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BOOK REVIEWS

Beryl and its Color Varieties. By A. Falster, M. Jarnot, G. Neumeier, W. Simmons, G. Staebler, T. Wilson and M. Wise, eds.). *ExtraLapis* English edition, Lapis International LLC, P.O. Box 263, East Hampton, Connecticut 06424, U.S.A., 2005, 112 p. US $26 + $3 shipping to non-U.S. addresses, soft cover, ISBN 0–9715371–6–X.

Readers are welcomed to *Beryl and its Color Varieties by* William (Skip) Simmons and Alexander Falster's advice that the term "beryl" applies not only to beryl, but also to four closely related cyclosilicate species: bazzite, stoppaniite, indialite and pezzottaite. The last mentioned Madagascan beauty, first named in 2003, is thoroughly described in volume 35 of the *Mineralogical Record* (Hawthorne *et al*. 2004). The other three rarities are longer established in the literature.

This seventh issue of *extraLapis* English is an elegant presentation by twenty-two authors on colorful varieties of beryl (including the varieties aquamarine, red beryl, morganite, emerald, goshenite and heliodor, in addition to the cyclosilicate species foursome noted above. Packed into the first 104 pages are contributions (the titles of which are taken from the Table of Contents) on: "Mineralogy of Beryl and the Beryl Group" (W. Simmons and A. Falster), "Pezzottaite" (F. Pezzotta), "Crystal Structure of Beryl and Pezzottaite" (W. Simmons and A. Falster), "Bazzite of the Alps" (S. Weiss), "Discovery Stoppaniite" (F. Tamagnini), "Beryl Color Varieties" (W. Simmons and A. Falster), "The Best of the Rockies" (A. Potucek), "Mount Antero: The Peak of Colorado Beryl Collecting" (M. Jacobsen), "New England Gem Beryl" (B. Jarnot), "Beryl from the Pegmatites of Southern California" (J. Fisher), "Emerald and Aquamarine in Canada" (L. Groat), "Gem Beryl from Russia and Ukraine" (P. Lyckberg), "Mellow Yellow: Heliodor and Golden Beryl" (M. Wise), "The Mysterious Golden Water of Tajikistan" (D. Belakovskiy), "Finland's Famous Find" (P. Lyckberg), "China: An Emerging Source of World-Class Beryl" (G. Liu), "Gem Beryl in Australia" (D. Henry), "Beryl from Southern Africa" (B. Cairncross), "Brazilian Beryl" (L. Menzes), "Bolivia and Columbia" (A. Petrov and R. Hochleitner), "Beryl Red and Green" (W. Simmons and A. Falster), "Grading and Pricing Gem Beryl" (J. Bradshaw), and "Element Beryllium" (L. Van Iderstine and M. Huber). Advertisements and just over four pages of references round out this 112-page issue.

This issue risks a catalogue-quality presentation by opening with several successive page-length articles, all of which end rather abruptly. Single-page contributions can, however, be nicely garnished, an example being "Finland's Famous Find" (p. 63). "Beryl Red and Green" (p. 98) supplies another snappy contribution, although this reviewer would delete the word "probably" in the first sentence, which states that "Emerald is probably the most valuable beryl variety." Fortunately, the incipient catalogue-quality alluded to above, fades into the distant background against superlative contributions by J. Fisher, L. Groat, P. Lyckberg, G. Lui, B. Cairncross and L. Menzes. Lastly, the short articles by J. Bradshaw on grading and pricing, and by Van Iderstine and Huber on beryllium and its industrial significance provide a delightful finale to the main fare.

Throughout are magnificent photos by a host of contributing experts, foremost among them without doubt, Jeff Scovil. Some stylistic elements risk detracting from the whole; for example, a couple of colored pages (17, 19) with superimposed text will pose a challenge for some readers. The chief criticism concerns maps and their scales (or lack thereof). It would have been appropriate, surely, to have included maps with "Beryl from Southern Africa" and "Gem Beryl in Australia". Then too, it is probably not enough to provide only a ratio scale for "Map of the Sichuan Province of China" (p. 71), and unforgivable to omit a scale of any kind on "Map of the Oriental Pegmatite Province" (p. 67), and on the untitled (!) map (p. 43) showing some emerald and aquamarine occurrences in Canada. Standardization has also yet to be achieved by *extraLapis* in exactly matching the titles in Table of Contents to those given in the text. Typos are few, *e.g*., "contry's" (p. 69), an editorial error carried over from page 3, that is further embellished on the last page in "Author's Adresses," and a few awkward moments in translation, as on p. 31 with "...for these schist beryl's (sic) green color." So, there's evidently room for improvement here. These criticisms aside, however, *Beryl and its Color Varieties* stands as a further esteemed issue (8 out of 10 perhaps?) of a very exciting series.

Reference

Hawthorne, F.C., Cooper, M.A., Simmons, W.B., Falster, A.U., Laurs, B.M., Armbruster, T., Rossman, G.R., Peretti, A., Günther, D. & Grobéty, B. (2004): Pezzottaite, $Cs(Be_2Li)Al_2Si_6O_{18}$, a spectacular new beryl-group mineral from the Sakavalana pegmatite, Fianarantsoa Province, Madagascar. *Mineral. Rec.* **35**, 369-378.

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Fleischer's Glossary of Mineral Species 2004 (ninth edition). Joseph A. Mandarino & Malcolm E. Back. Mineralogical Record Inc., P.O. Box 35565, Tucson, Arizona 85740, U.S.A., xiv + 310 pages. US $24 + $2 post (softcover). (No ISBN number).

The eighth edition (1999) was reviewed by me in *The Canadian Mineralogist* **38**, 251-252 (2000). From 1999, an increase of about 400 mineral species brings the total described to over 4,000. The price of a book has increased from US$18 to US$24 with an increase in pages from x + 226 to xiv + 310. Most of the increase is caused by the addition of type locality and crystal-structure references; however, the 41-page section on mineral groups of the eighth edition has unfortunately been deleted. In the early review, a number of suggestions were made to bring the work into the twenty-first century. How have these been handled?

The chemical elements and their abbreviations should follow the spelling of the International Union of Pure and Applied Chemistry (IUPAC). For instance, aluminum is correctly spelled on page 6 (Aluminium); however, aluminum (*sic*) on page viii is wrong. Alabandite has metallic bonding, so that the addition of ionic bonding on the Mn, indicated as 2+, is wrong.

IUPAC recommends that a Greek letter should not be used in front of a chemical formula, because in some cases, the same letter is used for two different minerals, and in others two different minerals have the same letter. The recommendation is ignored, for instance in akaganéite, because the "β-" remains. The formula of akaganéite is wrong, as the Cl occupies a unique atomic site, so that the correct formula $Fe_8(OH,O)_{16}Cl_{1.25}$. On page 3, akaganéite is spelled with an é; however, the acute accent is missing on page 81. In addition, the reference "56, 659" is wrong and should be "56, 639".

Although crystal-structure references are added, the crystal system should have been replaced by a space group or space-group aspect. Space group *P*3 (#143) is in the trigonal system with primitive Bravais lattice, whereas space group *R*3 (#146) is in the trigonal system with rhombohedral Bravais lattice. The crystal system is based upon the essential elements of rotation symmetry, whereas the Bravais lattice is based upon elements of translation. Therefore, the statement on page ix "trig. = trigonal (rhombohedral)" is wrong: a serious error.

The chemical formula of algodonite is given as Cu_6As, which means that Z = 2/7; however, Z must be an integer. Therefore, this chemical formula is misleading. In the epidote group, the chemical formula of androsite-(La) is given as "$(SiO_4)(Si_2O_7)O$", but "$[Si_2O_7]$" should be used to show a structural unit. In contrast, the chemical formula of allanite-(Ce) is wrong, with "Si_3O_{12}", which indicates three silica tetrahedra. The chemical formula of allanite-(Ce) has Ca>Ce, but this represents the chemical formula of clinozoizite. Allanite-(La), a CNMMN-approved species, is missing.

Allophane is described as amorphous; however, amorphous pertains to solid, liquid or gas. The more accurate description *non-crystalline* should be used for this mineral. Althausite is wrongly given as dimorphous with holtedahlite. The fact that anduoite occurs in the löllingite group is missing.

The reference to admontite (*Am. Mineral.* **65**, 205) does not include the errata in **65**, 1311. The structure reference to aerinite should be "**84**, 1467" instead of "**84**, 1464-1468", as the abstract is only one paragraph. This crystal-structure reference shows that the chemical formula given for aerinite is wrong. The chemical formula of agrinierite is wrong, as shown in *Am. Mineral.* **85**, 1294-1297 (2000). Albite has "type locality unknown" in contrast to allanite-(Y), which has no type-locality information. The comment "type locality unknown" is a waste of space. On page xiv, **Boletin** is wrongly given in bold face. On page 1 under acanthite, "argentite" is given in inverted commas only once out of the two mentions. On page 4, **Smectite** is given in bold face instead of italics.

Group names such as högbomite and nigerite are included in regular type and inverted commas instead of italics. Subgroup names such as **glauconite** and **illite** are included in bold face and inverted commas instead of italics. Many group names such as apophyllite are missing. Some varietal names, such as **actinolite** (an approved CNMMN name for Fe-rich tremolite), **parachrysotile** (a morphological variety of orthochrysotile), and **orthochamosite** (an orthorhombic polytype of chamosite) are included in bold face instead of regular type. **Brokenhillite** appears on page 165 in bold face; however, it does not appear in the alphabetical list on page 34. There are many exceptions to the

title of "Mineral Species" and the statement on page iv, "Synonyms and discarded names are not included."

The crystal system of amesite is given as triclinic; however, the polytypes are given in the hexagonal and trigonal systems only. The use of crystal systems and polytype symbols is unnecessary duplication. Orthochamosite is wrongly stated to be dimorphous with chamosite, because they are polytypes. There are three CNMMN-approved mineral species gersdorffite-*P*213, gersdorffite-*Pa*3 and gersdorffite-*Pca*21 and not one, because they are polymorphs. My conclusion is that the authors do not understand the difference between a polytype (structural variety) and a polymorph (species).

The Canadian Mineralogist always quotes an ISBN number in a review where available, because librarians like this unique number. No number is given. Only a few examples of errors, omissions and inconsistences have been given; however, there are about a thousand. My recommendation for the professional mineralogist is to use *Fleischer's Glossary of Mineral Species 2004* with caution.

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Minerals and their Localities. Jan H. Bernard & Jaroslav Hyrsl (2004). Granit s.r.o., Stef'nikova 43, CZ–150 00 Praha 5, Czech Republic [E-mail: info@granit-publishing.cz], 808 pages (hardcover), 1035 color photographs, €98.00. ISBN 80–7296–039–3.

The books contains a preface (6 pages), introduction (7 pages), mineral descriptions (670 pages), 34 richest type-localities of the world (2 pages), 63 references (1 page), an alphabetical list of mineral localities (119 pages), an appendix of 14 minerals described in 2004, acknowledgements, and biographical sketches about the authors (1 page each).

From about 8,500 localities, the authors describe about 4,200 mineral species, about 1,000 common mineral varieties and about 50 mineral groups or families. Information includes chemical formula, chemical-structural classification of Strunz, crystal system, space group, unit cell, Z, the strongest five or so X-ray powder-diffraction reflections, crystal types and size, physical data, optical data, locality data, and a reference or two. The length of each description varies from four lines to almost six pages with an average of 20 lines per entry.

This book is an updated version of the publication that won the Czech Literary Award for best book in the natural sciences for the year 1992. The main object is to describe the mineral localities. Therefore, more attention is paid to crystal habit, crystal size, rarity, aggregate development, typical assemblages of minerals, and the appearance of the mineral in different rock-types. The deposits are related to 11 different genetic types. Mineral species occasionally used as a gemstone are marked by a boldface asterisk.

Most groups/series/families are included; however, exceptions are alum and pyroxenoid. Some groups such as amphibole and axinite are in italics; however, synonyms and varieties are also in italics. Other groups such as apatite and apophyllite are in bold-italics; however, questionable mineral species also are in bold-italics. The apatite group under the fluorapatite entry is given in normal type; however, mineral species under an entry also are given in normal type. The simple system of bold for species, bold-italics for questionable species, italics for groups/series/families, and normal type for synonyms and varieties would have been significantly better.

The crystallographic, chemical and physical data are included to identify the mineral. A number of minerals are listed as inadequately described. One of the criteria defining a mineral species is a natural occurrence, so that the numerous names of hypothetical amphiboles are not included. The data shows about 150 questionable minerals, with some to be added and others to be deleted as mineral species.

The edges of the pages are color-coded to facilitate finding an entry in the book. The color photographs, which are clear and well focused, are 7 × 4½ cm. Space is not wasted by starting each letter on a new page. The standard of the English is high. The type is clear and printed on high-quality paper. There are a few typographical errors; however, most of them occur in the captions to the photographs. The publisher should have sent the captions to the authors to be proofread.

The book is especially useful for curators of mineral museums. Mineral collectors and mineral dealers also will find this book useful. The professional mineralogist will find additional information. The price is reasonable for a high-quality publication.

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Phoscorites and Carbonatites from Mantle to Mine: the Key Example of the Kola Alkaline Province. Edited by F. Wall and A.N. Zaitsev. The Mineralogical Society Book Series, Volume 10. 2004. £ 89 (price for member of the Society: £62). ISBN 0–903956–22–4.

The first reaction of many who come across this book will be "so what's a phoscorite?" The name does not spring readily to the lips even of those who study alkaline rocks, whereas others might dismiss it as yet another of those obscure type-locality names for some rare rock-type and of little interest to the general petrological community. Briefly, *phoscorite* is derived from the name of the *Phos*phate Development *Cor*poration (FOSKOR) and refers to magnetite – olivine – apatite rocks occurring around the Loolekop carbonatite complex of the Phalabora Complex, South Africa. A second reaction might be "do we need a book about these rocks?" Fortunately, as noted below, this book is about more than just phoscorites, and I consider that the answer to this question is yes, principally because "phoscorites" and the associated carbonatites are of significant economic and scientific interest.

The book consists of 14 chapters and is devoted to describing the geology, mineralogy and petrology of phoscorites, carbonatites and other rocks occurring in the Kola Alkaline Province of Russia. The editors are to be congratulated for having worked hard to ensure that all of the individual contributions to this volume are in a common format and in credible English. The illustrations are of uniformly good quality, with many being new versions of old Russian geological maps redone in color. Importantly, readers should be aware that description of phoscorites from the type locality or of the large agpaitic alkaline complexes occurring at Khibiny and Lovozero are not included.

The first three chapters offer a summary and review of Kola magmatism. The initial chapter (Bulakh, Ivanikov & Orlova) provides a useful overview of the Kola Alkaline Province, as it summarizes many obscure and difficult-to-obtain Russian publications. This is followed by a chapter (Krasnova *et al*.) describing the mineralogical and geological characteristics of phoscorites,with emphasis on those in the Kola region. The strengths of this chapter are its descriptive parts, whereas the petrological aspects are the weakest, the poorest being the characterization of phoscorites in terms of a pseudonormative scheme and treating them as liquids, eventually relying upon liquid immiscibility to explain the genesis of phoscorites. The third chapter (Kramm & Sindern) reviews existing data on the timing of the Kola magmatism, but contributes no new insights. However, from this chapter it is apparent that there is a paucity of Sm–Nd, U–Pb, Lu–Hf and Re–Os studies of the Kola rocks.

Chapters 4–6 concentrate on the geology and petrology of three phoscorite-bearing carbonatite complexes, namely Kovdor (Krasnova *et al*.), Sokli (Lee *et al*.) and Vuoriyarvi (Karchevsky & Moutte). All of these chapters are very useful with regard to the geological and mineralogical data presented, and include many new data. Chapters 7 and 8, which describe the mineralogy and petrology of phoscorite-free complexes at Sallanlatvi (Zaitsev *et al*.) and Afrikanda (Chakhmouradian & Zaitsev) are exceptionally well-written and provide an enormous amount of mineralogical data integrated into well-documented petrogenetic schemes. Chapters 9–11 concentrate on mineralogical aspects of Kola alkaline rocks and concern the mineralogy of high-field-strength elements (Chakhmouradian & Williams), rare-earth-element minerals (Wall & Zaitsev) and sulfide and PGE and mineralization (Rudashevsky *et al*.). All of these should be required reading for mineralogists. Chapter 12 (Demeny *et al*.) is a useful summary of the results of stable isotopes studies. In Chapter 13, Bell & Rukhlov summarize the origin, evolution and source characteristics of carbonatites from the Kola Alkaline Province, and attempt to integrate much of the information presented in this book into a coherent petrological scheme. The overall conclusion is that most of the magmas involved are plume-related, although many petrologists might find this somewhat biased, as no real consideration is given to lithospheric models of alkaline magmatism. Chapter 14 (Petrov) on the economic aspects is perhaps the most disappointing chapter, as it is far too brief and provides only cursory accounts of the existing mines. There are no detailed plans or cross-sections of the mines, and little information on ore grades. Curiously, brief descriptions of the apatite and loparite ores of Khibiny and Lovozero are included in this section.

The weaknesses of this book are few, and mainly in the petrogenetic aspects, as far too much credence is given to the chimera of liquid immiscibility as a petrogenetic process, for which no real evidence is offered. One very curious aspect of the work is that the various authors do not really agree as to a common definition of phoscorite, and have extended the original formulation to include pyroxene, amphibole, phlogopite and calcite, according to the particular occurrence investigated. This Procrustean approach to the definition of phoscorites might suggest that we do not actually need a specific term for these admittedly interesting ultrabasic rocks.

In summary, everyone interested in alkaline rocks and carbonatites should buy this book. The real strengths of this book are the summaries of the mineralogy and geology of carbonatite – ultramafic rock complexes in the Kola Alkaline Province.

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Ore Mineral Atlas. By D. Marshall, C.D. Anglin and H. Mumin (2004). Geological Association of Canada – Mineral Deposits Division, Department of Earth Sciences, Room ER4063, Alexander Murray Building, Memorial University of Newfoundland, St. John's, Newfoundland, Canada, A1B 3X5, publications@esd.mun.ca, or www.gac.ca/bookstore. x + 112 pages, 23 x 28 cm coilbound. $35 + taxes and shipping (ISBN 0–86491–243–9).

More than 40 people have contributed text, specimens, photographic images and advice during the assembly of this excellent book. The 53 principal ore minerals are mainly native metals, metallic oxides and sulfides, but they include also secondary copper minerals, graphite, diamond and asbestos. Each principal mineral has a page of text and a page of photographic images, usually four in number.

The text page tabulates basic physical and optical properties, gives hand specimen and microscopic distinguishing features, and lists associated minerals, ore types, references and descriptions of the photographic images. The text does not cover etching, staining or microchemical techniques. The texts for the metallic minerals are quite satisfying, but it is too big a challenge to deal satisfactorily with asbestos (broad sense) or diamond on a single page.

Most of the references are to literature readily available in a university library, with only one thesis (Jim Franklin's) and a few papers in less common journals. Great restraint has been exercised in the choice of references, while still listing sources of mineral data and papers on typical ore deposits.

The photographic plates normally present one or two very well-chosen hand specimens, and two or more microphotographs, usually featuring special textures or optical properties. As a bonus, we also get to see a number of associated minerals in these images. More than 100 specimens were photographed. The color in the images is mostly very good, but as the authors mention, some variation is inevitable, given the diversity of microscopes, light sources and film types employed. Some images have more bluish or greenish casts than the original is likely to have presented. All the images have either a scale bar or a numerical measure of the field of view. Some of the images could rank as art pieces worthy of framing. The gold crystals on the back cover are especially remarkable.

Abbreviations for the ore minerals are based on F.M. Chace and R. Kretz, updated by the University of Geneva web site. Wisely, lower case letters are chosen to avoid confusion with element symbols. Only one capital crept in, on sphalerite in plate 4 on page 17.

The ore specimens come from a great variety of sources throughout the Americas, with a few from Europe, Africa and Russia. The mineral descriptions are arranged alphabetically, making them easy to find. Tables of contents give listings both alphabetically and by chemical grouping. A four-page index at the back gives page numbers for the principal minerals in bold, and page numbers in regular type for any mineral mentioned in the book. A future edition might use italics for page numbers for associated minerals appearing in the plates (*e.g.*, tourmaline in the scheelite images). Only one misspelling was detected: "flourite" escaped detection, though it is replaced with "fluorite", in the list of minerals associated with acanthite (page 2).

The price of this *Ore Mineral Atlas* is a great bargain, given the generous number of color plates, the high quality of the specimens and their images. This can only have been possible with a terrific amount of volunteer effort, and a boost from publication grants.

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Rock-Forming Minerals. **4B**. *Framework Silicates: Silica Minerals, Feldspathoids and the Zeolites* (2nd edition). By W.A. Deer, R.A. Howie, W.S. Wise and J. Zussman. The Geological Society, London, 2004. xv + 982 pages. US$209 ($125 to members of AAPG; $104 to members of GSL). Available from AAPG Bookstore, P.O. Box 979, Tulsa, Oklahoma 74101–0979, U.S.A. (ISBN 1–86239–144–0).

Volume 4B is the eighth of the ten volumes projected to comprise the second edition of "DHZ". Only volumes 3B (Sheet-Silicates; Non-Micas) and 5A (Non-Silicates; Oxides, Hydroxides and Sulphides) remain to complete the task. The present volume, *Rock-Forming Minerals*. 4B. *Framework Silicates: Silica Minerals, Feldspathoids and the Zeolites* (hereafter referred to as vol. 4B in this review) will be the last to carry the original troika on the masthead. Prof. Howie wrote me last year that at 93 and with failing eyesight, Prof. Deer is letting fall the reins. Alex Deer will not be forgotten and, yet more important, his Herculean labors will continue to be appreciated by petrographers and mineralogists for decades to come.

Although it is far more detailed, vol. 4B broadly follows the outline of its predecessor, with each mineral or mineral group portrayed by structure, chemistry, experimental work, optical and physical properties, distinguishing features, paragenesis, and references, or a permutation thereof. The optical side carries a little less relative weight in the second edition than it

did in the first. Nevertheless, the authors state in their Preface (p. xv) that "...light microscopy remains the basic petrological tool underpinning all other methods, showing us the context and relationships in rocks of the minerals for which we can accumulate so much data, as outlined here". How true! One must deeply lament the widespread de-emphasizing of optical mineralogy in Canadian and American universities (this reviewer's university has gone against this trend and has wisely re-instated optical mineralogy as a full-semester course required for undergraduate geology majors; for a few bleak years, optical mineralogy was but an add-on to an already overburdened general mineralogy course). The electron microprobe in no manner replaces optical studies, it complements and expands them. It is here worth noting that a well-prepared thin section, ever so slightly thicker than standard (say 0.035 to 0.040 mm) and fitted with a cover slip cemented with Canada balsam, can fill a dual-purpose role: 1) Normal optical study (remembering here that subtle textural features are lost in polished, and especially in doubly-polished thin sections). 2) Microprobe analysis of phases. A technician can easily remove the cover slip and polish the surface of the section, bringing it down to approximately standard thickness. The petrographer can now analyze specific preselected spots.

Vol. 4B opens with the silica minerals which, with 152 pages and approximately 650 references, is about three times the coverage given in the first edition. Particularly noticeable is the large growth of data on structure and transformations over the past 40 years. Whereas optical properties of the most common polymorphs (quartz, tridymite and cristobalite) are given on the very first page, one must wade through more than a hundred additional pages to find the optical properties of the high-P polymorphs (coesite and stishovite) on p. 103.

Next treated is the nepheline–kalsilite group (137 pages, up from 40 pages in the first edition), petalite (13 pages *versus* 5), leucite (11 pages, down from 13), the sodalite and helvite groups (52 pages *versus* 20), the cancrinite group with its 15 members listed in Table 17 (17 pages *versus* 11), and the scapolite group (105 pages *versus* 17). It's unfortunate that the optical data corresponding to the 20 analyzed samples were not given, leaving a lot of blank space under Table 21. The reader must pass to Fig. 293 (p. 430) to find the strongly linear relationship between composition and index of refraction. It is sad that the graphical presentation of well-nigh the same diagrams in the first edition of DHZ (vol. 4, p. 329) is ever so much clearer. Then, the significance of silvialite, listed on the opening page of the section, and a mineral only recently approved by the IMA and thus probably unknown to most mineralogists, is buried clandestinely in the text (p. 447).

Closing vol. 4B is the zeolite group, where 70 of the 99 accepted zeolite species (Table 22) are described in varying degrees of detail. This takes up an astounding 466 pages (up from 79 pages in the first edition and, in fact, alone is 10 pages longer than the *entire* volume 4 – feldpars included – of the first edition, a reflection of the growth of knowledge plus the increasing importance of zeolites as industrial minerals). Noteworthy is that analcite (now analcime) has joined the zeolites. In the first edition, analcite was isolated, and DHZ wrote (vol. 4, p. 338): "Analcite is in all respects a valid member of the zeolite group of minerals, but in structure, chemistry and paragenesis it has close affinities with the feldspathoids." And, pollucite has at last been given its merited due (p. 891-899), perhaps prompted by the seminal studies of pegmatites by Petr Černý that appeared shortly after publication of the first edition of DHZ.

Volume 4B concludes with four pages of acknowledgements and an 18-page index. Though bereft of authors, the index is thorough and a vast improvement over the rather paltry indices of some of the earlier volumes of the second edition.

Errors and shortcomings are few and far between, though a small uncertainty appears in the first table where I must assume that the misaligned "RT"s mean room temperature. Then, Figs. 68 and 215 lack scales. Again, many of the graphical diagrams, lacking a grid or ticks on one *x* and one *y* axis, are hard to read (exceptions: Figs. 10, 79, 85 and a few others). Diagrams throughout the first edition of DHZ are mainly paragons of clarity, and it is unfortunate that such a high standard wasn't carried on into the second edition. Yet, on the whole, there's not much here to criticize in a book of nearly 1000 pages!

To round off, vol. 4B is enormously detailed and thorough. It is a *tour-de-force* through the whole range of non-feldspar framework silicates. It is a leading and all-inclusive reference work that will be indispensable to advanced students and researchers. On the other hand, undergraduates and petrographers dealing with routine problems will find the first edition easier to deal with. Even though it now has passed its 40th birthday, the old vol. 4 is not to be discarded.

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Encyclopedia of Geology (5 vols.). Edited by R.C. Selley, L.R.M. Cocks, and I.R. Plimer. Elsevier, Amsterdam (www.elsevier.com). In Canada and the Americas, available from Elsevier, Customer Service

Department, 11830 Westline Industrial Drive, St. Louis, Missouri 63146, U.S.A. 2005, 3297 + xxxvii pages. US $1200 (ISBN 0–12–636380–3).

A spate of encyclopedias in the Earth sciences has come off the press in recent years. I have reviewed several for *The Canadian Mineralogist*, and summarized the characteristics of five (v. 35, p. 1609). Elsevier's *Encyclopedia of Geology* is the best of the lot. This is a massive work. The five volumes weigh in at 12.7 kg, take up 22 cm of shelf, and total 3297 pages. The xxxvii pages are repeated at the opening of each of the five volumes.

The encyclopedia is arranged by 133 chapters, ordered alphabetically, that range from 2 to 143 pages in length. Thirty of the chapters are divided into from 2 to 23 subchapters that total 235 in all. Specifically, each of the volumes can be summarized as follows: Vol. 1, Africa to Engineering Geology, 31 chapters and 30 subchapters, 594 pages; vol. 2, Engineering Geology to Fossil Vertebrates, 10 chapters and 61 subchapters, 545 pages; vol. 3, Gaia to Moho Discontinuity, 45 chapters and 46 subchapters, 659 pages; vol. 4, New Zealand to Sedimentary Processes, 25 chapters and 50 subchapters, 692 pages; vol. 5, Sedimentary Processes to Weathering, 22 chapters and 48 subchapters, 807 pages. Note that vols. 1 and 4 terminate in the midst of chapters. A few chapters close with a glossary or list of terms, and every chapter and subchapter carries a final line or two of "See also", a list of cross-references to direct the reader to kindred sections elsewhere in the encyclopedia. The vast majority of chapters and subchapters have 10 and 20 references ("Further Reading"). A few have only one reference (Geological Surveys, Geology of Beer, and Geology of Whiskey), and one (Oceania) has more than 30. Where I feel competent to judge, the references have been well chosen and should easily lead the reader to a broad range of major citations under the subject. References are not cited directly in the text, which makes for particularly easy reading.

The *Encyclopedia of Geology* is richly illustrated, chiefly in color. Outstanding are most of the geological maps and the detailed "Global Boundary Stratotype Sections and Points" (vol. 5, p. 506-515). Graphs, diagrams and line drawings abound, and in general add greatly to the presentation.

The three editors deserve praise indeed. They have done a superb job. Apparently, they laid out strict ground rules, and then assured that they were followed assiduously. Despite the great range in the length of chapters, from cover to cover the encyclopedia reads smoothly, with neither hump or hiatus. All chapters are rich and well-crafted summaries of their respective fields of knowledge. I shall not list my favorites beyond saying that the chapter "Analytical Methods" brought me up to date in a field that has undergone remarkable advances in recent years, and that religious fundamentalists should read the chapters "Biblical Geology" and "Creationism" to achieve a balanced view. Nevertheless, gems are to be found here and there. Based on 50 years of personal regional mapping, I was delighted to read: "Trousers are best made of quick-drying, close-weave cotton, not jeans" (vol. 3, p. 47, "Geological Field Mapping"). How true! This chapter also features lovely hand-drawn illustrations.

The opening introductory pages of the *Encyclopedia of Geology* are well-nigh duplicates of one another from volume to volume. Pages vi–vii list the 26 members of the Editorial Advisory Board and their affiliations. Eleven members are from the UK, and seven are from other European countries. Only four are from Canada or the U.S. This distribution parallels rather closely the affiliations of the 316 contributors (p. xvii–xxv) and, not to be taken as a criticism, reflects the European slant of the encyclopedia. Two of the editors are themselves contributors. The contents of the full five volumes are given in each tome (p. xxvii–xxxvii). Inside front covers carry a NASA color photograph of the Earth and Moon. Inside rear covers are adorned with a much simplified monochrome geological time-scale. The fifth volume concludes with a finely detailed 217-page (!) general index which multiplies the usefulness of this superlative encyclopedia.

In a work as vast as the *Encyclopedia of Geology*, errors and shortcomings are inevitable. I shall list a few. Geographic coordinates on Figs. 3, 4 and 6 (vol. 1, p. 121-124) would aid the reader to relate them to other maps in the same chapter. Figures 2 (vol. 1, p. 143-144); 2 (vol. 1, p. 281); 3, 4 and 5 (vol. 3, p. 299-301); and 1 (vol. 4, p. 476) are largely illegible. Country names on Fig. 1 (vol. 1, p. 165) are wanting; not all readers will know where are Kazakstan, Turkmenistan, Uzbekistan, Krygystan, or Tajikistan. Figs. 5 (vol. 1, p. 349) and 5 (vol. 2, p. 239) have inverted legends with oldest at the top, which may catch readers unaware. That neither Alfred Russel Wallace nor the Galápagos Islands are mentioned in the subchapter on Charles Darwin (vol. 2, p. 184-187) is surprising. Also, it would have been more balanced to have included subchapters on one or more of the great geologists of North America such as Sir William Logan, James Dwight Dana, or Grove Karl Gilbert. It's Sedgwick's (not Murchison's) Cambrian (vol. 2, p. 215), and Sial's melting point is not 200–300°C above that of Sima (vol. 2, p. 248). The mixing of Celsius and Farenheit in the chapter "Geysers and Hot Springs" (vol. 3, p. 115-117) is unfortunate, as is the absence of a location map and geographic coordinates on Fig. 12. "Travertine is particularly widely used in McDonald's restaurants" (vol. 3, p. 116). Well, not

those that I have set foot in. Plastic reigns. Travertine is common, on the other hand, in entranceways of classy office or apartment buildings. The absence of a north arrow (vol. 3, fig. 5b, p. 279) is misleading. North is not "up", but rotated 50° counterclockwise from the long axis of the image. Table 5 (vol. 3, p. 606) lacks units. It is Baja, not Bajo California (vol. 4, fig. 1, p. 49), and fig. 11 (vol. 4, p. 237) is a total loss. It is Ecuador (not Equador, vol. 5, p. 9), and the caption to Fig. 12 (vol. 5, p. 139) does not seem to relate to the figure. The mean distances of the five outermost satellites of Neptune (vol. 5, table 5, p. 292) are wrong, and I suspect that the surface gravity of Pluto (vol. 5, table 6, p. 293) is likewise in error. Many figures lack scales, greatly diminishing their utility. A partial list, given by volume and page, is: Vol. 1, p. 435; vol. 3, pp. 274 and 523; vol. 4, p. 619; and vol. 5, pp. 28-36, 66, 68, 109, 115, 207, 229, 230, 279, 345, 446, 452, and 552.

Encyclopedia of Geology is an outstanding reference work. It stands above the competition in quality, organization and accessibility. Directed chiefly at the undergraduate level in geology, it is furthermore a useful tool for graduate students and professionals, as well as students in other fields. No college or university with a program in the Earth Sciences should be without *Encyclopedia of Geology* in its library.

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