

Other data suggest that Alpine-type ultrabasic rocks either separated in the latter half of the Earth's history and subsequently rose to the surface, or that they are residual accumulates from some very early Rb/Sr enrichment process, which was followed by a separation of sialic crust in the early Archean.

Murthy and Stueber discuss the variation of K/Rb, which in basalts shows systematic changes with varying K but not in eclogite inclusions, ultrabasic inclusions, and Alpine-type intrusions. They conclude that the upper mantle zone is characterized by low K/Rb. The residual nature of the Alpine-type peridotites seems almost certain, with fractionation removing alkalis to the crust.

Chapter 12, in addition to Wyllie's excellent summary, includes a section by MacGregor in which he proposes an upper mantle composed of a two-pyroxene peridotite with a spinel facies overlying a garnet facies. He suggests that seismic discontinuities in the upper 200 km of the mantle are the result of variations in the Al_2O_3 content of the pyroxenes. This is further supplemented by O'Hara who shows the changes in mineralogy of two fixed ultrabasic compositions in response to changes of temperature, pressure, and Al_2O_3 in the pyroxenes. A petrographic grid is presented showing compositional requirements of clinopyroxenes coexisting with orthopyroxene and olivine in an Al_2O_3 -saturated environment. An analysed clinopyroxene can be plotted on the grid giving an estimate of the equilibrium temperature and pressure.

The whole book, contents and the way they are presented, sets a very high standard and constitutes an authoritative account of ultrabasic rocks and the frequently contrary views about their petrogenesis.

T. W. BLOXAM

GASS (I. G.), SMITH (P. J.), and WILSON (R. C. L.), editors. *Understanding the Earth: A Reader in the Earth Sciences*. Horsham, Sussex (Artemis Press), 1971. 355 pp., 243 figs. Price £3.50 (boards), £2.10 (paper).

This book was written primarily as a set book for the Foundation Course in Science of the new Open University and has aimed at showing that the Earth sciences are mentally stimulating and conceptually demanding. The editors have been able to call on a galaxy of talent, and in addition to chapters on the Earth's surface features, there are authoritative statements on measuring geological time (S. Moorbath), the Chandler wobble (M. Chinnery), and the Earth's composition (P. G. Harris), magnetic field (Sir Edward Bullard), and internal heat (J. H. Sass). The book opens logically with a chapter on minerals and rocks (K. Cox) though one is surprised to find cordierite classed as a member of the amphibole group; other early chapters include those on the Earth-Moon system (Z. Kopal), meteorites (B. Mason), and the primitive Earth (P. Cloud, Jr.). The environments in which ancient rocks are inferred to have formed, from comparison with sediments accumulating today, are fully discussed (E. K. Walton) and the oxidation: polarity paradox, which seems to stand in the way of a theory that could account for reversed magnetization in rocks, is described (P. J. Smith). During the last decade there has been a revolution in the Earth sciences,

largely due to the oceanographic geophysicists, which has led to the wide acceptance that continents drift and that the sea floor spreads, and to the all-embracing theory of plate tectonics. Here continental drift (A. G. Smith), sea-floor spreading (F. J. Vine), polarity reversal and faunal extinction (D. I. Black), and plate tectonics (E. R. Oxburgh) are fully described and the application of this unified, revolutionary, and elegant hypothesis to explain ancient orogenies is expounded (J. Sutton) and taken on to suggest that the proportion of continental crust involved in mountain building has varied through geological time in long cycles some 800 Myr or more in length. Further chapters include those on volcanism and the Earth's crust (J. B. Wright), the regional location of mineral deposits (T. N. Clifford), earthquake prediction (R. L. Kovach), and the geopolitical fiasco of Mohole (D. S. Greenberg).

The book is profusely illustrated throughout: the diagrams are clear and aided by the frequent use of colour tinting but some of the black-and-white photographs are less successful in their reproduction. Despite its being conceived and produced in only nine months it has benefited from this short gestation period in being quite remarkably up to date without having suffered unduly from printing errors. The authors have certainly succeeded in presenting the modern view of the Earth and have at the same time authoritatively illustrated the scientific approach to problems involving several branches of science. Certainly this reviewer feels that the students of today are fortunate not only in starting to study geology at a time when a new and coherent picture is emerging of the Earth but also in having this book to stimulate their interest and to explain so clearly the methods and thinking that brought about this new understanding.

R. A. HOWIE

CLIFFORD (T. N.), and GASS (I. G.), editors. *African Magmatism and Tectonics. A Volume in honour of W. Q. Kennedy*. Edinburgh (Oliver and Boyd), 1970. xv+461 pp., 96 figs., 3 pls. Price £10.

Most of the contributors to this Festschrift to W. Q. Kennedy have at some time worked closely with him at the Research Institute of African Geology in Leeds. The composition of the volume, a monumental achievement in the development of African geology, naturally reflects his influence both in the topics and their treatment. Kennedy's main interests in geology have been in the sources and relationship of magma types to crustal structure, in regional structure and metamorphism especially in the Scottish Highlands, and subsequently in the evolution of the African continent. The latter interest, looking back to the first, has been aligned towards petrogenesis and mineralization. More than half the eighteen articles, each of the stature of a major paper, can be categorized as closely reflecting the title of the book. It may be thought that the magmatism is stronger than the tectonics, unless one agrees with the cynic's definition of tectonics as being 'structure which is too big to see'.

Let it be clearly said that the volume contains an enormous amount of factual information and solid scholarship from a body of researchers who have specialized in