

of the parent magma; assimilation; emanation, crystallization, and isomorphism. Later hydrothermal processes are also important.

It is envisaged that cooling under tranquil tectonic conditions made possible the crystallization of nepheline to form urtite layers, which, by selective removal of sodium and aluminium from the immediately adjacent magma, led to the crystallization of lujavrite, rich in feldspar and aegirine; this in turn gave rise to concentrations of constituents that determined the formation of foyaïtes in the next layers. The process is thus quite different from that usually invoked to explain rhythmic layering in basic complexes.

Volatile constituents tended to migrate upwards, but the urtite horizons constituted partial traps; sharp peaks in the concentration of minor constituents around the base of the urtite layers, only partly dependent on the nature of the principal minerals, are thus explained. More generally, however, concentration of volatile constituents, by increasing mobility and lowering temperatures of crystallization, gave rise to the poikilitic syenites, and most notably the pegmatites.

The translation is very literal and agrees in meaning with the original, sentence by sentence. Nevertheless, largely by appropriate reorganization of the form of dependent clauses to English constructions, the style of the translation is clear and readable. Occasional minor oddities occur: as, for example, 'rocks and pegmatites', but the Russian 'porodi' allows of no other translation. Again the term 'emanation' acquires a somewhat different meaning in the English content, so that the original sense is often better rendered by 'migration'. This and other slight shifts of meaning arise partly from the greater facility in Russian for deriving adjectives from nouns, such as 'phase' and 'facies'.

B. C. KING

WAGER (L. R.) and BROWN (G. M.). *Layered igneous rocks*. Edinburgh and London (Oliver and Boyd), xv+588 pp., 278 figs., 32 tables. 1968. Price 168s.

The book is divided into two parts. The first presents an up-to-date account of the Skaergaard Intrusion. The second describes other layered intrusions, of which the Rhum complex, the Stillwater Intrusion, and the Bushveld Intrusion are dealt with in some detail. These are followed by shorter descriptions of other basic layered intrusions, including the Cuillins of Skye, the gabbro complex of north-east Scotland, Duluth, and the Great Dyke. One chapter is concerned with the

layering found in granite and syenite intrusions, another with differentiated sills, and a third with a list of other layered or fractionated intrusions. A final chapter attempts to generalize on some of the many conclusions reached throughout the book.

In the first part of the book the authors systematically record, discuss, and evaluate the great volume of research devoted to the Skaergaard intrusion during the last thirty years. The collection of this work under one cover is an invaluable service and, as in the original Skaergaard Memoir, the careful logical build-up of the recorded facts into petrogenetic hypotheses will make it essential reading for any serious student of geology. Of particular importance, of course, are those aspects of the recent research that have modified the original concept of fractional crystallization under the influence of gravity and convection currents. These include the extended discussion on the various cumulate textures; the importance of supercooling, nucleation, and density currents; and the role of the oxidation state in determining whether the fractionation trend is towards extreme iron enrichment or more normal calc-alkaline types.

The second part of the book is, of necessity, largely a summary of published work, although the detailed descriptions of the Rhum complex and to some extent those of the Bushveld and Stillwater intrusions are based on the personal observations of the authors. The collection of this information around the important central theme of layering in intrusive bodies is of great value, but of greater interest is the critical review by the authors of the work on these intrusions—the discussion on the relative roles of crystal settling and crystal growth from the margins, for example, in differentiated sills, and the critique of the published evidence on the Shiant Isles teschenite sill.

It is perhaps a pity more discussion was not devoted towards such intrusions as those of Willow Lake and Freetown, where the steep structures carry features common both to layering, as defined by the authors, and to banding parallel to steep contacts. A confusion of terminology is apparent in such cases, which is particularly relevant to basic intrusions in orogenic environments. One might also remark that the title of the book, while technically consistent with their own definitions, is less obvious than 'Layered Igneous Intrusions'.

The book is magnificently produced; packed not only with the relevant maps and diagrams, but also with photographs of exceptional quality.

P. R. HOOPER