pendent of photosynthetically fixed organic carbon. All of which elegantly demonstrates the intimate coupling between biosphere and geosphere, which has thrown the previously disparate disciplines of microbiology and geology together and has vindicated the early disciples of geomicrobiology.

Some of these aspects are described in this book, but not all, and in that sense the book doesn't cover Geomicrobiology, but a sub set concerned with microbe:mineral interactions. Yet, there is more than just microbes and minerals. In the first two chapters there is a concise introduction to bacteria, their activity and diversity and, importantly, what's new in each. There are detailed chapters on the crystal structure, geochemistry, formation, and dissolution/weathering/corrosion of minerals and metals, which provide intriguing details of minerals as a potential microbial habitat: providing a substrate, energy source, nutrients and sometimes protection and a 'home', often within a biofilm. The biomineral 'home' becomes exquisite with the exoskeletons of calcium carbonate secreting algae and silica secreting diatoms and we are treated to a description of the fine cellular control of these elegant structures, only to find out that for calcium carbonate producers it might just be a clever way of maximising carbon dioxide concentrations which are limiting photosynthesis. But why are these delicate structures species specific if this is true?

Another chapter describes biomineralization of magnetic iron minerals and magnetotactic bacteria, and how these bacteria use magnetotaxis in combination with aerotaxis to find their optimum position in oxic:anoxic interfaces which occur in a range of environments. Seemingly there may be even finer control based on the composition of the magnetic mineral, with magnetite containing bacteria preferring microaerophilic (low oxygen) conditions, whilst those with greigite prefer the deeper sulphide-containing layers. These bacteria also demonstrate the exquisite control biology can have on mineral formation as they produce magnetic particles with optimum size to give maximum magnetism per magnetosome.

In contrast, for other bacteria biomineralization may be an inescapable and rather undesirable consequence of their activity, strongly influenced by the reactive chemical groups on their cell surface. As 'over their lifetime, bacteria must collect an increasing burden of minerals on their surfaces'. On death these minerals continue to grow, mineralizing and preserving the bacteria, which probably explains how the morphology of 'soft bodied' bacteria survive to provide one of our main clues for the origin of life.

The importance of microbe:mineral interaction in the origin of life is an aspect in several chapters. This is effectively complemented by the final chapter which describes the interplay between biosphere and geosphere in developing the Earth's environment since its formation some 4.5 billion years ago as seen through the evolving global carbon cycle and carbon isotopes.

There is too little space available to summarise all the chapters but I hope that the above provides a flavour of the riches in this book. It is not, however, a text book to be read from start to finish, and although the first two chapters provide an introduction to bacteria a non-microbiologist would benefit from consulting a more general microbiology text book either before reading or alongside these chapters. However, the first two chapters are important reading to enable the most to be obtained from the other chapters. These chapters cover specialist areas and can be read independently. All of these go into considerable depth and often reflect either a microbiological or mineralogical bias, hence they can be challenging to the non-specialist. If the area of geomicrobiology is going to continue to make important advances researchers need to understand both component disciplines and this book represents an important initiative in this direction. This is the type of book you need to dip into often and it will be an extremely valuable resource. It is unfortunate that there is not an index as this would have made accessing the resource more efficient, however, it is often what you stumble across that in the end proves to be most valuable and there is a lot to encounter in this book.

R. J. PARKES

Birch, W. D. and Henry, D. A. *Gem Minerals of Victoria*. Melbourne (Mineralogical Society of Victoria: Special Publication No. 4), 1997, 121 pp. ISBN 0 959 4573 3 X. Price A$29.95 (plus A$14.00 economy air post).

Although the State of Victoria is not the richest state in Australia for gemstones, nevertheless it contains a considerable range of collectable gems. The aim of this well illustrated book is not to be a locality guidebook (though each of the more

important localities for each species is listed and discussed), but rather to provide assistance with the identification of the gem minerals.

After an introductory chapter outlining the discovery of gem deposits, those such as diamonds, sapphires, zircons and olivine which are typically associated with basic volcanic rocks are described. Small diamonds have been found in alluvial deposits, most being dicovered by accident during treatment of wash dirt for gold and tin recovery; no commercial deposits have been found and the primary source of the diamonds remains unknown. Sapphires are of widespread occurrence as waterworn crystals in present-day streams and older gravels; blue is the dominant colour, but purple, yellow and brown varieties are found. Pale rubies also occur but are rarer and smaller than sapphires. Rounded grains of reddish brown to near colourless zircon are also found in stream gravels at numerous localities. The primary sources of the sapphires and zircons are thought to be basalts and volcanisedimentary rocks. Olivines and anorthoclase occur in xenoliths and megacrysts in lava flows of the Newer Voicanics in the W of the state; scoria cones have yielded olivine fashioned to give peridot $\leqslant$ 8 mm in size.

In the areas of granitic rocks and pegmatites, tourmaline is common but mainly as schorl; elbaite is extremely rare. Topaz has been found *in situ* in granites at only a few localities, but waterworn colourless to blue fragments are widespread in alluvial deposits. In Victoria, the garnet species almandine, spessartine, pyrope, grossular and andradite have been found, mainly in stream gravels, but few have been large or transparent enough to facet. Quartz is the most common gem mineral, with the varieties rock crystal, amethyst, smoky quartz and citrine all recorded; agate, chalcedony, jasper and common opal also occur.

The book is extremely well illustrated, both by numerous sketch maps showing most of the localities mentioned in the text and by an abundance of excellent colour photographs of rough and faceted stones for each of the principal localities. It ends with a list of some 180 references, a localities index and a glossary, together with tabulated mineral data for Victorian occurrences, and clearly fulfils the author's intentions of providing a book to assist with the identification of many of the gem minerals through the use of colour photographs.

R. A. HOWIE

Emeleus, C. H. *Geology of Rum and Adjacent Islands*. London (British Geological Survey), Memoir for 1:50,000 Geological sheet 60 (Scotland) 1997. xii + 170 pp. Price £35.00. ISBN 0 11 8845179.

Compared to Skye, Mull and Arran, the Small Isles are the least visited and hence least well known parts of the Scottish Tertiary Igneous Province. Remoteness, a limited ferry service, inability to take a vehicle, and lack of choice of accommodation have all conspired to make the islands of Muck, Eigg, Rum, Canna and Sanday the Cinderella region of the province. Yet as a group, the islands have a geological record that equals the more accessible regions of the province in range of geological interest. For example, Rum has a world renowned major layered ultrabasic intrusion where refluxing of a Tertiary intrusion was first demonstrated and the detailed record on Rum of ring fault tectonics and associated intrusive and extrusive magmatism is unmatched in the Province. Mesozoic and Torridonian sediments are also exposed on Rum, along with Lewisian gneisses and a fascinating record of Quaternary events. All this is packed into an island just 12 km in diameter. Fine sections of flat-lying basalt lavas and dykes dominate the other islands, rivalling those of Skye and Mull, and neither of these islands can match Eigg for its impressive 3 km-long Sgurr pitchstone ridge which represents a basal ash flow and one or more overlying lavas that flowed along a valley cut into the Tertiary land surface.

It is 90 years since the Survey published the first memoir on the Small Isles geology by Alfred Harker. Much new information has been obtained in that time and new insights and interpretations have been put forward. Most of this re-investigation follows the transfer of Rum to State ownership in 1957 and its designation as a National Nature Reserve, events which opened the island to natural history research of all kinds. The need for a new geological memoir had become pressing and the ideal person to write it was Henry Emeleus of the University of Durham; no other geologist has greater local knowledge or experience of working in the area (his first paper on Small Isles geology was written in 1957) and none has such a comprehensive knowledge of the Tertiary Igneous Province, essential for setting Small Isles geology in a regional context. In the task Emeleus has been ably supported by several specialist contributors on particular aspects.