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 librararies 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

sequences. Because volcanic ash-falls are short-lived events and often very widespread, K-bentonites have the potential to serve as event markers for interpretation of regional stratigraphy and, since the trace-element chemistry of the parent ash is essentially retained, can also provide information relevant to patterns of tectonism.

This GSA Special Paper provides comprehensive detail on properties and distribution of 60 K-bentonites in the Ordovician succession of eastern North America. Most of these are not widely distributed, but a few can be correlated for hundreds, or even thousands, of km by chemical fingerprinting techniques, tracings on wireline logs, and matching of outcrop descriptions. Two large folded sheets in pockets show correlations of K-bentonites along various traverses, based on wireline-log cross sections. Conclusions are drawn about the composifion of the parental magmas (mainly calc-alkaline) and the tectono-magmatic setting (destructive plate-margin volcanics). Other topics covered include: problems of 'dating' K-bentonites from K-Ar data (what do these signify? – mobilizafion of K at some time subsequent to volcanic ash deposition?; a regional K-flushing event?; what about Ar diffusion and resetting?); layer charges of the illite-smectite component (MacEwan crystallite model *vs* inter-particle diffraction); and the significance of high-resolution TEM of K-bentonites.

Although this evidence for long-distance correlation of K-bentonites 'across the pond' is convincing, the real challenge is to use these clays to help unravel events accompanying closure of that other, older 'pond' – the Iapetus Ocean, as K-bentonites are also widespread in Lower Palaeozoic sequences in north-western Europe. Kolata, Huff and Bergstrom are active among investigators currently aiming at this goal, and the present Publication confirms that the basic approach is sound. D.J. MORGAN

Lichtner, P. C., Steefel,C. I. and Oelkers, E. H. (eds). *Reactive Transport in Porous Media*. Washington, D.C. (Mineralogical Society of America: Reviews in Mineralogy Vol. **34**), 1996, xiv + 438 pp. Price US$28.00 (MSA Members $21.00). ISBN 0-939950-42-1.

Understanding transport of fluids in non-reactive systems is hard enough when the only variables are the physical properties of the fluid and rock matrix. Getting fully to grips reactive transport in porous media where the material properties of the matrix are in flux and even living organisms play an important role is really pushing the boat out. This is a topic that encompasses much of the physical and a fair helping of life sciences. Can it even be properly defined? Imagine taking a degree in 'microstructural bio-geochemical fluid dynamics'! This is truly the stuff of Renaissance man. But the reality is that fluid flow in the crust, from metmorphism and diagenesis to hydro-thermal ore deposition and transport of radiogenic and toxic waste, involves reaction of one kind or other kind with its surroundings. Given this, the 34th volume of the Mineralogical Society of America Reviews of Mineralogy series *Reactive Transport in Porous Media* is to be praised for tackling this complex area of research in a coherent and systematic way. In essence, a book on reactive transport in porous media is only possible because of the computer – more explicitly the exponential growth in computational power that now allows complex numerical calculations to be undertaken in seconds that even a few years ago took weeks to perform. As the technology allows us to include more and more variables in our calculations, so the job of building multidisciplinary models becomes easier.

The book comprises eight chapters. The first by Lichtner provides an excellent overview of the physical principles (conservation of mass and momentum) of fluid flow, along with a discourse on the philosophical aspects of treating rocks as a continuum (do the properties of rocks really change 'smoothly' enough to allow the application of differential calculus to processes taking place within them?), along with a detailed technical description of multicomponent transport reaction equations and how they are applied in modelling. Steefel and MacQuarrie, who further address the technicalities of reactive transport from a modelling perspective, continue this theme in Chapter 2. Chapters 3, 4 and 5 deal with a review of the physical and chemical proprieties of crustal rocks and fluids (Oelkers), multicomponent ion exchange and chromatography (Appelo) and solute transport in the unsaturated near surface (Suarez and Simunek).

Chapter 6 is anothpr excellent overview, this time on reactive transport in heterogeneous systems Thompson and Jackson). The important word here of course is heterogeneous. Even the most sophisticated computer models can produce nothing of real consequence if the effects of rock heterogeneity, both physical and chemical, are not