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BOOK REVIEWS

Crystal Habits of Minerals, by Ivan Kostov and Ruslan I. Kostov, 1999. 415 pages, hardbound. Prof. Marin Drinov Academic Publishing House & Pensoft Publishers, Sofia, Bulgaria. Full address: Akad. G. Bonchev Str., Bl6, 1113 Sofia, Bulgaria. $65 + $7 shipping and handling (US). Credit card payment is acceptable.

Every now and then, a book is published and my reaction is "Why wasn't this published long ago?" *Crystal Habits of Minerals* is such a book. The Bulgarian father and son who put this book together are to be congratulated for compiling a massive amount of data on this fascinating subject. In doing this, they also acted as a "bridge" between Bulgarian/Russian literature and that of the western world. The text is well written and does not suffer from the failings of many books written by authors whose first language is not English.

Chapter 1 is a brief Introduction (two pages).

Chapter 2, Historical Background (21 pages), starts with Pythagoras of Rhegium in the 5th century B.C. and continues to 1995 A.D. with Mackay's flexicrystallography and flexicrystals. The first pages of this chapter devote short paragraphs to each major development in the science of crystallography. These are summarized in a chronological list in the last four and a half pages. I know of no better treatment of the historical development of crystallography; it is superb.

Chapter 3, Morphology of Minerals (32 pages), covers the following subjects: Classic crystal forms including (1) The 32 classes of crystal symmetry, (2) Twinned crystals and epitaxy, (3) Malformed crystals, (4) Pseudomorphs, (5) Morphology of mineral aggregates and (6) Morphology of paragenetic minerals; Non-classic symmetry including (1) Five-fold symmetry and symmetry of quasicrystals and (2) Finite symmetry applied to minerals.

Chapter 4, Structure and Crystal Habits (15 pages), consists of: (1) Law of Bravais and Donnay–Harker Principle, (2) Niggli's Zones and PBC Method, (3) Structural Anisometricity and Notation of Crystal Habits and (4) Evolving Principal Crystal Habits.

Chapter 5, Crystal Growth of Minerals (17 pages), has the following sections: (1) Development of Ideas, (2) The VKS and Bcf Growth Mechanisms, (3) Autoepitaxial (Accretion) Growth and (4) Factors Influencing Crystal Habits.

Chapter 6, Crystal habits of Important Minerals (248 pages), is divided into: (1) native elements (15 pages), (2) sulphide and related minerals (44 pages), (3) oxide and hydroxide minerals (26 pages), (4) halide minerals (9 pages), (5) silicate minerals (91 pages), (6) borate minerals (6 pages), (7) phosphate and related minerals (14 pages), (8) molybdate and tungstate minerals (6 pages), (9) sulphate minerals (14 pages), (10) carbonate minerals (19 pages), (11) chromate, nitrate and iodate minerals (2 pages) and (12) organic minerals (2 pages).

Chapter 7, Applied Crystal Morphology (16 pages), consists of (1) General Notes, (2) Crystal Habits Applied to Geosciences and Crystal Habits Applied to Industries.

The 58-page Bibliography appears exhaustive, with well over a thousand references. The book concludes with an Index of Minerals (6 pages); the reader searching for information on a specific mineral will find this index very useful.

The book is well organized and contains 173 illustrations, most of them (130) in Chapter 6. Many of the figures illustrate the relationship of various factors to the variation in habit of selected minerals. For example, there are striking diagrams showing different habits arranged with respect to such variables as rate of crystallization, temperature, time, *etc.* Some of the morphological crystal drawings could have been improved by using a programme such as SHAPE. However, their purposes are clear.

As a systematic mineralogist, I was disappointed to see the names of twenty nonvalid minerals (acanthite, alumochromite, bagrationite, bucklandite, chillagite, chlormagnesite, columbite, herschelite, iozite, jaipurite, julienite, kandites, magnochromite, metahalloysite, olivine, orthite, tantalite, tauriscite, wolframite and xanthokon) listed in the Index of Minerals. It also contains eighteen terms without page numbers, which appear to constitute a mini-directory of synonyms or varieties. Unfortunately, an entry such as buergerite = wurtzite perpetuates the use of buergerite as a synonym of wurtzite and masks its true status as a valid member of the tourmaline group. In a compilation such as this, it is inevitable that some mineral names will be misspelled; there are twenty-eight examples in the Index of Minerals. Fortunately, most of these are easily recognized (*e.g.*, anthophillite for anthophyllite, aphtitalite for aphthitalite, *etc.*). There are many mineral names in the

book without the diacritical marks they should have.

The nomenclature matters just discussed do not diminish the value of this book. There is much to be found in this volume, and careful study of the examples are sure to awaken more interest in this fascinating subject. It should be on the shelf of every crystallographer and mineralogist.

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Glossary of Obsolete Mineral Names. By Peter Bayliss, 2000. 244 pages, hardbound. The Mineralogical Record, Tucson, Arizona. $32 + $3 postage (US).

Glossary of Mineral Synonyms. By Jeffrey de Fourestier, 1999. 435 pages, hardbound. The Mineralogical Association of Canada, Ottawa, Ontario. $50 (CAN) inside Canada, $50 (US) outside Canada.

When I first learned that the book by Peter Bayliss was to be published, my first reaction was "But the Mineralogical Association of Canada has just published a similar book, *Glossary of Mineral Synonyms* by Jeffrey de Fourestier. Do we need two such books?" This thought became the basis for this review, and I decided that it was impossible to review one book without comparing it closely with the other. In effect, this review became a review of both books.

I recently had a project in which I used both books to track down synonyms. This afforded an excellent, but rather qualitative, comparison of them. In addition to this assessment, I undertook to make definite comparisons of certain names; this was done in the following way. I decided to sample each book by selecting an entry from one book and comparing it to the same entry in the other book. The Bayliss and de Fourestier books contain, respectively, 235 and 432 pages of synonym listings. The Bayliss book is arranged in two columns with small font-size, and the de Fourestier book has three columns with larger font-size. Also, the Bayliss book has references for each entry. In order to avoid any bias, I chose the last entry in the first column of pages 1, 11, 21, 31, *etc.*, through 231, giving 24 entries from the Bayliss book. For the de Fourestier book, the last entry in the middle column was chosen for pages 1, 21, 41, 61, *etc.*, through 421, resulting in 22 entries. The results are shown in the two tables below where the entry for one book is followed by the entry (indented) of the other book.

Table 1. ENTRIES FROM THE BAYLISS BOOK COMPARED WITH THE CORRESPONDING ENTRIES (INDENTED) FROM THE DE FOURESTIER BOOK.

1. Achtaragdit = (OH)-rich **grossular** pseudomorph after **mayenite**, *Am. Min.* **81**, 265 (1996).
   Achtaragdite, Achtarandite, Achtaryndit = **Hibschite** or **Katoite** pseudomorph after **Wadalite** or **Mayenite** [Hydrogarnet, not a mixture]
11. Antimony glance = **stibnite**, Dana 6th, 36 (1892).
   Antimony Glance = **Stibnite**
21. **Basaluminite** = **felsöbányaite**, IMA Abst. 713 (1990); *Lapis* **23**(**11**), 41 (1998).
   No entry.
31. Brown chalcedony = brown fine-grained **quartz** ± moganite, Egleston 282 (1892).
   No entry.
41. Chanarcilite = **arsenic** + **dyscrasite** + **stibarsen**, de Fourestier 19 (1994).
   Chanarcilite, Chanarcillita, Chanarcillite = mixture of **Silver** or **Acanthite** and **Chalcopyrite**, **Galena**, **Nickeline**, **Sphalerite**, *etc.* [Huntilite, not **Dyscrasite**]
51. Cr-illite/smectite = Cr-rich *illite*-montmorillonite mixed-layer, *Clays Clay Min.* **28**, 295 (1980).
   No entry.
61. Eisenleucit = synthetic $K[FeSi_2O_6]$, Hey 410 (1974).
   Eisenleucit = artificial iron analogue of **Leucite** [Iron-Leucite]
71. Ferroromerite = **römerite**, Aballain *et al.* 123 (1968).
   Ferroroemerite, Ferrorömerite = **Römerite**
81. Godlewskit = **godlevskite**, Chudoba 33, (1974).
   Godlevszkit, Godlewskit = **Godlevskite**
91. Hornblendeasbest = **actinolite** Chudoba 79, (1971).
   No entry.
101. Japanite = Fe-rich **clinochlore**, *Min. Mag.* **24**, 614 (1937).
   Japanite = **Clinochlore** [Pennine]

111. Kohlenspath = **whewellite**, Dana 6th, 993 (1892).
Kohlenspath = **Whewellite**

121. Lithionitsilicat = **trilithionite** or **polylithionite**, Dana 6th, 624 (1892).
Lithionitesilicat = **Lepidolite**

131. Mauersalpetr = **nitrocalcite**, Chudoba 79, (1971). **Reviewer's note:** The next entry is
Mauersalz = **nitrocalcite**, Strunz 551, (1970).
Mauersalz = **Nitrocalcite**

141. Muriate d'argent = **chlorargyrite**, de Fourestier 235, (1999).
Muriate d'Argent = **Chlorargyrite**

151. Oktaedrisches phosphorkupfer = **libethenite**, Chudoba 97, (1971).
Octaedrisches Phosphorkupfer, Octaedrisches Phosphorsaures Kupfer = **Libethenite**, **Olivenite**

161. Phyllovitrit = vitrain (bituminous coal), Hey 558, (1962).
Phyllovitrite = coal [Vitrain]

171. Pseudo-zircon = metamict **zircon**, *Min. Mag.* **25**, 642 (1940).
Pseudozircon = metamict **Zircon**

181. Rothbraunstein = **rhodonite** or **rhodochrosite**, Hey 583 (1962).
Rothbraunstein, Rothbraunsteinerz = **rhodochrosite**, **rhodonite**

191. Septetalc-chlorite = Zn-rich **caryopilite** or Zn-rich **greenalite**, *Am. Min.* **61**, 174 (1976).
Septetalc-Chlorite = mixture of various minerals of the Serpentine and Chlorite groups

201. Sternberyll = asteriated **beryl**, Haditsch & Maus 209 (1974).
No entry. **Reviewer's note:** There are entries such as Sternquartz, Sternquarz = asterated (*sic*) quartz; Sternrubin = **Corundum** [Star Ruby]; etc. so the meaning of Sternberyll is apparent.

211. Tirolit (original spelling) = **tyrolite**, Dana 6th, 839 (1892).
Tirolit = a) **Tyrolite**, b) **Lazulite**
Tirolite = **Tyrolite**

221. Vermlandite = **wermlandite**, Aballain 15 (1973).
No entry.

231. Yttromelanocerite = Y-rich **melanocerite-(Ce)**, *Min. Mag.* **33**, 1157 (1964).
Yttromelanocerite = Yttrian **Melanocerite-(Ce) Reviewer's note:** Yttrian is the preferred usage over Y-rich.

Table 2. ENTRIES FROM THE DE FOURESTIER BOOK COMPARED WITH THE CORRESPONDING ENTRIES (INDENTED) FROM THE BAYLISS BOOK.

1. Aceche = **Melanterite**
Aceche = **melanterite**, de Fourestier 1 (1999).

21. Argent Rouge Foncé = **Pyrargyrite**
No entry.

41. Binnenthal Unknown = (of Gordon) **Sinnerite** [Curious Crystal from the Binn Valley]
No entry.

61. Carbonate of Silver = mixture of **Acanthite**, **Dolomite** and **Silver** [Selbite]
Carbonate of silver = **acanthite** + **dolomite** + **silver**, Egleston 308 (1892).

81. Coprolites, Coprolithes = **Carbonate-hydroxylapatite** [Phosphorite]
Coprolites = **carbonate-fluorapatite** or **carbonate-hydroxylapatite**, Dana 6th, 769 (1892).
Coprolithes = **carbonate-fluorapatite** or **carbonate-hydroxylapatite**, Egleston 23 (1892).

101. Eisennatrolite, Eisennatrolithe = mixture of **Natrolite** and Chlorite or **Stilpnomelane**?
Eisennatrolith = **Natrolite** + **chamosite** (?), Dana 6th, 600 (1892).

121. Flos Nitri = **Natron**, **Trona**
No entry.

141. Hagel, Hagelkörner = **Ice** [Hail]
Hagel = water, Egleston 365 (1892).
Hagelkörner = water, Egleston 365 (1892).

161. Iolithe = **Cordierite**.
Iolithe = **cordierite**, Dana 6th, 419 (1892).

181. Klinolivine, Klinoolivine = titanian **Clinohumite** [Titanhydroclinohumite]
Klinolivine = Ti-(OH)-rich clinohumite, Hey 351 (1962).
Klinoolivine = Ti-(OH)-rich clinohumite, *Min. Mag.* **22**, 622 (1931).

201. Lumpenerz = impure **Jamesonite** [Tinder Ore]
Lumpenerz = **jamesonite** ± **stibnite** ± **metastibnite** ± **pyrargyrite**, Dana 7th **I**, 454 (1944).

221. Mészklinobronzit, Mészklinoensztatit, Mészklinohipersztén = **Pigeonite**
No entry.

241. Natural θ-Silicon Carbide = **Moissanite**
No entry.

261. Palaeo-Epidote = **Epidote** pseudomorph after another mineral
Palaeoepidote = unknown converted to **epidote** pseudomorph, Hey 548 (1962).

281. Porzelanerde = **Kaolinite**, mixture of **Kaolinite** and **Halloysite**
Porzellanerde = **Kaolinite**, mixture of **Kaolinite** and **Halloysite**
Porzellanerde = **kaolinite**, Dana 6th, 685 (1892).

301. Rhabdophane = **Rhabdophane-(Ce)**, **Rhabdophane-(La)**, **Rhabdophane-(Nd)**
No entry for Rhabdophane, but eight entries for variants of the name.

321. Silberglanz, Silberglanzerz, Silberglas, Silberglaserz = **Acanthite** [Argentite]
Silberglanz = **acanthite**, Dana 6th, 46 (1892).
Silberglanzerz = **acanthite**, Chester 249 (1896).
Silberglas = **acanthite**, Dana 6th, 46 (1892).
Silberglaserz = **acanthite**, Hey 598 (1962).

341. Sziderogél = colloidal hydrous iron oxides [Limonite, Siderogel]
No entry, but an entry for Siderogel = colloidal **goethite**, Strunz 217 (1970).

361. Tyujaminite, Tyuyamuyunite, Tyuymunite = **Tyuyamunite**
Tyujaminite = **tyuyamunite**, Zirlin 7 (1981).
Tyuyamunuyunite = **tyuyamunite**, Aballain *et al.* 359 (1968).
Tyuyamuyunite = **tyuyamunite**, *Min. Mag.* **20**, 287 (1925).
Tyuymunite = **tyuyamunite**, *Am. Min.* **12**, 382 (1927).
Tyuyumunite = **tyuyamunite**, de Fourestier 17 (1994).

381. Xaphyllite = **Tridymite** [Daphyllite]
Xaphyllite = **tetradymite**, Chester 291 (1896).

401. Pd(Bi,Sb) = (of Dobrovolskaia *et al.*) stiboan **Sobolevskite**
No entry, but PdBi is sobolevskite.

421. Unnamed Calcium Carbonate-Silicate = (of Taner *et al.*) **Rustumite** ? *AM***64**(1979)658
No entry.

I think that the foregoing comparisons will allow readers of this review to decide which of these books gives the kind of information they want to obtain. However, the person who needs such a compendium probably will need both because there are gaps in each of them. There are some other points to be made. For example, how user-friendly are they? I'll set the scene for that answer by referring to the fonts and their sizes used. The de Fourestier book is set in Futura Book 10/11 font, whereas the Bayliss book is in New Caledonia 8 font. Therefore, the de Fourestier book is easier to use for a person without 20/20 vision. The font size used in the Bayliss book is much too small. I also found the format of the de Fourestier book better than that of the Bayliss book. Another "plus" for the de Fourestier book consists of thirty-seven pages of "Inadequately Described and Unknown Minerals", with about sixteen pages listed by "Chemical Composition", two pages by "General Description", three and a half pages by "Mineral", one page by "Phases", eleven pages by "Unbekanntes, Undescribed, Undetermined, Unknown, Unnamed" and three and a half by "Location". The book by de Fourestier is said to contain over 35,000 entries, no figure is given for the book by Bayliss; my estimates are, respectively, 37,000 and 31,000.

No book is perfect, and that certainly holds true for both of these. As a mineral systematist, I was annoyed by some of the statements made in the Introduction to the de Fourestier book, some of which are wrong and

misleading. Mr. de Fourestier makes several suggestions for naming minerals; these are out of place in a book such as these. It is inevitable that when nonapproved mineral names appear in print, they acquire a higher status than they deserve. A few such names appear in de Fourestier's Introduction and they are, in effect, new names coined without the approval of the Commission on New Minerals and Mineral Names of the International Mineralogical Association. "Chabazite-?", which is used on page x, is not mentioned in the CNMMN approved zeolite nomenclature; unfortunately, this name is now in print. The only approved names for members of the chabazite series (referred to as the chabazite *group* by de Fourestier) are chabazite-Ca, chabazite-Na and chabazite-K (the latter name is not mentioned). A similar nonapproved name, Allanite-(?), is given and has no validity. He equates manganoan pectolite with sérandite on page xi. This is a complete misuse of the Schaller modifiers [de Fourestier credits these modifiers to Nickel and Mandarino (1987), but they definitely stated that the modifiers were suggested by Schaller]. In another statement, he equates "ferrous-iron analogue of Sicklerite" with "ferroan Sicklerite"; these are *not* the same. Strangely, de Fourestier has applied the Schaller modifiers correctly throughout the bulk of his book, using terms such as ferroan instead of the old-fashioned "Fe-rich", which Bayliss uses.

On page ix, de Fourestier states: "Where more than one proper name exists for a particular entry and all proper names are equally possible or the priority of likelihood is unknown, they are listed in alphabetical order." Presumably he is referring to synonyms, and these are *not* "proper names". On the same page, he states that "discreditation of mineral names is not always handled as meticulously as the accreditation of names of new mineral species." This is not true. The statement "The bold-face font is applied to names of minerals (*sic*) species approved by the Commission" should have the added phrase "or to species considered by the mineralogical community as being 'grandfathered'". Mr. de Fourestier suggests a number of stylistic "improvements" to mineralogical nomenclature (some good, some bad), but this is not the place to do this. Suggestions should be submitted as proposals to the Commission on New Minerals and Mineral Names of the International Mineralogical Association.

Prof. Bayliss is not without fault either. I have already mentioned his use of terms such as "Fe-rich" instead of "ferroan" or "ferrian"; this is not an isolated example. Schaller modifiers are conspicuous by their absence. Apparently, he also has discredited some species without approval of the CNMMN. The following eighty-four examples have been brought to my attention, and there may be more: actinolite, anorthoclase, arsenosulvanite, ashanite, augite, bakerite, basaluminite, beidellite, borishanskiite, brammallite, calciovolborthite, calclacite, carbonate-fluorapatite, carbonate-hydroxylapatite, cerotungstite-(Ce), cesstibtantite, chaoite, cheralite-(Ce), chukhrovite-(Ce), chukhrovite-(Y), clinochrysotile, coeruleolactite, dickite, dienerite, fukuchilite, giorgiosite, glauconite, halloysite, harmotome, hectorite, heliophyllite, hellandite, hibschite, hinsdalite, hyalophane, imgreite, joséite, joséite-B, kamacite, karpinskite, kemmlitzite, kobeite-(Y), loranskite-(Y), makarochkinite, melanocerite-(Ce), melilite, meymacite, monimolite, murataite, nacrite, natrobistantite, omphacite, orpheite, orthochamosite, orthochrysotile, orthoclase, osarizawaite, oyelite, parachrysotile, paraschoepite, perrierite, pigeonite, protoferro-anthophyllite, rilandite, rowlandite-(Y), sodic-ferri-clinoferroholquistite, sodium autunite, sofiite, spadaite, stevensite, strontio-orthojoaquinite, sulphotsumoite, tadzhikite-(Y), thérèsmagnanite, thorogummite, tocornalite, troilite, turanite, uhligite, vanoxite, viséite, woodhouseite, xiangjiangite and yukonite. These names are listed here without the species names to which they are equated by Prof. Bayliss to avoid legitimizing them as synonyms. Some of them are probably candidates for relegation to the synonymy, but the point is that there have been no official proposals made to and approved by the CNMMN. I think it appropriate to discuss a few of these names. Actinolite is part of the CNMMN-approved nomenclature of the amphibole group. Similarly, brammallite and harmotome are approved as names in the mica group and zeolite group, respectively. An example that does not require CNMMN approval is a spelling correction: the entry for thérèsmagnanite reads "Thérèsmagnanite = thérèsemagnanite, Mandarino 160 (1999)"; the second name is the correct spelling, and this reviewer takes full blame for the incorrect version.

As I stated earlier, no books are perfect. In spite of the specific errors noted above, those of us in search of compendia of synonyms or obsolete names for minerals will find both of these books valuable additions to our libraries.

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Gold. By L.S. Sher. Ocean Pictures Ltd., P.O. Box 368, Moscow, 103009, Russia. 1999. 123 pages. Mineralogical Almanac, volume 1. US$45 (postage and handling included). ISBN-5 900395-18-9.

According to the author, "This book contains a condensed popular description of the history of discoveries and mining of gold (in general) and nuggets (in particular) in Russia." Unlike other major gold-producing countries where lode (read "bedrock") gold mining prevails over placer production, in Russia the reverse applies. The emphasis throughout this book is on nuggets, and following N.V. Petrovskaya (1973) [Native Gold. Nauka Publishing, Moscow, 348 p., in Russian], Sher defines gold nuggets as "... relatively large segregations of gold which occur in lode and placer deposits and usually are sharply different by their dimensions from prevailing mass of gold and which weight is more than 1 gram." This loose translation of a broad definition leaves much to be desired by those of us accustomed to thinking of a nugget as a large lump of placer gold.

Chapter 1, "History of gold discoveries and mining in Russia" provides an interesting overview of gold production in Russia. Begun in the Urals in 1745 at Berezovskoe, the focus was on lode gold up to about 1814, when it was discovered that placers too could be economic. This breakthrough evidently came about with the discovery that preliminary crushing of placers was not required! Improved methods of extracting gold from unconsolidated deposits provided to the Russian gold industry a boost that helped promote a global gold fever. Prior to the First World War, Russian production had increased steadily to over 63 tonnes/year, sufficient for a fourth place position after South Africa, the U.S. and Australia. Before 1985, we are told, the then USSR held second place in world gold production, chiefly owing to its placers. It now holds fifth place, after Canada.

There follow chapters: 2. "Bedrock gold," in which classic epi-, meso- and hypothermal Russian deposits are identified; 3. "Placer gold," where the concept is advanced that nuggets in placers result only from release of relatively coarse gold from certain types of lode deposits; 4. "General features of native gold," in which the physicochemical attributes of gold (and their measurement) are outlined; 5. "Gold nuggets as a unique constituent of natural gold" examines the disposition of nuggets in gold ores generally, and their transition from lode to placer in particular. Apart from briefly acknowledging a role for electrochemical erosion in modifying the morphology of nuggets, the author offers little comment about possible secondary growth of placer gold; 6. "Morphological varieties of gold nuggets" draws heavily on the more recent book by N.V. Petrovskaya (1993) [Gold Nuggets. Nauka Publishing, Moscow, 192 p., in Russian], and introduces a crystallomorphic classification of native gold relating nugget morphology to crystal growth as depicted in Goldschmidt's *Atlas der Krystallformen*. Numerous splendid photographs of dendritic gold enhance this chapter. In chapter 7, "Fancy images," the aesthetic value of gold nuggets is extolled, and the suggestion made that they are a rare species in danger of extinction. Overall, chapters 1 and 6 contribute the most substance to the book.

Despite consistently high-quality (mostly color) photography, this book suffers throughout from lack of editorial attention to simple details and to common-sense description. It starts with the cover photo, a magnificent gold nugget, provenance undeclared (unknown?). Nowhere is there any information supplied on this illustration (which also completely occupies p. 120) beyond mention on the last page that the sample, together with dozens of others illustrated in the book, resides in the collection of the A.E. Fersman Mineralogical Museum, Russian Academy of Sciences. Several other full-page color photos lack captions. In fact, on most photos, the captions (if provided) read only "lode gold," "rod-like crystals in gold," "a rose," or something similarly inadequate. One illustration (p. 46) appears upside down. Indications of scale are rarely supplied, and as often as not they are incorrect. Typical is the caption to the photograph (p. 63) of Russia's largest nugget, in which the stats are given as "...weight 36.015 g, dimensions $31\times$ 27.5 $\times$ 8 cm...". Elsewhere, sample weights are noted only sporadically, although a cryptic note (p. 71) reads "In fugure (sic) captions the weight is specified only for nuggets heavier than 5 g". Nuggets and samples are identified only (on p. 123) according to the contributing agency or person. Space is wasted with gay abandon; for example, over a dozen numbered pages are entirely blank. Typos are rife. Titles of chapters listed in the Table of Contents (*e.g.*, chapters 2, 4 and 5) differ from those in the text. Overall, the editorial work is appalling. To cap it all, apparently the glue wasn't hot enough to effect the intended "Perfect" binding. Consequently, my review copy fell apart midway through what really should have been a great read.

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Mineral Collections of Russia, Part I. Fourteen Personal Collections (*18th–20th Centuries*). Edited by Dmitrii V. Rundqvist. Mineralogical Almanac, Volume 2/2000, Ocean Pictures Ltd., Moscow, Russia, 2000, 136 pages, softbound, US$44. including shipping and handling (ISBN 5-900395-18-9). Available from Terry Huizing, 5341 Thrasher Drive, Cincinnati, Ohio 45247, U.S.A.

This is the second volume published by Ocean Pictures under the series title Mineralogical Almanac. The first in the series was *Gold*: *Nuggets of Russia*. A third volume, *Mineral Collections of Russia, Part II* is in preparation. All three volumes can be purchased for a subscription price of US$105. Ocean Pictures is also the publisher of *Minerals First Discovered on the Territory of the Former Soviet Union*, which was recently reviewed in these pages (*Can. Mineral.* **37**, 779-781).

The aim of *Mineral Collections of Russia, Part I* is to acquaint readers with "Russian mineral collectors of the past and present." This volume is dedicated to the 300th anniversary of the Geological Survey of Russia. Beginning with an introductory essay, *Mineral Collections of Russia* is organized into two chapters, Chapter 1: Historical Collections, and Chapter 2: Contemporary Collections. Each chapter is a collection of articles written by different authors.

In a five-page introduction, under the intriguing title "Collecting Minerals as Environment Protection", Boris Z. Kantor, who is one of the collectors featured in Chapter 2, argues that the preservation of minerals through mineral collecting is an environmental activity akin to the protection of flora and fauna. Perhaps this argument, taken further to include the scientific study of minerals as part of understanding the environment, needs to be used more often by the mineralogical community. Kantor follows with a brief overview of the history of mineral collecting in Russia and of the post-Soviet-Union growth of amateur mineralogy.

The eight collections described in Chapter 1 (60 pages) were assembled by a varied group of prominent people: Count Nikolai P. Rumyantsev (1754–1826), a great grandson of Peter the Great, Archbishop Nil (1798–1874), the geologist, mineralogist and explorer Ernst K. Gofman (1801–1871), Mikhail K. Sidorov (1823–1887), a pioneering entrepreneur in Russia's Arctic, the chemist Dimitrii I. Mendeleev (1834–1907) of Periodic Table fame, Prince Grigorii G. Gagarin (1850–1918) and his descendents, and the mineralogists Mikhail V. Erofeev (1839–1889) and Viktor I. Stepanov (1924–1988). Their collections (a single species suite in the case of Sidorov) are now in state or university museums. The authors of the articles in this chapter are all associated with these institutions. Each article includes biographical information about the collectors, a history of the collection from its formation to its present disposition, and a description of its contents, highlighting some of the more notable specimens; bibliographies are provided for further reading. Anecdotes, quotations from letters and other documents, and various asides enliven the stories. We learn, for example, that Archbishop Nil's labels were scrawled in illegible handwriting, that Erofeev named his favorite beryl crystals after characters in Shakespeare's *King Lear*, and that Prince Georgii G. Gagarin purchased 325 specimens from the Paris agent of the Foote Mineral Co. between 1900 and 1913 for $2,076. Like so many other historical collections, those described in this chapter have suffered from neglect and misguided curation. Much of the Rumyantsev collection "has been lost and exists only in books; [and] much has lost its value as the labels are lost." Of Erofeev's 1,200 specimens, only 320 remain, and the identification of specimens from the Sidorov collection has been complicated by the "negative effect" of later specimen renumbering.

The last and longest article (17 pages) in Chapter 1 is devoted to the Stepanov collection. Hardly historical, but certainly remarkable, it comprised 20,000 specimens representing 1,300 species. This collection is now in the Fersman Mineralogical Museum. A professional mineralogist, Stepanov was also a consummate collector whose zeal extended to rescuing mineral specimens from the periodic clean-up of the basements of Moscow geological institutes. He had a special interest in mineral ontogeny, the origin and growth of minerals, and topomineralogy, the mineralogy of particular localities; these are descriptive terms that deserve wider use. Stepanov was an inspiration and mentor to several of the mineral collectors in Chapter 2. Their inquiries about minerals "eventually [led] to the famous Moscow basement where the great mineralogist, Victor Ivanowich Stepanov, reigned," and where mineral collectors and amateur mineralogists were regular and welcome visitors.

Chapter 2 (55 pages) in *Mineral Collections of Russia* features six contemporary collectors: Vyacheslav Kalachev, Vladimir Pelepenko, Dmitry Lisitsyn, Aleksei Timofeev, Boris Kantor and Igor Pekov. Two are well known outside of Russia. Pelepenko is one of Russia's most prominent mineral collectors. Pekov is a mineralogist at Moscow State University and the author of *Minerals First Discovered on the Territory of the Former Soviet Union*; he has published extensively on rare-earth and other minerals from the alkaline massifs of the Kola Peninsula (*e.g.*, *Can. Mineral.* **37**, 901-910) and has described a number of new species. Three of the articles in Chapter 2 are written by the collectors themselves (Kalachev, Lisitsyn, Kantor) and provide refreshing personal insights. These collectors talk about how they got started in mineral collecting, their collecting experiences, and their mineralogical interests; what they have to say about their collections is almost inci-

dental. Although we learn more about the collections in the remaining articles in the chapter, they also capture the spirit of the collectors (Pelepenko, Timofeev, Pekov). As a group, the contemporary collectors in Chapter 2 come across as serious collectors who like to study and understand minerals as well as to collect them. They are primarily field collectors, and many of the localities they have visited, the Kola Peninsula, the Subpolar Urals and Primorskii Krai (Dalnegorsk), will be familiar to readers. In the case of Pekov, whose collection of 6,000 specimens contains 1,900 species, vocation and avocation happily converge.

Mineral Collections of Russia is profusely illustrated. There are 131 high-quality color plates of mineral specimens, mostly from Russia and republics of the former Soviet Union. Chapter 1 is further illustrated with eight color or black-and-white portraits of the collectors, two maps, and three reproductions from historical documents. Color graphics adorn the outside covers, the frontispiece, and the chapter separations. An index is provided for the mineral color plates.

A page of acknowledgements and seven pages of advertisements are included in the back of the volume. The advertisements are non-intrusive, and as something of a bonus, incorporate color plates of a few more Russian mineral specimens. *Mineral Collections of Russia* is printed on high-quality, glossy paper, with a nice layout and sharp text.

Unfortunately, *Mineral Collections of Russia* suffers from awkward English and a considerable number of spelling errors. Particularly annoying are misspelled or obscure mineral names (the latter provided this reviewer with an opportunity to test the *Glossary of Mineral Synonyms* recently published by the Mineralogical Association of Canada, and it came through with flying colors). Like many mineralogical publications translated into English by translators whose first language is Russian, *Mineral Collections of Russia* would have benefitted from the scrutiny of an English-language editor. The publishers would also do well to provide their translators with English glossaries of mineral names and mineralogical terms. However, despite the awkward English and misspellings, this reviewer found *Mineral Collections of Russia* to be an interesting, informative and enjoyable read.

This book will especially appeal to mineral collectors, mineral museum curators, mineral dealers and mineral historians, but professional mineralogists should find lots of interest in it as well. The color plates alone make it a worthwhile acquisition for anyone interested in the minerals of Russia.

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Långban. The Mines, their Minerals, Geology and Explorers. By Dan Holtstam and Jörgen Langhof, editors. 1999. 215 pages, hardbound, format 23 × 30 cm. Raster Förlag and Swedish Museum of Natural History. ISBN 91 87214 881. Exclusive North American distributor: Excalibur Mineral Company, 1000 North Division Street, Peekskill, New York 10566, U.S.A. US$ 74.95 plus shipping.

The Långban dolomite-hosted iron–manganese deposit, situated in central Sweden, is one of the most mineral-rich sites in the world, with about 270 different species. It is the type locality of nearly 70 of these, and for more than 20 species, Långban is the only known locality. There is now a general agreement that the deposit is of exhalative-sedimentary origin. The main reasons for the diversity of mineral phases are (1) the unusual enrichment in elements like Ba, As, Sb, Pb, B and Be in a silica-undersaturated environment, and (2) the broad range of crystallization temperatures, producing skarn minerals formed at the peak of metamorphism down to fissure-controlled mineralization below 170°C.

This well-produced volume on a classical mineral locality is authored by ten people. A foreword by Paul B. Moore contains a brief comparison with the related occurrence in Franklin, New Jersey. The general geology of the Bergslagen ore region, in which the Långban deposit is situated, is presented by Ingmar Lundström, followed by a chapter on the geology of the Långban deposit by Frej Sandström and Dan Holtstam. Some aspects of the origin of the deposit are discussed by Bengt Bollmark. Then follows a chapter on Långban's mining history by Jörgen Langhof and Thomas Österberg, and one on mineralogists and collectors who have been active in the area by Jörgen Langhof. Personally, I found these two chapters very stimulating. The famous collection of Långban "unknowns" by the mineralogist and mineral dealer Gustaf Flink (1849–1932) is a fascinating story.

The bulk of the book, nearly 100 pages, deals with descriptions of the close to 270 different species from the Långban deposit, authored by Per Nysten, Dan Holtstam and Erik Jonsson. The minerals are described in alphabetical order, the text running from one line (pyrrhotite) to about half a page (*e.g.*, långbanite, nadorite). Emphasis is placed on mineral parageneses. Data other than formula and crystal system are generally not included. The chapter is lavishly illustrated with crystal drawings and a number of color photographs of minerals. Most of the latter were taken by Michael P. Cooper and Erik Jonsson and are of excellent quality. Some of the highlights are, in this reviewer's opinion, the pictures of sarkinite, allactite and pyroaurite. That of långbanite, which also very aptly adorns the dust cover, is also a good shot.

The book is rounded off with a short account on today's collecting at Långban by Erik Jonsson and an extensive bibliography (567 entries) by Urban Strand followed by a mineral index with references in coded form to the bibliography. There are three useful appendices: (1) a systematic list of the Långban minerals, where the minerals for which Långban is the type locality are marked with an asterisk (I miss this in the alphabetical descriptions); (2) synonyms, varietal and obsolete mineral names in Långban mineralogy, and (3) a list of fluorescent minerals from Långban.

It is stated by the editors that the book primarily addresses the world's mineral collectors and museum curators, but is likely to be of use to scientists as well because of the comprehensive bibliography. (Hopefully, curators and scientists are not meant to be two entirely separate groups of people.) I can only say that the authors have succeeded extremely well in producing a marvellous book that should satisfy any of these groups of readers. The binding is sturdy, the lay-out is professional, and I could only spot a couple of typographic errors. However, it is a pity that metasedimentary rocks and marble are represented by the same blue color on one of the geological maps.

The mineral world is now awaiting a companion volume on the other related deposits of the area: Jakobsberg, Sjögruvan, Harstigen and Pajsberg. These contain several minerals that are, at least seemingly, absent at Långban.

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Optical Crystallography. By F. Donald Bloss. Mineralogical Society of America, 1015 18th Street, N.W., Suite 601, Washington, D.C. 20036, U.S.A. 1999, 239 pages. Monograph Series no. 5. US$32 (US$24 to MSA members), hardbound. (ISBN 0 939950-49-9).

A good book is a reviewer's delight, and this fine text, *Optical Crystallography*, is a splendid example. It is also the third optical text that I've reviewed in the last decade, and by far it is the best of the triad. This should come as no surprise because its author, Prof. Bloss, is the Dean of optical mineralogy, the Galahad of the subject, having tilled the fertile field for forty years. His *An Introduction to the Methods of Optical Crystalography*, published in 1961, offered a ground-breaking approach in a student-friendly format that quickly rendered irrelevant other, more opaque texts then in bookstores. Fundamentally, *Optical Crystallography* is an update of Prof. Bloss's earlier book. The current edition is number 5 in the Mineralogical Society of America's Monograph Series.

The book's 13 chapters begin logically with such groundwork subjects as the nature of light, its behavior in isotropic media, some basic optics, and the petrographic microscope, with special attention paid to oculars and objectives. This is followed, in chapter five, by a treatment of the optical examination of isotropic substances and a truly exhaustive discussion of the determination of *n* by half a dozen methods.

Succeeding chapters deal with the interference of light, subtly and smoothly leading the reader (student!) to conoscopic observation and uniaxial interference figures. Extinction, elongation, and pleochroism come next, followed by a short introductory chapter on the spindle stage. Two chapters then cover all the complexities of biaxial crystals in 50 pages. Chapter 12 applies spindle-stage techniques to biaxial crystals and the use of software to compute 2*V* and orientations to measure *nx*, *ny*, and *nz*. The final chapter explains the rapid optical determination of "asbestos" fibers – chrysotile, grunerite, "crocidolite" (another banished term! ed.), tremolite, actinolite, anthophyllite – by dispersion staining, a technique covered in detail earlier in the book in chapter 5.

Three appendices close the text. The first lists five pages of Cauchy constants and temperature coefficients (to six and seven figures!) to calculate the precise value of a n f (lambda) of Cargille oils (*n* in the range 1.40 to 1.80) for the double-variation method. The last two appendices outline the geometrical and mathematical properties of the ellipse (essential for quantitative work with indicatrices), and the recording of optical data. Three pages of references and a seven-page index conclude the volume.

The strengths of *Optical Crystallography* lie in its exhaustiveness and clarity of expression. This is a reflection of the author's unbending dedication to his subject through a long and rich career. Probably anything that the reader (student and teacher!) needs to know about "optical" is to be found somewhere between the covers of this book. Presentation is further enhanced by a short "overview", a sort of abstract, at the opening of each chapter, and the sprinkling of problems and questions (some with answers) at their endings.

Optical Crystallography is not faultless, however. An immediate and general criticism is its very thoroughness; there is just too much material given to cover in a standard, single-semester "optical" course. The teacher will have to be selective. For those earth-science departments that have taken the unwise decision to fold "optical" into a standard mineralogy course, the text is wholly

unsuitable. Then, there are a few more specific criticisms. The interference color chart (between pages 118 and 119) is a bit washed out, and contrary to the caption, there is no 0.009 line. The user must construct one. The nicol prism is not discussed, even though it is still found in many microscopes (this reviewer's included). Not all objectives are centered with wrenches (p. 33); some use a pair of slip rings. Köhler illumination is given short shrift and deserves more than a footnote (p. 35). In spite of Prof. Bloss's vaunting of the illustrations (p. vii), not all are clear, and the print in some (subscripts in Figures 10-30 and 10-32 to 10-35) is illegible. Finally, treatment of the spindle stage in two widely spaced chapters (9 and 12) is unfortunate. The topic would be better presented in a single appendix, and formulas for cements currently in vogue would be welcome.

This reviewer first taught optical mineralogy in 1959 and has since given the subject many times in English, in Spanish, and in French. Based on this long association, perhaps I'm qualified to make a few observations in the role of teacher (rather than reviewer).

Tabular biotite or, better yet, stilpnomelane in thin section is easier to come by than "a needle of $PbCl_2$, $HgCl_2$, or natrolite" (p. 34) to verify whether a microscope's cross hairs are properly aligned. Also, these two strongly pleochroic minerals serve admirably to determine whether a microscope's substage polarizer is oriented N–S or E–W (p. 25). Earlier, I mentioned the omission of the nicol prism. This is too bad because it is a wonderful teaching tool to introduce uniaxial crystals, particularly if a real nicol is available as a "hands-on" lab device. Biaxial crystals, on the other hand, are splendidly introduced through the use of X–Y, Y–Z, and X–Z wave-velocity surfaces, given only incompletely in *Optical Crystallography* and inadequately labeled in Figure 10-4. These three surfaces are easily captured by students, offer a sound overture to the biaxial indicatrix, show clearly the reciprocal relationship of n to v, and reveal the mystery of mysteries: why the Bxa ray is not seen in a Bxa interference figure!

The pinhole ocular, hardly mentioned, is invaluable in teaching, particularly if the learners are using binocular student microscopes, which all too typically give lousy interference figures. I supply my students with aluminum foil and encourage them to wrap a small piece over the top of an empty tube and to pierce a pinhole through its center. It's astounding what fine interference figures can thus be obtained on even the tiniest of grains.

Although the homodrome–antidrome story and Lommel's Rule (pages 102-103) are rigorous and correct, the old "thumb-on-the-stage" rule, taught to me in the 1950s by Alonzo Wallace Quinn, remains indelibly inscribed on this toiler's mind. Students don't seem to forget it, either.

Finally, rather than to have students sketch the shapes of cover-slip fragments (pages 61, 227), I provide them with blank slides inscribed with letters at the left-hand end (A, B, C, *etc.*) on which there is room for two (or three) mounts. These are designated A-1, A-2, B-1, *etc.*, and there is no confusion.

Optical Crystallography is a first-rate reference and, in my view, the current premier text for a rigorous full-semester course in optical mineralogy. It is unsuitable for a survey course or a course where "optical" constitutes a chapter of, or an add-on to, a traditional course in mineralogy. The book is nicely printed on non-glare paper and is in a rugged sewn binding. At US$32, it's reasonable, and at US$24 (for MSA members), it's a true bargain. If you're not a MSA member, I'll bet that you have a colleague who is!

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