

BOOK REVIEWS

Introduction to Optical Mineralogy. By William D. Nesse. Oxford University Press, New York, 1986, 325 pages. \$59.95 (Can.), hardbound.

This book is intended for use by the beginning student in optical mineralogy. It combines, in one volume, both the optical theory necessary for mineral identification with the petrographic microscope, and mineral descriptions of the common rock-forming minerals.

The theory and methods of optical crystallography are thoroughly outlined in chapters 1 through 7 and are explained using the optical indicatrix. (A discussion of ray-velocity surfaces is included in the appendix). Many students, especially those with three-dimensional visualization problems, find optical theory difficult to understand. Nesse realizes this and presents the material in a clear, very readable style and makes frequent use of excellent diagrams. Particularly good are the figures employed to illustrate the formation and appearance of interference figures.

A welcome inclusion on Kamb's chart are curves for a numerical aperture of 0.65 in addition to the more common curves for a numerical aperture of 0.85. However, small size and sparse graduations of this and other charts (2V, 2E determination using Tobin's method and the Mertie diagram) makes them a little difficult to use for precise determinations.

Chapter 8 is a short but useful chapter which will be greatly appreciated by the beginning student. In it, a systematic approach to the often intimidating task of identifying an unknown mineral is presented. Included is a helpful summary of frequent mineral associations in a variety of common rock types.

The latter part of the text presents detailed descriptions of the common rock-forming minerals. The material is well organized, clearly presented, and amply illustrated with crystallographic diagrams and black and white photomicrographs. Numerous useful charts showing the variation of optical properties with composition for minerals with variable chemistry are given. Again, however, the small scale of the charts makes precise determinations difficult. The appendix contains useful identification tables, based on a variety of optical properties. The book has a large and extremely high-quality chart of interference colors.

Nesse includes little in the way of crystal chemistry, no chemical analyses of actual minerals, no experimental phase diagrams, and very little on reflected-light studies. This may be a disadvantage

in some introductory courses and does limit the usefulness of this text in more advanced courses. Nevertheless, this is the best "combined" text currently available and is ideal for most introductory courses in optical mineralogy.

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Low Temperature Metamorphism. Edited by M. Frey. Blackie, Glasgow, 1987, 351 pages, £45.00.

Those working in the area(s) of diagenesis and very low-grade metamorphism will recognize the void that editor Frey and co-authors intended to fill with this book. Aside from volcanic rocks, metamorphic petrologists have paid scant attention to the effects of very low-grade metamorphism. The aim of this volume is to assemble a series of papers on very low-grade metamorphism, with particular emphasis on clastic sediments and organic matter.

From the outset, it is apparent that the book is mistitled. More appropriate would have been 'Very Low-Grade Metamorphism', a phrase which is repeated from the preface to the last page of text and appears in all but one chapter title. In chapter one Frey and Kisch introduce the vocabulary of very low-grade metamorphism and expand somewhat on the inevitably arbitrary distinction between diagenesis and very low-grade metamorphism. In chapters two and three Frey, and the trio of Liou, Maruyama & Cho, discuss very low-grade metamorphism of clastic sedimentary rocks, and basaltic and andesitic volcanic rocks, respectively. Chapters four through six provide a multidisciplinary approach to the study of very low-grade metamorphic rocks. In chapter four Teichmüller emphasizes optical methods in studying irreversible changes in the maturation of organic matter. Fluid inclusions are covered by Mullis in chapter five, and in chapter six Hunziker discusses uses of radiogenic isotopes (with a contribution by A.J. Hurford on fission-track dating). In chapter seven Kisch links some of the diverse material of earlier chapters by correlating the various indicators of very low-grade metamorphism. An extensive reference list of about one thousand entries is included, providing a valuable compilation of recent and classical papers in diagenesis and very low-grade metamorphism. Surprisingly, the use of stable isotopes is not covered in detail.

Considerable care has been taken in producing what is undoubtedly the most comprehensive and up-to-date review of very low-grade metamorphism available. The high editorial standards are complemented by the consistently high quality of illustrations and photomicrographs. North American readers will notice the use of a number of terms and concepts more common on the eastern shores of the Atlantic. Among these is the concept of anchizone metamorphism, which arose from and is defined exclusively on the basis of illite crystallinity data. Other technique-specific (*i.e.*, vitrinite reflectance, fluid inclusion) metamorphic zones are established throughout the text, and are correlated in the last chapter. Although the correlations are made with considerable success, no attempt has been made to synthesize this information, leaving the reader somewhat overwhelmed by the scope of this subject.

I recommend this book to researchers working in the fields of diagenesis and very low-grade to low-grade metamorphism. In particular I recommend it to sedimentary petrologists studying diagenesis. With the advent of high-resolution backscattered-electron imaging coupled with quantitative electron-dispersive microanalysis, sedimentary petrologists now have the ability to quantify textural and chemical states of the typically micrometer-scale minerals they encounter. This book provides the sedimentary petrologist with an established framework for working with the information gathered at the limits of resolution now available. Researchers working with metamorphism of sub-greenschist grade, and metamorphic petrologists in general, should consider purchasing this book as a comprehensive and up-to-date summary of work in this field. The book would serve well as a reference text in courses on diagenesis or low-grade metamorphism, but its price probably puts it beyond the reach of most students.

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Alkaline Igneous Rocks. Edited by J.G. Fitton and B.G.J. Upton. Geological Society Special Publication No. 30, Blackwell Scientific Publications, London, 1987, 568 pages, U.S. \$130.00.

Alkaline Igneous Rocks is a collection of 25 papers originally presented at a symposium held in Edinburgh in 1984. The object of the symposium was to review developments in the petrology of alkaline rocks during the previous decade. In common with many symposia proceedings the papers are of variable lengths (from 4 to 87 pages) and quality, although in general the standard is high. The editors are to be congratulated on producing a uniform type-set

volume containing legible figures rather than using a camera-ready format.

The volume commences with three general papers summarizing mantle metasomatism, inclusions in alkaline rocks, and experimental studies relevant to alkaline rock genesis. The next two papers, which are concerned with carbonatite genesis, are instructive in that their authors expound completely opposing views regarding the status of natrocarbonatite as a primary magma. Papers summarizing the petrology of lamproites and lamprophyres are followed by reviews of specific alkaline provinces, namely, Hawaiian alkaline volcanism, South Atlantic islands (2 papers), the Kenya rift (2 papers), the Chilwa province, Malawi, the Niger-Nigeria-Mali region (2 papers), the Velasco province, Bolivia, Trans-Pecos, Texas, Monteregian-White Mountain series, eastern North America, the Gardar province, Southwest Greenland (2 papers), East Greenland, and the Kola Peninsula. Common to all of these latter papers is the application of whole-rock isotope and trace-element geochemical studies to provinces whose basic geology and petrology is relatively well understood. Mineralogical studies are notably absent.

The volume provides an opportunity for some of the contributors to beat some old petrological drums without the addition of much new data. The description of the Kola province is particularly disappointing in this regard. Individual petrologists will no doubt find something to criticize in every paper, but the volume succeeds in providing welcome summaries of many aspects of alkaline-rock petrology. The papers provide a useful starting point for anyone wishing to learn something about current ideas concerning the petrogenesis of these rocks. Particularly welcome to this reviewer is the summary of lamproite petrology, the reviews of the Gardar and Kenya provinces, and the modern overview of the Ilimaussaq complex.

Despite the long delay in publication since the conference, the papers are worth reading as reviews of this type do not rapidly date. I would recommend the volume to all who are interested in the petrogenesis of alkaline rocks.

Roger H. Mitchell
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Alkaline Rocks and Carbonatites of the World. Part 1: North and South America. By A.R. Woolley. British Museum (Natural History) and University of Texas Press (Austin), 1987, 216 pages, US \$65.00.

This is the first of a planned series of four volumes that will summarize the alkalic rocks and carbonatites of the world — a monumental task eminently

suited to a museum and particularly to the British Museum with its outstanding rock collection and libraries. It is an ambitious undertaking, and if the succeeding volumes are of the calibre of this first one, the series will be an outstanding contribution to the study of the alkaline rocks and carbonatites.

The book lists all the occurrences that could be traced in the literature through the author's extensive "intelligence network" of alkaline rock enthusiasts. The format chosen is double column with bold headings and a location in latitude and longitude for each occurrence, with a map wherever possible. The geological descriptions are brief and capture the essential features of rock types and mineralogy, economic features, ages where known, and principal references. The printing is of excellent quality, the lay-out is pleasing to the eye, and the book is easy to use.

The book is mainly a catalogue of known occurrences and brings up-to-date the early summaries published by Currie and by Tuttle and Gittins which are now ten and twenty years old. It will be the starting point for a wide range of investigations and should be on the shelf on any geologist interested in these rocks from the purely petrological or miner-

alogical viewpoint all the way to the exploration geologist. It will have no primary value as a text book, and it was not prepared with that in mind, but in reading it associations of ideas tend to form, and it is in many ways a great aid to all shades of thinking about these fascinating rocks.

There is no comparable book available and as such it is invaluable. Dr. Woolley has wisely restricted "alkaline rocks" to those that have modal feldspathoids (including analcime) and/or alkali pyroxenes or amphiboles. Normative mineralogy is not used and so alkali olivine basalts are excluded. The book, in short, lists what any petrologist with common sense would call alkaline, and leaves out the rest. Thus, it is well-focused and does not dissipate itself in unnecessary degrees of "near alkalinity".

The index is particularly thorough. The book is also something of a landmark in that the British Museum appears finally to have abandoned barytes, although only to baryte rather than barite. This is a work that will last and will be widely consulted.

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