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BOOK REVIEWS

Barren Lands: an Epic Search for Diamonds in the North American Arctic by Kevin Krajick. Henry Holt & Company, 115 West 18th, New York, N.Y. 10011, U.S.A. 464 p., soft cover. CDN $42, ISBN 0–7167–4021–5.

Kevin Krajick has written a truly fascinating and fast-paced book centered on the search and discovery of diamond in the Barren Lands of northern Canada and the opening of the Ekati mine. Whereas this is a scientific detective story, it is much more. It is a fact-based real adventure story, with secrets, spies, attempted murder, mysterious fires, plane crashes and feats of daring and courage. But the book provides also a rich historical context that traces the history of diamonds and their exploitation. It is full of interesting details and little-known facts. For example, diamond was first mined in India in 400 B.C. In North America, the search for diamond goes back 450 years, and the first discovery was not in Canada, but in the United States. The first North American diamond mine was in Arkansas, and its long and mysterious history is linked with even today's world through the past involvement of former President Bill Clinton. The reader is treated to tales of scams, larceny and frauds, including the Great Diamond Hoax of 1872 in the United States. The exposer of this scam was C. King, who went on to become the first Director of the United States Geological Survey. The text visits many locales, some exotic, some strangely beautiful, but also stark and dangerous. Much of the book centers around the exploits of Canadian geologists Chuck Fipke and Stew Blusson, who, building on the framework data of the Geological Survey of Canada, seized upon the Barren Lands for diamond exploration and later mining. They are true characters in their own right, and we learn about their many idiosyncrasies. One had a penchant for sardines and oatmeal for breakfast, whereas the other often wore only a golf shirt for protection against "... enough biting insects to eat a planet...", as are found in the Barren Lands, where enveloping clouds of mosquitoes can be seen long before the approaching person. This is an enormously enjoyable book that commands and holds the reader's attention. Sub-themes include the growing knowledge about diamond, its origin and occurrence, the development of the use of other minerals to signal the proximity of kimberlites and, most importantly, the "secret" chemical signatures in these so-called "indicator minerals" that herald the presence of a diamond-bearing kimberlite. Krajick's account is factual, but has the color and storyline of a Hollywood blockbuster with the poor but brave lone heroes (Fipke, Blusson, and others) facing the immensely rich but faceless empire of a manipulative cartel (De Beers).

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The Oxford Companion to the Earth. Edited by Paul L. Hancock and Brian J. Skinner. Oxford University Press, 70 Wynford Drive, Don Mills, Ontario M3C 1J9, 2000. 1174 pages, CDN$104.95 (ISBN 0–19–854039–6).

A spate of Earth-science encyclopedias has reached the marketplace over the past score of years. I summarized five of the more popular ones in a table that accompanied a review a few years ago (*Can. Mineral.* **35**, p. 1609). We now have yet another: The Oxford Companion to the Earth (Cambridge published theirs in 1981; see the aforementioned table).

The present addition to the encyclopedic stable, here referred to as The Companion for short, is a truly imposing volume. It is 6 cm thick, weighs 2.5 kg, and contains nearly 1200 pages of fine (8-point) type printed on choice, substantial acid-free stock. The text is supplemented by hundreds of tables, line-drawings, and photographs (none in color).

The Companion is made up of more than 900 entries, each six pages or less in length (the longest, Fossil plants, is eight pages). Entries are arranged alphabetically, from Acid rain to Zoogeomorphology, and cover the solid Earth, atmosphere, hydrosphere, planetary geology, and capsule biographies of some 90 outstanding Earth scientists. The Companion is the combined work of 266 contributors (listed, with addresses, on p. vii–x), chiefly from the U.K., followed by the U.S., and a sprinkling of other nations. Eight Canadians are in the muster. The editors, Paul L. Hancock (1937–1998) and Brian J. Skinner are eminent scholars in the Earth sciences and clearly have chosen their contributors with care.

Each entry is basically a summary overview of a topic. Most topics are predictable: Archaean eon, Braided rivers, Collisional orogeny, Deep-sea trenches, and on down the line through Water-table, Yardangs, and Zone fossils. There are, nevertheless, eclectic and amusing entries: Fraud in geology, Music and the Earth sciences, and Wine and geology. One finds also a few unexpected and rather narrow entries, such as: Specialization in the Earth sciences after the Second World War. The entry on asbestos (by Jill Schneiderman) merits particular praise. In only half a page, it puts into sound scientific focus a topic that has ballooned into a wholly irrational "new age" issue. Kudos!

The entries end on page 1118(!), and are followed by four appendices: Geological timescales, Numerical data about the Earth and Solar System, Periodic table of the elements, and a pot pourri of units and abbreviations. To help readers, the appendices are succeeded by a 6-page thematic list of subjects, and a 40-page general index. Eight maps that depict the distribution of land masses from the Late Proterozoic to the modern world are printed on the endpapers.

Errors found by this reviewer are sparse, and only one is serious: the text on p. 625 is inexplicably truncated. The first spelling error is on the first page of text (meterology for meteorology, on p. iii). Others are Columbia for Colombia (p. 21), Vostock for Vostok (p. 23), and so on. The heading DVI in table 1 (p. 128) is misplaced, the Scopes trial was in 1925, not 1926 (p. 186), and the labelling of a mantle pyroxene as perovskite (p. 654) perpetuates a misconception. More care in decimal-justification would have made some of the tables easier to read (p. 184, 276, 1121, and others). Finally, most of the entries offer anywhere from one to half a dozen references. Having at least one reference for every entry, even the biographies, would be beneficial.

For whom is The Companion? The editors have cast their net widely, aiming at a broad readership: "...to those with a concern for the environment; to those who simply wish to know more about planet Earth...", as well as town planners, civil engineers, administrators, and politicians (p. iii). It is for the practicing mineralogist only if he/she is seeking background information in a neighboring field. It is for the student who perhaps needs to fill a void here or there, but is not in quest of a concise definition. It is for the intellectually motivated non professional. In short, The Companion is a sound, scholarly reference work that can stand proudly among its encyclopedic cohorts.

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Rock Magnetism: Fundamentals and Frontiers. By David J. Dunlop and Özden Özdemir. Cambridge University Press. The Edinburgh Building, Cambridge CB2 2RU, United Kingdom 573 pages. 2001. CAN$76.42 (paperback). ISBN 0–521–00098–X.

The study of the magnetism of rocks may seem to many readers to be a highly specialized field, but a moment's reflection serves to remind us that it is a topic that has been at the very heart of many major developments throughout the Earth Sciences in recent decades. The role of geomagnetic polarity reversals in the rise of plate tectonics is the most outstanding example. But the role of polar wandering in the earlier theory of continental drift should not be forgotten. The current use of magnetic stratigraphy to establish robust chronologies, of paleopoles to establish tectonic histories and of paleodirections to unravel the intricacies of the geodynamo all demonstrate its widespread success. To these, we may add the knowledge that the magnetism of meteorites and lunar samples provide concerning the evolution of the Solar System. So, specialized or not, there can be no doubt that rock magnetism is not a topic to be lightly dismissed. Without a solid understanding of how magnetism gets into geological materials, of where it resides and how it can be decoded, we run a severe risk of constructing a grandiose house of cards.

Over the years, a number of textbooks on rock and mineral magnetism have appeared, but the Dunlop and Özdemir volume is the yardstick by which all others must be measured. It will undoubtedly become the standard reference for the next generation. By issuing this paperback version, to augment the extremely well-received original 1997 hardback version, the publishers have done a great service to the wide readership that can, and should, benefit from this excellent book. The volume itself contains 17 chapters, the first of which is a hors d'oeuvre comprising 15 pages on magnetism in general and the many ways in which rock magnetism, in particular, is applied in the Earth Sciences. What follows are three substantial courses, each one a meal in itself. The first of these consists of 6 chapters (totaling 185 pages) describing in great detail the basic ingredients, the fundamentals of magnetism (chapter 2), magnetic minerals (chapter 3), the energy budget (chapter 4), magnetic domains (chapter 5), microscopic observation techniques (chapter 6) and theoretical calculations (chapter 7). Everything one needs to understand the subject from the atomic scale upward is here. It is particularly gratifying to see the recent developments in micromagnetic calculations given such a thorough treatment. But there are many other tasty morsels, including a lucid description of magnetic fields inside magnetized particles of various shapes (essential for assessing energies and thereby predicting domain structures) and up-to-date summaries of the MOKE and MFM (Magneto-Optical Kerr Effect and Magnetic Force Microscopy) techniques.

The next course again consists of six chapters (190 pages), this time dealing with the various ways in which natural materials can become permanently magnetized. This so-called remanent magnetization (RM) is absolutely central to the success of the subject, since it is the means by which a readable geological record is handed down to us. Thus we have thermoremanent magnetization (chapters 8 and 9), viscous remanent magnetization (chapter 10), isothermal remanent magnetization (chapter 11) and crystallization-remanent magnetization (chapter 13), or as the chef would put it, TRM, VRM, IRM and CRM. Chapter 12 provides an essential component emphasizing the vital role played by particle size as opposed to physical mechanism. It covers the middle ground between true single-domained (SD) particles and true multidomained (MD) particles, an area that has become steadily more and more important since Frank Stacey first put pseudo-single-domain (PSD) particles on the menu in 1963.

The last course consists of four chapters (136 pages) that describe the main features of magnetism in the three major terrestrial rock categories (igneous in chapter 14, sedimentary in chapter 15 and metamorphic in chapter 16), plus those of extraterrestrial (lunar and meteorite) samples. Having digested the earlier courses, the diner can now appreciate not only the main contributions that rock magnetism has made to geology and geophysics (such as geomagnetic polarity reversals, polar wandering and plate tectonics), but also the finer points of the cuisine (such as how the rock magnetic record is encoded and how it can be meaningfully deciphered).

The whole book is handsomely produced, with clear illustrations and an attractive layout. Furthermore, it is worth pointing out that there is scarcely a topic to which the authors themselves have not made important contributions through their own enormous research output: the reader is certainly in good hands. If one wishes to quibble, one could have asked for a little more about the Earth's magnetic field itself (since without it, it is unlikely that any of the topics discussed would have ever arisen), and a tiny bit more on the now fast-developing fields of biomagnetism and environmental magnetism. But after such a satisfying meal, this is perhaps bordering on gluttony! As it is, it's a meal fit for a king, and I strongly recommend it to the widest possible audience. Bon appétit!

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Ores and Minerals of Rare Earths, Thorium and Uranium (*Lanthanides and Actinides*). By E.I. Semenov. GEOS, Moscow, Russia, 2001, 307 pages, hardcover, in Russian (ISBN 5-89118-192-4).

The majority of researchers interested in geochemically evolved rocks would most likely be familiar with the works of Semenov on rare-earth minerals, including his 1963 monograph and a chapter in Vlasov's *Geochemistry and Mineralogy of Rare Elements* (1966, IPST, Jerusalem). That is why I was very much looking forward to seeing this new book, published under the auspices of the Fersman Mineralogical Museum, Institute of Mineralogy, Geochemistry and Crystal Chemistry of Rare Elements, and Inter-Regional Center for Geological Cartography (all in Moscow, Russia). However, already a brief acquaintance with *Ores and Minerals* brought me disappointment and a sense of confusion as to the purpose of this book. Because the English résumé provided in the monograph, at the very least, does not reflect its coverage, and a due paragraph in the *Chemical Abstracts* will unlikely be any more informative, I shall first outline the book's contents in a "non-opinionated" fashion.

The first chapter, General Information on Scg (Sc, Y, Ln, An), opens with a brief retrospective on the history of discovery of the rare-earth elements (hereafter, *REE*), actinides and Sc. The following section describes the place of these elements in the Periodic Table, and discusses the relationship between their atomic structure, physical characteristics, reactivity, and the properties of selected *REE*- and actinide-bearing compounds. The last six pages are occupied by Tables 4 and 5, which list Sc-, *REE*- and actinide-bearing minerals, their formulae and the relative abundances of individual *REE* elements in their composition.

Chapter 2, entitled Genetic Types of Scg Mineralization and Ores, is an extensive 59-page discussion of the distribution of Sc, *REE*, U and Th in terrestrial rocks, meteorites and lunar basalts. This chapter begins with an overview of elemental abundances averaged by rock type, and carries on to discuss the occurrence of Sc, *REE*, U and Th in various geological and petrographic settings. The latter are characterized in the following order: ultramafic rocks, mafic rocks, alkaline silicate rocks, granites and pegmatites, metamorphic and clastic sedimentary rocks, carbonatites, carbonate sedimentary rocks, apatite-rich rocks, phosphorites, evaporites, "oxide rocks" (banded iron formation, gondites, manganese nodules, bauxites), miscellaneous sulfide-rich parageneses, "halide rocks", fossil fuels, waters and soils. Most descriptions of the endogenic settings are augmented with geological maps and tables listing the major *REE* and actinide minerals. The occurrence of Sc, *REE*, Th and U in the surficial milieu is discussed largely in terms of the "bulk" abundances of these elements, and correlations between those abundances and the chemistry of a precursor (source) rock.

Chapter 3 (Geology, Geography and Economics of Scg) is concerned with the distribution of Sc, *REE*, Th and U resources around the world, and some economic aspects of their extraction and beneficiation. Table 32 lists major deposits of *REE*- and actinide-bearing minerals, classifying them into eight groups (foidites, biotite granites, granite hydrothermalites, aegirine granites, aegirine "hydrothermalites", carbonatites, phosphatites [*sic*], and placers), and Table 33 lists most localities mentioned in the book. Tables 34 and 35 include data on the global production of *REE*, and *REE* reserves in seven major Russian deposits: Lovozero, Khibina, Belaya Zima, Ulug-Tanzek, Katugin, Seligdar and Yareg.

Various aspects of the geochemistry of Sc, *REE*, Th and U are covered in Chapter 4, Evolution of Scg and their Correlation with Other Elements. The first half of this Chapter is an attempt to correlate relative abundances of Sc, Y, lanthanides and actinides with major compositional characteristics of their host minerals and rocks, and to establish evolutionary paths of these elements in diverse petrogenetic processes. The second half discusses affinities of Sc, *REE*, Th and U for other elements, and the importance of these geochemical trends for mineral exploration, including such aspects of the latter as indicator minerals and the distribution of *REE* among minerals from the same paragenesis and among different parageneses. This section features several tables and diagrams illustrating the distribution of *REE* and actinides in the Earth's crust, selected minerals and rock types.

Chapter 5, entitled Mineralogy of Scg, begins with notes on the history of *REE* research in mineralogy, and an overview of contemporary instrumental methods employed for the analysis of *REE* in minerals and rocks. The following sections deal with general aspects of the crystal chemistry, isomorphism and properties of *REE*-bearing and related minerals. The crystal chemistry is discussed in the following order: symmetry, ordering, polytypism, structure topologies and coordination polyhedra. Chapter 5 concludes with an analysis of *REE* spectra of selected minerals, and looks into the possible driving mechanisms of *REE* partitioning.

Descriptions of Sc, *REE*, Th and U^{4+}-bearing minerals (Chapter 6) occupy nearly 40% of book's volume. They are arranged on a "group" basis, in the following order: oxides (29 pages), borates (0.5), carbonates (14), silicates (46.5), phosphates and related compounds (25), sulfates (1), halides (4), sulfide and other minerals (1.5). A typical description contains the generalized formula of a mineral, provenance of its name, principal information on mineral's symmetry, chemistry and physical properties, and concludes with a list of occurrences. Many descriptions are complemented with tabulated analytical data, including chemical compositions and relative abundances of individual *REE* (in total, 162 tables). In addition to Sc, *REE*, Th and U minerals *per se*, Chapter 6 also includes minerals in which these elements substitute for other cations. As discussed in the preceding chapters, some of these phases may be sufficiently abundant and enriched in *REE* (or actinides) to become a major carrier and economically viable source of these elements (*e.g.*, apatite at Khibina). The maximum recorded levels of *REE*, as well as the relative abundances of Y and individual lanthanides in rock-forming felsic and ferromagnesian silicates, also are provided.

The final chapter (Geology and Mineralogy of Scg-groups and Individual Elements) is essentially a summary of the data presented in Chapters 1–6, laid out in an element-by-element format. Sc, Y, lanthanides and actinides are considered here in separate sections. For each of the elements, the description begins with a historical note, and carries on to a discussion of its distribution among major rock types and, for principal carriers, among different minerals in the same paragenesis. Most descriptions conclude with an overview of various economic aspects concerning the element, such as its practical applications, available resources, and market price. Chapter 7 contains 24 tables, about one third of which list the abundances of individual *REE*, and their ratios (La/Nd, Yb/Lu, *etc.*) for chondrite meteorites, lunar basalts and selected terrestrial rocks. The rest of the tables catalogue Sc-, *REE*-, and actinide-bearing minerals (both major and minor carriers), with formulae and examples of deposits.

Despite the broad coverage attempted, most of the book is a poorly organized collection of chemical analytical data. It suffers from many serious omissions, inconsistencies and errors. For example, I was surprised to read that Mitchell *et al.* (2000, *Can. Mineral.* **38**, 145-152) reported an ordered distribution of cations in loparite-(Ce) (p. 130). Actually, this is *exactly* what Mitchell *et al.* (2000) looked for, but did *not* find! On the next page, it is stated that arsenoflorencite is not a valid mineral name, even though arsenoflorencite-(Ce) *was* approved by IMA in 1985 and published two years later. One page down, the author remarks that, because the compositional data for gysinite are limited to a single sample, we "probably have no right to speak of that mineral as being characteristically enriched in Nd" (p. 133, translation mine). However, since the discovery of gysinite at Shaba, it has been found at two other localities, both of which also yielded gysinite-(Nd)! And this list goes on....

Apart from the text, I was dissatisfied with many of the data presented in Tables. Analyses dating back to the pre-microprobe era are plentiful, which probably explains why such minerals as ilmenite, pyrophanite and goethite (among others) were classified as "containing 1–5% R, Th, U" (Table 5). For example, the description of *REE*-bearing titanite features the analyses by Erdmann (1844) and Semenov (1967), even though there are scores of more recent microprobe-derived data available (*e.g.*, Russell *et al.* 1994, *Can. Mineral.* **32**, 575-587; Chakhmouradian & Mitchell 1999, *Mineral. Petrol.* **67**, 85-110). Finally, I find it extremely inconvenient that all mineral compositions reported have Y and lanthanides grouped as REE_2O_3, whereas the data for individual elements are given as separate Tables. Most references, cited in the Tables and text, are virtually useless because they include only a senior author's name and the year of publication. Although Semenov claims that using these data as search criteria, one can readily find the complete reference, I do not believe that it is that easy. For example, which of Khomyakov's five or so papers published in 1996 is referred to on page 105? How about Pekov (1997), mentioned on page 41? The matter is further complicated by incorrectly given years: *e.g.*, Vinogradov's data on KREEP basalts cited in Table 6 could not have been published in 1962 simply because the term KREEP did not appear until the early 1970s. Then, when did this paper really come out? The list of references (p. 303–304) contains only 68 titles, 60% of which are older than 1980 and 19% feature Semenov's name, whereas such important contributions to the mineralogy and geochemistry of *REE* as Bingen *et al.* (1996, *Geochim. Cosmochim. Acta* **60**, 1341-1354), Yakovenchuk *et al.* (1999, *Minerals of the Khibina Massif*, Zemlya, Moscow), Elsevier's series *Handbook on the Physics and Chemistry of Rare Earths*, and many others have been overlooked or left out.

The style of presentation adopted in the book makes it extremely difficult even for an occasional reading, let alone consulting it on a regular basis. Some topics (*e.g.*, Crystal Chemistry) are dealt with in an insufficiently detailed and even excursive manner, whereas others (like relative abundances of *REE* in rocks), in my opinion, receive too much coverage. One of the most obvious flaws of this book is the author's disregard for the existing guidelines on the nomenclature of minerals and rocks. I find it particularly surprising because *Ores and Minerals* was published under the aegis of the Fersman Museum – undoubtedly, the most research-oriented mineralogical museum in Russia. On page 133, Semenov claims to have refined the nomenclature of *REE* minerals by combining minerals with different Levinson's modifiers under one name (*i.e.*, monazite, bastnäsite, *etc.*), and yet invents a bewildering multitude of new names. His "new" system is cumbersome and completely devoid of systematic approach. A good taste of what I am referring to is provided by the description of allanite (*sensu lato*) and related minerals on pages 198–202, that includes: orthite, CaAl-orthite (defined as having Ca:Ce = 1–3 and Al:Fe = 3–5), Ceg-Fe-zoisite (Ca:Ce = 3–7, Al:Fe = 5–11), Ceg-Fe-epidote (compositional range not defined), Ceg-epidote (not defined), yttro-orthite [obsol., allanite-(Y)], Y-orthite, CeNd-orthite (not defined), orthite-LaCe (not defined), GaGe-orthite (not defined), CaMgAl-orthite (not defined), magno-orthite (not defined), hydro-orthite (not defined), and Ceg-piemontite (not defined). In my opinion, such revisions can hardly qualify as an improvement of the existing nomenclature!

In addition to the "new" mineral names, the author regularly refers to old, discredited and varietal names, without even warning the reader that his mineralogical lexicon does not comply with the contemporary standard. Examples are numerous, and include ferutite (var., davidite), taiyite [var., aeschynite-(Y)], marignacite (obsol., ceriopyrochlore), polymignite (obsol., zirconolite), weibyeite [obsol., calcio-ancylite-(Ce)], keilhauite (var., titanite), kanaekanite (obsol., turkestanite–steacyite series), chlorotile (var., agardite), and so forth. Further, some mineral groups have been single-handedly renamed (*e.g.*, "hatchettolite group", p. 167; "semenovite group", p. 189, *etc.*), and numerous mineral formulae "revised". In many cases, the newly invented formulae are not even charge-balanced (*e.g.*, gysinite, ancylite and kamphaugite in Table 36, schorlomite and kimzeite on page 195, olgite in Table 219). In these revisions, one is further perplexed by the fact that the conventionally accepted acronyms for *REE* have been changed to author's own R, Scg, Ceg, Gdg, Ybg, Smg, and Yg. The relationship among these groups, supergroups and subgroups (as he refers to them) is not straightforward, and does not readily stick in one's memory. These innovations seem particularly unnecessary, given the plentiful choices already available in the geological and materials-science literature: *REE*, *RE*, *LREE*, *HREE*, *Ln*, and *TR*.

The nomenclature of rocks and related petrological terminology also suffered from revisions. Some rock names are used incorrectly (*e.g.*, "foidite" appears in place of feldspathoid syenite throughout the monograph), whereas many others (like "alhyperbasites", p. 32; "Mn-oxidites", p.76; "chloridites", p. 101, "sodites", p. 274) are simply made up. The same rock type may be referred to differently in different parts of the book (*cf.* Vishnevogorsk "biotite-foidite" in Table 11, and miaskite in Table 227). Some sort of jargon is also commonplace in the descriptions of rock textures, geochemistry and petrogenetic processes (*e.g.*, "comagmates", p. 34; "hypopotassic", p. 35; "epigenites-gigantites", p. 108, "lanthanophile" and "neodymophobe", p. 117). These numerous neologisms affect the style to such an extent that it is not always possible to understand what the author is trying to convey.

Last, but not least, the author has modified many Occidental and Australian geographic names, in a few cases, almost beyond recognition. For example, I found numerous mentions of Olympicdam and OlympicDam in the book, but the real name was nowhere to be discovered. Similarly, Mont Saint-Hilaire is reduced here to Sainthilaire, SaintHilaire and Saint-Hilaire; different combinations of these names are commonly used in consecutive paragraphs and even consecutive lines (*e.g.*, p. 174). The Democratic Republic of Congo is persistently referred to as Zaire, and Kenya as East Africa (*e.g.*, Table 33).

In my opinion, the most useful part of the book is sections 2.1 through 2.7 that describe some of the important occurrences of *REE*, Th and U minerals, and provide important details on their geological setting and mineral parageneses. Here, you can find maps and information on several Russian localities that, until very recently, had been classified. Examples include the Strel'tsovskoe ore field (the type locality for several U minerals) and Karasug (home to karasugite and tikhonenkovite) in southern Siberia.

To summarize, I would certainly hesitate to recommend *Ores and Minerals* to any serious student of the mineralogy and geochemistry of rare earths. Neither is this book likely to interest the "uranium community", principally because (i) it does not cover U^{6+}-bearing minerals (except for a few lines on pages 60, 255 and 291), and (ii) it can hardly compete with the recently published MSA volume *Uranium: Minerals, Chemistry and the Environment*. Amateur mineralogists and collectors will most probably find the nomenclature problems insurmountable, and the complete absence of crystal and texture images disappointing. For all of the above reasons, I can only recommend selected parts of this monograph to individuals interested specifically in the topomineralogy of a particular "covert" locality in the former USSR.

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Is the present the key to the past or the past the key to present? James Hutton and Adam Smith versus Abraham Gottlob Werner and Karl Marx in interpreting history. By A.M. Celâl Şengör. Geological Society of America, Special Paper 355, 3300 Penrose Place, P.O. Box. 9140, Boulder, Colorado 80301-9140, U.S.A., 2001, 62 pages (ISBN 0-8137-2355-8).

This book starts by a citation from Johann Wolfgang von Goethe (1829): "A wrong hypothesis is better than none, because the fact that it is wrong does no harm; but when it takes root, when it is generally accepted, becomes into a sort of article of belief which no one doubts, which nobody may investigate; that is the real evil from which centuries have suffered."

This book is a contribution to the philosophy of geological research. The author's interest concerning philosophical thinking started when he was undergraduate student at the State University of New York at Albany. At that time, he believed that every geologist going to the field should have a preconceived theory in mind in order to see whether that theory was true, but he could not understand the often-voiced opinion among geologists that one had to go to the field with an open mind, and there, on the basis of observations, to try to develop multiple working hypotheses. Then, he realized that there were two kinds of geologists: those able to test their most cherished preconceived hypotheses and change their minds when necessary, and those who were unable to do so. Şengör tries to give an answer to this dilemma by reading about Karl Popper's essays (Magee,1973: Karl Popper: the Modern Masters series, Viking Press, New York, 115 p.).

This book analyzes the answers to two questions (1. Is history the key to present? 2. Is the present the key to understanding history?) by four well-known researchers, two natural scientists [James Hutton (1726–1797) and Abraham Gottlob Werner (1749–1817) and two social scientists (Adam Smith (1723–1790) and Karl Marx (1818–1883)]. These scientists have had great impact in their chosen fields to this day, and the answers continue to influence the way we live.

The author points out that Adam Smith and James Hutton realized that interpretation of history must be based on a comparison with present, *i.e.*, Smith's economic history upon contemporary human behavior and market development, and Hutton's geological history upon actual landscape. In contrast, Abraham Gottlob Werner taught that a visible succession of strata is interpreted as the result of progressive aqueous deposition, and Karl Marx's economic history was an inevitable progressive evolution of society from primitive to capitalist to communist. Both Werner and Marx assumed that only the end phase of the phenomenon they investigated was available for direct study. However, both Hutton and Smith wanted to learn what had happened earlier.

The author tries to objectively synthesize in detail and reconstruct the temporal context of these four scientists (natural and social) with written documents about them and with his personal thinking, in order to point out their substantial contribution to our modern society. I recommend this book to scientists of all disciplines.

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