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BOOK REVIEWS

The Petrographic Microscope. By Daniel E. Kile. Mineralogical Record, Special Publication 1, US$20.00 (available from The Mineralogical Record Inc., P.O. Box 35565, Tucson, Arizona 85740, U.S.A.), 2003, 96 pages.

Of all complex scientific instruments, probably none has been in use for so long with such few fundamental changes as has the petrographic microscope. The instrument used by today's students doesn't differ much from that used by Harry Rosenbusch to teach visiting North American geologists the new science of optical petrography in the 1870s. Well, today the microscope is made of light metal and plastic rather than brass, we may focus by moving the stage rather than the tube and view our sample with both eyes, and we've forsaken the candle as our light source, but those details aside, the good Prof. Rosenbusch would quickly and easily adapt to one of today's instruments.

The "book" here under review is a floppy magazine-like booklet with shiny covers that in size and thickness calls to mind an issue of *MacLeans* or *L'actualité*. Nevertheless, any resemblance to a news magazine is dispelled by content: *The Petrographic Microscope* is a serious and carefully documented account of the origins and development of the petrographic microscope and its accessories from their beginnings in the mid-19th century to about 1980. The pages are free of chit-chat, speculative political opinions, and above all, they carry no mind-numbing advertising. This booklet is handsomely illustrated with dozens of beautifully reproduced color photographs, mostly of petrographic microscopes and ancillary equipment.

Let me here issue a warning; your reviewer is prejudiced. For the past 35 years he has used, nearly exclusively, a brass Model CM Leitz research petrographic microscope, no. 305294, manufactured in 1932. Three features account for my unswerving fidelity. 1) Solidity. You can rest your elbows on the stage and yet the thin section stays in focus. Objectives, once centered, stay centered for years. 2) Quality. Everything is machined to perfection. The microscope is a pleasure to manipulate, and if you tire of looking through the 'scope, lean back and gaze at it. Not only is it a fine instrument, it is a work of art. 3) Interference figures. No microscope of my experience approaches the capability of this brass-bound Leitz to cull interference figures from minuscule grains; serviceable figures are readily obtained from grains as little as 0.02 mm across. Where this aged Leitz isn't up to the task, however, is for microphotography. The optics aren't flat-field; the periphery of the image curves perceptively upward. For photomicrographs, I go to modern instruments.

The Petrographic Microscope is divided (loosely!) into ten sections of decidedly unequal lengths. The first three offer background material that includes an abridged description of the traditional petrographic microscope, and hair-thin coverage of optical theory. Presentation of the Quirke method, an exceptional and sadly neglected aid for the teaching of interference figures, is particularly welcome. The author also deserves credit for his unhesitating praise of the grain-mount method of mineral identification (p. 9; Howard Jaffe's spirit lives on).

The fourth section, "Historical Development", is the heart of this publication. In pictures and words, it traces the evolution of the petrographic (and ore) microscope from humble beginnings in 1844. The section closes with a four-page table that lists more than 100 milestones that led to today's instruments. The most important historical manufacturers of petrographic microscopes (many no longer extant) are discussed briefly and richly illustrated in the following section. Oddly, "Accessories for the Petrographic Microscope" constitutes the booklet's longest section (the sixth, at 32 pages). Such commonplace accessories as oculars, objectives, stage clips, retardation plates and the quartz wedge all turn out to have surprisingly complex and engaging histories. Stages are treated next: mechanical, universal, and spindle stages. The section ends with discussions of compensators and other exotic accessories, and commercially prepared sets of thin sections.

Succeeding sections, each only one to three pages, deal with the evaluation and restoration of (antique) petrographic microscopes and their accessories, conclusions, and acknowledgements. An astounding 402 references on eleven pages conclude the volume. This richness alone is a remarkable and eminently poignant testimony to the vitality and importance of the petrographic microscope to the dynamic sciences of mineralogy and petrology.

It is disappointing that the author downplays the versatility and broad usefulness of his subject, in places reducing the petrographic microscope to a "collectible" (p. 81–83). Optical mineralogy, too, is given short shrift when cited as having had its zenith "from about 1890 to

1935" (p. 49). Any petrologist at the cutting edge of modern research uses thin sections routinely to establish (or verify) mineral reactions and textural relations that can be evaluated by no other means. This reviewer would go a step further and state that the petrographic microscope is a thinking person's instrument. The author alludes to this (p. 84): "Unfortunately, it [the petrographic microscope] has largely been replaced by "black-box" technology because of the one feature that has driven mineralogists and students away from it: it is outwardly too simple an instrument, with an origin dating back to the 19th century, it is perceived as being anachronistic. Moreover, in the absence of a computer interface, use of the petrographic microscope requires a conceptual integration of mineralogy, chemistry, and physics in a manner that requires the user to assimilate data and think within a three-dimensional framework".

The minor points are worth bringing up. Kile doesn't mention that modern petrographic microscopes, particularly student 'scopes, are constructed of light metals and are nearly weightless in comparison with their older counterparts. This contrast is only in part due to today's improved technology and lower cost of aluminum alloys; it is due also to the incorporated illumination of the newer microscopes. Previously, with an external light source, an electric lamp or a distant window (Fig. 19), it was a chore to get it all right: the tilt of the microscope tube, the placement of the 'scope itself, and the alignment of the mirror. Once right, however, it stayed right. The massiveness and weight of the microscope assured that. Then, many of the microscopes pictured (the cover, Figs. 22, 27, 29, *etc.*) have naked brass stands. I suspect that this was not their original state, and that at least the upper surfaces of the stands (see Fig. 21) were painted to prevent annoying reflections, particularly intrusive with external illumination. Rarely can collectors put up with brass (or any shiny metal) being concealed by paint.

Mineralogist or petrologist, even if you have passed wholly to the dark side and use black-box technology exclusively, thumb through (dare I ask you to read the text?) this beautiful and illuminating booklet. You'll be amply rewarded.

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The Seashell on the Mountaintop. By Alan Cutler. Dutton (Penguin Group, U.S.A.), 2003, 228 pages. CDN$36.00. Available in Canada from Penguin Books Canada Ltd., 10 Alcorn Avenue, Toronto, Ontario M4B 3B2 (ISBN 0–525–94708–6).

English-speaking Earth scientists attribute, in general, the beginnings of modern geology to James Hutton and his "bulldog", John Playfair. *The Seashell on the Mountaintop* presents the significant contributions of a remarkable Danish scientist who preceded the Hutton–Playfair duo by some 150 years. Although not unknown, this nordic pioneer certainly is underappreciated.

In the opening lecture of my undergraduate mineralogy course (it begins with crystallography; the horse should precede the cart, n'est-ce pas?), I dwell on an astute observation first recorded 350 years ago: The angle between corresponding crystal faces of a given mineral is constant from one specimen to another. This is "Steno's Law", commonly and loosely given as the constancy of interfacial angles. *The Seashell on the Mountaintop* is a short, eminently readable biography of the man who formulated this law, the somewhat enigmatic and quixotic 17th-century Danish scientist, Niels Stensen (1638–1686; a.k.a. Nicholas Steno, Nicolaus Steensen, Nicolas Sténon, Niccolò Stenone, Nicolai Stenonsis...)

Steno was born in Denmark during the depths of the Thirty Years' War. As a student of medicine at the University of Copenhagen (he never graduated, receiving his M.D. from the University of Leiden some years later), he excelled at anatomy, and by the age of 21, had become recognized for his outstanding dissections. He was influenced by a fellow Danish scientist, the meticulous astronomer Tycho Brahe, who ceaselessly stressed the importance of observation, as opposed to unrewarding restudy of authoritative texts such as Aristotle and the Bible (too many of today's geoscientists fail to heed Tycho's advice as they sit at their keyboards, endlessly massaging old data, to the detriment of fresh regional mapping, which now is seen as a low-tech occupation).

At the age of 22, Steno took his skills to Holland where, in comparison with the universal and imposed Lutheranism of his native Denmark, he found the mixture of religious faiths disturbing. In Amsterdam, he published his first geological paper, *De Thermis* ("On Hot Springs"), and a few years later, in Leiden, discovered the duct of the parotid (= saliva) gland, to this day called the *ductus Stenonianus.* On to Paris where, during a stay of less than a year, Steno firmly established his reputation as Europe's foremost dissector.

Next, Steno undertook a long and leisurely journey to Italy. In the Alps, he made extensive observations of rocks in layers, in places crammed with fossils. It was in Italy, where he was taken under the wing of the Medici family (an important protection!) and admitted to the *Accademia del Cimento* ("Academy of Experiments"), that Steno's life began its radical transformation, scientifically and theologically. He quickly burst upon the scene with numerous and significant discover-

ies. He quelled an ongoing controversy by showing conclusively, following the dissection of a shark's head, that "tongue stones" were in fact shark's teeth. He correctly interpreted graded bedding. He demonstrated that muscles work by the contraction of fibers, rather than by ballooning as was then believed. He showed that females of live-bearing species produce eggs, just as do egg-laying species. In mineralogy, he here made his fundamental observation on the constancy of interfacial angles and laid down such basic rules of the relative ages of geological objects as: 1) cobbles in a conglomerate are older than the rock, and 2) discordant quartz veins are younger than their enclosing rock. He established himself as the father of stratigraphy by introducing: 1) the principle of superposition; 2) the initial horizontality of layers, and 3) the lateral continuity of sedimentary strata. In his incomplete publication *De Solido* (1669), Steno presented for first-ever geological cross-section (of Tuscany) and mulled over the idea of a global geological time-scale, although he never proposed one.

Steno, in a pre-Darwinian world, was troubled by the observation that so many fossil shells were not represented by living species. It was not an easy task for him to defend his views against prevailing opinion that fossils were products of some sort of ill-defined *in situ* crystallization, "sports of nature".

In 1667, Steno converted to Catholicism. Six years later, under a sort of special dispensation, he was invited back to his native Denmark. At the dedication of his revamped anatomical theater, Steno spoke, saying: "Beautiful is what we see; more beautiful is what we understand; most beautiful is what we do not comprehend." In 1675, Steno returned to his adopted Italy and was ordained into the priesthood. In 1677, he was made a bishop and sent north into Germany with the mission to convert and bring back to the Church lost Lutheran souls. Here, Steno established a warm friendship with the great mathematician Gottfried Leibniz, a Protestant (!).

With time, in his declining years, Steno's exacting standards honed by his distinguished career as a scientist, came into conflict with the clerical laxity and financial corruption then widespread in the Catholic Church. He lived an increasingly ascetic life, embracing poverty and fasting. Little by little, he destroyed his health, dying of an abdominal infection in 1686 at the age of 48, viewed by some as a pauper, and by others as a saint.

The final two chapters of *The Seashell on the Mountaintop* treat, respectively, some of the absurd post-Steno geological theories, and the gradual development of a modern "old Earth" paradigm. In an epilogue, the author points out that although Steno's ideas contradict Scripture in many places, there is no evidence that the Church objected to any of his writings. Contrast this with the hysterical opposition of today's "Creation Science" to modern geological discourse! Steno's remarkable life came full circle on 23 October, 1988, when he was beatified in a mass said by Pope John-Paul II, 5992 years to the day from the creation of the world, according to the good Bishop James Ussher.

Cutler concludes *The Seashell on the Mountaintop* with a brief discussion of his sources and a list of more than 80 references, acknowledgments, and a ten-page index.

It is no easy task to write a coherent biography of a widely travelled 17th-century figure where primary sources are scarce, the subject's *opus magnus* has been lost (or perhaps, never was completed), and secondary sources are heavily colored by theological perceptions. Cutler has, in this reviewer's view, succeeded nicely. He has crafted a well-written account, amply enriched with history and science, that will interest Earth scientists curious to learn more about where it all came from. [And readers will understand the reason why the mineral *stenonite* was named after Niels Stensen in recognition of his important contributions to mineralogy (Ed.)].

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Nordic Stone. Edited by Olavi Selonen and Veli Suominen. UNESCO, 7, Place de Fontenoy, F–75007 Paris, France, and the International Association of Engineering Geology, IAEG C–10, c/o Geological Survey of Finland, Betonimiehenkuja 4, FIN–02151 Espoo, Finland, 2003, 64 pages. € 16.00, soft cover (ISBN 92–3–103899–0).

This slim volume is the product of Scandinavian academia, government, and industry to illustrate that stone has given civilization a material for shelter that is aesthetically pleasing and available in a variety of colors and textures. The objective of the publication is to contribute to a compilation of the world's stone resources. One in a series of books entitled "Stone in the World", it is published by UNESCO and the International Association for Engineering Geology and the Environment (IAEG) as part of the IAEG Commission C10 project "Building Stones and Ornamental Rocks" (the other books in this series, either published or "in preparation", unfortunately are not listed).

The book contains seven sections on the use of stone in Norway, Sweden, and Finland and includes definitions and terminology commonly used in the nordic

countries. The history and heritage of stone resources, use, and distribution, and the technologies used to discover, extract and process the material are presented, together with notes on environmental impact.

The section on *Definitions and Terminology* is essential for the lay reader because the stone industry has its own classification of rock types. For example, "granite" includes not only granite but virtually any "crystalline" rock, *e.g.*, gneiss, gabbro, and syenite. Another example is "marble", which includes some serpentinites and limestones. However, even this "classification" is not consistent. Thus, in the *Stone Resources* section, "quartzite" occurs in the flagstone, schist and quartzite subdivisions, and a new category is introduced for larvikite, rather than treat it as a variety of "granite" as indicated in Table 1.

Requisites for Natural Stone is too concise and ought to have provided more instruction on the numerous factors that make a marketable stone. Emphasis is placed on gang-saw-sized blocks of stone for use as a construction material; other uses of large and small blocks of stone, such as statuary or ornaments, are ignored. From an economic viewpoint, it is noted that the acceptability of a particular stone is largely dependent on taste and fashion. It could also have been noted that local factors and influences may play a role in selection of the stone used in prestigious buildings.

The *History and Heritage* section is an interesting and quite readable review of the 1000-year history of stone as a building material, and the development of the stone industry in the nordic countries. Photographs illustrate impressive stone buildings and historical photographs of quarrying practices.

Stone Resources and Use includes a systematic listing of areas in Norway (45), Sweden (30) and Finland (50) where stone deposits are being quarried or have been quarried. The descriptions of the various stones are arranged by country and primary rock-type. The amount of information given under the subheading "Geology" ranges from a simple geological description of the quarried rock to an extensive review of the history of the quarry and a description of the various uses of the stone. Whether or not a quarry is in use or abandoned is not consistently given. A summary of the number of producing quarries is given for each country. However, whereas detailed information is given for all the Norwegian quarries, the presentation is inconsistent for the Finnish and Swedish examples. Also, although there are numerous photographs of quarries, the location map (Fig. 9) is inadequate. The use of color would have been advantageous, and the numbering system ought to be geographically systematic rather than based on rock type. The systematic descriptions make no use of the location map.

Technologies describes the procedure from discovery of a deposit to the final product. The methods used to extract granite and soapstone blocks are clearly described, but no such details are given for limestone and marble. Photographs of some marble and limestone quarries are presented in the proceeding section, but unfortunately there is nowhere any description of methods used to extract the blocks. The photographs are generally of good quality, and the line drawings used to illustrate mining methods are helpful. The photograph of the grey Iddeford granite (Fig. 41) is distinctly yellow and does match the same rock shown in Figure 19.

Environmental Impact of the Natural Stone Industry clearly reflects the industry's awareness that minimizing the short-term and long-term effects of quarrying and processing is important and must be considered in any development plan. Most building-stone quarries produce a significant amount of waste rock, and the use of leftover material for other purposes (*e.g.*, in rehabilitating abandoned quarries, use as armor-stone, aggregate, rock walls, talc production from waste soapstone) can alleviate some of the environmental stresses.

As more than 100 quarries and over 200 commercial rock names are mentioned in the book, a more comprehensive photo gallery would seem appropriate. Unfortunately, there are only 18 small (41 $\times$ 27 mm) color photographs of polished stone. No reference is made to these photographs, nor is the scale of the photographs given.

A glossary of the various geological terms used to describe rocks is conspicuous by its absence. Terms such as "porphyritic", "foliation", the various minerals mentioned, and rock types not listed under *Definitions and Terminology,* merit a simple explanation. A "Summary" or "Conclusions" section to review the main points in each section would be very useful. Only one spelling error was noted (*polymic*, page 35).

This is an interesting and very useful little book. It provides a good and concise introduction to the stone industry in Norway, Sweden and Finland. Much useful descriptive historical, geological, and technological information is presented, along with a sampling of technical data. The geological data and terminology are clearly aimed at geologists. However, the introductions to each section and the photographs allow the lay person to appreciate the information presented. As a compilation and summary of the stone resources of the nordic countries, the book succeeds. Anyone involved with or interested in the stone industry should obtain a copy.

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New Data on Minerals. Ocean Pictures Limited, Moscow, Russia, 2003, volume 38, 172 pages, 66 color plates. Price US$29, obtainable from *Rocks and Minerals* magazine, e-mail: rocksandminerals@fuse.net

I must confess that when I received this volume for review, I was somewhat sceptical about it. With all the journals available for publishing mineralogical data, is this a reasonable addition to that list? I thought not, but after looking through the publication, my reservations were softened a bit. The varied contents of this publication should attract many readers.

The volume consists of 152 text pages plus 20 color pages. Some of the color photographs are OK, but people who have been exposed to really excellent color photographs of minerals such as those which appear in the *Mineralogical Record* and in *Rivista Mineralogica Italiana* will be disappointed. The 18 articles are arranged in four categories as indicated below; the titles are given exactly as they appear in the Contents (except for two typos).

New Minerals and Their Varieties, New Finds of Rare Minerals, Mineral Paragenesis

pages	*Title*
5-8	Telyushenkoite $CsNa_6[Be_2(Si,Al,Zn)_{18}O_{39}F_2$ – a new cesium mineral of the leifite group
9-14	Neskevaaraite-Fe, – $NaK_3Fe(Ti,Nb)_4(Si_4O_{12})_2(O,OH)_4 \bullet 6H_2O$, – a new labuntsovite group mineral
15-19	Pabstite from the Dara-i-Pioz moraine (Tadjikistan)
20-33	Rare-metal "zeolites" of the hilairite group
34-40	On the chemical composition of germanite
41-44	On germanocolusite from Kipushi (Katanga)
45-56	Mineralogy of epithermal gold–sulfide–telluride ores
57-63	Cavitation model of mineral microspherula formation in hydrothermal ores

Crystal Chemistry, Minerals as Prototypes of New Materials, Physical and Chemical Properties of Minerals

65-69	Isomorphism in the minerals of stannite-family
70-79	Additive models of optical properties in minerals of humite polysomatic series

Mineralogical Museums and Collections

81-88	Articles of Kolyvan grinding factory in the Fersman Mineralogical museum of the Russian Academy of Science
89-98	Petr A. Kochubei and his mineral collection in A.E. Fersman Mineralogical Museum
99-100	Ten tales more to the fund of the Museum
101-112	New acquisitions of the Fersman Mineralogical Museum, Russian Academy of Sciences (1997–2001)
113-124	Geographical location of mineral type localities
125-128	Archive of the Mineralogical Museum: replenishment of collections in 1909–1914
129-134	The role of A.E. Fersman in the Mineralogical Museum
135-141	A.E. Fersman's contribution to the systematic collection of the Mineralogical Museum of the Russian Academy of Sciences

Mineralogical Notes

143-146	Photographing Minerals
147-151	Reminiscences
152	Book reviews

Color Plates

i-xx	Color photographs of ornamental objects (14) and mineral specimens (52) in the Fersman Mineralogical Museum

Not only is this an impressive and varied list, but the articles are very interesting. I personally have interests that span most of the articles, and this makes me return to my initial reservation. Will a person interested in new minerals know that the descriptions of two new species can be found only in this volume? With this in mind, I prepared abstracts of the two descriptions and they will be sent to the *The Canadian Mineralogist* and the *Mineralogical Record.*

There is nothing in the volume giving the frequency of publication of subsequent volumes, but after much probing, I was able to find out that the editor-in-chief plans an annual volume. In addition to the price quoted above, subscriptions are US$26 (one year) and US$50 (two years).

One of the most important features of this volume is that the entire text is in English. Generally speaking, the translation from Russian into English appears to be satisfactory. Having stated that, I have a suggestion. It would be a great service to the mineralogical community if institutions such as the prestigious Fersman Mineralogical Museum produced volumes of English abstracts of papers published elsewhere in Russian, such as in *Zapiski Vserossiyskogo Mineralogicheskogo Obshchestva*. From a purely personal (and admittedly selfish) viewpoint, this could start with new mineral descriptions.

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Granito di Baveno: Minerali, Scultura, Architettura. Edited by Graziella Buccellati; scientific editor: Carlo Maria Gramaccioli. Published by the Università degli Studi di Milano, via Festa del Perdono 7, I-20122 Milano, Italy. 2003, 194 pages, A4 format. No ISBN number.

Serious granite petrologists are undoubtedly familiar with the attractive Baveno granite, widely used in major monuments and obelisks in Italy, elsewhere in Europe, and widely exported as Rosa Baveno. This welcome coffee-table book is all about this famous granite, quarried near Lago Maggiore, Piemonte Province. The contributors focus on history and on the mineralogical treasures recovered. The story of Baveno is closely tied to the development of mineralogy in general and at the University of Milan in particular. Father Ermenegildo Pini wrote the first article (1779) on the striking clusters of orthoclase, some up to 12 cm across, and in addition, quartz, schorl, fluorite, and mica.

Prof. Gramaccioli reproduces the illustrations and descriptions of Pini and other early contributors to the literature on Baveno, among them Romé de l'Isle in 1783 and 1803, Haüy in 1784 and 1801, and F. Gautier d'Agoty in 1801. There followed other early contributors, like Quintino Sella (of sellaite fame), Johann Strüver (of strüverite fame) and Etore Artini (of artinite fame). Key excerpts from their writings and illustrations are reproduced.

The development of quarry operations is described, with reproductions of very old quarry plans and early photographs. The historical development of major architectural projects that feature the Baveno granite is set forth, again with abundant reproductions of important documents from the 19th and 20th centuries.

Alessandro Guastoni and Federico Pezzotta review the historical development of the mineralogical holdings of the Museum of Natural History of Milan, where they are curators, and highlight the treasures that it has acquired. Slabs show off orthoclase with smoky quartz and fluorite from walls of major miaroles, and others are striking clusters with bavenite, zinnwaldite and babingtonite.

The classical minerals of Baveno are reviewed in turn, starting of course with the orthoclase, which shows striking combinations of twins, including the Baveno twin law, with (021) as the composition plane. Special attention is given to the unusual development of minerals of scandium in the miarolitic cavities; Baveno is the type locality of bazzite, cascandite, jervisite and scandiobabingtonite, as well as bavenite. Another sequence of photos shows off the holdings at the University of Milan.

The closing section of this fascinating book focuses on the miarolitic cavities. Pezzotta and Guastoni explain what these cavities are all about in petrological terms, and Gramaccioli provides a short description and thumbnail photos of the more exotic species, including SEM photos.

The Baveno granite is Permian and anorogenic. It is, in my opinion, a classic example of a metaluminous subsolvus A-type granite. The authors have provided a wonderful account of a famous granite, likely to appeal to a very broad audience, including mineralogists, petrologists, architects and historians of science.

Robert F. Martin