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BOOK REVIEWS

Igneous Rocks: A Classification and Glossary of Terms (*Recommendations of the IUGS Subcommission on the Systematics of Igneous Rocks*). Second edition. Edited by R.W. LeMaitre. Cambridge University Press, New York, N.Y., 2002, 236 + xvi pages. US$65 (ISBN 0–521–66215–X).

A decade ago I evaluated the first edition of this useful book, and I urge the interested reader to consult that review (*Can. Mineral.* **30**, 1182) because it applies broadly to the second edition as well.

Igneous Rocks: A Classification and Glossary of Terms is a bit wider, higher, and thicker than its predecessor, which bore the title *A Classification of Igneous Rocks and Glossary of Terms*. It is noteworthy that the second edition's moniker is in keeping with a swelling trend toward the inclusion of a colon in book titles, something that personally I deplore. I refer to it as the "colon cancer of book titles". (As an example of the prevalence of this illness, of the 129 technical and scientific books reviewed from January to October, 2001, in the *American Scientist*, fully 95, or nearly 75%, bear colons in their titles.) All too commonly, a colon is no more than a path of least resistance, a measure of sloppy writing that causes confusion rather than clarity. Worse, in many examples, the colon dilutes the impact of the title and puts at the end what should come at the beginning. *Igneous Rocks: A Classification and Glossary of Terms* is a case in point. The subject of the book is *not* igneous rocks; it is a classification. The switch of titles between the first and second editions is unfortunate indeed.

The format of the second edition parallels closely that of the first. Introductory materials and notes on the principles of the IUGS classification and nomenclature take up the first few pages. Included here is an homage to Prof. Albert Streckeisen, the father of it all, who passed away in 1998 at the age of 97. In his portrait (p. viii), he holds a fine-looking cigar in his right hand ("Pipe and cigar smokers of the world, unite...").

The nuts and bolts of the text, the IUGS classification itself, takes up a scant 36 pages (p. 7-42). It is arranged into the following groups: pyroclastic rocks, carbonatites, melilite-bearing rocks, kalsilite-bearing rocks, kimberlites, lamproites, leucite-bearing rocks, lamprophyres, charnockitic rocks, plutonic rocks, and volcanic rocks. The major changes from the first edition are a rewriting of the section on melilite-bearing rocks, new sections on kalsilite- and leucite-bearing rocks, and the replacement of the section "lamprophyric rocks" by three wholly independent sections on kimberlites (our ignorance of these hybrid and jumbled rocks is evident!), lamproites, and lamprophyres.

A long (p. 43-158) and useful glossary of 1637 terms (51 more than in the first edition) takes up nearly 50% of the book. It includes innumerable rare terms that may befuddle researchers. Type localities and references are cited. The 316 recommended terms (from 'acid' to 'wehrlite', 19 more than in the first edition) are highlighted in bold capitals. The glossary is followed by a bibliography of terms (p. 159-208; 809 references, up from 791), with brief analyses of their sources.

Three appendices conclude the text. The first is a list of the 455 participants (not 456, as stated on p. 1) from 51 (not 52) nations. Twenty-five participants (5.5%) are Canadian. Appendix B is a four-page list of the 316 recommended terms (redundant, as they are already flagged in the glossary). The last appendix is on the IUGSTAS software package, which appears to be a long-cut aimed at those Earth scientists who like to spend hours immobile before a computer screen. Certainly there are quicker and hardware-free shortcuts (pencil and paper plus a calculator) to the TAS classification.

Let me leave this review by offering a few objections and observations. A rock with 0% glass is not a glass-bearing rock. Rather than a range of 0–20% glass for these rocks, <20% would be more appropriate (Table 2.1). Then, the rigid adherence to color index terms is unfortunate. Under the recommended scheme (Table 2.2), a diorite with 10% modal mafic minerals is considered leucocratic (true), as is a granite with 35% modal mafic minerals (false). Also, the newly introduced terms "hololeucocratic" and "holomelanocratic" are etymologically incorrect (the first must have a CI of 0, and the second a CI of 100).

Adhesion to the rule that modifiers be given in order of increasing abundance is an aberration. What in the field would be a biotite granodiorite with sparse scattered grains of hornblende, by the IUGS classification would be a hornblende–biotite granodiorite. Shameful!

During my years as a graduate student (1958–1964), a clear trend prevailed to get away from odd and specific rock-names; yamaskite became melagabbro,

nordmarkite became quartz syenite, and so on. In more recent years, this trend has been turned on its ear, and the introduction of new names for rocks has enjoyed a resurgence. In fact, the greatest number of introductions ever in a single year, 57, took place in 1973 (Table 3.4). This proliferation is due in part to the IUGS classification itself (p. 48).

Outright errors in the volume are scarce. One is the omission of the "thick stippled lines" in Figure 2.17. The writing is mostly clear and concise, but the misuse of adverbs of time permeates the text.

Finally, a remarkable historical blindness is displayed in the very opening lines (p. 1): "Decades of field and microscopic studies and *more recent quantitative geochemical analyses* have resulted in a vast, sometimes overwhelming, array of nomenclature and terminology associated with igneous rocks" (my emphasis). It is as though CIPW had never existed! That vast and ambitious classification scheme, based on, yes, quantitative geochemical analyses, flourished not yesterday, but a century ago. It produced hundreds (if not thousands) of new rock names, most now mercifully forgotten, and led to a magnificent compilation of 8602 geochemical analyses in a huge (1201 pages, 4 kg) and timeless publication: *Chemical Analyses of Igneous Rocks* by Henry S. Washington (*U.S. Geol. Surv., Prof. Pap.* **99**, 1917).

In summary, *Igneous Rocks: A Classification and Glossary of Terms* is an indispensable reference and cook book for up-to-date petrographers and regional mappers. If you have the first edition, you may not need the second unless your particular interests lie with melilite-, kalsilite-, and leucite-bearing rocks, or with kimberlites, lamproites, and lamprophyres. In my earlier review, I made mention of the yellowed issue of *Geotimes* from 1973. The pages of my copy of *A Classification of Igneous Rocks*, now 13 years old, are patently yellowing at their edges. The bright new second edition has a far fresher look. One only hopes that the publisher chose a superior quality of paper, because this is a book that will have a long life as a major and authoritative reference.

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The Company I Kept: The Autobiography of a Geologist. By John Rodgers, The Connecticut Academy of Arts and Sciences, P.O. Box 208211, New Haven, Connecticut 06520-8211, U.S.A., 2001, 223 pages. US$35 (ISBN 1–878508–23–7).

What a genuine pleasure it is to read (and review) this short autobiography of one of North America's major living geologists. How fortunate we are that he took the time to write it. My pleasure is enhanced by knowing Prof. Rodgers personally, albeit rather peripherally. We first met shortly after I began regional mapping in southeastern Connecticut for the U.S. Geological Survey in 1956, and our paths crossed frequently at meetings and NEIGC field trips during the ensuing decade. I am ever grateful to Prof. Rodgers who, unlike many of his contemporary professorial types and "established" geologists (including some from Yale), was accessible, friendly, and downright helpful to me as a neophyte trying to unravel the complex plutonic geology and mantling surficial deposits of what proved to be a piece of Avalonia. The four quadrangle maps that came out of my work were indeed enhanced by this enthusiastic and constructive mentor.

The Company I Kept opens with a short prologue, followed by 16 chapters arranged more or less chronologically, and a one-page epilogue. The book concludes with a selected list of 83 publications in four languages, from 1937 to 1997, and a three-page index of names. With the exception of Chapter 5, the text is tightly woven around people particularly influential in the development of a rich and joyful geological life that has already spanned two-thirds of a century. Nearly 50 of these people are (or were; 18 of the 47 are now deceased) geologists; the rest are family, musicians, and scholars. Not only is the author's unusual literary tactic wonderfully human, but it also gives the reader delightful insights about the professional lives and personal characteristics (as well as some idiosyncracies!) of a number of well-known figures. It is to this ample cast of characters that Prof. Rodgers dedicates his book (p. 11). The accuracy and detail of his accounts are enhanced by referral to a personal diary kept since 1930.

Rather than to summarize *The Company I Kept* (it already is quite compact), I should like to dwell on a few points that seem especially pertinent, things that carry weight. The first is the importance of breadth. We

live in an age of specialization where the goal seems to be (facetiously) "to learn more and more about less and less until one knows everything about nothing". The result is, of course, unendurable sterility. Such a worldview may lead to skillful technicians, but it will produce no great scientists. Although Prof. Rodgers may be an international authority on orogenesis and the structure of mountain belts, it is his compelling interest in geography and history, languages and literature, music and art that has made him an interesting communicator and a great teacher. Along these lines, the softening (our outright elimination) of foreign-language requirements for graduate degrees in mineralogy and geology is a disastrous step backward. A second point is the importance of historical background in teaching: to expose the development and evolution of ideas. What we teach today was not discovered today, or even yesterday. No, one cannot effectively teach mineralogy without mention of Haüy, the Danas, or the Braggs; optical mineralogy without mention of Sorby or Rosenbusch; igneous petrology without mention of Bunsen, Daly, or Shand; metamorphic petrology without mention of Grubenmann, Harker, or Ramberg; and so on. The author's cognizance of this facet of teaching is clear. A third point is the importance of openness and the avoidance of personalizing scientific disagreement. Many examples where personal acrimony held sway over reasoned discussion are found in *The Company I Kept*. Some are truly odious. A final point is the importance of finding a vocation early. Students who are "fired up" on a subject in secondary or even intermediate school carry with them a huge advantage when they enter university. The fortunate informal family connections to geological mentors during the high-school years of Prof. Rodgers played an important role in his development as a professional (p. 24-27).

Only now, on reading *The Company I Kept*, did I learn that it is to Prof. Rodgers that I owe what was probably the geologically most stimulating day of my career. Away on a sabbatical year (1959–1960), Prof. Rodgers arranged to be replaced by S. Warren Carey, a Tasmanian Wildman and mega-iconoclast (p. 194–195). Prof. Carey took the time to give talks at many Canadian and US universities during his year at Yale. He came to Brown University (where I was a graduate student) on Thursday, October 15, 1959, and gave a barnburner of a talk that left no one indifferent. In fact, delivering in his stentorian voice that a fixist view of the Earth was "rubbish", that the permanence of continents and oceans was "rubbish"... and substantiating his views with strong evidence, changed the Department of Geology forever. The next day, the staff member who was to drive Prof. Carey to the NEIGC meeting in Rutland, Vermont, took ill, and the departmental Chairman, Prof. A.W. Quinn, asked if I'd do the honors. Was I delighted to accept! Prof. Carey and I poled into my eight-cylinder 1936 Hudson and headed north. The trip took nearly 12 hours because we stopped at innumerable road cuts to discuss the rocks, many diners for coffee to discuss history, ethnology, and linguistics (he taught me the rudiments of the Papuan language for which he'd worked out the syntax), and all along the way, offering a smattering of Tasmanian humor and expounding on the folly of conventional thinking.

The Company I Kept is nearly free of typographical errors. In a few places, the writing is a bit awkward and could have benefitted from gentle editing. Nevertheless, the only place where truly the thread is lost is at the top of page 145. Illustrations consist of 27 black-and-white photos, and 13 small maps. Many of the photos are too grey, and P.B. King (p. 68) would have done a far better job than the computer with the maps.

Reading geological biography and autobiography has been a great source of enjoyment for me through the years, and I can earnestly recommend the menu to all Earth scientists. It offers a wide variety of flavors, my personal favorite being Raphael Pumpelly's "Reminiscences", published in two volumes (1918). *The Company I Kept* is a fine appetizer because it is contemporary and accessible. Don't read it as you would a scientific paper, or even a novel. Imagine instead that you are sitting at a campfire, having eaten supper after a good day in the field, a mug of "cowboy coffee" in your hands, and before you, sitting on another log, is John Rodgers telling you a bit about his life. It's fascinating.

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Noble Gases in Geochemistry and Cosmochemistry. Edited by D. Porcelli, C.J. Ballentine and R. Wieler. Reviews in Mineralogy and Geochemistry, volume 47. Geochemical Society and Mineralogical Society of America, Washington, D.C. 2002, U.S.A., 844 pages. US$40 for nonmembers, US$30 for members. ISBN 0–939950–59–6.

Noble Gases in Geochemistry and Cosmochemistry is the ninth in a series of reviews published jointly under the banner of the Mineralogical Society of America and the Geochemical Society. Discovered little more than 100 years ago, the noble gases are a unique group of elements, the isotopic and elemental composition of which is evidently closely linked with astrophysical, cosmochemical and geochemical processes on Earth and throughout the Solar System. It is a great accomplishment to have presented here in one coherent volume such an enormous amount of information together with relevant detailed discussions.

This volume consists of 18 chapters: 1) An overview of noble gas geochemistry and cosmochemistry, 2 to 7) Reviews of noble gases across the Solar System, 8 to 15) Reviews of noble gases in Earth's mantle, crust, lakes, groundwater, ocean water and sediments, 16) Review of cosmic-ray-produced noble gases in terrestrial rocks, and 17 and 18) Chapters relating to K–Ar (including Ar–Ar technique) and (U–Th)–He geochronology.

Each chapter stands as an independent review, complete with introduction and references. The editors have placed the chapters in a special sequence, designed to promote readers' understanding of the relationship between the content of noble gases and their isotopic compositions in different substances. Each review is illustrated with graphs and tables well suited for reference purposes.

Chapter 1 begins with a discussion of the problem of noble gas isotopes and the behavior of noble gases in different substances. It also contains definitions of keywords, which will be much appreciated by readers for whom this subject is relatively new. Chapters 1 to 15 provide an overview of techniques used in analyzing noble gases, as well as an outline of the usefulness of the resulting data. The history and chronology of the noble gases are also set out here, together with profiles of important contributing scientists. The authors of Chapter 16 discuss noble gases formed by interactions of high-energy cosmic-ray particles with rocks; the focus is mainly on cosmogenic helium and neon. Chapters 17 to 18 provide an overview of the use of noble gases (unfortunately only argon and helium) for dating and thermochronology. These applications are fully presented, from methodology through problem-solving.

This important volume is addressed to workers in various scientific pursuits. It should certainly prove of interest to professionals in physics and chemistry, Earth sciences, ocean sciences, climatology and environmental sciences in general, and likewise to students in these disciplines.

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Geology of the Deposits of the Kovdor Massif. By Olga Rimskaya-Korsakova and Natalya Krasnova. Edited by G.F. Anastasenko. St. Petersburg University Press, St. Petersburg, Russia. 2002. 146 pages, hardcover, in Russian (ISBN 5-288-02859-1).

The Kovdor massif in the Kola Peninsula (Russia) is one of the more complicated alkaline ultramafic and carbonatite complex in the World. It represents a rather rare case where an entire sequence from olivinite to carbonatite is present, well preserved and excellently exposed. And of course, it is rather well studied, to judge from the list of references in the book under review. Thus any publication about Kovdor is very interesting for many geologists, petrologists, mineralogists, and economic geologists studying and working on alkaline complexes.

This new monograph, written by Natalya Krasnova, contains a full compilation of Rimskaya-Korsakova's publications, who studied the mineralogy and geology of the Kovdor massif for over 25 years starting in 1945; she died in1987. Moreover, Natalya Krasnova has used many more recent and personal geological data and a compilation of modern papers to describe the geology of Kovdor. The book consists of two prefaces (the editor's and the authors'), an introduction, seven chapters, a conclusion and a list of references.

The first chapter (19 pages) is about the history of discovery of the Kovdor massif and related deposits. It covers the industrial and mining development in the Kovdor area from 1933 up to the present. A reader can find here much interesting information about what happened during the early geological expeditions, mapping and investigations of this wild northern territory, close to the Arctic Circle. There are many old and modern black-and-white photos in this chapter, which allows the reader to get to know geologists, including the one who discovered the Kovdor deposit of titanian magnetite, K.M. Koshits), scientists, engineers, managers and all the others, who made a major contribution to Kovdor studies and its industrial development.

The general geological context of the Kovdor massif and its internal structure are described in the second chapter (12 pages). This is mostly a compilation, taken from published articles and monographs. The reader is reminded that all famous alkaline ultramafic complexes of the Kola Peninsula are situated within Early Proterozoic intracontinental rift systems (NE strike) activated in the Middle to Upper Paleozoic (370–290 Ma). The localities of alkaline intrusions are controlled by intersections of this ancient rift system with deep W–NW-striking faults. According to data in the references, the Kovdor massif intrudes biotite gneiss of Late Archean to Early Proterozoic age. The authors do not contribute directly to this information, and they limit themselves to citing the literature. In the second part of this chapter, the reader can find a short description of the internal structure of Kovdor. It consists of nine different rock series (or complexes ?) of different ages: 1) olivinite, olivine–pyroxene rock (?), pyroxenite; 2) melilite and monticellite rocks: turjaite, melilitolite, monticellitite; 3) ijolite–melteigite series: ijolite, melteigite, jacupirangite, ijolite–urtite and malignite; 4) rock of the phlogopite complex (?); 5) phoscorite complex; 6) vein ijolite;

7) carbonatites; 8) vein nepheline syenite complex (?); 9) apatite–"francolite" complex (?). ["Francolite" is written here with quotation marks because it is not an IMA-approved term; a synonym is carbonate-fluorapatite; ed.] From the text and the schematic geological maps and cross-sections that are presented, it is clear that ultramafic rocks occur in the core of massif and are surrounded and cut by ring intrusions of alkaline rocks and various carbonatites. The last-named unit forms also conical intrusions with foci at different levels. It is not made clear why, but unfortunately the authors used a different legend for the geological map and the cross-section drawn through the massif. This makes it difficult for the reader to understand the geology of Kovdor. Moreover, the authors do not use a correct terminology in describing of different groups of rocks. On one hand, they call some groups of rocks series, and on the other, they refer to individual complexes. In one case, a rock group is named on the basis of rock names, and in another case, on the basis of a mineral name. What does phlogopite or apatite–"francolite" complex mean? What kind of rock do they consist of? One cannot find answers to these questions in the text of this chapter. In the final part, the authors present age data, determined by different researchers and methods. They note that the most reliable age was obtained by the K–Ar method using phlogopite, and conclude that the Kovdor massif formed in the time interval 435–370 Ma without providing any evidence in the text.

All the following chapters become more difficult to read and understand because of the absence of clear internal structure and the presence of numerous ancillary details that cloud the main issues. Chapter 3 (22 pages), entitled Geology – Petrographic Characteristic of Rocks of the Kovdor Massif, seems to contain complete information about the shape of rock bodies, their relationships to each other, and, of course, a general petrographic description. This description must be very explicit, without minor, unimportant details, because it is not possible to give an adequate account of everything taking place in such a complicated alkaline complex like Kovdor and hope that a reader can get a satisfactory impression about it. I agree that it is very difficult task, but it isn't a problem with the reader, but rather with the authors. In many instances, the authors make a declaration about the genesis (magmatic or metasomatic) of some type of rocks without any evidence, or on the basis of opinion of the majority of geologists. There are several tables of chemical data and modal compositions of rocks in this chapter. But there are no petrochemical diagrams here displaying rock variations or trends. One cannot understand why the chemical data are required if the authors do not use them to make an interpretation.

At the end of the third chapter, the authors note that six different deposits are related to the Kovdor massif: 1) titanian magnetite deposit within olivinite, 2) phlogopite deposit in ultramafic pegmatite, 3) complex iron – phosphorus – rare-element deposit related with calcite – magnetite – forsterite rock, 4) carbonatite deposit, 5) apatite–"francolite" deposit, and 6) vermiculite deposit in the upper part of the phlogopite deposit. The geology of these deposits is described in the following chapters (4–7).

The title of the fourth chapter, "Geological Structure and Rocks Features of the Phlogopite Complex" (read phlogopite deposit), is not a good one. As I noted above, it is not clear what is meant by a "phlogopite complex". As is well known, the Kovdor phlogopite deposit is one of the largest in the world. About 80% of phlogopite resources of Russia are concentrated here. The main body is $200 \times 500 \times 300$ m in size, and single crystals of phlogopite may be 1–2 m across. The authors suggest that this body represents a huge magmatic alkaline-ultramafic pegmatite formed before the deposition of the titanian magnetite ore. In this point of view, they disagree with common opinion that the phlogopite deposit is the result of an autoreaction-skarn process. There is no doubt that ultramafic forsterite–phlogopite and diopside–phlogopite pegmatites could form during an episode of skarn formation. Perhaps the final decision about this controversial topic will require additional arguments, which are not provided here. The upper zone of the phlogopite deposit, down to a depth of 50–100 m, is strongly altered, and phlogopite has been transformed to vermiculite. Unfortunately, the vermiculite deposit is not described here.

Chapter 5, "Geology and Description of Rocks of Complex Apatite–Magnetite Deposit (Ore Complex)" focuses on the description of various phoscorites. Unfortunately, instead of the internationally recognized term "phoscorite", the authors commonly make use of the Russian neologism "camaforite", which stands for calcite – magnetite – forsterite assemblage. Moreover, they believe that rock name "phoscorite" was derived from the name of the "Phoscor" Mining Company. In my opinion, this is incorrect. The term "phoscorite" was used to describe magnetite – olivine – apatite rock with a carbonate core by H.D. Russel *et al.* in 1955. Phoscorites with various amounts of rock-forming minerals are named here forsteritite (F), apatite – forsterite (AF) rock, apatite – magnetite – forsterite (AMF) rock, forsterite – magnetite (FM) rock, calcite – forsterite – magnetite (CFM) rock, calcite – magnetite (CM) rock, apatite – calcite – magnetite (ACM) rock, and apatite – magnetite (AM) rock. There are many such acronyms in the text, which adds difficulties for the reader. It will be more important to understand what common genetic features link these rocks in one whole complex. The authors especially emphasize that they can illustrate the vein nature of the most phoscorite rocks in the Kovdor massif. They tried to show this complicated situation in

Figure 5.1 (p. 78). The presence of too many details makes this scheme absolutely impossible to understand. I am sure that any schematic geological diagram, map, cross-section and so on must reflect not only the true situation, but also some understandable relationships between rocks, order of emplacement of rock sequences and, of course, the authors' geological hypotheses. One cannot decipher what the authors wish to say with this schematic diagram. At the end of the fifth chapter, the authors propose a theoretical model for the origin of phoscorite, carbonatite and the related titanian magnetite ore that is similar to well-known petrological models (*e.g.*, Le Bas 1977).

In Chapter 6, on "Carbonatites, Their Types and Textural and Structural Features", the authors describe carbonatites, which are closely connected with the various phoscorites. They distinguish four types of carbonatites, and ask readers to scrutinize Table 5.1 in the previous chapter, where are indicated the order of their formation and their connection with the various phoscorites. The reader is surprised to find there six types of carbonatites. Moreover, in the text, the authors distinguished an additional variant, aegirine–calcite carbonatite, and underscore its earlier formation in comparison to the dominant calcite carbonatite. I have a question. How many different types of carbonatite are present in the Kovdor massif? We again see the same flaw. There are a lot of small details and an absence of common features. In the previous chapter, carbonatites were described also because they are involved in the phoscorite sequence and closely related with these rocks. I am puzzled; what was needed was to have separate descriptions of carbonatites. Many facts are repeated in the two chapters. In Table 6.1 (p. 110), one can find a few chemical compositions of calcite carbonatite (Cc1), calcite carbonatite with tetraferriphlogopite (Cc2), and dolomite carbonatite (Dc3). What is interesting is that compositions of Cc1 and Cc2 carbonatites are very similar, but modal compositions are rather different, especially if you compare calcite : dolomite ratios (?). The authors offer no comments. What is clear from the text is that calcite carbonatite is absolutely dominant, dolomite and calcite–dolomite carbonatites are less developed, and *siderite and ankerite carbonatites* (again additional types of carbonatites not described in the text) do not form separate bodies.

In the seventh chapter, on "Geology of Apatite–"Francolite" Deposit and Types of "Francolite"- Bearing Rocks", the authors describe one of the youngest and lowest-temperature rocks of the Kovdor massif, enriched in "francolite". The authors have analyzed all geological and mineralogical features of this rock, along with conditions of mineral equilibrium, and concluded that "francolite"-rich rocks formed like explosive breccia pipes during the latest stage of carbonatite evolution, at which point melts were extremely enriched in a separate fluid phase. The final evolution of this material took place at a shallow level and under low-temperature conditions. This model is contrary to the widespread opinion that "francolite"-rich rocks represent a crust on carbonatite bodies due to weathering. But on the basis of evidence presented in this book, the former model also is possible.

To summarize, I have to say that this book made a very strange impression on me. No doubt, Kovdor is a very famous and interesting alkaline ultramafic and carbonatite complex. According to the list of references in this book, it is rather well studied by various researchers using many modern methods, including geochemical and isotopic techniques. Such data are absent in this book, as are data about the composition of rock-forming and accessory minerals. Perhaps, the authors do not have their own information about these features, but they could have used data from published papers. Moreover, there are no petrochemical or geochemical diagrams here, which makes it impossible to trace the evolution of the very complicated Kovdor massif. On the other hand, there are a great many relatively unimportant and some totally unimportant details in the text of each chapter. Very often, the authors use local names of rocks, unknown to the international geological community. There are too many acronyms (name of rocks, minerals and so on), adding difficulties to readers. It seems to me that the book was written very hastily. If one is not an expert in Kovdor geology, it will be very difficult to understand the contents of this book and get some important (or general) information from it. But, if one is already an expert, this book is really not necessary.

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