

of basic chemical principles (volume, energy, entropy, kinetic and phase equilibria), which are, in part, required for the developments in later chapters (146 pages). Much of the chemical material could be found in standard texts on physical chemistry, but the authors' approach is, as they rightly claim, of more direct relevance to Earth materials. The remaining six chapters deal with reactions in gases, distribution of trace elements and isotopes, solid-state transformations, and reactions in natural waters. The standard of treatment is, however, patchy. There is, for example, an excellent chapter on solid-solution phenomena, which introduces the concepts of regular solutions and metastable homogeneous solution, but the chapter on trace element distribution is weak and the discussion on ionic size does not, as is implied, have general applicability. Those applications that are discussed are generally treated rigorously but the range is somewhat disappointing. There is little discussion on 'natural' gases in the chapter with that heading and other topics that could well have been included such as hydrothermal activity or fractionation processes in magmas are absent. Occasionally these absences are more critical, such as when oxidation potential is given scant attention in the section on reactions in natural waters. Here it would have been a simple matter to relate Eh to the treatment on free energy given earlier.

The book is lucidly written and well presented, but the absence of many S.I. units, even from the list of conversion factors, is to be regretted. The problems at the end of each chapter (answers are not given) offer the student some good and relevant challenges in applying the theory (although a few proved to be unnecessarily repetitive and tedious to solve). The approach adopted in this book is to be warmly welcomed, and it will undoubtedly prove to be of great benefit to the more advanced undergraduate or postgraduate student in mineralogy, petrology, or geochemistry.

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TRÖGER (W. E.). *Optische Bestimmung der gesteinsbildenden Minerale. Teil I. Bestimmungstabellen*. Fourth edition by BAMBAUER (H. U.), TABORSZKY (F.), and TROCHIM (H. D.). Stuttgart (E. Schweizerbart'sche Verlag.), 1971. 188 pp., 376 figs., 3 coloured pls. Price DM42 (\$13.50).

This fourth, revised edition of the 'Determinative Tables' is part I of the complete work, the other 'Text volume' which forms part II having been published in 1967 (M.A. 18-80). The new edition largely retains Tröger's widely acknowledged format; the minerals are presented in order of increasing refractive index within the three large optical groups (isotropic, uniaxial, and biaxial). Each mineral has a fixed code number, which is used throughout this volume and in the supplementary text volume, and most are represented by a three-dimensional perspective diagram or sketch stereogram. The morphological, optical, chemical, and paragenetic characters are also tabulated and where appropriate the relationships between optical properties and chemical composition are represented diagrammatically.

In addition to the updating of graphs and diagrams, changes in this edition include

a useful table of d -values for the four strongest lines in the X-ray powder diffraction pattern (the references given there being found in the corresponding sections of the text volume) and a detailed explanation in English of the nomenclature, abbreviations, and symbols wherein one finds that in the tables schl. = poor and zers. = decomposed. It is regrettable, however, that this important work retains the style n_α , n_β , n_γ for refractive indices rather than that of α , β , γ as recommended by the I.M.A. The mineral index is greatly improved and lists the pages on which seven different types of information can be found. Again 244 rock-forming minerals are selected and although one could quibble that it might have been better to include strontianite rather than, say, wagnerite, in general all the minerals a petrographer is likely to meet are included. Because some minerals have been updated and others retain the information of the first edition (1952) [M.A. 12-4] there are inevitably some inconsistencies but it would be inappropriate to list these in detail. In the reviewer's opinion this work deserves to be more widely known. The mineral orientation diagrams themselves make it an indispensable laboratory manual for all petrographers.

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GUEST (J. E.) and SKELHORN (R. R.), Editors. *Mount Etna and the 1971 eruption*. London (The Royal Society), 1973. Phil. Trans. Roy. Soc., Ser. A, Vol. 274 (no. 1238), pp. 1-179, 89 figs., 3 pls. Price £6.60.

This publication arose from a discussion meeting held at the Royal Society in February 1972, organized jointly by the Royal Society and by the Volcanic Studies Group of the Geological Society. The 19 papers (for full details see M.A.73-3084) summarize the present state of knowledge of the structure, geological history, and eruptive behaviour of the Etna volcano as well as the chemistry and physical properties of its magmatic products, both lavas and gases. The 1971 eruption seems to have produced phonolitic tephrites, tephritic basalts, and later mugearites, but the extremely detailed records for this eruption serve to emphasize how little is known about the chemistry and petrology of the lava of most of the more recent historic eruptions.

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