appreciated by petrologists through its provision of a comprehensive and balanced introduction to the characteristics of igneous, sedimentary, and metamorphic rocks as seen in thin section. The extensive series of drawings of thin sections by the late Howell Williams which formed a major feature of the First Edition (and were, in fact, the only illustrations) have been retained in the Second Edition. Happily, additional contributions from his pen have been included in the present work: the most notable is a full page illustration of petrographic variation shown by eight basalts and andesites from the Parícutin volcanic suite. About half of the rocks described and illustrated are from the United States.

Although the descriptive petrography remains little changed, substantial changes and additions (amounting to approximately 200 pages) have been made to the more petrogenetic material. This reflects the spectacular advances made in all branches of the science in the past 30 years. It also reflects the research interests of the authors working in a geologically stimulating environment, and has been designed to be consistent with their other published works.

A theme of thermodynamics has been woven unobtrusively into relevant parts of the text, and thermodynamic principles are outlined in a 20-page Appendix, using data on albite for illustration. Other major additions include: an opening chapter on the nature and crystallization of magmas, illustrated by phase diagrams; discussion of the influence of geological setting in time and place on petrographic variation; updating of the account of sedimentary rocks, especially in regard to their classification and to discussion of sedimentary processes; while the metamorphic section is enriched with information—much of it in diagram form—on chemical reactions, mineral assemblages, and facies.

There is an interesting discussion on classification and nomenclature of igneous rocks with cogent arguments in defence of schemes such as the authors use, based on modal mineral composition as pioneered by Rosenbusch and now 'time-honoured and seasoned by a century's use'. At the same time they question some of the basic assumptions regarding the universal applicability of the IUGS proposals based on the rigidly symmetrical divisions of the proportions of Q–A–P–F components as shown in Fig. 2.13 which reproduces the now familiar diagram for the plutonic rocks.

With all the additional material listed above, this Second Edition of 'petrography' has acquired many attributes of a course book of petrology. Many will doubtless welcome this; but the book's success in its rather new and certainly enlarged role will depend upon individual budgets and the programmes of learning and training that are followed.

M. K. WELLS

Arndt, N. T., and Nisbet, E. G. (editors). *Komatiites.* London, Boston, and Sydney (George Allen & Unwin), 1982. xvii + 526 pp., 227 figs. Price £40·00

Komatiites are highly magnesian ultramafic lavas whose unique character was recognized as recently as 1969, when they were first described in detail from the Komati river valley in southern Africa. Petrographers were of course familiar with picritic lavas which are olivine-rich, but unlike picrites which crystallize from a basaltic magma carrying suspended olivine crystals the komatiites are the products of a genuinely ultramafic liquid. The key to their recognition was the presence of spinifex-texture, a dendritic growth of olivine and pyroxene crystals caused by the quenching of Mg-rich liquid.

This volume is a collection of twenty-nine papers on all aspects of komatiites, including their occurrence, their textural and field characteristics, their geochemistry, and their economic significance. Most of the descriptions of komatiites are from Archaean greenstone belts, because this is where komatiites are normally found. Naturally many of these very ancient rocks have been altered, metamorphosed or deformed, but the characteristic chemistry and spinifex texture has enabled them to be identified. Several papers describe possible occurrences of komatiitic rocks of post-Archaean age, usually as part of an ophiolitic assemblage, and these are mostly described as komatiitic basalts, being less magnesian than the Archaean examples. The geochemical studies of komatiites reported here include work on major and trace element compositions and on Sr, Nd, and O isotopes. Several of the geochemical authors refer to the evidence for mantle source heterogeneity shown by these lavas. Because they must represent such a high degree of melting in their mantle source regions, the komatiites may prove to be very informative about the nature of the early Precambrian mantle, and particularly about its content of chalcophile and siderophile elements. This is of more than academic interest because economically significant nickel sulphide deposits are associated with a number of komatiite occurrences in different parts of the world.

This volume as a whole is beautifully produced and well illustrated. Many of the papers contain information which has already been published in journals, but it will be valuable for specialists in this

group of rocks to have the information brought together in one volume.

A. HALL

Tertian, R., and Claisse, F. *Principles of Quantitative X-ray Fluorescence Analysis.* London and New York (Wiley-Heyden), 1982. xviii + 386 pp., 149 figs. Price: Hardback £30·00.

With a great many combined years of experience in X-ray spectrometry these authors have produced a text that is both useful and timely. Useful because it combines together details of a wider range of quantitative techniques than older texts, and timely because it emphasizes those fundamental and theoretically based methods of analysis which are gradually, and rightfully, becoming of major importance.

The text is divided into five parts (and 19 chapters) the first part being an introduction to X-ray physics. Part 2 (18% of the text) is an exellent account of the theory of X-ray fluorescence emission, first for monochromatic and then polychromatic excitation. The account is up to date and gradually develops the mathematical relationships which are required later for application to quantitative analysis. Most of the specific examples in this section relate to alloys or stainless steels but Fe/Ca and Fe/Si systems are discussed and the principles apply equally well to 'geological' matrices. Part 3 (54% of the text) is concerned with methods of quantitative analysis for homogeneous specimens. Here a great number of (usually multicomponent) models are derived and discussed based upon the background established in Part 2. Useful chapters within Part 3 include 'Dilution methods' which discuss fused samples so widely used in geochemistry, and the 'Double Dilution Method' which is not particulary well known to geochemists but is simple and extremely useful for 'unusual' samples. Part 4 (2% of the text) is on the effects of heterogeneity; heterogeneous specimens, the particle size effect, the mineralogical effect. That is: powdered samples. Part 5 which is provided to round off the book discusses sample preparation in one chapter and 'intensity measurement techniques' (counting statistics) in another.

This is a theoretical text, its strength lying in the lucid and well presented Parts 2 and 3 which together make up the bulk of the work. There is no doubt that some of the methods discussed, particulaly those based upon the theory of XRF emission, will become very important during the next few years, and this book will provide an excellent background. For the geochemist, however, often working with powdered samples, and frequently determining trace rather than major concentrations, it will represent something more desirable than practical. The chapter on heterogeneity, while a difficult and usually qualitative subject, is particularly weak in this respect. The text was not, however, written for geochemists. It was, to use the authors own words 'intended to be especially helpful to X-ray spectroscopists and analytical chemists, not only in recognizing pitfalls in analytical procedures but in becoming sensitive to the great potential that exists in the X-ray fluorescence field'. It is an advanced text, potentially of great value to geologists and geochemists, and should certainly be available as a reference work in libraries and all XRF laboratories.

P. K. HARVEY

Forty volumes of *Meteoritika*

The arrival of volume 40 of the Soviet Academy of Science publication Метеоритика serves to remind us that this, the longest established serial publication devoted expressly to meteoritic matters, commenced publication in 1941, the time of the Nazi invasion of Russia. The last three decades have seen approximately annual publication, although there was an understandable interruption between the first two volumes of 1941 and volume 3 of 1946, with some catching-up in the 1950s, until the current volume 40 which is dated 1982. Surprisingly there was no volume dated 1981 and there is no editorial recognition of a significant jubilee. However volume 38 (1979) did commence with a review 'The path of progress and attainment of Soviet meteoritics' by the senior editorial adviser E. L. Krinov.

On that occasion Dr Krinov wrote 'in pre-revolutionary Tsarist Russia meteorite studies were sporadic, from event to event, and represented only a small amount of scientific endeavour, according to the interest of the investigator. The systematic collection of meteorites, as also the observation of their infall, was not organised . . . . [However] A sharp break in the development of native meteorite studies came after the revolution. [Indeed] In 1981 the Russian Academy of Sciences organised, under the direction of L. A. Kulik, ... a small expedition to study the circumstances of fall of the reasonably large stony meteorite Kashin, which fell 27 February 1918 near the Glasatov estate, Kashin district, Tver government.' [The Catalogue of the British Museum (Nat. Hist.) records this meteorite as Glasatovo, a stone of over 150 kg of which the main mass 121.23 kg and 364 g of fragments are in Moscow and 122 g in London.]

Krinov's review notes the fall of another large stony meteorite at Saratov, in the autumn of 1918 and records that the Physico-mathematical division