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BOOK REVIEWS

A Systematic Classification of Minerals. By James A. Ferraiolo (2003). 2206 Harwood Lane, Bowie, Maryland 20716-1107, U.S.A., jferr@erols.com, 441 + viii pages. Classification Additions and Corrections (2004), 18 pages. US$50 (ringbound) + US$5 postage in USA and Canada; overseas additional. CD–ROM version US$22 postpaid (3.5 MB). No ISBN number.

The classification contains columns for Dana classification number, name of mineral species plus polytype symbols, chemical formula, questionable mineral species, crystal system, and space group (158 + 3 pages). A bibliography (6 + 1 pages) contains journals cited and general bibliography. The viii pages contain title page, contents, and introductions to both the 1982 and 2003 editions.

An alphabetical tabulation contains columns for mineral name, Dana classification number, Strunz & Nickel (2001) classification number, CNMMN number or Dana 6^{th} or 7^{th} edition reference, and 0 to 25 references (277 + 12 pages). The tabulation contains about 4,000 mineral species; however, mineral species without references are unpublished minerals accepted by CNMMN and available from mineral dealers. An *American Mineralogist* abstract is also added to some references. The tabulation also contains about 800 discredited mineral names with correct names of the mineral species; however, discredited mineral names without references usually have a Dana 7^{th} edition reference.

The additions are mainly new mineral species and new references. The corrections are mainly changes to the Dana reference number; however, two mineral species have not yet been assigned Dana reference numbers. A list of CNMMN approved but unpublished mineral species (2 pages) contains 34 mineral species in the period of 1987 to 2001. Mineral dealers provide the names of 12 mineral species. The policy of CNMMN is that a mineral description should be published within two years of approval.

This volume uses the 78 classes of Dana; however, the mineral species numbers are different. For instance, zinc is 11.10 in Palache *et al.* (1951), 1.1.5.1 in Gaines *et al.* (1997), and 1.1.8 in Ferraiolo (2003). No separate numbers are given to polytypes, since they are regarded as crystallographic varieties by CNMMN. Class 16 (carbonates containing hydroxyl or halogen) has been divided into class 16A (anhydrous) and class 16B (hydrated).

Diacritical marks ä, å, ç, ö, ü, and I are included, but rarely an acute or chek. Aërinite has ë, but not kësterite. The present CNMMN ruling is that the diacritical marks should be included after the original location or person; however, a severe problem occurs when the original mineral species description does not follow this rule.

One aspect of the book that must be praised is that about 100 minerals are regarded as doubtful, although a "?" and "D" would be more informative than a "X" for a doubtful and discredited mineral by CNMMN, respectively. The number of errors found is about average for a large book of data. The CNMMN-approved names of aluminium, baryte, spherocobaltite and sophiite should be used; however, the CNMMN-approved names of natroautunite and metanatroautunite were used in the corrections.

"Type" suggests structure-type, so that the term "subclass" is more appropriate. Rather than the abbreviations cubic, hex., trig., tet., orth., mon., and tric.; the accepted symbols of C, H, T, Q (quadratic), O, M, and A (anorthic), respectively, could be used. Rather than the "preferred" space-group, the space-group aspect would be more informative. Where the nomenclature was approved by CNMMN but no number is available, the term "IMA" would be useful.

The use of square brackets in the chemical formula to show structural units is excellent. "Amorphous" should be replaced by "non-crystalline", since a mineral species is a solid and not a liquid or gas. The International Union of Pure and Applied Chemistry (IUPAC) states that symbols before chemical formula such as "α-", "β-", "γ-", "λ-", and "ϵ-" with mineral species names should not be used, because different authors have used different symbols for the same mineral species.

Over 150 years ago, the introduction of the chemical classification was a major step forward; however, this classification does not actively consider crystal structure. Therefore, in my opinion, a chemical classification is obsolete, and a structural classification is better.

The book is printed on a good-quality paper, and the text is easy to read. The strength of this publication lies in the list of references, which are descriptive, chemical, and crystallographic or structural rather than based on a new locality. My recommendation is a CD-ROM, which will be regularly updated with a purchase price that is reasonable.

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Introduction to Ore-Forming Processes. By Laurence Robb. Blackwell Publishing, 108 Cowley Road, Oxford 0X4 1JF, UK, 2004, 373 p. 400 ZAR Paperback (ISBN 0632063785).

Here at last is a first-class senior undergraduate – postgraduate textbook focused on the spectrum of geological processes involved in the genesis of ore deposits. Professor of Economic Geology at the University of the Witwatersrand, and Director of its Economic Geology Research Unit, Laurence Robb has worked for over two decades in many of the great mineral districts of Africa (including the Bushveld Complex, the Witwatersrand gold fields, and the Central African Copperbelt) and is familiar with numerous ore deposits world-wide. In the introduction, Robb discusses mineral resources and emphasizes that the term "ore deposit" is inappropriate in a professional description of a mineral occurrence, but is best employed "...as a descriptive or generic term." Thus, what may be economically viable in one nation's economy may not be extractable at profit in another. Early emphasis too is placed on the need to understand the processes whereby metals become concentrated in the Earth's crust, not only for the purpose of establishing and sustaining reasonable standards of living for humankind, but also for the benefit of people dealing with environmental preservation and remediation.

Central to all, Robb argues, in the need to understand metallogeny and the genesis of mineral resources, including fossil fuels. This can be achieved effectively by classifying mineral deposits in terms of processes. To this end, the table of contents is divided into four parts and six chapters: Part 1, Igneous Processes (Chapter 1, Igneous ore-forming processes, 2, Magmatic-hydrothermal ore-forming processes); Part 2, Hydrothermal Processes (Chapter 3, Hydrothermal ore-forming processes); Part 3, Sedimentary/Surficial Processes (Chapter 4, Surficial and supergene ore-forming processes, 5, Sedimentary ore-forming processes); Part 4, Global Tectonics and Metallogeny (Chapter 6, Ore deposits in a global tectonic context). The in-depth, up-to-date and upbeat treatment of these five admittedly rather broad categories has resulted in a remarkably handy 373-page volume.

My review copy states that this book was first published in 2005. This impossibility aside, kudos are merited on all the important fronts. For example, hydrothermal processes receive most attention, with Chapters 2 and 3 taking up 139 pages. In Part 2, which is dedicated to this topic, the author clearly explains the spectrum of physical and chemical processes that bear on fluid flow and fluid–rock interaction within the Earth's crust. I was surprised not to find reference to work by W. Fyfe in the bibliography and suggested further readings, but hey, one can never do it all. As in all chapters, Robb packs an enormous amount of information and advice central to the study of economic geology in this portion of the book. Included are substantial subsections on metal solubilities, metal complexing, mechanisms of precipitation, and metal zoning, together with a balanced range of examples to help illustrate the roles of the principal fluids involved. Specifically, the fluids under consideration are: seawater (*e.g.*, volcanogenic massive sulfide deposits), meteoric water (*e.g.*, sandstone-hosted uranium deposits), connate water (*e.g.*, red-bed copper deposits), and metamorphic water (*e.g.*, orogenic gold deposits), and waters of mixed origin (*e.g.*, iron oxide – copper – gold deposits). Most appropriate too, in this reviewer's opinion, Robb includes a half dozen pages on biomineralization, which presentation, although all too brief, is well thought out and commands a careful read. "Boxes" highlighting examples seem "de rigueur" in modern texts. One might wish that at least the shading could have been omitted, for it does absolutely nothing to improve readability of the subject of interest. Presumably the author will have had little choice in this matter, the procedure being now so well established (worse luck!)

Summaries at the end of each chapter have been carefully assembled. In each case, these are accompanied by a short list of "Further Readings". Then, there are about 20 pages of references, including the names of authors of those "...many excellent texts...that describe the Earth's mineral deposits" (from the Preface, p. vii) so familiar to all teachers of the discipline. But this book is by far the best of the lot. This, despite the compact size of the volume, for which a special tribute to the author is due, in view of the tremendous advances that have been made in the discipline during the last couple of decades. Most important of all, this book shows clearly that the study of ore-forming processes merits inclusion in mainstream Earth-sciences curricula. No question whatever, *Introduction to Ore-Forming Processes* succeeds in its principal stated purpose, that being "...to provide a better understanding of the processes as well as the nature and origin, of mineral occurrences and how they fit into the Earth system."

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