

Advancing igneous petrology

The Alkaline Rocks. Edited by H. Sorensen. Pp. xii+622. (Wiley: London and New York, March 1974.) £20.00.

In this book Professor Henning Sørensen brings together contributions covering recent intensive investigations of the mineralogy, geochemistry and experimental behaviour of alkaline rocks, together with new information on their occurrence and field relations. The cover is wide but, deliberately, no attempt has been made to be comprehensive in terms of occurrence. Recently reviewed rock types (such as carbonatites) receive limited treatment, and the mineral parageneses of alkali pegmatites are not considered in detail.

In a short introduction Sørensen clarifies the complex terminology and definitions of the group and provides a brief historical review. The book is subsequently divided into six major sections concerned with petrography and petrology, regional distribution and tectonic relations, alkaline provinces, conditions of formation, petrogenesis, and economical (*sic*) geology. An appendix includes a useful glossary of over 400 alkaline and related rock names, and the book has been carefully indexed on the basis of rock names, subjects, geographical localities and authors.

In the first three major sections the contributions range from being largely descriptive to those with much petrogenetic content. It is difficult to do justice here to the wealth of ideas presented, but a number are of particular interest. The long duration of alkaline magmatism in certain areas is stressed by Sørensen in introducing the chapters on regional distribution. In this section, D. K. Bailey makes skilful use of African examples to examine the relationships between continental arching, rifting and magmatism, and concludes that volatile movement, with attendant heat and alkali transfer, may be important in the development of both flood and localised occurrences of alkaline rocks. The importance of structural controls over the location of magmatism in Siberia is stressed by E. L. Butakova, who also points out that in this region the development of alkaline rocks in stable areas seems to be linked with tectonic activity and calc-alkaline magmatism in adjacent fold belts. In contrast, M. Mathias does not find any obvious and simple correlation between alkaline rocks and structural features in southern Africa.

The alkaline provinces were selected to cover common rock associations, using well documented areas for which there were no readily available reviews. They are: the Kola Peninsula, South-

West Greenland, France and central Europe, the Mongol-Tuva province south-west of Lake Baikal, the Montegian Hills in eastern Canada, Oceanic Islands and Niger-Nigeria. In several, the parental role of alkali olivine basalt or of melilite basalt is favoured, with extensive anorthosites requiring explanation in South-West Greenland and Niger. A. S. Pavlenko expresses a different viewpoint on the origins of the dominant alkali granites and miaskitic syenites of the Mongol-Tuva province. Here, the field and other evidence indicates a replacive origin for some at least of the alkaline rocks, which are seen as the climax of palinogenesis of a thickened crust.

Reviewing experimental studies, A. D. Edgar stresses the role of volatiles in alkali rock evolution (a topic also considered by L. N. Kogarko), discusses mechanisms by which thermal barriers may be crossed, and examines

the conditions of formation of specific minerals. Researches on homogenisation temperatures of inclusions in minerals, described by V. S. Sobolev and others, indicate temperatures in excess of 850°C during nepheline syenite crystallisation, whereas phenocrysts in effusive rocks may have commenced crystallisation at appreciably higher temperatures (>1,250°C).

Several of the contributors dealing with petrogenesis express doubts on any simple parental role of alkali olivine basalt in alkali rock genesis, although this is clearly a reasonable assumption in Oceanic Islands and in provinces such as France and central Europe, and South-West Greenland. J. L. Powell and K. Bell find that the isotopic composition of strontium may indicate derivation from continental basalt for many alkaline rocks but processes involving partial fusion of inhomogeneous source material may also be involved, as may assimilation, although not of limestone (a process also not favoured by P. J. Wyllie in a later chapter). D. K. Bailey argues strongly in favour of derivation of felsic alkaline magmas by partial melting in the deep crust. After reading the petrogenesis section one is left with the impression that relatively little is known about the nature and structure of the supposed source areas for the alkaline magmas in the upper mantle or the deep crust. It is to be hoped that this imbalance will be corrected in an extension of geophysical investigations, of the type in progress in East Africa and the Oslo Fjord area, to other alkaline provinces, and that these will be integrated with the petrological researches.

The common development of layering and other features of igneous cumulates indicate the importance of crystal fractionation in alkali rock formation, a topic given detailed consideration by R. Macdonald. The sequence of types in many alkali associations is, however, not always readily explicable in terms of crystal fractionation of a parent magma, and the suggestion by L. N. Kogarko and others that compositionally graded magma chambers may form from volatile migration along *P-T* gradients is welcome and deserves to be explored further.

The book contains a wide range of informative and stimulating contributions. Professor Sørensen is particularly to be congratulated on obtaining, with the help of Dr V. P. Volkov, contributions from so many Russian petrologists. The book is well produced and clearly illustrated with numerous line diagrams. It is a volume which can be thoroughly recommended to everyone interested in advanced igneous petrology.

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Concepts for testing

H. B. Barlow

Concepts and Mechanisms of Perception. By R. L. Gregory. Pp. xi+669. (Duckworth: London, September 1974.) £18.00.

THIS book consists of 56 articles by Richard Gregory and his collaborators. Some are only a page or two long, though the longest, and probably the most important, is a reprint of his study (with Jean Wallace) of the vision of a man who was blind from the age of a few months until he received a successful corneal graft at the age of 52. The book starts with a 30 page "Pretext" and short commentaries link and up-date each chapter. About 15 of the articles have not appeared before, but a good deal of this new material consists of descriptions of apparatus, patent specifications, or rather lightweight articles. The more substantial parts would be available to anyone with access to a good library, and it is not clear who will find it necessary or desirable to purchase this rather expensive collection.

Anyone who dips into the book will find that the articles and commentaries make light and easy reading; a delightful air of geniality pervades it. The "Pretext" especially is written with a constructive imagination that always makes it alive and interesting. But we know, since Popper and Fisher, that science advances by the brutal destruction of hypotheses, and I am not sure that the benign and gentle ideas that Gregory advances will survive for long in the vicious jungle of facts uncovered by critical psychologists.