

Gibbs, A. K. and Barron, C. N. *Geology of the Guiana Shield*. Oxford (Clarendon Press), 1993. 246 pp. Price £75.00. ISBN 0 19 507350 9.

This text serves as a geological memoir and summarizes a vast amount of the available information on the Guiana Shield which crops out in six countries. Importantly, the text provides the way of getting at greater detail in each of the many topics covered. It comprises 16 chapters arranged into five parts; four describing the geology in stratigraphic order, and one on economic geology. There is an extensive reference list, together with an index and three appendices covering data sources—the addresses of agencies and geological institutions, available maps and remote sensing, and a tentative evolutionary model. Finally, there is a fold-out, coloured, geological sketch-map and cross-section which, because of its scale, is really only a sketch. It is clearly only intended as a guide to the broad picture, a researcher being referred to one of the available series of maps for more detail.

A brief introduction broadly summarizes the whole book (and also includes interesting facts about the local fauna). A summary of the geochronological framework is included which shows that this is an area where much more could be accomplished. Each section of the geology is considered both chronologically and also geographically to bring out some of the problems in the various correlations that have been made across the six countries. This takes a bit of getting used to, but none-the-less is successful.

Part I, dealing with the Archaean and Lower Proterozoic, treats the geology on a petrological basis which is considered to be broadly stratigraphic. Thus the high-grade basement is considered first followed by the greenstone belts and finally belts of supracrustal rocks that are not greenstones. The debate as to how much of the Shield is Archaean is considered and the opinion presented that most is Proterozoic in origin. The two chapters in Part II deal with the Lower Proterozoic Trans-Amazon tectono-thermal event which occurred some time between 2.3 and 1.9 Ga. Chapter 5 deals with the basic and ultrabasic intrusives which become caught up in the event and is followed by Chapter 6 on the extensive syn- and post-kinematic granitoids.

Part III concerns the Middle Proterozoic cover rocks which have been variably deformed and generally only weakly metamorphosed. The problem of correlating large areas of thick, unfossiliferous continental sediments is addressed. Finally, chapters on post-kinematic basic and alkaline intrusives are included. In Part

IV the Upper Proterozoic and Phanerozoic geology is considered. This covers development of Mesozoic graben structures and discusses the inter-relationships of several different fault systems. The final chapter in this section covers the geomorphology of the Shield and briefly the Phanerozoic geology of the periphery. One point in this section is that several of the geochemical diagrams have relatively little data on them and one wonders why they occupy so much space.

To many, Part V, on economic geology, will be the most useful section as it contains a comprehensive list of the minerals exploited, resource maps and, for certain examples, production figures. The importance of the first four parts is that they give the geological context. However, the chapter can only represent a summary, and it is the comprehensive reference list which allows detailed follow-up.

Throughout, the diagrams and maps are generally good, though a few of them have presumably been reduced, and contain an overwhelming amount of information. Photographs are used mostly to good effect, though one or two are perhaps of limited value. One slight quibble is with the rather poor quality of the tables which have presumably been produced in camera-ready format by a dot-matrix printer. Otherwise the general production is very good.

As the authors say in their Preface, the geology of the Guiana Shield has often been forgotten and their aims were several; to improve access to the available information, to publicize disproved ideas, to draw attention to some of the unsolved problems, to draw attention to the rich mineral resources of the region and finally, to encourage inclusion of the region in Precambrian studies. In these aims the authors certainly succeed and it is likely that the bulk of the book will remain up to date for some time to come. It should be a reference book in any University Library and probably in the collection of any researcher on South America and economic geology. This book is a very useful summary and at the price represents good value.

C. R. L. FRIEND

Mitra, S. *Applied Mössbauer Spectroscopy — Theory and Practice for Geochemists and Archaeologists*. Oxford (Pergamon Press), 1992. Price £220.00. iv + 381 pp.

This book forms Parts III–VI of Volume 18 of Pergamon's Physics and Chemistry of the Earth series, but it is a stand-alone volume dealing with the various applications of Mössbauer spectro-

scopy to the characterization of minerals and related materials. It is based on a series of lectures presented during 1987–1988, but has been updated by the incorporation of more recent published material.

The author's objective of producing a monograph that offers students and research workers a basic background in Mössbauer spectroscopy combined with an overview of its wide ranging applications in earth sciences and related fields has largely been achieved. Almost 20% of the book is devoted to theoretical principles that are relevant to the study of minerals, and these have been presented in a logical and straightforward manner. This section provides the reader with the necessary background to understand the applications of the technique that make up the remaining almost 80% of the book.

Most of the applications are concerned with the use of ^{57}Fe Mössbauer spectroscopy for studying the geochemistry of iron-containing minerals. All of the various groups of iron-rich minerals are reviewed, including chapters on carbonates and sulphur- and phosphorus-containing minerals along with more extensive treatments of oxides and aluminosilicates, but no consideration is given to minerals containing other Mössbauer nuclei, such as tin. Other topics covered include applications to the characterization of amorphous phases, petrological and high pressure studies plus a small section on extraterrestrial materials. The final section deals briefly with environmental and archaeological applications of Mössbauer spectroscopy.

A major feature of the book is its large number of citations and it represents a valuable reference source for publications on Mössbauer spectroscopy of minerals. It does, however, have the feel of an extended review and much of the cited work is presented in an uncritical manner with the author largely avoiding discussion of controversies that surround the interpretation of many of these results. I also found the unconventional use of English in places rather annoying, a problem that could have been overcome by better editing by the publishers. Nevertheless, this volume represents a valuable contribution to the literature on the Mössbauer spectroscopy of minerals and can be recommended for purchase by any person or organization to whom the high cost is not a deterrent.

B. A. GOODMAN

Parnell, J., Kucha, H. and Landais, P., Eds. *Bitumens in ore deposits*. Berlin, Heidelberg and New York (Springer-Verlag), 1993 (ISBN 3-540-55621-4), x + 520 pp. Price DM 248.00. Special Publication no. 9 of the Society for Geology Applied to Mineral Deposits

This is the second opportunity that I have had to look closely at this book, and so this review is not limited to first impressions. The title is absolutely right; as its core theme, the book concentrates on the diverse occurrences of bitumens in ore deposits. It is a collection of 27 research articles written by a total of 50 authors, drawn together and edited by Parnell, Kucha and Landais (who contribute to just five articles), and these extend the scope of the book rather beyond consideration of bitumens alone. Consequently, the book will be of interest to those involved in studies of any hydrothermal or mineralising processes in which organic matter might become involved, and it will also be relevant to those interested in bitumen from the point of view of the petroleum geologist or organic geochemist/petrographer.

The book is divided into six subject areas: First, the problems of nomenclature and methodology are addressed, considering the special problems of dealing with organic materials using chemical analytical, optical and electron microscopic techniques. The importance of petrographic work is emphasised; after all, bitumens are sufficiently solid to yield textural and paragenetic information.

Secondly, Simoneit and Tiercelin *et al.* address the formation of petroleum in modern hydrothermal systems. This section provides an important review of the occurrence of petroleum within active systems; Simoneit highlights similarities and differences in comparison with 'conventional' reservoir petroleum, and Tiercelin *et al.* provide excellent photographic coverage of the East African Rift examples that they describe.

In a major section, five papers address bitumens in precious metal and mercury deposits. Topics covered range from descriptions of the occurrence of petroleum-bearing fluid inclusions through to graphite. Although the emphasis is on case studies, two papers in particular provide very valuable and copious sources of data: Pearcy and Burruss' description of the Cherry Hill gold deposits (California) and Peabody's description of the Californian mercury mineralization.

Moving to seven papers on uranium-thorium deposits, Landais provides a general but comprehensive review of associated occurrences of