erraticus), which once flew a longitudinal course from the Antarctic Peninsula to Spitzbergen across the site of the future Atlantic but developed an increasingly zig-zag course as the Atlantic opened beneath it.

In spite of these humorous touches the author's style is serious rather than popular and his presentation is commendably clear and straightforward. The text, set in double columns, is liberally broken up by specially prepared illustrations. These diagrams, particularly those illustrating geophysical concepts, are carefully explained in captions and in the text. A final chapter provides the now obligatory review of environmental geology and progress in earthquake prediction. The volume is rounded off by a useful list of popular plate tectonics references and an adequate index.

There are a few shortcomings in an otherwise successful exercise in the preparation of a new style of textbook: summaries appended to each chapter when the chapters are sufficiently short to be re-read if necessary; overconscientious cross-referencing to simple diagrams across several chapters; overaddiction to John Holden's fussily humorous sketches; and slapdash proof-reading on page 15. Also the book will prove to be too highly priced on this side of the Atlantic, in its present form, for the audience at which it is aimed, but it may be strongly recommended to school and college libraries. A. J. BARBER

Ringwood (A. E.). *Composition and Petrology of the Earth's Mantle*. London, New York, and Sydney (McGraw-Hill), 1975. xviii+618 pp., 153 figs. Price £19·45.

This important new textbook by Professor A. E. Ringwood of the Australian National University is in two parts, the first on the upper mantle and crust, and the second on the transitional and lower mantle.

The first part of the book is largely petrological in character, and starts with a review of the present state of knowledge of the lower crust. The author then considers the various sources of geophysical and petrological evidence on the composition of the upper mantle, including seismic wave velocities, Alpine-type peridotites, and ultramafic xenoliths. Chapter 5 is an account of Ringwood's pyrolite model of the upper mantle, which is rather taken for granted in the preceding chapter on the origin of basalt magmas. This is followed by a summary of the author's views on the constitution of the upper mantle, and by discussions of orogenic magmatism and the petrological evolution of the crust and upper mantle.

The second part of the book deals with the composition of the lower mantle and its dynamics and origin. The only direct evidence on the constitution of this region is geophysical, and present knowledge of the physical properties of the lower mantle is summarized rather briefly. Studies bearing on possible phase transformations in the region between 400 and 1000 km depth are discussed at length, including details of experimental techniques. Ringwood modestly refrains from referring by name to ringwoodite, the cubic polymorph of olivine, which was discovered in meteorites by Binns, Davis, and Reed, and which is very likely the main constituent of the mantle between 400 and 650 km. He uses the experimental data to construct a model of mantle compositions down to 1000 km. Below this level there is much more uncertainty, but variations in the mantle below this depth are tentatively attributed to further phase transformations rather than to a change in chemical composition.

The book concludes with a look at some broader aspects of Earth structure. In chapter 15 the dynamics of the mantle are discussed in relation to its phase transformations, with obvious implications for plate tectonics, and the final chapter of the book discusses the origin of the Earth in relation to the solar system as a whole. Great progress has been made on this important subject in the last 20 years.

This is the best account of the petrology of the Earth as a whole, as opposed to its outer layers, and a remarkable proportion of our knowledge on the subject has been contributed by Ringwood himself. This book is therefore very much *the* authoritative account of the subject, comparable with Bragg's *Atomic structure of minerals* or Goldschmidt's *Geochemistry*. It is not only authoritative but also very readable, despite the many technicalities that are discussed, and the author has been very successful in writing an account that will be useful to students and specialists alike. What a pity it is that he has not found a publisher able and willing to price this work within reach of the average student. A. HALL

Wenk (H.-R.), Champness (P. E.), Christie (J. M.), Cowley (J. M.), Heuer (A. H.), Thomas (G.), and Tighe (N. J.), Editors. *Electron Microscopy in Mineralogy*. Berlin, Heidelberg, and New York (Springer-Verlag), 1976. xiv+ 564 pp., 277 figs. Price DM 96.00; $39.40.

The publication of this book constitutes an important landmark not only in relation to the development of electron-optical techniques as applied in mineralogy but also in the integration of such studies with similar problems in inorganic chemistry and materials science. It owes its origin to an extremely successful TEM conference organized, under the auspices of the American Crystallographic Association, by H.-R. Wenk and G. Thomas at Berkeley in 1974.

Wisely the editors of this volume decided that it should be split into sections each dealing with one aspect of the use of the electron microscope in mineralogical studies [M.A. 76–3157]. Apart from the fact that, in such a scheme, there is bound to be a certain amount of overlap the final result is extremely satisfactory and each of the sections is largely self-contained.

The first major section (section 2) deals with the basic principles of electron microscopy under the neat title of 'contrast'. In this section I was particularly impressed with the chapter contributed by Cowley and Iijima which deals with the direct imaging of crystal structures, This is extremely clearly written and provides the mineralogist at large with a very readable account of the art and its limitations. By contrast the chapter on contrast effects at planar interfaces makes few concessions to the uninitiated and lacks follow-up in relation to simple worked-out mineralogical examples. Section 3 deals with experimental techniques and contains a substantial bibliography.

The next major section (section 4) deals with exsolution phenomena, is prefaced with a good account of the relevant theory, and is well illustrated with a large number of examples chosen from the feldspar and pyroxene mineral groups. In addition to a number of minor contributions on exsolution in a range of mineral systems this section also contains an elegant account of spinodal decomposition in the system TiO_2–SnO_2 (chapter 4.2), which should be studied carefully by mineralogists interested in this topic.

Section 5 deals with polymorphic transitions and again a thorough review of the principles is included with particular emphasis on the distinction between transitions involving non-glissile and glissile interfaces. Examples of transitions involving glissile interfaces (martensitic transitions) have not been much studied in mineralogy although they are of considerable importance in materials science. Examples chosen by way of illustration include baddeleyite (ZrO_2) and the ortho–clinoenstatite transition, which may or may not belong to this class. Included in section 5 is a short contribution by B. G. Hyde (chapter 5.3) on the behaviour of non-stoichiometric rutiles, which fulfils an important function in introducing the mineralogist to a wealth of electron-optical data currently existing in inorganic chemistry on ordering in terms of crystallographic shear mechanisms.

The penultimate section of this volume deals with the study of deformation microstructures in minerals and in the review article on this topic an account of the theory of dislocations and