American Mineralogist, Volume 77, page 889, 1992

BOOK REVIEW

INTRODUCTION TO OPTICAL MINERALOGY, second edition, By W. D. Nesse. Oxford University Press, New York, 1991. xii + 335 pages. $45.

The second edition of Nesse's useful book on mineralogical optics is nearly identical to the first edition. Sixteen additional figures and a table of birefringence vs. the index of refraction have been added in this edition. This book is most useful for a mineralogy or petrology course that includes some optics. The book by Bloss, *An Introduction to the Methods of Optical Crystallography,* should continue to be used in full-fledged four-credit optics courses, and Tröger's book, *Optical Determination of Rock-forming Minerals,* is best used as a required adjunct to all graduate-level metamorphic and igneous petrology courses with significant petrographic exercises. Nonetheless, Nesse's book has a central role for the undergraduate curriculum in most geology departments in the United States.

At the University of Michigan, Nesse's book is used in conjunction with a dozen lectures on optical mineralogy as part of a mineralogy course and with a dozen lectures on the petrography of rock-forming minerals as part of a petrology course. Although this may be a schizophrenic way to teach optical measurements to undergraduates, Nesse's book serves the students well in both courses. Its introduction to optics is at the right level for a 1–2 credit course in optical mineralogy. In addition, Nesse has systematic optical descriptions of the rock-forming minerals with about the right coverage (ca. 130 minerals and mineral groups) for an undergraduate petrography laboratory. One might question the inclusion of a few rare minerals such as sylvite, witherite, dumortierite, axinite, pectolite, apophyllite, and vishnevite, but the coverage is generally similar to that of Deer, Howie, and Zussman's (DHZ) original five volumes on rock-forming minerals. Nesse is to be congratulated for including the widespread minerals stilpnomelane, pumpellyite, glaucophane, and lawsonite and the melilite and humite groups, which are often neglected in introductory mineralogy texts.

In his discussion of optical properties Nesse uses indicatrices and relegates ray velocity surfaces to Appendix B. His treatment of extinction angles is excellent. Nesse shows the $\{hkl\}$ (or random) plane properly, which may eventually convince undergraduates (if not their professors or teaching assistants) that orthopyroxene usually shows inclined extinction in thin section. Nesse's discussion of conoscopic measurements is sound, and he wisely includes graphs from Mallard, Tobi, and Wright, and the especially useful Kamb's method of estimating 2V from centered optical figures.

In the systematic optics of each mineral or group, Nesse includes a three-dimensional drawing with the crystallographic and optical axes properly denoted (unlike DHZ, who continue to use x,y,z for crystallographic a,b,c and the scalars α,β,γ for the optical vectors, X,Y,Z) These drawings, which were popularized by Tröger, are greatly useful for visualizing the cross section seen in thin section. Nesse gives the formula, crystal system, axiality and sign, refractive indices, birefringence, and 2V immediately below the mineral name. This is followed by brief sections of relief, composition and structure, physical properties, color and pleochroism, form, cleavage, twinning, optical orientation, indices of refraction and birefringence, interference figure, alteration, distinguishing features, and occurrences. References to some relevant literature is appended to the end of each chapter on mineral groups.

The reviewer would suggest just a few additions to the figures for the third edition of this book. The standard XRD determination graphs should be included for forsterite-fayalite, almandine-pyrope-grossular, albite-anorthite, and alkali feldspars. The clinopyroxene quadrilateral should be contoured for RI and 2V (from Hess) as well as $Z \wedge c$ (from Turner). The sodic amphibole quadrilateral should also show variation in 2V and the boundaries for change in the orientation of the optic axial plane. The very useful centered bisectrix method for plagioclase determinations should be included. This reviewer would prefer to see the interference color chart bound with the book, as in the first edition, rather than folded into a pocket in the back of the book. No one has been able to duplicate a realistic retardation color chart for white light, and published versions all have colors shown for first and second order that are too intense. Nesse's version substitutes an orange for first-order yellow and a carmine for first-order red that are unrealistic. Someone should take a carefully exposed photograph of a quartz wedge under crossed-polarized sheets and replicate a realistic enlargement for publication.

Nesse also describes how to make grain mounts and thin sections in Appendix A. This reviewer would add that, when making grain mounts, it is critical to wash the crushed grains to remove the fines before mounting. For thin sections the entire process is accelerated if the chip is ground on paper-mounted grit on a strip or a wheel. This allows skipping several steps in the grinding process and improves the flatness (which can be checked with the chip face coated with wet abrasive held against a glass plate). Canada balsam is a carcinogen and should not be used in routine work.

Despite the minor carping, this reviewer thinks that Nesse's book is already excellent. It should be considered strongly for adoption as a required text for mineralogic and petrologic optics by all undergraduate geology departments.

ERIC ESSENE
University of Michigan

0003–004X/92/0708–0889$02.00