

## BOOK REVIEWS

ROCK FORMING MINERALS, VOL. 5, NON-SILICATES. W. A. DEER, R. A. HOWIE, AND J. ZUSSMAN. John Wiley & Sons, Inc., New York, N. Y. ix+371 pages, 59 figures and 54 tables, 1962, \$15.50.

Volume 5, the non-silicates, was the first of the volumes to be published and, through an oversight, the last to be received for review. Reviews of the first four volumes have been published in *The American Mineralogist*—vol. 48, p. 218, 1963; vol. 49, p. 825–826, 1964; vol. 50, p. 814–915, 1965.

The minerals considered here are chiefly the accessory minerals of igneous and metamorphic rocks and of the druses, cavities and veins associated with them. Special emphasis is given to many of the minerals of the sedimentary rocks. Here, it must be borne in mind, that the clay minerals are treated in the volumes on sheet structures (phyllosilicates), and quartz in the volume on the framework structures (tectosilicates).

Ten oxides minerals and the spinel group; six hydroxides and limonite; five sulfides, four sulfates; the calcite group, the dolomite group, the aragonite group and huntite; the phosphates—apatite and monazite; and the halides—fluorite and halite are excellently presented for the student and researcher.

This volume follows the same presentation of the material as that of its predecessors. There is a careful analysis of the published data on a mineral, or a mineral group, an interpretation of the physical and chemical data as they apply to mineral paragenesis, and an assessment of their petrologic significance.

These five volumes will not only be of great value to mineralogists, petrologists, and geochemists but also to the general geologist and investigators in solid state physics.

GEORGE T. FAUST

RESEARCH ON THE NATURE OF MINERAL-FORMING SOLUTIONS. N. P. YERMAKOV *et al.* Vol. 22 Inter. Series Monographs, Earth Sciences, Pergamon Press. Transl. by V. P. Sokoloff and edited by Edwin Roedder. 743 pp. 1965, \$25.00.

[This is a most welcome and valuable addition to the literature on the geothermometry of minerals. As the subtitle states “. . . with special reference to data from fluid inclusions,” the book is concerned *mainly* with what can be deduced about mineralizing solutions *from a study of the character and behavior of fluid inclusions of minerals.*

The book is in three parts, of which Part I (348 pp.) is a translation of Prof. Yermakov's book, “*Temperatures and State of Aggregation*” for which he received the Stalin Prize, (at one time!) the highest Soviet scientific award. The first 100 pages of his book were not translated inasmuch as these are mainly a literature review. Yermakov's book (in Russian) apparently was published in the early 1950's (its bibliography contains no post-1950 references), and its appearance was followed by an immense amount of Russian research on fluid inclusions. Some of this research is documented in Parts II and III, which are translations of Vol I, No. 2, 1957 and Vol. II, No. 2, 1958, respectively of the *Transactions of the All-Union Research Institute of Piezo-optical Mineral Raw Materials.*

Part II (pp. 349–558) contains 19 articles and one abstract; most of these deal with liquid inclusions in quartz. Part III (pp. 559–712) includes 18 articles, also mainly on quartz, but tourmaline and fluorite studies also are represented.

These English translations have been sorely needed, and mineralogists and geologists will welcome their availability.

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CLAYS AND CLAY MINERALS—PROCEEDINGS OF THE THIRTEENTH NATIONAL CONFERENCE ON CLAYS AND CLAY MINERALS. Edited by W. F. BRADLEY AND S. W. BAILEY, Pergamon Press, 1966, ix+449 pages.

The volume of papers from the 1964 annual meeting of the Clay Minerals Society, although characteristically slow to appear in print, reflects the vitality and broad interests of this newly formed organization. The proceedings of the thirteenth conference (the first ten conferences were sponsored by the National Academy of Sciences—National Research Council) contains thirty-one papers and seven extended abstracts on various aspects of clay mineralogy and clay technology.

A symposium on structural aspects of layer silicates includes discussions of brittle micas, coexisting muscovite and paragonite, illite as a valid group name for the 10 Å clay minerals, stilpnomelane, the tobermorite minerals as model structures for hydrous layer silicates, disorder in pyrophyllite, and interstratification in montmorillonite.

A group of papers on occurrence and genesis of clays—of particular interest to the geologist—includes reports on endellite in Kentucky, hydrothermal clays in granodiorite at Steamboat Springs, kaolinite in Georgia, and a disordered kaolinite alteration product of volcanic rocks in Mexico. Papers on soil clays describe interstratified montmorillonite-mica from western Canada, weathering in loess and shale-till soils, and sepiolite and attapulgite in New Mexico calcareous soil.

There are infrared studies on O—H bonds of micas and chlorites, hydroxyl groups in intercalated kaolinite complexes, and pyridine adsorbed on montmorillonite surfaces. Among montmorillonite studies, many of which have important practical application, are papers on swelling of synthetic montmorillonite and lattice substitution, structural charge density, behavior in ammonia atmosphere, character of organoclay bonded to polyethylene, modification by low-temperature heat treatment, and thermal stability in foundry sand.

Among other papers one on the use of *x*-ray diffraction automation in clay mineralogy should be of particular value to laboratories in which large quantities of data must be processed rapidly.

A brief appendix on the work of the Society's nomenclature committee offers recommendations for general classifications and nomenclature of the phyllosilicates.

The volume will be indispensable to students of clays and soils, and a seventeen-page index increases its ability. Editors Bradley and Bailey are to be congratulated on an excellent product.

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POLYMORPHISM AND POLYTYPISM IN CRYSTALS. AJIT RAM VERMA AND P. KRISHNA. John Wiley & Sons, Inc., New York, N. Y., 1966, xx+341 pages, 124 figures, 23 tables. \$12.75.

*Polymorphism and Polytypism in Crystals* is the first in a new Wiley series called Monographs in Crystallography, edited by M. J. Buerger. The purpose of this series of monographs is to bring together data on specialized areas of crystallography so workers in other areas can gain a sufficient understanding of the subject without searching the original literature. *Polymorphism and Polytypism in Crystals* has succeeded well in doing this.

Following a brief introduction, two chapters are devoted to polymorphism, considering first the phase aspects and then the structural aspects of the subject. The remaining six chapters are concerned with polytypism. Various notations used to name and describe polytypes are thoroughly considered. Numerous polytypic compounds, most notably of

which are silicon carbide, cadmium iodide and zinc sulfide, are described; and special methods used in the determination of the structures of polytypes are presented. Various theories concerning the formation of polytypes are presented, and of these special attention is given to the role of screw dislocations and the spiral growth of crystals.

The writers have thoroughly covered the literature of polytypism. The name index at the end of the book contains over 450 authors who are quoted, and Chapter 5, for example, has over 250 references. The book is especially strong in its presentation and evaluation of the theories of polytypism, including the most recent ideas on the subject. The numerous excellent illustrations and tables add much to the book.

The title seems a bit misleading since less than 60 pages are devoted to polymorphism, while over 260 are devoted to polytypism. The book would have been more pertinent to the mineralogist if the literature on polytypism in the micas, clay minerals, and related layer structures had been presented in more detail. These materials are covered in a little over two pages, while dozens of pages are devoted to silicon carbide and cadmium iodide. There are a few minor discrepancies in the book. For example, on page 81 the comment is made that silicon carbide does not occur in nature as a mineral, whereas on page 93 four natural occurrences of the substance are cited. Also on page 81 Acheson is given credit for first synthesizing the substance in 1893, whereas on page 92 Berzelius is cited for having observed silicon carbide as early as 1824. Another discrepancy is on page 238, in Table 2, where silicon carbide polytypes 19H and 27H are listed as undiscovered, but predicted. However, on page 107, in Table 3, these forms, with the predicted structures, are listed as known polytypes.

This summary of polytypism is a valuable contribution to the literature of crystallography, and will be a valuable addition to any library.

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THE MINERAL RESOURCES OF AFRICA. NICOLAS DE KUN. American Elsevier Publ. Co. 52 Vanderbilt Ave. N. Y. xxvi+740 pp., 172 tables 136 figs., 2 appendixes. 8×11½", 1965, \$40.00.

This prodigious piece of work is in two parts: Part I constitutes a review of the African mineral resources, country by country; Part II, somewhat longer, describes the geology of types of deposits.

Part I is divided into 10 sections—I—Africa's share of World Resources and Production; II—The Value of African Production; III—The Distribution of African Output and Resources; IV—The History and Development of Mining; V—Northern Africa; VI—Northeastern Africa; VII—West Africa; VIII—Middle Africa; IX—Southern Africa; X—The Islands and the Sea. Further descriptive subdivisions are chiefly by countries. In this part the emphasis is on data dealing with production, processing, exploitation, grade and reserves.

In Part II, entitled "Economic Geology" the information is also grouped into 10 sections: I—The Mineralogenetic Provinces of Africa; II—Iron-Bauxite Group (Fe, amphibole asbestos, Mn, bauxite); III—Gold Group (Au, Os, Ir, Ru, U, Ra, Sb, As, pyrite); IV—Base Metal Group (Cu, Co, Zn, Pb, Ag, Cd, Ge, Ga, Se, In, Re, V, Hg, F, Ba, Sr); V—Ultrabasic Group (Cr, Ni, Pt, Pd, Rh; chrysotile asbestos, talc, magnesite, Iceland spar, vermiculite, diamonds); VI—Tin-Rare Metal Group (Sn, W, Mo, Nb, Hf, Ta, Be, Li, Rb, Cs, Sc, Bi, RE, Ti, Zr, Th, mica, feldspar, quartz); VII—Carbon-Fuel Group (graphite, anthracite, bituminous coal, lignite, bituminous sediments, bitumen, oil, gas, CO<sub>2</sub>, methane, He); VIII—Sediments (phosphates, diatomite, salt, soda, potash, N, S, Br, B, I, alum, gypsum, limestone, cement, bentonite, meerschäum, kaolin, clay, pigment); IX—Miscel-

laneous (pumice, pozzuolana, perlite, nepheline, corundum, kyanite, sillimanite, andalusite, wollastonite, garnet, semi-precious stones, stone, sand, silica); X—Water and Soil (groundwater, deuterium, hot springs, steam, hydropower, soil). Many geologists might quarrel with some of the above groupings, and any geological descriptions arranged by metals or minerals obviously will lead to some duplicative description. A more satisfactory form would be to present a more completely genetic grouping of deposits. This is the only major disadvantage of the book. The data in Part II are primarily geological in character.

Appendix I is a list of conversion factors. Appendix II is a lengthy list of "companies, individuals and organizations (and their addresses) engaged in or having interests in the cement, mining, petroleum and power industries of Africa—a compilation representing no mean feat in itself! There are also a 12-page list of references and an index.

Unquestionably this represents the *ne plus ultra* on African mineral resources and, as such, will be the foremost and most authoritative reference work in this domain for a long time for geologists, mining engineers, mineral economists and geographers.

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MINERAL RESOURCES OF SOUTH-CENTRAL AFRICA. R. A. PELLETIER. vii+277 pp., 56 figs., 1 color plate as frontispiece; 39 maps, 1 fold-in map in color. 8½×11 in. Oxford Univ. Press, Thibault House, Cape Town. Price in South Africa, R.6.00.

This is an assessment of the actual and potential mineral resources of practically all of Africa south of the equator. It is complete, detailed, accurate and handsomely as well as lavishly illustrated. In addition to these virtues, it also provides numerous excellent summary descriptions of the major mineral deposits in one of the most highly mineralized areas of the world.

After introductory and historical chapters, the descriptive sections are by countries, with further subdivisions by metals or minerals. A brief chapter on exploration in this part of the world concludes the work. Not to be overlooked are the generous sections (for each country) on physical features, geology and mineral statistics. This book should appeal to both geologists and mining engineers. It is possibly the best book of its type that this reviewer has encountered.

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GEOLOGICAL PROBLEMS IN LUNAR RESEARCH. Conference Chairman, J. GREEN. *Annals New York Acad. Sci.* 123 (art. 2), 367–1257, 1965.

From May 16–19, 1964 the New York Academy of Sciences held a conference entitled, "Geological Problems in Lunar Research"; this volume is a series of papers reporting the results of that important conference. It represents a major milestone in recording man's attempts to extend and systematize his thinking on the nature and origin of the lunar surface.

There are included some 56 papers, grouped into 10 sections: Introduction; Volcanic and Impact Mechanisms and Origins; Lunar Tectonics; Surface Properties and Radiation Effects; Lunar Surface Features and Changes, Lunar and Terrestrial Analogs; Shatter Coning; Tektite Origin; Possible Lunar Technologies; Geophysical Programs.

Although it will soon be outdated, the volume is an absolutely indispensable present tool for any worker or thinker in the field of "extraterrestrial geology."

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#### SHORT REVIEWS

GEOLOGICAL INVESTIGATIONS OF CHROMITE IN CALIFORNIA. KLAMATH MOUNTAINS. CHROMITE DEPOSITS OF SHASTA, TEHAMA, TRINITY AND HUMBOLDT COUNTIES, CALIFORNIA. F. G. WELLS AND H. E. HAWKES. *Calif. Divis. Mines and Geol. Bull.* 134, pt. I, chap. 3, 130–191, 1965.

GEOCHEMISTRY OF BERYLLIUM AND GENETIC TYPES OF BERYLLIUM DEPOSITS. A. A. BEUS. Ed. by Lincoln R. Page; transl. by F. Lachman; prelim. ed. by R. K. Harrison, W. H. Freeman and Co., San Francisco. 401 pp., 61 illus., 148 tables, 1966. \$15.00. Essentially a new "edition" of Beus' 1956 book "Beryllium, Evaluation of Deposits During Exploratory Work" (*Am. Mineral.* **48**, 718-719, 1963). Unfortunately, partly because of the "time lag" in publication, it is badly out-of-date and thus incomplete, since it incorporates no data on many new types of Be-deposits, such as Aguachile, Mexico, north-western Utah and Seal Lake, Labrador.

DEPTHS OF THE EARTH; CAVES AND CAVERNS OF THE UNITED STATES  
WM. R. HALLIDAY, Harper & Row, Inc. 49E. 33d St., N. Y. 16, N. Y. 398 pp. \$7.50. 1966  
Written for the layman by an M.D. who is director of the Western Speleological Society, this is an account of the history of cave exploration in the United States.

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