across these diverse categories. Sometimes the papers make strange bed-fellows. For example Tunell's paper seems totally out of place here.

It seems to me that a book of this kind provides an ideal opportunity to proselytize about thermodynamics in geology. The papers should be fundamentally educational although maybe presenting new research, certainly summarizing and rationalizing old research. Holland's paper comes in this category. Straight research papers like the one of Lindsley *et al.* surely should be found in a research journal. The authors may even have benefited from the more stringent reviewing thus entailed.

It might seem churlish to criticize the conception and content of a book in this way. Given that the book now exists, there is much to be learnt from many of the chapters. It is a valuable addition to any theoretical petrologist's library. Unfortunately, the lack of an attempt to educate makes much of the material inaccessible to 'ordinary' petrologists, sadly, as the book is of profound relevance to them.

R. POWELL

West, D. R. F. *Ternary Equilibrium Diagrams* (2nd edn.). London and New York (Chapman and Hall), 1982. viii + 149 pp., 101 figs. Price £13·00 (hardback), £5·95 (paperback).

This is the second edition of a book first published in 1965. The main text of the book is little altered but the overall size is enlarged by the addition of problems (with answers) and a chapter on 'selected case studies of ternary systems'.

It is a book for metallurgy students and therefore pays little, if any, attention to topics of importance in geology such as evolution of melt composition, pressure as a variable, and effect of volatiles. The nomenclature used is somewhat different from that used by geologists: it was interesting to learn that 'eutectic', a word restricted to isobaric invariant situations in ceramics and earth sciences, is used in a wider sense to include univariant situations, i.e. 'field-boundary' is never used, being replaced by 'binary eutectic curve' or 'eutectic valley'. Similarly for peritectic, so that 'peritectic curve' is used in place of 'reaction curve'. West also describes a 'monotectic reaction' but I failed to grasp the meaning of this. His use is certainly different to that of Ricci's.

I was not too happy with West's descriptive treatment of the subject (i.e. the material carried forward from the first edition), certainly a sound knowledge of binary systems is a pre-requisite and greater use of the bounding binary systems would have been appreciated. A few vertical sections are shown but the method of sectioning is not explained. The text deals with plotting on equilateral triangles and then without any explanation certain systems (e.g. Al–Cu–Mg, C–Cr–Fe) are shown on rectilinear diagrams. The Fe–O system surprisingly gets only a brief mention and no attempt has been made to show oxygen isobars on either a binary or ternary diagram.

The strong points of the book are threefold: (1) the very good 3-D drawing) (2) the problems with answers; (3) the presentation of a few 'real systems'. A diligent student will learn a lot by answering the questions.

The book is possibly of much use to metallurgists but I can only give it a moderate recommendation for earth scientists.

D. L. HAMILTON

Hughes, C. J. *Igneous Petrology* (Developments in Petrology, 7). Amsterdam and New York (Elsevier Scientific Publishing Co.), 1982. xvi + 551 pp., 79 figs. Price Dfl. 70.00 ($28.00).

Textbooks on igneous petrology usually fall into one of two categories. On the one hand there are those texts which deal mainly with field relationships, mineralogy and petrography, and form essential references for any student of the subject. On the other hand there are the more advanced texts, dealing with magma series, geochemistry, thermodynamics, isotope systematics and so on—invaluable reading for the more senior undergraduate and research student. This latest book on igneous petrology by Dr Hughes of Memorial University, Newfoundland, seeks to bridge the gap between the two types of text by integrating the various aspects of igneous petrology within a framework of modern global plate tectonics.

The book comprises fourteen chapters covering a wide range of subjects, including mineralogy, petrography, volcanic activity, forms and structures of intrusive rocks, classification of igneous rock series, and degradation of igneous rocks. Chapters 8 to 10 deal with igneous rocks from specific tectonic settings (oceanic areas, continental areas, and supra-Benioff zone regions); Chapter 11 deals with Precambrian igneous rocks; and Chapter 12 deals with the petrogenesis of igneous rocks. In general, the layout of the book is not dissimilar to texts already available, and is aimed ostensibly at more senior undergraduate and higher levels.

The book is lucid and well-referenced, but certain features (or their absence) give rise to serious misgivings. For example, the three chapters on petrography, volcanic activity, and forms and structures of intrusive rocks contain *only one illustration* among them; this, surely, is a serious shortcoming? Indeed, in its present form, the

chapter on petrography could be omitted, and the section on mineral recognition is of little value. The classification scheme adopted in this book (based on texture and mineralogy) is similar to those published elsewhere, although I see no reason for spilites and keratophyres to be in a special category; a similar treatment is not given to other meta-igneous rocks.

More important, perhaps, is the general absence of modern geochemical systematics—particularly isotopes and trace elements—and their application to magma genesis. Sr-isotopes are barely considered, Nd-isotopes are not mentioned, and trace element modelling is treated very scantily indeed.

The development and implications of recent hypotheses and theories concerning evolution of mantle inhomogeneities, models of magma genesis, selective crustal assimilation, and magma chamber processes, are not considered in any depth, although to be fair even a book of such breadth cannot be all things to all men.

A book, therefore, to enjoy for its lucidity but not for its presentation and treatment of modern developments in igneous petrology. Alas, students of petrology must apparently still await that elusive bridging text if, indeed, it can be written.

A. D. SAUNDERS

Gillen, C. *Metamorphic Geology: An introduction to tectonic and metamorphic processes.* London (George Allen and Unwin), 1982. xiv + 144 pp., 69 figs. Price: hardback £12·00, paperback £4·95.

This book is intended to serve as an elementary text on the subject of metamorphism and mountain building for non-specialist students of geology. The emphasis is on processes, and the links between orogeny and metamorphism are explained. Textures and field relations are introduced followed by a discussion of the factors controlling metamorphism. Case studies of areas of metamorphic rocks are presented in the context of modern theories of the Earth's activity. The book is well illustrated with diagrams and should fulfil its intent. A legitimate criticism, however, is that there is a lack of emphasis on the chemistry of the rocks and minerals concerned (and the only formula given for garnet is incorrect).

R.A.H.

Tankard, A. J., Jackson, M. P. A., Eriksson, K. A., Hobday, D. K., Hunter, D. R., and Minter, W. E. L. *Crustal Evolution of Southern Africa: 3.8 Billion Years of Earth History.* New York, Heidelberg, and Berlin (Springer-Verlag), 1982. xv + 523 pp., 182 figs. Price $55.00 (DM 118.00).

To my mind this is a successful book and one of the best which has yet appeared on the geology of a southern continent. It sets out to trace the history of southernmost Africa; essentially the area covered by the State of South Africa with excursions where geologically necessary into neighbouring countries.

Between them the six authors have the necessary knowledge to follow each of the three main themes which reappear throughout the history of that part of the world. The book opens with descriptions of the Archaean metamorphic complexes and comes back to that subject in a later chapter concerned with the high-grade rocks formed in Proterozoic times. It then traces the long succession of sedimentary basins opening with an account of what they picturesquely call the Golden Proterozoic and taking up in succeeding chapters the history of the earliest Red Beds, the Palaeozoic sediments of the Cape, the Karroo, and the sediments that accompanied and followed the break-up of Gondwanaland. In each of these chapters the description of the sediments is accompanied by an analysis of the conditions under which they formed. These accounts are consistently good throughout the book, from the account of the Transvaal Epeiric Sea to the record of the Karroo deposits with their 80 billion tons of bituminous coal. The book is worth buying simply for these accounts of a unique succession of sedimentary basins. The third ingredient is the igneous activity, largely basaltic, sometimes alkaline, and to a small extent granitic, which from time to time erupted through the fractured South African crust from earliest Precambrian times through the formation of the Bushveld complex, and the intrusions of alkaline rocks including the economically important kimberlites up to the vulcanicity which formed the ocean floors as Southern Africa separated from other southern continents. The book is clearly written, very well planned and well illustrated. In short it is a success, a worthy memorial to du Toit to whom it is dedicated.

JOHN SUTTON

Tahirkheli, R. A. Khan. *Geology of the Himalaya, Karakoram and Hindukush in Pakistan.* Peshawar (National Centre of Excellence in Geology, Univ. of Peshawar), 1982. 51 pp., 20 figs., 23 colour plates, 1 coloured geol. map (~ 1 : 1 400 000). Price Rs. 150/-.

This publication (produced as a Special Issue: Vol. 15, *Geological Bulletin, University of Peshawar*) concerning the geology of three of the best known mountain chains of the world takes account of the recently discovered Kohistan Island arc [M.A. 80-2570, 81-2085, 82M/4000] which lies between