

quency distribution patterns and models, search theory, Bayesian statistical decision theory, with a brief excursion into geostatistical methods.

The author has backed up explanatory theory and comment with 19 illustrative case studies (some 60% of the text) taken from the literature and professional reports and studies between 1957 and 1988. These range from Allais' classical study (1957) of the economic feasibility of mineral exploration of the Sahara, through various oil plays and metallic mineral exploration cases, to a demonstration of the mathematical methodologies involved in a most detailed simulation (Harris and Ortiz-Vertiz, 1981) of roll-front sandstone uranium deposits, exploration procedures, and modelling of development and mining operations and costs, with consideration at all stages of economic factors and risks.

The contribution of economic analysis to the overall efficiency of the exploration process is optimised in situations where the objective of exploration is cost-effective extension of known mineralised environments, blessed by a rich data base. This point is demonstrated by nearly 75% of the case study material referring to oil, porphyry copper and sandstone uranium deposits. Enthusiasm for guidance by statistical analysis may, by contrast, be unwelcome in situations where greenfield discovery could be impeded by the cold touch of unimaginative statistics and economics. Some exploration managers guard against imposing on talented explorers those constraints that may stifle such qualities as flair, enthusiasm and geological inspiration that lead to discovery of the unexpected—cases where no model exists until the new find is made—for example Boddington and Olympic Dam. Like other exploration tools, economic analysis and modelling may be used or abused, and its proper application should be understood.

The book is well presented, with few typographic errors, clear diagrams (nearly all reproduced from earlier sources) and with ample help around the text from a 9 page index, many sub-titles in the text, a catalogue of Contents covering 7 pages, and a useful if not comprehensive 7 page reference list of the subject matter.

This volume will be very useful in libraries of specialist teaching and professional institutions and exploration companies, but not many individuals will wish to spend £59 for material that is, by and large, already available in the literature.

G. R. DAVIS

Dunham, K. C. *Geology of the Northern Pennine orefield—Volume 1. Tyne to Stainmore*, London (British Geological Survey), 1990. x + 300 pp., 10 plates, 46 figs. Price £32.00.

This volume describes the geology of the important carbonate-hosted lead/zinc deposits in the North Pennines district of Northern England. It is the second edition of the original 1948 publication and contains a large amount of additional information which has been derived during the last 40 years, much of it from the continued mining activity.

The first part of the text includes descriptions of the mining history, regional geology (of the granite, the host Carboniferous sediments, and the Whin Sill) and the regional structure. Then there follows a general description of the mineral deposits, including the primary and secondary mineralogy, paragenesis and zoning, wallrock alteration, age, and genesis. The second (and major) part is devoted to detailed descriptions of the individual deposits in the orefield, and includes numerous maps and sections.

The most valuable aspect of this publication is the presence of several diagrams showing the form of the ore 'shoots' and the structural and lithological controls to the mineralisation. Unfortunately, thoughtless binding means that some of the diagrams cannot be viewed fully, and this has marred their otherwise high quality and value.

The style of the text is rather ponderous and does not make for easy reading. In addition, some of the editing could have been better. A cursory glance through the reference list revealed several mistakes—including misspelling the names of BGS personnel! Most of the text is however informative, although the part which deals with the genesis of the deposits does appear rather dated. For instance the mineralisation is thought to be due to aqueous solutions as 'melts of the minerals could not exist within the introduced mineral suite'. Similarly, there is a discussion on whether saline brines necessarily point to a source from granites. Such discussions are unnecessary; it would have been much better to include some comparisons with similar deposits worldwide and make reference to recent conclusions concerning their genesis.

As a reference work for the location, form, geological setting and characteristics of these deposits, this is an excellent publication. Researchers involved in the North Pennines district or carbonate-hosted Pb-Zn-F-Ba deposits in general, will find it useful for this. However, it says little about their status as

Mississippi-Valley-type Pb/Zn deposits, and throws little new light on their genesis.

D. H. M. ALDERTON

Carswell, D. A., Ed. *Eclogite Facies Rocks*. Blackie (Glasgow & London), Chapman & Hall (New York), 1990. xv + 396 pp. Price £77.00.

This is the second book ('book 2' here) to appear which is devoted to eclogite-facies rocks, the first ('book 1' here) being: Smith, D. C. (Ed.), *'Eclogites and Eclogite-Facies Rocks'*, Elsevier Science Publishers (Amsterdam & New York), 1988, xxii + 524 pp., price £60, which constituted n° 12 in the Elsevier Series 'Developments in Petrology'. Although they are both multi-author books with about 20 authors each, they are complementary rather than competitive. Thus whereas book 1 dealt in great detail with a few selected topics (since earlier special volumes of three journals (ed. Smith, D. C.) dealt with many other selected topics), book 2 attempts to provide a comprehensive review of all relevant topics but in significantly less detail. Unlike book 1, book 2 is however one of those books where editorial control is exercised strongly by the editor being coauthor of most of the chapters, only 5 of the 13 chapters having escaped.

In chapter 1 D. A. Carswell introduces his versions of the definitions and classifications of eclogites and of the elusive eclogite facies; unfortunately chapter 1 reviews only certain favoured opinions and perpetuates some well-entrenched but disputable ideas without attempting to find a consensus such that it cannot succeed in providing a major advance for the 1990's. A. Mottana, D. A. Carswell, C. Chopin and R. Oberhänsli describe eclogite-facies mineral parageneses for various kinds of bulk-rock compositions (chapter 2) and thus provide a petrological basis for the rest of the book.

A pair of chapters by S. L. Harley and D. A. Carswell and D. A. Carswell and S. L. Harley respectively summarise a number of experimental studies on natural and synthetic rock compositions (chapter 3) and a range of geothermobarometric methods relevant to eclogites (chapter 4); however, despite a well-organised approach, there are several notable omissions for supposedly comprehensive reviews, whereas one receives an overdose of 'evaluation tests' by Carswell and Gibb (1980a, b, 1987a, b) and of their rather subjective assertions of 'superior' geothermobarometric methods based on dubious geosynclinal foundations.

D. C. Rubie explains modern ideas on the

kinetics of mineral reactions (chapter 5) and D. Gebauer provides a modern review on isotopic systems used for the geochronology of eclogites (chapter 6); both of these chapters are particularly important when dealing with polymetamorphic terrains, which is often the case of eclogite-bearing terrains.

The subsequent chapters principally concern one or more specific geographical regions displaying eclogite-facies rocks. Thus M. Schliestedt reviews low-*T* eclogites in California, New Caledonia and Greece (chapter 7), whereas high-*T* eclogite xenoliths in Kimberlites and other diatreme environments are reviewed by W. L. Griffin, S. Y. O'Reilly and N. J. Pearson (chapter 12) and/or by J. B. Dawson and D. A. Carswell (chapter 13). The three principal medium-*T* eclogite-bearing orogens in Europe are dealt with in reviews by S. J. Cuthbert and D. A. Carswell (Caledonides: chapter 8), P. J. O'Brien, D. A. Carswell and D. Gebauer (Variscides: chapter 9) and G. T. R. Droop, B. Lombardo and U. Pognante (Alps: chapter 10).

In chapter 11 L. G. Medaris and D. A. Carswell summarise the available data on Mg-Cr garnet-peridotites in Europe, these rocks representing certain ultrabasic bulk-rock compositions at high *P* which is a subject where Carswell does have a solid reputation.

The various chapters incited innumerable praiseworthy comments but also innumerable condemnations such that the first version of this review almost became a new 'book 3'. However space limitations necessitated the present format which is obliged to concentrate on repudiating one appalling chapter (n° 8) which sets the clock back a decade just when most petrologists are preparing for the new models of the next century as the coesite saga blossoms with further discoveries of ultra-high *P* metamorphism in China, Russia, Switzerland and Germany in addition to the already-classic discoveries in Italy and Norway; indeed the publications on the Norwegian occurrences are now being treated as reference descriptions by other researchers so it is essential to get the record straight concerning Norway. All of the references cited below may be found in book 1.

Chapter 8 reviews various aspects of eclogites in the Scandinavian Caledonides in a superficially elegant fashion which helps to hide the fact that the authors lead the reader into a minefield otherwise known as the 'Norwegian eclogite controversy'. This began in the 1960s and was based essentially on the recognition of a significant difference in *P* between very high-*P* eclogites (in the range 20–40 kbar) and lower-*P* country-