission-track studies, the tracks are shortened by the process of annealing above 50°, and are erased above 120°. Similar track shortening and fading occurs over different temperature ranges in other mineral species. Thus, because of track annealing and erasure, it is commonly not possible to obtain reliable absolute ages by fision-track methods. However, by additionally measuring the lengths of preserved tracks, important inferences can be made in many instances about the thermal and burial history of the sample. Interest in fission-track dating techniques, therefore, has grown enormously in recent years, particularly as a result of their application in basin analysis studies, where they can provide important clues to the magnitude and timing of thermal events. Because of the close correspondence between the temperature range of annealing in apatite grains, and the temperature range of oil generation in sedimentary rocks, the study of apatite fission tracks has become an important tool in hydrocarbon exploration.

Thus, there is a need for a general text on this topic, not only for the benefit of the geochronological specialist, but also to provide essential background to other scientists who may have to work with, and interpret the results derived from, fission-track dating methods. This well prepared and presented book by Wagner and van den Haute is, therefore, timely.

The book contains seven chapters which fall naturally into two parts, more or less equal in