

composition. Subsequent chapters deal with each of the main processes which may be responsible for the formation of andesites.

The review of factual data is very comprehensive, and there is even a list of the active andesite-erupting volcanoes of the world with chemical information on each, and maps of all the regions where andesitic volcanism occurs, giving tectonic information such as the depth of inclined seismic zones. The first chapter is the least satisfactory, mainly because the nomenclature of andesites is not very logically discussed. For example, 'orogenic andesite' is defined by chemical parameters, selected in such a way as to exclude most trachy-basalts, icelandites, and other intermediate lavas occurring in non-orogenic environments. One wonders why 'orogenic andesite' could not have been defined by a combination of composition and tectonic environment as the name implies. However, this distinction is of little consequence as all andesites, including non-orogenic ones, are subjected to scrutiny in subsequent chapters of the book.

The discussions of petrogenesis are tackled in a very systematic way. Firstly, the author discusses the possibility that andesites might be primary magmas, either from subducted oceanic crust or from the overlying mantle wedge. Both alternatives are found to be inadequate by themselves, but the possibilities multiply as one considers interactions between subducted oceanic crust and overlying mantle, especially the transfer of fluids and metasomatism. The more complex the hypothesis, the more difficult it is to test by geochemical and other criteria, but the spatial relationship between andesites and inclined seismic zones must obviously be of some significance. Next, the secondary processes are examined, such as contamination, differentiation, and magma mixing. The arguments for and against all of these are stated, but Professor Gill comes down in favour of low pressure (plagioclase + orthopyroxene/olivine + augite + magnetite) fractionation from a basaltic parent magma as the most likely origin of andesites. He recognizes the difficulty of explaining why andesites predominate at convergent plate boundaries if they are simply differentiates of basalt which occurs everywhere, and most of his final chapter is spent in trying to resolve this paradox. He concludes that although the plate tectonic environment must influence the nature of the parental magma from which andesites evolve, the andesites themselves are the result of nothing more exciting than ordinary crystal fractionation.

The book will be essential reading for anyone interested in the origin of andesites. The first two-thirds, i.e. the data review, is very detailed, and

is primarily for research students and specialists working in this field. The later chapters on petrogenesis are more readable, and could be studied with profit by the undergraduate or less specialized petrological reader.

A. HALL

Turner, F. J. *Metamorphic Petrology: Mineralogical, Field and Tectonic Aspects. 2nd Edition.* Washington, New York, and London (McGraw Hill), 1981. xv + 524 pp., 162 figs. Price £26.95.

The second edition of Turner's textbook on metamorphism is a substantially enlarged and updated version with more than 100 extra pages. Several new chapters on metamorphic facies have been added, and Professor Turner has extensively updated the parts dealing with phase equilibria for several systems, and has followed recent developments in the regional geology of his many case study areas.

In many ways this book seems to be more of an essay than a textbook, and indeed this is the source of much of the enjoyment of reading it. Turner expounds his views about many topics without actually getting down to details of how they work, so that his discussion of, for example, experimental methods requires a prior knowledge of the field. Similarly the thermodynamics section starts from an elementary level but fails to explain many of the steps—for example, there is no mention of standard states. Curiously, there is no reference to any of the recent texts on this subject.

The structure of the book makes it an excellent reference for the worker seeking information about the assemblages found in a particular facies, but it is difficult to extract information about metamorphism of a particular rock type or area, and there is a lot of repetition. The metamorphism of the Haast Schist appears in more than ten separate sections spread amongst 400 pages, with ten separate maps. Inevitably, inconsistencies sometimes result.

Although the equilibrium aspects of metamorphism have been thoroughly updated, many other areas of current research have not been so closely attended to and the book is now far more specialized than it was in 1968. The discussion of kinetics is disappointing, and does not include many of the new approaches developed since the first edition. The book sticks to a more rigid concept of progressive metamorphism than many petrologists would accept, and there is no discussion of ideas about the variation of facies series with time within a belt, currently being developed from both field studies and theoretical considerations. Typically, the old ideas and controversies of the first edition are

thoroughly updated, but many new approaches of the past decade receive scant notice. Despite the title, plate tectonic models for metamorphism are not included.

The book is well produced on the whole, with relatively few typographical errors, as it should be for the price. The references to kyanite as typical of Buchan metamorphism (p. 30) and to calcite as the product of reaction between quartz and calcite (p. 75) could cause confusion, however. It will be an important reference for workers on metamorphic rocks requiring information about other areas, but in my view this book is not sufficiently readable, clearly structured, nor cheap enough for an undergraduate course text, though it will be an invaluable source for supplementary reading.

B. W. D. YARDLEY

Holland, C. H., Editor. *A Geology of Ireland*. Edinburgh (Scottish Acad. Press), 1981. x + 335 pp., 191 figs. Price: Paperback £15.00, Hardback £27.50.

This well-illustrated book treats the geology of Ireland mainly in a historical manner from Pre-Cambrian to Recent, including chapters not only on the Caledonides and on Caledonian and Tertiary igneous activity but also on geophysical evidence and on economic geology. The nineteen chapters are contributed by only nine authors so there is a unity of style and approach. Since the appearance of the important work on the historical geology of Ireland by the late Professor J. K. Charlesworth some twenty years ago, much has happened in Irish geological research; this new treatment is at once broad and concise, each chapter having a comprehensive bibliography. There is a wealth of sketch-maps and diagrams as well as fifty-eight black-and-white photographs. A book for all libraries and the personal shelves of all concerned with Irish geology.

R. A. HOWIE

Belousov, V. V. *Geotectonics*. Moscow (Mir Publishers), Berlin, Heidelberg, and New York (Springer-Verlag), 1980. x + 330 pp., 134 figs. Price DM. 48.00 (US \$28.40).

Belousov, in this text, sets out to give an alternative scheme of geotectonics to the plate tectonic views currently in vogue amongst western geologists. It is unfortunate that the author does not indicate as to whether the views expressed are widely held in the USSR for they are certainly very different from those held and taught in the West. I enjoyed reading the book but I have to admit that I found my faith in plate tectonics and sea-floor

spreading reinforced rather than weakened by its content. It is, however, unfair to completely dismiss this text because of its rather outrageous ideas on the origins of the oceans and of fold mountain belts. The earlier chapters are connected more with the processes of epigenesis than orogenesis and the treatment of vertical crustal movements within the continents is very good. The 134 figures are all line diagrams and are generally very difficult to follow because of the host of symbols employed and the complex nature of the key supplied with each. This complexity makes some of the ideas described very difficult to follow. To sum up, this book demonstrates that life with lithospheric plates is much simpler than life without. I suspect that parts of it will infuriate many western readers (as they did me) but it has a role, assuming that it represents the views held by many Russian geologists, because it presents that view to the West and does challenge our own ideas.

MERVYN E. JONES

Batley, H. M. *Mineralogy for Students* (2nd edition). London and New York (Longman), 1981. xii + 355 pp., 324 figs. Price (paperback) £8.95.

Two appendices have been added to the second edition to assist the student working with the polarizing microscope. As in the first edition, 170 pages are devoted to brief descriptions of the principles and methods of mineralogy. The following 130 pages consist of descriptions of about 200 minerals. Simplified descriptions of the atomic structures are accompanied by brief notes on physical including optical properties, but there are few diagrams of the minerals and a photograph only of obsidian. The appendices consist of lists of symmetry classes, hardness, reflectance, refractive indices, and uniaxial and biaxial minerals.

In the second edition one additional appendix consists of a brief procedure for the identification of minerals by their optical properties and ten charts showing the birefringence and mean refractive index or ranges of these properties. The charts refer to minerals of similar colours, length slow or fast and straight or inclined extinction. The second new appendix contains optic orientation diagrams of the commoner rock-forming minerals.

It remains the author's hope that the university student will find most of what he needs to know about mineralogy up to the level of a first degree in geology or mining. For the geologist the descriptions of the silicate minerals are inadequate and are much less informative than the data provided in the standard text *An Introduction to the Rock Forming Minerals* by Deer, Howie and Zussman.