American Mineralogist, Volume 93, pages 1481–1482, 2008

BOOK REVIEW

MINERALOGY AND OPTICAL MINERALOGY by M. Darby Dyar and Mickey E. Gunter, Illustrations and animations by Dennis Tasa. (2007) Mineralogical Society of America, Chantilly, Virginia (http://www.minsocam.org/MSA/DGT-txt). 708 p. + DVD-ROM (for PC and Mac). ISBN: 978-0-939950-81-2.

When this hefty volume arrived in the mail, I realized that I was in for some serious reading, but I didn't know yet that this was only one part of the story. The viewing turned out to be just as extensive. I was looking forward to seeing this package that puts much emphasis on new teaching and learning approaches. This emphasis partly answers the question: Why another textbook on mineralogy? What sets the text apart from other mineralogy books, according to the authors' own words, is (1) an integrated DVD with color figures and animations, (2) a searchable mineral database, (3) the use of modern pedagogy, (4) the way information is presented, from basic to advanced material. What may possibly ruffle some feathers in academia is the authors' concern that mineralogy courses are taught in old-fashioned ways, that they are, more often than not, boring or tedious. I don't believe things are quite so bad. I am sure there are plenty of lecturers who make a conscious effort to teach an interesting mineralogy course, and I am also sure that there are many students who enjoy these courses.

To give a brief overview of contents, the book has 24 chapters, an introductory one, followed by five chapters that cover the basics of mineralogy, and 18 chapters on advanced topics covering chemical aspects, crystallography, diffraction, optical mineralogy, mineral analysis, environments of mineral formation, nomenclature and classification, systematic mineralogy, and "non-geological" mineralogy. Each chapter has an introduction page that recounts a personal story related to the topic being presented, including some of the more troublesome experiences while being a student. This introduces a conversational style of presentation that breaks with the more rational-impersonal approach of typical textbooks. The book is amply illustrated, and all the printed figures (plus more material) are also contained on the DVD, in color.

CDs and DVDs have become common add-ons to geoscience texts in recent years. However, the strong integration of a DVD into the text and the extent and quality of the material contained on the DVD makes this package almost something of a pioneering act, at least in the field of mineralogy. The DVD adds a lot of substance to the book by providing countless color photographs (minerals, experimental set-ups etc.), three-dimensional figures that can be manipulated to be viewed from different directions, and a large range of animations. This also means that book and DVD complement each other in such a way that they cannot be used entirely on their own with the exception of the mineral database.

The use of color opens up a lot of possibilities for enhanced presentation, but it also has some minor drawbacks. As the book itself does not use color, certain figures that do require color can only be viewed properly on a computer screen. Probably due to the fact that the original figures are in color, some figures in the book have a relatively low contrast that makes them a bit difficult to read in the gray-shaded version (e.g., complex polyhedral crystal models). Lecturers who like to use photocopied material in class could experience a bit of a challenge here.

The DVD contains a separate, extensive mineral database, listing for each mineral its physical properties, crystal class and habit (with a rotating crystal form as an example), optical data, plus information on classification, occurrence, and important localities. Furthermore, there are hand sample photographs and photomicrographs, a structural model for each mineral that can be examined in detail with CrystalViewer, as well as XRD data. The database is searchable, using physical properties, crystallographic, and optical data. The amount of minerals covered is impressive (and quite a few of these I have never heard of before). Putting the database to the test by randomly checking for some minerals of petrological significance I came across during projects, I detected few omissions (e.g., xenotime, carpholite, merwinite). Multi-chain silicates are discussed in the book (p. 133), but have no corresponding entries in the database, which I am sure will be taken care of in future updates of the database. I have no doubt that this database will prove to be an invaluable resource of information for students, teachers, and researchers.

What can be said about the ground covered by the book? As one would expect from such a substantial volume, a large range of topics is taken care of, from the more "down-to-earth" (pardon the pun) introductory bits to the more advanced subjects of mineralogy, crystallography, and mineral analysis. Topics such as optical crystal chemistry, mathematical crystallography, or mineral formula calculations and site assignment receive a lot more attention than in most other standard mineralogy texts. The Dyar and Gunter text has its own bias towards certain mineralogical subjects, structural and chemical properties in particular, as well as analysis, and that is where its strength lies. Applied aspects, including synthesis of minerals and technical uses of minerals, are under-represented. I would have liked to see a separate chapter on physical properties of minerals beyond those needed for identification. Apart from optics and geometrical-morphological characteristics, comments on physical properties are scattered throughout the various sections, and some receive only cursory treatment (electrical, magnetic, radioactivity). The chapter I was least happy with is Optical Mineralogy (Ch. 5). I could not see the necessity for it, considering that there are three chapters in the "advanced section" covering that subject in

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much more detail. Chapter 5 represents a crash course in mineral optics that, in my opinion, will see most students getting lost halfway through unless there is substantial input and assistance from the lecturer.

To me, the big plus of *Mineralogy and Optical Mineralogy* is that it represents an enormous resource of teaching and learning materials. The accomplishment of the authors in that respect is outstanding. On the one hand, they provide a modern teaching aid to lecturers, and, on the other, they offer students a multimedia package that supports the learning process in a tutorial fashion. The way the book and the DVD are structured leaves little doubt that the prime targets are students. Teaching straight from the DVD is perhaps not ideal as some frames contain a lot of text, which is more geared towards self-study. Dedicated lecturers will probably prefer to assemble their own sequence of materials anyway. Even though not explicitly encouraged, it is possible to extract figures and animations from the DVD and incorporate them into computer-based lectures.

It is a bit of an unthankful task for a reviewer to list errors. Finding errors is a trivial task compared with the effort of producing the book. Anyway, misprints and grammatical errors are rare enough in this particular case. There are some glitches to mention: Fig. 1.13: Cordierite is not uniaxial; the hexagonal high-temperature variety indialite is incidentally sorted under beryl instead of cordierite where it should be in Table 22.17. Fig. 16.24 and, earlier on, Figs. 5.16, 5.17, 5.18 contradict the observation of two distinct rays (rather than one) leaving a crystal surface (p. 413–418). The terms "mineral", "mineral species", "mineral group", and "series" are distinguished, but their use in various parts of the book is a bit inconsequential and hence confusing for students. There are some statements that need to be reconsidered, such as "Minerals that are isometric have the same physical properties in all directions (p.8)", or "Kyanite is only found in rocks from high-pressure, low-temperature environments" (p.6). *High-pressure, low-temperature* has a specific meaning in metamorphic petrology, and kyanite is not restricted to such environments. The addition of an average steady-state geotherm to the Al_2SiO_5 phase diagram would clarify that. From a petrological point of view, an unfortunate error is the incorrect presentation of the Al_2SiO_5 phase diagram with a triple point at 2.6 kbar (p.199 and 536). Presenting a mineral formula with subscripts showing four digits behind the decimal point (Table 10.5) surely must give students a wrong impression of analytical accuracy. The difference between using six and seven crystal systems should have been explained, rather than leaving it at the remark "In England there are seven [crystal systems] but we won't worry about that here." The question may occur to an alert student whether they have more minerals in England. And what about the rest of the world (minus England and North America), by the way?

Such criticisms aside, this book and DVD package is not only an excellent addition to the Mineralogy bookshelf but its fresh approach breathes some new life into this subject—and blows some dust off that bookshelf. The package demonstrates quite well what modern teaching materials could offer, beyond the more classical textbook approach. The authors are to be congratulated on this achievement. As the price is inversely proportional to the weight of the book, there is no need to wait for the library copy to become available; it can be purchased for $90 (Mineralogical Society of America, Clay Minerals Society and Geochemical Society members get a 25% discount). This book and its DVD will serve those who teach Mineralogy courses very well, professionals who want to refresh or extend their knowledge in mineralogy, and, perhaps foremost, students who have a keen interest in the subject and look for materials that allow a good deal of self-study.

JUERGEN REINHARDT
School of Geological Sciences
University of KwaZulu-Natal
Durban, 4000
South Africa