

## BOOK REVIEWS

**MINERAL DEPOSITS OF EUROPE, VOLUME 1: Northwest Europe.** Edited by S. H. U. Bowie, A. Kvalheim and H. W. Haslam. The Institution of Mining and Metallurgy and The Mineralogical Society, London, 1978. 362 pages, numerous tables and figures. £25 (members), £30 (nonmembers), approx. \$50.00 and \$60.00.

This volume is the first of five covering the mineral deposits of Europe (including Turkey and Russia to the Urals). If the succeeding volumes maintain the quality of this one, our science will be well served by a comprehensive, up-to-date, and extensively documented account of European mineral deposits, large and small, including both metallic and non-metallic (fuels are not covered). This volume has a large page size (11½ × 8 inches), enabling the adequate reproduction of maps and diagrams; there is a large tip-in table listing the mineral deposits in sequence of geological age, and a tip-in colored map and sections of the Outokumpu and Vuonos mines in Finland.

An introductory chapter by F. M. Vokes (38 p., 13 tables, 2 figures, 107 references) provides a general geological framework and a great deal of statistical information on production; most of the statistics are for 1974. This is followed by national chapters, as follows: Finland, by P. Isokangas (54 p., 10 tables, 18 figures, 84 references); Sweden, by E. Grip (106 p., 15 tables, 35 figures, 78 references); Norway, by J. A. W. Bugge (51 p., 9 tables, 20 figures, 97 references); Denmark and Greenland, by H. Sørensen, B. L. Nielsen and F. L. Jacobsen (11 p., 5 tables, 5 figures, 27 references); United Kingdom, by K. Dunham, K. E. Beer, R. A. Ellis, M. J. Gallagher, M. J. C. Nutt and B. C. Webb (55 p., 9 tables, 16 figures, 168 references); Ireland, by C. E. Williams and P. McArdle (27 p., 5 tables, 11 figures, 36 references). Name and subject indexes for the whole volume are included.

This book will be particularly valuable in providing excellent descriptions in English for many Scandinavian deposits for which little or no information has been available in other than the national language. The space devoted to each country corresponds well with the variety and economic significance of the mining industry therein. For those deposits with which I am acquainted, I found the descriptions excellent. In a multi-authored work of this kind, it may be invidious to select one person for special comment; nevertheless, the chapter on Sweden by E. Grip is a remarkable summary of an extremely complex geological and mineralogical region, and reflects the author's lifetime involvement in the economic geology of his country.

This book is certainly a must for any economic geologist concerned with the region, and should be available in all geological libraries.

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**PRINCIPLES OF SEDIMENTOLOGY.** By G. M. Friedman and J. E. Sanders. Wiley, New York, 1978. 792 pages. \$21.95.

A new compilation of the geology of sedimentary deposits has been prepared in text form for senior undergraduate and begin-

ning graduate students by two highly experienced sedimentologists, G. M. Friedman and J. E. Sanders. One may ask if there is real need for such a volume on sedimentology. The question is appropriate in view of the growing number of books on this subject, including several good available texts, and a tendency for many teachers to assign readings from selected sources rather than from one text. My response is strongly affirmative for several reasons, the foremost being that *Principles of Sedimentology* provides a comprehensive update of processes and products of sedimentation, compares modern and ancient sedimentary analogs, and highlights the interplay of sedimentology with other branches of geology. The subject is treated in six major categories that cover sedimentology as an adventure in ideas, properties of sedimentary particles, processes, classification and naming of rocks, analysis of modern sedimentary environments and their products in the rock record, and megasedimentology, that is, the relationship between sedimentary deposits, stratigraphy and tectonic framework.

The diverse teaching and extensive research experiences of the authors clearly have helped them produce a well-organized and thorough presentation of the subject matter. Awareness, for instance, that many undergraduates are insufficiently trained in, or perhaps simply shy away from, mathematics has resulted in the subdivision of two chapters into sub-courses: in chapter 3 on particle properties, statistics of moment measures are treated separately, and in chapter 4 on the dynamics of moving particles and fluids, the quantitative treatment of shearing resistance and particle dispersions are discussed in supplements. Useful teaching aids include the presentation in boldface type of important technical terms where they appear for the first time in the text, and the use of italics where a term or concept is defined. Valuable also are an extensive glossary, a truly massive bibliographic listing (92 pages of references) that thoroughly covers the subject matter through the 1970's, and a well-compiled subject index. The largest section of the book, consisting of five chapters, is devoted to the interpretation of depositional environments, where the reader is familiarized with characteristics of most non-marine to deepwater settings. The examples presented are synthesized from key studies by North American, European, and other workers. In these, as well as in other chapters, the authors also highlight examples from their own investigations and those of their students in the Middle East, off the U.S. East Coast margin, and elsewhere.

The prose is clear and informative, and good editing has resulted in a minimal number of errors. This text material is amply illustrated by 558 figures. The quality of some illustrations, however, is disappointing: line drawings are often gray, or with insufficiently large lettering or patterns, and half-tones are not sharply defined. This deficiency is due, in part, to the printing process used by the publisher. Moreover, the awkward size of figures has resulted in the ill-fitting position of the illustrative material on pages and too many large blank areas. It is also annoying that topics of such importance as wave and wave-influenced sediments, deltas, subaqueous gravity-displacement processes, circulation and stagnation of waters in basins, and tides and peritidal deposits are discussed as addenda at the end of the book, rather than being incorporated in the appropriate text chapters. On the other hand, favorable attention should be called to sections on the dy-

namics of moving particles and fluids, biological and chemical processes, coastal environments, and circulation and stagnation of waters in basins.

The book is a *tour de force* for which the authors are to be congratulated. It is probably the best textbook available to those teaching undergraduate sedimentology courses, and practicing sedimentologists also can profitably be directed to this broad-scope training guide.

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GEMOLOGY. By Cornelius S. Hurlbut and George S. Switzer. Wiley, New York, 1979. xii + 243 pages, 53 color photos, 265 figures, 7 tables. \$21.95.

Both Cornelius S. Hurlbut and George S. Switzer are too well known to dwell upon their qualifications for writing this new gemology textbook whose stated aim is to provide an "up-to-date textbook . . . for college courses, adult education classes, and correspondence courses." Noting the availability of many other books on gemology, they nevertheless point out that there has been published no new work specifically designed as textbook for over thirty years, perhaps a reference to the 5th edition of Kraus and Slawson's *Gems and Gem Materials*, first published in 1925 and still in print in its 5th edition of 1947. Its long publishing history indicates the continuing need for such a textbook.

In view of the availability of Smith's *Gemstones* (14th ed. by F. C. Phillips, 1972), Webster's *Gems* (3rd ed. 1975), and the several identification texts by Liddicoat, Anderson, and others, one may well ask why this new text is needed. The answer lies in the choice of material in respect to the time estimated for its absorption, the new text being obviously designed for a one-semester college course in gemology. The coverage includes all important aspects of the study but not in the encyclopedic detail characteristic of both of the Smith and Webster works, nor in the fine detail of the monographs of Liddicoat and Anderson on a narrower aspect of gemology.

In respect to scope, however, it seems that the choice of material was conditioned by the professional backgrounds of Hurlbut and Switzer, with a far stronger emphasis being placed on the theoretical basis of gemology than may be found even in the encyclopedic gemological works mentioned above. More specifically, the mineralogical parts of the new book bear more than a passing resemblance to Hurlbut's 18th edition of *Dana's Manual of Mineralogy*, including many of the illustrations which are reproduced entire or suitably modified. Considering the long success of the *Dana's Manual*, the sole responsibility of Hurlbut for many years, its choice as a model for the mineralogical discussions is both logical and wise. The contributions of Switzer are perhaps less clearly defined, but seem to begin in discussions of optical properties and the special methods of gem identification and instrumentation which follow, and in succeeding chapters where the practical applications of theory and descriptions of gem materials are treated. Despite the perils of co-authorship, the text as a whole is stylistically uniform.

In terms of specific content, it begins with preliminaries defining terms and setting the stage for the discussions which follow, the first being on the origin and occurrence of gemstones in the several classes of rocks, with special remarks on hydrothermal activity and pegmatites. Next are chapters on crystal chemistry, crystallography, physical and optical properties, with the latter being

accorded two chapters in view of the crucial role played by light phenomena in making gems the beautiful objects that they are and in explaining the principles of operation of those instruments and devices that are used in testing by the gemologist. All of the chapters so far mentioned are written in greater and sometimes more complex detail than can be found in other gemological books. In contrast, chapters on the microscope and spectroscope are very short, perhaps with the idea that the use of these instruments is given in far greater detail in specialized identification texts. Similarly, a chapter on inclusions summarizes the bare essentials of this branch of gemological study, basing its important facts on those developed over many years' study by E. J. Gübelin.

A chapter on synthesis is also brief but perfectly adequate and presents the essentials of the principles, methods, and apparatus used in synthesis. On a related topic, that of imitation, composite, and treated gems, another concise chapter is provided, but its brevity again probably reflects the view of the authors that the subject, for those students who wish to explore it more fully, is covered far more completely in identification texts. A somewhat longer chapter on lapidary work follows and is the last of the "instructional" chapter in which the gemstones are grouped according to their importance, with sections provided for organic and synthetic gemstones. The final chapter is actually a pair of determinative tables, the first listing gemstones in order of increasing refractive index, this usually being the first definitive property determined by the gemologist on polished gems, and the second listing gemstones according to increasing specific gravity, with cross-referencing between tables.

The appendix provides a discussion of interference figures in transparent gemstones and tells how they may be simply obtained and analyzed, but it seems out of place and perhaps should be brought forward and inserted in one of the optical chapters. Following this are two tables of notable diamonds, rough and cut, and again better placed under diamond in the descriptive chapter. A short statement and list of birthstones is introduced here and unfortunately separates the discussion of notable diamonds from its tables, a matter of layout that should have been corrected by the publisher.

There are two indexes, the first the usual subject index which should be improved by including the names of persons mentioned in the text, e.g., Lester Benson (p. 69, unfortunately given as "Brown"), the names of notable diamonds, and objects and gemstones depicted on the color plates. After the subject index is one for gemstones, which in effect is a summarized property table and more logically placed with the other determinative tables just ahead.

There is no set of collected references, these being given either as footnotes or at the ends of chapters. A handsome and useful feature is the color plate insert which reproduced very well and shows fine examples of cut and rough gemstones with explanations for each plate placed on a facing page. Text photographs and drawings are generally good but many figures drawn especially for the work do not stylistically match those borrowed from *Dana's Manual*, and for some future edition it is suggested that all such figures be drawn by one hand to attain uniformity. The lettering of form faces is another matter that should be resolved, inasmuch as the text discussion of the use of such letters is very brief and no listing of standard application of form letters given.

In summary, *Gemology* accomplishes what it claims to do, and for college level courses in gemology it is assured of success and should become the standard textbook. On the other hand, the

treatment in the technical portions may cause some difficulties among readers in adult education classes and correspondence courses, whose backgrounds in the sciences and mathematics are skimpy or acquired in some distant past.

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MINERAL NAMES. WHAT DO THEY MEAN? By Richard Scott Mitchell. Van Nostrand Reinhold, 135 West 50th Street, New York, New York, 10020, 1979. xiii + 229 pages. \$13.95 (hardcover).

Not since the publication, some 80 years ago, of Chester's *A Dictionary of the Names of Minerals* has there been a compendium of all well-recognized mineral names. The present work is very well written and is a delightfully interesting volume. The book is divided into two parts, comprising 80 pages of text and an alphabetical listing of the names of minerals and their derivations. The result is a most useful book which not only tells the mineralogist, geologist, or collector how the names of specific minerals were derived, but also discusses in some detail the many different ways all minerals were named and gives specific examples of each, in a most illustrative manner. This is not some lightly-composed effort; the research which preceded this volume must have been very painstaking because many of the names are derived from obscure words and classical languages. Some of the major chapters discuss mineral names derived from persons' names, places, chemical composition, the Greek and Latin languages, and many others. In addition, there are sections which discuss prefixes and suffixes, Levinson's Rules, the chemical modifiers of Schaller, and polytype symbolism. The effort is a rather complete one; this reader was impressed with the comprehensiveness of Mitchell's approach to the topic. At no point does one feel that the author is belaboring points; the text reads easily and delightfully. To one who has long been curious about mineral name etymology, the scope of this work is all-encompassing. In particular, the small groupings of mineral names under various headings, such as: names derived from botanical terms (7); names from institutions and expeditions (9); names from mythological characters (13); minerals named for women (9), and many others, are most interesting and give the reader more of a feeling for the diversity of the naming of minerals, and the elements that such diverse names have in common.

This volume will be an essential reference work for all who must teach and communicate with the curious layperson. But even more so, the reading of it makes minerals more interesting, because one can now appreciate more readily the *how and why* of their names. There is almost no technical knowledge required, and the book will be very popular with the collector community. In addition, it will be useful to the professional mineralogist as well. I heartily recommend it. It is well-indexed and well-bound. The lack of a less-expensive paper edition is regrettable.

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OPTICAL CRYSTALLOGRAPHY. By Ernest E. Wahlstrom. Wiley, New York, 1979. 488 pages, 317 figures, 11 tables. \$22.95.

It is a pleasure to review a text that I used as a student in its third edition, and find that the author's attention to detail and

content have only increased in later editions. The fact that after 25 years Wahlstrom's *Optical Crystallography* is in its fifth edition is testimony enough that the book has passed the critical review of numerous students and instructors. This new, fifth edition is not a simple repeat of previous editions. Over one-third of the blackline drawings in the fourth edition have been replaced by new or extensively altered figures. The more extensive use of shading and the detailed and expanded diagrams (compare Figures 5.7 and 5.9 in the 4th edition to Figures 6.7 and 6.8 in the 5th edition) have resulted in diagrams of high quality that clearly illustrate the concepts discussed in the text. The addition of photomicrographs to the discussion of the "Becke Line Method" and the "Oblique Illumination Method" are a direct aid to students first attempting each of these methods.

The sequence of chapters has been slightly changed and additional material inserted throughout the text. The chapter on "Polarized Light" has been moved forward so that it precedes the chapter on "The Polarizing Microscope." This is an improvement, as it allows a more orderly development of the theory of the polarizing microscope. Some of the material that had previously been included in the Appendices, such as the Senarmont method of measurement of path difference, has been moved forward and included in the appropriate chapters, while retaining the more detailed discussion of the same method in the Appendix. The Appendix on the "Accuracy of refractive index measurement by immersion methods" has been included in Chapter 15, "Optical examination of crystals or fragments in immersion media." A new appendix on the "Optics of opaque substances" has been added. The discussion of reflectance and birefractance is much too short, but it at least serves as a necessary introduction to reflected light microscopy. Perhaps one day the theory and practice of transmitted and reflected light microscopy will be taught as a single course from a single text.

As with any text, one is compelled to offer suggestions for the amplification and rearrangement of topics in order to bring the text into harmony with one's own prejudices on the subject. The first chapter, "Crystallography and Crystal Projections," still remains too brief an introduction to the very wide range of topics covered. A student without a good background in crystallography will find little basis for understanding such concepts as the unit cell or the significance of crystal systems. The first chapter could be omitted without serious loss. In Chapter 2, the discussion of the interaction of light with matter has been slightly expanded, but it still will not provide answers to some of the most commonly asked questions. The discussion of color in Chapter 3 is too limited, and should have been expanded. I was disappointed that the usual list of references was missing at the end of this chapter, thus thwarting the interest of a student who might want to pursue the subject of color in transmitted light. In Chapter 14, "Crystal Rotation Methods," the multi-axis universal stage is discussed before the one-axis universal stage. This reverses the order of the previous edition, and the new sequence is one that I find most inconvenient. Finally, it would have been a great aid to students if the Michel-Lévy chart was in color rather than in its present black and white version. The figures and text are remarkably free of errors and the textbook is attractively bound and typeset.

I would expect this fifth edition to continue to be one of the standard texts of an optical mineralogy course. I hope that teachers and students will maintain the same academic standard that Ernest Wahlstrom has set with each new edition of *Optical Crystallography*.

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TRONDHJEMITES, DACITES, AND RELATED ROCKS. Edited by F. Barker. Elsevier, Amsterdam and New York, 1979. xv + 659 pages. Dfl. 135, approx. \$68.00.

Potash feldspar is such a common and abundant constituent of granite that otherwise granitic rocks lacking it were long ago given a special name—trondhemite. This volume contains 14 essays about current work on particular trondhemite complexes, and 4 on volcanic rocks some of which are very similar to trondhemite in bulk composition, the dacites of certain island arcs. In addition to detailed reviews or summaries of recent work on trondhemitic rocks in Manitoba, Labrador, Newfoundland, Greenland, Scotland, the Massif Central, Swaziland, the eastern Transvaal, Wyoming, Idaho, Oregon, and California, there are more general chapters on the 'plagigranites' of ophiolites, trace elements in trondhemite, strontium-isotope geochemistry of trondhemite, the oxygen-isotope geochemistry of Archaean granitoids, and a brief restudy of the rocks of the type locality in Norway. A long and exceedingly detailed chapter contains a "review of the mineralogy and chemistry of Tertiary-Recent Dacitic, Latitic, and Related Salic Volcanic Rocks," and there are separate chapters on dacites in the Tonga-Kermadec arc, the Lesser Antilles, and Fiji. All 31 authors are thoroughly qualified specialists and many are well known for earlier studies of rocks of this kind.

As several of the authors point out, trondhemite may occur in Archaean gneiss complexes, with amphibolites in well-defined orogenic belts, and in ophiolites. In a number of places in the volume it is argued that the amphibolite-trondhemite association is characteristically bimodal, whereas, in pre-Cambrian "gray-gneiss" terrane, materials transitional in composition between "tonalitic gneiss" and trondhemite are common. Most of the authors favor crystal fractionation of basaltic magma as an explanation of the latter association and partial melting of amphibolite for the former.

The plagigranites of ophiolite assemblages usually lie between the equivalents of "oceanic crust layers" 2 and 3, and are connected by transitional members to the more abundant associated diorites and granodiorites. Most authors concerned with the problem consider crystal fractionation of subalkaline basaltic or gabbroic magma the preferred hypothesis of origin, some adding the caveat that this takes place at lower pressures than in the Archaean gneiss environment and one suggesting contamination by or exchange with sea water as an explanation of the remarkable depletion of K.

Most of the work described is very recent, and the analyses usually include much information about rare-earth and other trace elements. Fascinating in its own right, with regard to rock genesis this information seems not more persuasive or conclusive than the conventional graphical appraisal of major-element abundances and "trends." Petrogenetic speculation in the separate chapters follows very much the same general lines, and the relaxed, undogmatic manner in which most of it is presented is at the same time reassuring and a little depressing. More precisely, it is reassuring in each individual chapter but depressing in 17 chapters back to back in the same volume. Once over lightly would have been enough.

The dulling effect of this incessant repetition raises two questions of paramount importance in evaluating any book of this size and cost, viz., what its purpose may be and whether that purpose could have been served better. The editor says his intent is to "give the reader a view, by a diverse and active group of geologists and geochemists, of the geology, geochemistry and petrology of the several kinds of trondhemites and dacites, and of the genetically

related rocks." This is assuredly a worthwhile endeavor, but the book does not serve it well because, for what it contains, it is very much too big. It needn't have been. Most of the information in it, though indeed recent, is not novel. Working from the literature, with which he is obviously thoroughly familiar, the editor, alone or with a couple of collaborators, could have presented a unified summary of the data, a single resume of the speculations currently called upon to rationalize them, and a single bibliography. A better organized volume half to two-thirds the size of the present one, with running titles and a more adequate index, might have been less expensive, could have been just as useful for the specialist, and would almost certainly have had much greater appeal for the general petrological reader.

The book was "prepared and printed by a word processor" that the editor holds responsible for typographical errors "which, inevitably, seem to be found in material produced by this apparatus." There are in fact so many typographical and clerical errors that the publisher should issue an erratum slip. Many of these are amusing—as, for instance, citations to works of such well-known petrologists as Lecroix, Nickolds, Schaver, and Tiller—but their concentration in particular chapters suggests it is basically the man part of the man-machine interface that is at fault.

The book is difficult to read because it is printed on insufficiently opaque paper in a thin and uninteresting type face. Several of the maps are so reduced as to be almost illegible without a magnifier. The half-tone illustrations, however, whether of outcrops or thin sections, are for the most part very handsome.

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MAGNETIC PROPERTIES OF COORDINATION AND ORGANOMETALLIC TRANSITION METAL COMPOUNDS, Supplement 2 (1969, 1970). By E. König and G. König. Vol. II/10 of *Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology*, edited by K.-H. Hellwege and A. M. Hellwege. Springer-Verlag, Berlin, 1979. xxxv + 982 pages, 288 figures. DM 980, \$539.00.

This volume is the second supplement to Vol. II/2. It is based on the same principles and considers the publications on magnetic susceptibilities and electron spin resonance in 1969 and 1970. It covers the compounds of the elements Ti, Zr, Hf, V, Nb, Ta, Cr, Mo, W, Mn, Tc, Re, Fe, Ru, Os, Co, Rh, Ir, Ni, Pd, Pt, Cu, Ag, Au (except for garnets, perovskites, spinels, and hexagonal ferrites, which were included in Vols. III/4a, b and III/12a, b, c). The high standard of this series is fully maintained by the present volume. However, most of the compounds listed are organometallic compounds, and there are few data on minerals or compounds of mineralogical interest.

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CRYSTAL STRUCTURE DATA OF INORGANIC COMPOUNDS, KEY ELEMENTS P, As, Sb, Bi. By W. Pies and A. Weiss. Vol. III/7, part c2 of *Landolt-Börnstein: Numerical Data and Functional Relationships in Science and Technology*, edited by K.-H. Hellwege and A. M. Hellwege. Springer-Verlag, Berlin, 1979. xxvii + 452 pages, 14 figures. DM 550, \$302.50.

See reviews of Volume III/7, parts a, b, e, f, and g (*Am. Mineral.*, 59, 1142; 61, 334, 61, 817; 63, 800). Part c2 extends the coverage to 2205 compounds of P, As, Sb, Bi (not including simple oxides and hydroxides, which were covered in part b). For each compound the formula, space group, cell dimensions, cell content, calculated and observed specific gravity, and (if available) structure type, crystal form, and refractive indices are given. The data content per page is high, but the price of the volume is a severe limitation on possible purchases.

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ON MINERALS AND MINERAL PRODUCTS. By Eucharius Rösslin the Younger. *Ars Medica*, IV. Abt., Band I. Walter de Gruyter, Berlin and New York, 1978. Text in English and German; translation, editing, and commentary by Johanna Schwind Belkin and Earle Radcliffe Caley. xxxvii + 418 pages. DM 240, approx. \$135.00.

Eucharius Rösslin the Younger was the town physician for Frankfurt am Main in the middle of the sixteenth century. His herbal of 1535 was the culmination of a century of publication of medical works of medieval inspiration which included sections describing minerals and their physiological properties. Mercury, for example, was known as both antiseptic and poison. Two scholars at the University of Ohio have prepared this beautifully detailed translation and study of the mineralogical chapters in Rösslin's *Kreutterbuch* (herbal). It is published in the series *Ars Medica* of critical editions of German medieval and early modern medical texts with facing pages of English translation. They have very carefully placed Rösslin in context, showing that his work was

largely derivative from classical authors (such as Pliny) but by way of the encyclopedists (Isidore of Seville to Albertus Magnus) and specifically by way of his German predecessors. Rösslin culled and reorganized 92 descriptive accounts of minerals and their medical application, largely from the earliest works on herbs and medicine published in Germany. The work is an exposition "On the Nature, Quality, and Efficacy of Precious Stones, Ores, Metals, Earth, and Gums." The historian of the earth sciences will find it an invaluable reference for the nomenclature of minerals at the dawn of the modern age. The serious science student will appreciate the role of medieval scholars. The intellectual historian will find this the backdrop against which to compare Agricola's dramatic innovation in *Bermannus* and *De Re Metallica*.

The appendices include tables locating the descriptions of minerals in the first printed German herbal (1485) and its successors leading to Rösslin. There is an *Index Verborum* to the German text and a *Name and Subject Index* which goes far beyond the mere location of pages, functioning as an extensive glossary and a cross-reference guide. These tools place this material within reach of any reader, even those of us who like myself have not the slightest acquaintance with the 'Early New High German' of the text and only the vaguest notions of Greek and Latin mineral terminology. The bibliographies are thorough and by themselves justify the purchase of the book for libraries.

There are some minor problems. The mineralogy is referred to Dana's *Manual* in the 12th Edition (1909)! On p. xix, Cyril S. Smith's name is misspelled. The translators are just unfamiliar enough with mineralogy to refer to "the variety of spinel now called almandine" on p. 276, although on p. 217 almandine is red garnet. Finally, the price of this 418-page octavo is 240 Deutschmarks.

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