BOOK REVIEWS

PHYSICAL METHODS IN DETERMINATIVE MINERALOGY, Edited by J. ZUSSMAN, Academic Press, London and New York, 1967, xi + 514 pp., $22.00 (U.S.)

This volume consists of thirteen chapters on different aspects of determinative mineralogy, each written by a different author (several authors are responsible for two chapters each), and the whole is edited by Prof. J. Zussman of the University of Oxford. The chapters are as follows:

Mineral Separation	by L. D. Muller
Microscopy: Transmitted Light	by I. D. Muir
Microscopy: Reflected light	by S. H. U. Bowie
X-ray Fluorescence Spectrography	by K. Norrish
Electron Probe Microanalysis	by J. V. P. Long
X-ray Diffraction	by J. Zussman
Electron Microscopy and Electron Diffraction	by J. D. C. McConnell
Infrared Absorption Spectroscopy	by R. J. P. Lyon
Thermal Techniques	by R. J. W. McLaughlin
Emission Spectrography	by G. D. Nicholls
Density Determination	by L. D. Muller
Autoradiography	by S. H. U. Bowie
Atomic Absorption Spectroscopy	by R. J. W. McLaughlin

The authors are all recognized authorities on the subjects on which they have written, and each chapter represents a comparatively up-to-date review of the state of the art. Bibliographic references are gratifyingly abundant.

"Physical Methods in Determinative Mineralogy" is an important contribution to mineralogical literature, and should be of great value to anyone concerned with the many aspects of determinative mineralogy in universities, industrial laboratories and research institutions. As seems inevitable in a compendium of this kind, the editor has chosen not to include several topics that might have been covered, such as microradiography and contact chromatography. Although these techniques are being superseded by electron probe microanalysis, not every laboratory can afford an electron probe. These relatively minor omissions, however, do not significantly detract from the value of the book.

E. H. NICKEL

DIE OPTISCHE ORIENTIERUNG DER PLAGIOKLASE, C. BURRI, R. L. PARKER, E. WENK, unter Mitarbeit von H. R. Wenk, Unterlagen und Diagramme zur Plagioklasbestimmung nach der Drehtischmethode, Birkhäuser Verlag, Basel und Stuttgart, 1967, 334 pages, 90 figures, 17 Bestimmungstafeln, sFr 78.

This is a re-evaluation of all available data on the orientation of the optical indicatrix with respect to crystal morphology of plagioclases of

which reliable chemical analyses exist. The book will therefore prove an indispensable tool for petrologists and mineralogists making use of universal-stage methods for the determination of plagioclases.

A historical review gives an appraisal of merits and limitations of the methods by which the optical data have been obtained—conoscopic determination of the position of the optical axes, extinction angles in oriented cleavage flakes, universal-stage methods.

Equations and FORTRAN programs for the transformation of these data into a uniform presentation are followed by a tabulation of the numerical data.

The use of Euler angles constitutes a marked development. The Euler angles permit, in fact, a clearer distinction between high- and low-temperature optics and they give a better means for interpolation of the An-content than the usual migration curves of morphological directions referred to fixed orientation of the indicatrix. Unfortunately, the concept of the Euler angles has so far not been too well covered in the mineralogical literature in English. The modern textbook on rock forming minerals by Troeger discussed the principle adequately, but this book is in German. The recent manual by Deer, Howie and Zussman seems strangely unaware of this precise and elegant approach. The Euler angles, as used in the connection of plagioclase optics, refer to two rectangular co-ordinate systems—XYZ and X′Y′Z′—which have the origin in common. One of these co-ordinate systems, X′Y′Z′, is given by the main refractive indices n_α, n_β, n_γ while the other, XYZ, gives the crystallographic co-ordination by three preferential directions which appear particularly suitable: [001], that is the twin axis of the Karlsbad law; the normal to (010), that is the twin axis of the albite law; and thirdly the direction which is at the same time normal to 1 and 2—this corresponds to the twin axis albite-Karlsbad complex (roc tourné). Two of these crystallographical directions can generally be ascertained without difficulty in twinned plagioclases. The Euler angles can then be determined graphically in a stereographic projection.

The tables are the fruit of careful and critical interpolation. Low-temperature and high-temperature series are dealt with separately. The Euler angles of the reference material are first tabulated. This is followed by a tabulation of the calculated Euler angles, Goldschmidt position angles and the Fedorow- and Becke-position angles of the main optical directions in intervals of 5 per cent An, both for low temperature and for high temperature plagioclases. Then there are a number of crystallographic data followed by tabulations of the position angles of the optical main directions referred to different crystallographical directions as well as of important twin axis directions, and of the normals of the most frequent planes, referred to n_β and n_γ. The extinction angles in sections

parallel (010), parallel (001), normal (100) are given for both low- and high-temperature plagioclases as well as the main refractive indices and the refractive indices on cleavage flakes parallel (010) and (001).

The determination graphs are available separately. They are outstanding in clarity and presentation. As the legend is also in English, they should become the generally accepted correlation graphs for U-stage work.

The book is a marked advance on previous publications in this field. It is to be hoped that an English translation will be available before long.

C. G. I. FRIEDLANDER

MINING AND MINERALS, by E. N. DAVIES and G. A. NORTHEDGE. Pergamon Press, 1967, xi + 123 pages, hard cover $4.00, flexi-cover $2.50 U.S.

This book is the first in a proposed six-volume Economic Geographies Series, whose purpose is to provide illustrated references on mining, fuels, power, agriculture, fishing and manufacturing for pre-matriculation students. This issue discusses the mining industry. It is illustrated by 66 black and white photographs, 24 figures and 12 tables; the illustrations comprise approximately one-half of the 123 pages.

The main text consists of 8 chapters: 1. How minerals occur, 16 pages; 2. The economics of mining, 6 pages; 3. Prospecting and development of new sources, 2 pages; 4. Iron and steel minerals, 28 pages; 5. The common non-ferrous metals, 23 pages; 6. Precious minerals, 13 pages; 7. Non-metallic raw materials, 14 pages; 8. Materials for building and road-making, 6 pages. A section on review-questions, a glossary and an index complete the book.

The major part of the book (chapters 4–7) is concerned with the characteristics, uses and production of metals, and with the occurrence and treatment of ores. Steel making processes and the smelting of iron are described in detail. The first chapter deals mainly with mining methods and could more appropriately be titled "How minerals are obtained." The text is interspersed with italicized exercise-type questions.

The book serves as an acceptable introduction to the mining industry. Its uses of certain terms, however, could be misleading to students of the earth sciences, eg. (1) "... Steel Minerals" (title, Chapter 4); (2) "Alloy Minerals" (title p 48). In the second example, Alloy Metals would be more appropriate.

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