the stage of the ore microscope is the only addition required, enabling domain structures to be seen clearly.

The discussion above relates only to pyrrhotine; obviously it also applies to other magnetic minerals. Preparation and use of the magnetite colloid are discussed by Bitter (1931), Elmore (1938), and Craik (1956), Craik and Griffiths (1957).

Dept. of Geology,
University of California,
Berkeley 4, *California*

R. G. J. STRENS

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BOOK REVIEWS

DEER (W. A), HOWIE (R. A.), and ZUSSMAN (J). *Rock-forming minerals.* London (Longmans), 1963. Vol. 4: *Framework silicates.* ix+435 pp., 118 figs., 53 tables. Price £4. 15*s*.

This volume completes the series of five volumes, those previously published having been reviewed in this Magazine, vol. 33, pp. 434 and 525. Vol. 4 deals with the feldspar group, the silica minerals, the nepheline group, petalite, leucite, the sodalite group, cancrinite, scapolite, analcime, and the zeolite group.

The large section on the feldspar group includes 179 chemical analyses, nine being of Amelia albite alone. One of the most valuable features of this volume is the lucid account of the complex structural and thermal relationships between the members of the alkali feldspar and of the plagioclase series, together with a clarification of their nomenclature and classification. The grouping, in this volume, of the best available determinative charts relating to optical and other physical properties may, at last, lead to some consistency in routine petrographic work on the feldspars. The authors, with advice from Dr. W. S. MacKenzie, have succeeded in presenting an easily readable account of a subject that is formidable in its magnitude and complexity. At the same time, however, it is easier now to recognize those aspects in need of reform. For instance, a nomenclature that employs the term 'intermediate' with

reference either to composition, temperature, or structural state of the plagioclases, and according to which a bytownite may have either an anorthite or an albite structure, must lead to confusion should attention to meticulous expression be relaxed. Also, the authors introduce the feldspar section by stressing the use of these minerals '. . . as the primary tool in the classification of the igneous rocks'. On reading further, one is forced to conclude that the tool is shaped according to the worker's inclinations. Thus, in the subsection on the paragenesis of plagioclase in igneous rocks (which is surprisingly sketchy and uncritical), anorthite is said to occur in norite, troctolite, and gabbro (pp. 145–6); also, anorthosite may contain any plagioclase within the compositional range An_{30} to An_{86} (pp. 146–7). The petrographic classification of rocks according to the proportion of potassium feldspar to total feldspar is also in need of revision, unless it is assumed that the potassium feldspar content of cryptoperthites, and even microperthites, can readily be estimated.

The section on the silica minerals is concerned largely with the structures and temperature ranges of stability of the low- and high-temperature modifications of quartz, metastable tridymite, and metastable cristobalite, although fifteen modifications, including coesite and stishovite, are described briefly. Most of the recent work is considered, although it is unfortunate that the P–T diagrams do not include the available data on the high-pressure forms and on the system SiO_2–H_2O. Few criticisms can be levelled at the excellent sections on the various feldspathoids and zeolites, for which most of the information stems from research during the past decade. The fortunate choice of a structural classification of the silicates is clearly vindicated in this volume, which brings together, under one cover, the closely related data on the alkali feldspars, feldspathoids, and zeolites.

The subsections on paragenesis, as in the other volumes, often tend to create a rather flat and dull impression, particularly as they lead on from the presentation of a wealth of mineralogical data. For example, in the nepheline section (p. 258), no mention is made of the classic nepheline-bearing rocks of the layered Ilimaussak intrusion and of the Pilandsberg, Spitzkop, or Borolan intrusions, or of their problematical association with quartz-bearing rocks. Comparable omissions were evident in most of the paragenesis sections, perhaps because such topics are viewed as belonging to petrology. However, the subsections on the structure, chemistry, and phase relationships lead naturally to what should be a better discussion of the genesis of these minerals and the

significance to be attached to their environment and associations. This need not create space problems in revised editions, for in many cases the paragenesis subsections are in need of complete reappraisal rather than expansion (e.g. pp. 144–53 of this volume). G. M. BROWN

SCHOUTEN (C.). *Determination Tables for Ore Microscopy.* Amsterdam (Elsevier Publishing Company), 1962. vii+242 pp.

This manual is the outcome of Professor Schouten's experience that students frequently misidentify ore-minerals under the microscope because existing tables are 'almost too systematic and concise'. The situation improved in his mineragraphy demonstrations when the author introduced a more comprehensive classification that was not based solely upon the determination of one or two physical properties. This classification, which has 23 tables with 54 sub-groups, does not follow a uniform scheme but is based on distinctive physical properties, mineral associations, and chemistry. An immediate consequence of so many subdivisions is that border-line minerals are listed several times, e.g. chalcocite appears in nine different sub-groups because it lies on the chosen border-lines for hardness, colour, anisotropism, and reflectivity. However, the author considers that such cross-references are desirable and should reduce the possibility of error.

The main subdivisions for the tables are: I. *Distinctly coloured*: blue, green, brown, yellow, pink to violet (5 tables), subdivided into isotropic and anisotropic categories, and sub-grouped where appropriate under internal reflections, hardness, and reflectivity. II. *Not distinctly coloured*: reflectivity > 50 %, < 25 %, and < 50 but > 20 %, further subdivided and grouped on the basis of hardness, isotropy, internal reflections, and bireflectance (7 tables). III. *Special mineral groups* based on composition, e.g. Ni–Co–Fe arsenides, tellurides, selenides, and platinum minerals (11 tables).

Apart from a dozen works listed in the Introduction, only a couple of additional references appear in footnotes in the text and the reader is left to his own devices to obtain further information on a particular mineral. In this connexion, the numerous blank spaces in the book would appear to give tacit encouragement to the user to make his own notes.

Although much useful information is contained in these tables, the reflectivity data have been obtained from four different sources employing different techniques and must be used with caution. References to hardness in the tables relate solely to polishing hardness, which is classed