Sites of Special Scientific Interest (SSSIs). The statement considers that volumes in this series must be written to the highest scientific standards so that the importance of the site is clear; and that each account of an SSSI must contain an introduction (including information on previous work), a description, an interpretation (of the site's scientific importance), and a conclusion (written in simpler terms for the non-specialist).

Within the terms laid out above, the two authors have done their job admirably. The SSSIs are combined into larger frames of reference so that those related to individual Tertiary Centres are discussed together. Thus the Chapters include in order: 1. A general introduction to the Tertiary Igneous Province with some indication of current researches in this field; 2. Isle of Skye; 3. The Small Isles (Rum etc.); 4. Ardnamurchan; 5. Isle of Mull; 6. Isle of Arran; 7. Others (including the Shiant Isles, St. Kilda etc.). In each of these accounts the various SSSIs are described according to the NCC format and a very accurate picture of the general and specific geology of both the sites and region emerges. I am familiar with Ardnamurchan geology and the authors have given a concise and accurate picture of it in their descriptions. The diagrams are excellent throughout and the photographs well chosen.

The Index is comprehensive with well selected terms and the References are complete, and give an excellent picture of Tertiary research over the past few decades.

My only serious criticism of this book (apart from the price—a mind-blowing £65.00) is the lack of detailed mineralogical data and geochemical analyses of rocks and minerals. Since the NCC statement mentions the scientific importance of sites and justification for a sites inclusion, it is difficult to understand why such data are not given. It is extremely difficult to discuss the petrogeneses of the Tertiary rocks of the various centres without a full discussion of rock and mineral chemistry, geochemical trends, comparisons with other centres, and other scientific information.

I realise that the authors' hands are tied by the statement that the conclusions have to be *written in simpler terms for the non-specialist* but I am of the opinion that the dearth of detailed scientific data detracts from the volume and reduces its importance to the professional geologist and other scientific workers who must be interested in the origin of the main Tertiary magmas and their relationships with other Tertiary magmatic rocks.

As far as it goes, the book gives an excellent account of the British Tertiary Province, but I cannot understand why essential petrological ingredients have been omitted because of perceived difficulties for the non-specialist reader, when such a volume is likely to have more specialist than non-specialist buyers.

C. D. GRIBBLE

Parson, L. M., Murton, B. J. and Browning, P. (eds.) *Ophiolites and their Modern Oceanic Analogues*. London (Geol. Soc. Special Publication No. 60) 1992. vi + 330 pp. Price £55.00.

It is almost inevitable that papers collected together under such a title should be polarised into two groups, and it is not surprising that most authors attempt to bridge the gap between the two cultures from a firm standpoint on one side or the other. Of course, the correlation between ophiolites and oceanic crust, however widely accepted in general, is fraught with difficulties when it comes down to details. This is largely the result of insufficient three-dimensional information on present-day oceanic crust, and the obscuring of earlier magmatic history by later tectonic events in the case of the ophiolitic complexes. However, this memoir represents a praiseworthy effort to establish firmer connections between the two, and contains a wealth of valuable information, as well as some fascinating speculation. It's a pity that there is not a more extensive introduction—setting the scene, defining the jargon, and emphasising the problems—and perhaps a concluding chapter to re-assess the situation in the light of the contributions presented here.

The eighteen papers (following a very brief preview) are informally grouped by the editors into three categories, although the rationale for this grouping is not particularly clear, and a review of the contents is not helped by the absence of chapter numbers. The first five papers are described as having an essentially tectonic flavour, and comprise two on specific ophiolites (Josephine and Oman), and three on modern oceanic crust (one general, and one each on segments of the East Pacific Rise and Mid-Atlantic Ridge, respectively). The next nine papers are more geochemical in nature and cover such diverse topics as marginal or back-arc basins, boninites, and chromites, as well as specific ophiolite complexes (e.g. Ballantrae, Pindos, Troodos), apparently in no particular order. The final four papers are said to have a varied content, but to represent a 'similarity of methods and concepts'. This coherence is not strong, and three of these papers would have fitted equally well into the earlier 'tectonic' group, and the other is essentially geochemical. This section contains the

most idiosyncratic contribution in which an analogy is drawn between the development of individual oceanic island volcanoes, and the growth of oceanic plates. The same authors also speculate that some ophiolite complexes in Kamchatka represent abducted remnants of the Hawaiian–Emperor volcanic chain, where its northward extension appears to have been involved in subduction. (M.A. 93M/1073–1090)

Minor quibbles include the poor quality of the field photographs in an otherwise excellent account of the Josephine ophiolite; the lack of any diagrams in the valuable review article on the volcano-tectonic setting of oceanic lithosphere generation; and the frequent perpetuation of the unfortunate term 'sheeted dykes'—a tautology if ever there was one.

Overall, this compilation provides a stimulating basis for further research, and if it adds up to slightly less than the sum of its parts, this is surely a reflection of the current state of the ophiolite/oceanic crust debate, in which the detailed complications outweigh the overall simplicity of the concept.

W. J. WADSWORTH

Tossell, J. A. and Vaughan, D. J. *Theoretical Geochemistry: Applications of Quantum Mechanics in the Earth and Mineral Sciences.* Oxford (Oxford University Press), 1992. xiv + 514 pp. Price £60.00

This text by Tossell and Vaughan is outstanding and timely. At the beginning of this century, the applications of chemistry revolutionised the way in which we study the Earth and its constituent minerals. Today thanks to advances in supercomputing, we are in a position to apply more sophisticated aspects of chemistry to geology. This book provides the first major introduction and review of such advanced geochemical methods and shows how they can be applied to mineralogy.

After a brief introduction to the subject, the next eighty pages are dedicated to a discussion of the major advanced experimental methods which are used to measure the behaviour, properties and characteristics of solids. This includes a review of diffraction methods and of adsorption, vibration and nuclear spectroscopic techniques. There then follows a clearly and authoritatively written chapter on the basic theoretical methods used in quantum mechanics, including discussions of the Hartree-Fock method and density functional theory, which ends by bringing the reader to the forefront of research with a discussion of quantum molecular dynamics.

The three following chapters provide an outstanding review of the progress to date in the simulation and calculation of the properties of oxides, silicates and sulphides. The literature is well and fairly covered, and references to work done as recently as 1990 are included. Subsequently, progress on specific topics is reviewed, with fascinating discussions on, for example, the reinterpretation of Pauling's rules, the problems of studying the properties of the minerals of the Earth's deep interior, and of industrial minerals such as zeolites. A chapter on geochemical problems includes a discussion on the nature of melts and solutions, modelling of mineral surfaces, and the partitioning of elements.

For anybody interested in the way in which geochemistry will evolve in the 21st century, this book is essential reading. The authors are to be congratulated in producing a first-class contribution to literature.

R. J. PRICE

Butt, C. R. M. and Zeegers, H. (eds.). *Handbook of Exploration Geochemistry in Tropical and Subtropical Terrains.* Amsterdam (Elsevier Science Publishers), 1992. 630 pp. Price Dfl360.00 ($205.50).

Exploration geologists, to whom this Handbook is mainly directed, and who use geochemistry of surface and near-surface materials as one of their major ore-finding techniques will particularly welcome this large and comprehensive collection of data on the subject of the origin and interpretation of the regolith and its geochemistry in tropical and subtropical terrain. The regolith is incredibly complex and the interpretation of the results of mapping and geochemical surveys is often a frustrating experience. With climatic changes having superimposed different weathering products on older deposits the exercise in decoding the data is daunting. In addition it must also be remembered that the duricrust not only conceals ore bodies, but it also hosts them.

The message that this book delivers to all exploration geologists using geochemistry is quite clear. Prepare a regolith landform map and use it in the preparation of the sampling programme and in the interpretation of the results. If this is not done then the survey will be inadequate and most probably miss many of the important clues. If the authors' advice is followed then the chances of success will be greatly enhanced. How often do we hear of soil sample surveys being carried out with samples having been taken at a constant depth without any thought being given to the genetic significance that the samples have in the