

orogenic collapse model widely advocated. Rey *et al.* consider that whilst contraction was occurring in the Variscan, extension was happening over the site of the Caledonian belt. Several different proposals are examined to explain the effects observed, the conclusion being reached that the rheology of the different continental crust segments was the important control.

Another Australian fold belt, the Lachlan, is succinctly summarised by Gray. This Palaeozoic belt, approximately synchronous with some of the Caledonian, formed on the other side of Gondwanaland. A range of thin-skinned features are described across the belt and fitted into an overall model explaining the diachronous changes in sedimentary sequences, tectono-metamorphic evolution and plutonism. A main point of interest is that there seems to be no foreland-propagating sequence of thrusts. Given the stratigraphic control here this would seem to be a reasonable assumption. However, given the problems of out-of-sequence thrusting now emerging from other orogenic belts, it may, in fact, not be so unusual.

It is often very difficult to find reliable summaries of the geology of many of the remoter parts of what was once the USSR. The paper by Puchkov on the evolution of the Urals appears to be one of these rare finds. There has been a synthesis of a large number of references in Russian which, to the ordinary geologist, would probably be inaccessible. Several types of geophysical profiles are discussed and there is a substantial summary of the stratigraphy and lithological correlation, all of which appear to carry an air of authority. The contribution is unique in that it suggests lines of future research and so highlights many of the problems that are extant.

The final contribution by Lamb *et al.* is also a lucid one discussing the development of the central Andes in Bolivia and northern Chile. This is a critical area as it is located at the convergence point of the Nazca oceanic plate and the continental South American plate. The key to the argument is suggested to be the relative strengths of the lithosphere in each portion; that of the Brazilian Shield being stronger and causing the Bolivian Andes to develop a zone of thin-skinned deformation.

The editors state in the abstract to their introductory paper that they "... present a personal overview of the most notable developments in orogenic studies since the 1960s." This is indeed what is provided, as the book originated

from a series of seminars designed to provoke discussion, essentially within one Department. Therefore, the volume produced has a very different basis from a group of papers drawn together from a scientific meeting. The idea of a book which provides a summary of aspects of the geology of representative orogenies from as large a portion of geological history as possible is very attractive, however, my feeling is that this is not the book that will do it. Partly, because it has taken at least three years to come to press, the basis for some of the arguments has become dated, such is the pace of study. The balance of the seven papers dealing with the orogenic episodes does not, to my mind, reflect the present understanding of orogenic belts generally. There is always going to be a problem in trying to bring together a volume comprising several individual interpretations which are drawn from databases of very different qualities. In conclusion, I feel this is one for the libraries and not, perhaps, the individual. C. R. L. FRIEND

Cong, B. (ed). *Ultrahigh-Pressure Metamorphic Rocks in the Dabieshan-Sulu Region of China*. Dordrecht (Kluwer Academic Publishers), 1996, ISBN 0 7923-4163-5, and Beijing (Science Press) 1996, viii + 224 pp. Price £75.00.

This book brings together a series of chapters devoted to different aspects of UHPM in two regions of East China (Dabieshan and Sulu) which are widely believed to have been formerly united as the WNW-ESE-trending Qinling-Tongbai-Dabieshan-Sulu orogenic belt prior to the operation of the major Tancheng-Lujiang fault. This belt cuts right through China and marks the boundary between the Sino-Korean craton to the North and the Yangtze Craton to the South.

The book is well constructed, being composed of nine chapters which each treat one of the key aspects of the problems concerning the genesis and exhumation of UHPM rocks. B. Cong and Q. Wang (Chap. 1) provide an excellent overview which sets the rest of the book in context. In particular, they draw attention to the key geodynamic problem of whether these UHPM rocks were created *in situ* within their present geological environment or whether they were tectonically introduced as 'foreign' bodies with a previous higher-pressure UHPM history.

Chapters 2 and 3, both by Q. Wang *et al.*, describe respectively the regional geology of the

whole of the orogenic belt and the structural geology of the UHPM rocks, the latter including both the nature of the outermost boundaries of the UHPM units and the deformation within them. Major and trace element geochemistry are treated by M. Zhai and B. Cong (Chap. 5) whilst S. Li deals with isotopic geochronology (Chap. 6). These chemical chapters surprisingly separate the key petrographical data by R. Zhang *et al.* (Chap. 4) from the key mineralogical data also by R. Zhang *et al.* (Chap. 7). All of the preceding data are integrated into a petrological discussion of the metamorphic evolution of the UHPM rocks by B. Cong *et al.* (Chap. 8) and into a geodynamical discussion by Q. Wang *et al.* (Chap. 9); in the latter chapter tectonic models for UHPM genesis, and especially for the difficult problem of exhumation of these rock units, are first presented in a systematic and comprehensive way and then dissected one by one. In all chapters 2–8 many similarities with UHPM rocks elsewhere in the world can be found, but although this is usually mentioned in the introductory sections, profitable comparisons are unfortunately rather rare in the detailed sections.

Previously I have referred to the first three books concerned exclusively with eclogites and UHPM as 'Book 1' (ed. Smith, 1988); 'Book 2' (ed. Carswell, 1990) and 'Book 3' (eds. Wang and Coleman, 1995) (*Mineral. Mag.*, **55**, 490–2, 1991, and **61**, 324–5, 1997). They were all multi-authored and international and they presented new data incorporated into reviews of older data, and I have recommended their acquisition by libraries and all research schools in metamorphism and geodynamics. I hesitate to call this new book 'Book 4' on the same level as it contains a lesser proportion of new material, it concerns only one region, comparisons with UHPM rocks elsewhere in the world are rarely detailed, and all the authors are Chinese or expatriate Chinese (but not all the different Chinese eclogite research schools are included as co-authors). Although the overall presentation resembles the three earlier books, one feels that it is written as an internal report for a Chinese government ministry. This segregation is rubbed in by the unconventional but consistent use of capital letters for all Chinese authors and small letters for all non-Chinese authors in every bibliographic citation, whether within the text or in the final cumulative reference list!!! The book is entirely written in English whose quality is generally good, but some parts are frustrating. The Foreword is often unintelligible

and it is astonishing that Kluwer agreed to publish it without a proper translation. Fortunately the Preface is intelligible and appropriate.

Most of the scientific content of the book, which is indeed presented in a modern 'Western' format with good illustrations and tables, has been published before in an article in one or other journal. A problem for researchers is that the Dabieshan–Sulu region has produced an extraordinary quantity of published papers since the discovery of UHPM in 1989, far greater than those on Norway or Italy where UHPM was discovered many years earlier. Although in part this is due to an influx of motivated foreign researchers from many 'Western' countries, it is also due to uncomfortable Chinese tendencies (a) to publish a new paper for each new data point, and (b) for different research teams to publish very similar data collected on the same locality. In this sense the book is extremely useful in that one can learn much about the important Dabieshan–Sulu region in a single volume without having to re-read for the *n*th time the same information in yet another article.

The scientific end result of this book is about the same as that of the state of research in the other UHPM terrains in the world: that the rocks are fascinating by the peculiarity of their mineral assemblages and textures, and that although we now have good constraints on their chemistry, deformation, age and *P–T* history, still no one really knows where they were formed nor how they got to their present locations at the Earth's surface. At the end of a millenium, this can be considered as one of the most pressing unresolved problems of our 'dynamic Earth' and amply justifies further research funding, and, from time to time, publication of a review book like this one.

In conclusion, despite the few above-mentioned drawbacks, as well as the relatively high cost, the acquisition of this book is considered necessary for the specialist and useful for the generalist such that it merits the rating as 'Book 4' in the unofficial series of books devoted to HPM and/or UHPM.

D.C. SMITH

Kolata, D. R., Huff, W. D. and Bergström, S. M. *Ordovician K-bentonites of Eastern North America*. Geological Society of America Special Paper 313, 1996. v + 84 pp. Price US\$46.00 (post paid). ISBN 0-8137-2313-2

K-bentonites are the altered products of volcanic ash beds, occurring mainly in Lower Palaeozoic