and other phases (including melts, solutions and gases).

The first two chapters (Ribbe, and Blashi and Blashi) are concerned with aspects of crystal structure, site occupancy and cell parameters and their determination, while Chapter 3 (Salje) details the information that can be gained from vibrational spectroscopy about phase transitions and the degree of Al/Si order. A considerable portion of this chapter is devoted to the theoretical background of the technique.

Chapter 4 (Koepke and Behrens) describes new experiments on the partial melting of plagioclase, while Chapter 5 (Nekvasil) is a review of the equilbrium between ternary feldspars and melts. A possible subsolidus phase diagram for the plagioclases is presented in Chapter 6 (Carpenter) and the lines of investigation that have led to it are described in detail. Phase transitions at high pressure are the subject of Chapter 7 (Angel).

After a review of recent work on oscillatory zoning in plagioclase (Pearce), there are three chapters concerned with diffusion of oxygen, strontium and other cations (Giletti) and argon (Foland) in feldspars and on the role of hydrogen in promoting reactions (Graham and Elphick). The next two chapters delve into petrology: the first on the important role that feldspars play in igneous rocks (Brown and Parsons) and the second on the evolution of feldspars in granite pegmatites (Černý).

In the penultimate chapter, the various techniques that can be used to investigate the surfaces of minerals (both internal and external) are described briefly (Smith). As little work has yet been carried out on feldspars, many of the examples are from related structures such as clays and zeolites. Finally, there is a chapter that deals with the weathering of feldspars, both in nature and in the laboratory (Blum).

Overall, considering that this book is multi-authored and that it must have been produced to a tight time-scale, the standard of writing and editing is very high. There is some overlap in content, most notably in Chapters 9 and 10, but generally the cross-referencing from one chapter to another is good, although there is reference to a non-existent chapter on p. 522! It would have been easier to read the book if a standard set of symbols had been used, e.g. in the chapters that deal with thermodynamics. Most contributions are suitably illustrated (the exception being Chapter 14, which has only four figures), but the standard of reproduction of the diagrams is variable. One, on p. 166, is missing its caption and there is a discrepancy concerning temperature and pressure between the caption and the diagram in Fig. 2 on p. 200. Each chapter has its own reference list and there is an extensive subject index at the back of the book. There are few typographical errors.

Because of its comprehensive coverage and the fact that it contains summaries of the latest research, this book will be essential reading for the hardened 'feldspathologist', whether a mineralogist, petrographer or geochemist, and for anyone entering the fascinating and enigmatic world of feldspars for the first time. It is expensive for individuals, but it should be widely recommended for library purchase.

P. E. CHAMPNESS

Smellie, J. L., ed. *Volcanism Associated with Extension at Consuming Plate Margins* London (Geological Society: Special Publication No 81), 1994. Price £60.00 ($100.00) [Price to members £29.00 ($48.00)]. vi + 293 pp., 28 maps.

This thematic volume explores the relationship between extension and coeval magmatism at consuming plate margins. As the editor points out in his introduction, "nothing in the plate tectonic paradigm... leads the observer to expect extension to be the dominant tectonic regime at consuming margins". A rational observer might well expect the dominant forces within the over-riding plate to be compressive. Within the last ten to fifteen years, however, theoretical modelling and field evidence both point towards the conclusion that subduction zones do not lock and that sub-horizontal extension perpendicular to the arc is commonplace within arc systems, and may even be the normal mode of behaviour within such systems.

The 14 papers included within this volume present the evidence for extension at consuming plate margins. The first paper, by Hamilton, is a review of the relationships between subduction, extension and magmatism. Of the remainder of the papers, seven present data from oceanic arc systems and six from continental margin arcs. Most of the papers deal with the circum-Pacific system and the majority of these deal with magmatic arc systems which are still active, or within which magmatism is as recent as the Pliocene. Field structural data, seismic data, logs of sedimentary and volcano-sedimentary sequences and geochemical data sets are variously used to constrain the structural and magmatic evolution of these systems. The combined data set provides conclusive proof that extensional stresses are commonplace in modern arc systems, and likely to have been so in ancient ones as well. The obvious value of the assembled data is that, if modern arc systems are indeed analogies of pre-Tertiary arc systems, then it should be clear exactly what sedimentary, volcanic and geochemical criteria should be required to demonstrate the prevalence or otherwise of extensional stresses in arcs from further back in the geological record.

If the volume has a shortcoming it is in that it is dominated by case studies replete with data. These studies tend to address the consequences of extension rather than the causes. What is sadly lacking are a couple of critical review articles. One of these could usefully have dealt with the causes of extension (for instance, why does the over-riding plate decouple from the subducting plate? What causes subduction zones to lock or not?) and could have critically assessed the two dimensional finite modelling that predicts the dominance of extensional stresses in the over-riding plate. The second could have assessed, equally usefully, the likely types and chemistry of volcanic rocks extruded coeval with extension. Although the geochemical data detailed throughout the volume are always interpreted as being consistent with extension, the volcanic rocks do show significant differences in type and geochemistry from case study to case study. Is there a signature characteristic of extension at consuming plate margins? Unfortunately, Hamilton's review article is overly assertive and fails to address either of the areas where I believe that a review would have been most useful.

This is a valuable book which, with the exception of a bizarre typographical error on the back cover, has been excellently produced, as usual, by the Geological Society Publishing House and which does provide a useful synthesis of structural styles and volcanic products of extension of the over-riding plate at subduction zones. I heartily recommend it to anyone working in any arc terrain, modern or ancient, and to anyone with an interest in volcanism and magmatic processes. P. J. TRELOAR

Saha, A.K. *Crustal Evolution of Singhbhum North Orissa Eastern India.* Geological Society of India, Memoir 27, 1994. 341pp. Price US$ 40.

For many readers outside the Indian sub-continent, understanding of the Precambrian evolution of India is dominated by the data from southern India, notably the Dharwar Craton. The nineteen chapters in this Memoir redress this imbalance by providing an up to date summary of the Archaean and Proterozoic crustal evolution of another very important area of Precambrian rocks, those of northeastern India. Unravelling this area has been very much the life-time work of the author, who figures prominently in an extensive reference list. However, summaries of geological debate over the author's work, for example, the geochronology of the Older Metamorphic Group, are included.

Chapters 1 to 3 give an outline of basic concepts of Precambrian crustal evolution, the geology of the Sinhghbum-North Orissa region and the regional structure. Data from remote sensing and geophysical studies are included thus providing an integrated framework for the detailed descriptions of the major units which follow in chapters 4 to 16.

The Archaean (Chapters 4–9) covers the evolution of the old gneiss complex and the overlying supracrustal rocks. Chapters dealing with younger, individual components follow, each broadly organised in a similar way describing field relations and structure, petrography, geochemistry and petrogenesis. To many this information will be readily accessible in one place for the first time.

The geochronology (Chapter 10) is used to link the Archaean and Proterozoic parts of the Memoir. However, it seems a little out of place as data and argument about the Proterozoic rocks (Chapters 11–16) which have not been described, are presented.

Description of each of the Proterozoic components is broadly organized into supracrustal and volcanic rocks with associated intrusive bodies followed by intrusive granitic rocks. Again there is a logical organiztion of information within each of the chapters. The short Chapter 15 describing a group of supracrustal rocks does not follow easily.

Chapter 17 deals with major thrust zones whilst Chapter 18 describes metallogeny which, together with Chapter 5, provides good information on the economic geology of this region. The final chapter provides a personal model for Precambrian crustal evolution.

The use of abbreviations for many of the components causes difficulties because of the number involved. Most of the diagrams and photographs have been well reproduced, though some unfortunate misprints *(e.g.* Nb instead of Nd) occur. There are both author and subject indices.

This book would be a useful addition to a University Library catering for research as it provides a comprehensive guide to a relatively unknown region. I suspect that undergraduates will not be directed towards this Memoir as the region is not generally considered to be a classic area of geology. However, this book is a very useful summary and represents good value. C. R. L. FRIEND

Babu, T. M. *Tin in India* Bangalore (Geological Society of India: Mineral Resources in India, 7), 1994. ISBN 81 85867 10 0. x + 217pp., 15 maps. Price Rs 200 ($25.00).

Although India is a country which is not usually associated with tin mineralization, it does in fact contain numerous scattered deposits of cassiterite. The majority of these deposits are contained in pegmatites hosted by high-grade Proterozoic meta-