BOOK REVIEWS

THE OPTICAL PROPERTIES OF ORGANIC COMPOUNDS, by A. N. WINCHELL. Second Edition. Academic Press, Inc., New York (1954). xviii+487 pages, 153 figs., 2 diagrams in pocket. Price $12.00.

The second edition of this very useful compilation contains descriptions of some 900 more compounds (total, 2500) than were in the original (1943) edition. Almost twice as many (ca. 2000) are included on one or both of the two diagrams for determination of compounds than were on the single diagram of the first edition.

In its manner of treatment, classification of the compounds, and explanation of the diagrams this edition is essentially identical with the first edition. The remarks in Faust's review[1] of that edition still apply, therefore, with one important exception noted below.

Most of the changes made are very minor ones:

1. The key to the diagrams has been placed in a table in the text rather than on the margins of the diagrams themselves.

2. N_x, N_y and N_z are used for indices of refraction of biaxial crystals instead of N_p, N_m and N_g.

3. The systematic part of the treatise begins with a two page summary of the properties of the various forms of carbon: diamond, graphite, and coal.

4. Faust's criticism that it is commonly difficult to obtain maximum and minimum indices of refraction from cleavage fragments has been considered and a brief supplement on this subject added to the explanation of the diagrams. Also, a second diagram based on N, N_0, or N_y, the optic angle, and the optic sign has been added, which simplifies the use of the diagram(s) and key a great deal.

It should be realized that the chances of finding a given organic compound in the tables or diagrams is comparatively remote. This is in no wise the fault of the compiler; he has done a remarkable job of getting together a mass of optical data from the literature and has included unpublished information on some 200 compounds. It is rather a reflection of the general failure of organic chemists to realize the importance and usefulness of optical properties in the characterization of compounds. Some 500,000 solid crystalline organic compounds are known; with approximately 2500 such compounds in the volume under review it would appear that the chances are about 200 to 1 against finding a given compound described in it. Actually, the chances are considerably better than this, because many more relatively common compounds are included than rare ones.

Optical properties of gases are meaningless for the purpose of this volume, but for organic compounds that are liquids at room temperature it would have been very useful to include such data as are available on indices of refraction and variation thereof with temperature, dispersion, optical activity (power of rotation), etc. The fact that liquids were not included raises the question as to whether the title should have been "The Optical Properties of Crystalline Organic Compounds."

Winchell's compilation is far and away the best single source of information on the optical properties of solid organic compounds. It should be widely used in identifying them, but from the comparatively few optical descriptions that have been published since the first edition appeared it is evident that Faust's hope that "this book will stimulate a wider interest amongst chemists in the useful methods of microscopic-petrographic research" has not yet been fulfilled.

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[1] *Am. Mineral.*, **30**, 545–546 (1945).

TEXTURES OF THE ORE MINERALS AND THEIR SIGNIFICANCE, by A. B. EDWARDS. 242+xiii pp., 31 tables, 204 figures. Australasian Inst. Min. and Met. (Inc.). Melbourne, Australia. 2nd ed. (revised), 1954. Costs are as follows: Members Aus. I.M.M. (one copy only) £2-, plus postage; Student Members Aus. I.M.M. (one copy only) 30/-, plus postage; Non-members £3-, plus postage; Bona-fide Students (non-members) £2-, plus postage. The above prices are in Australian currency.

The first edition of this book, which appeared in 1947, was a welcome addition to the scanty modern literature, *in English*, on the interpretation of ore-mineral textures. Despite little publicity or advertising, copies became widely distributed. The reviewer found the book highly useful as assigned collateral reading in a course on ore-mineral paragenesis. The second edition follows faithfully the plan of the first; no significant alterations have affected the mode of presentation. New data have been included throughout, however, and a final chapter on the textures of smelter products has been added. Since the first edition was not reviewed in *The American Mineralogist*, readers may obtain an idea of the scope and arrangement of the book from the following list of chapter headings and some of the topics:

I. The textures of native metals—silver, gold, bismuth, arsenic and antimony.
II. Primary zoning and banding in oxide and sulfide ores—growth zoning, magmatic layering, crustification, colloform banding.
III. Textures due to deformation—banding, twinning, recrystallization, fracturing.
IV. Solid solutions—in native metals, in oxides, in sulfides and sulfosalts.
V. Replacement textures—rim, core and zonal replacements, veins, relicts, pseudo-eutectic textures.
VI. Application to ore geology—paragenesis (simultaneous, successive and overlapping deposition), temperature determinations.
VII. Application to ore dressing.
VIII. The transparent gangue minerals.
IX. Smelter products.

The numerous photomicrographs are generally pertinent, and many are clear reproductions, although some are sufficiently lacking in detail so that they should be replaced or drawings substituted (e.g., figures 14, 15, 89, 103, 106 and 126). A number are taken from Schneiderhöhn and Ramdohr, *Lehrbuch der Erzmikroskopie*, as well as from other published sources. To all workers in ore-mineral microscopy the book may be recommended as a very good summation of the textures of the opaque minerals and interpretations of their genetic significance.

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MINERALS IN WORLD INDUSTRY by WALTER H. VOSKUIL, 324 pp., 38 tables, 26 figures. McGraw-Hill Book Co., New York City. $5.75, 1955.

Of considerable interest to many mineralogists, geologists, mining engineers and mineral economists will be *Minerals in World Industry*, an up to date summary of the participation and importance of minerals in economic systems, with particular emphasis on their significance in the founding and development of high living standards, especially in that of the United States. Unusually well organized, the book appears to be designed principally as a text for mineral economics, although its content is sufficiently detailed and modern to permit its use as a general work of reference.

After a brief discussion of mineral economy, six chapters are devoted to iron and its alloys—its relations to man, the geographic pattern of steel empires, iron in the Americas, in Europe and in Asia, Australasia and Africa. Chapters 8 to 16 deal with mineral fuels,

coal, petroleum and natural gas, with brief comments on solar energy, water power and nuclear energy. Then follow chapters on copper, lead and zinc, aluminum and magnesium, building materials, three on mineral plant foods—nitrogen, phosphates and potash, one on sulfur, and one on minerals used in minor tonnages. The last two chapters are entitled American Mineral Policy and Relation of Industrial Nation to Undeveloped Areas. The whole is a well integrated and highly readable, fact-crammed account of world-wide mineral economics.

Although the author realizes the importance of adequate water supplies in promoting high living standards, it is disappointing that no discussion whatsoever of this vital material is included. Here and there the tone, particularly of some of the topic headings, becomes somewhat pedagogical. Significant omissions appear to be few—no mention of Br or I, of light weight concrete aggregate material, of synthetic mica or of the importance of Li in nuclear reactions, but these and others are all minor. More serious is the inadequacy of the index in which many topics and materials, touched on briefly in the text, find no reference. Beyond these the book is comprehensive and comprehensible. Its particular forte is its outstanding exposition of the interrelations of economic geology and *geopolitik*.

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A HISTORICAL SURVEY OF PETROLOGY by F. Y. Loewinson-Lessing, translated from the Russian by S. I. Tomkeieff. 112 pp. Oliver and Boyd Ltd., Tweeddale Court, Edinburgh 1, Scotland. 12/6, 1954.

This book, which was originally written in Russian by the late Professor Loewinson-Lessing and published in 1936 under the title of *Vvedenie v Istoriu Petrografi* (An Introduction to the History of Petrography), has at last appeared in an English edition. The only possible regret on its appearance is that it was not available earlier, for although the translation was completed in 1939, World War II delayed its publication. The translator, Dr. S. I. Tomkeieff, who is Reader in Mineralogy, King's College, University of Durham, was a student of Professor Loewinson-Lessing and in his own words, has " . . . translated rather freely, curtailing some parts, amplifying others, and including additional material drawn from Professor Loewinson-Lessing's latest papers."

The book is primarily a synthesis of the evolution of petrogenetic thinking, assembled in the light of the author's own experience and considerable contribution to the science, rather than a detailed chronological record of the development of petrology. Thus, after an introductory chapter, the book outlines the major concepts and important discoveries separately under the different lines of approach to petrology—geological, petrographical, chemical, experimental and synthetic. Although the author refers to his work as " . . . simply a modest introduction . . . ," the book is so concise and so well organized that it encompasses easily and skillfully the entire lifetime of the science, without descending to mere tabulation of dates, men and ideas. It is not only worthwhile reading, but also interesting reading. No review can do justice to its wealth of detail, naturally arranged.

So often today, because of the looming mass of factual material whose mastery is required of students, an appreciation of the work of our predecessors tends to be neglected. Graduate students in particular should be encouraged to look beyond their textbooks and acquaint themselves with the original classical monographs that spelled out, one by one, the basic laws and theories of the science. A Historical Survey of Petrology is recommended as required reading in petrology and petrography; it is a stimulating summary, the only adequate one available in English.

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GUIDEBOOK TO THE GEOLOGY OF UTAH, NUMBER 9, URANIUM DEPOSITS AND GENERAL GEOLOGY OF SOUTHEASTERN UTAH. Ed. WM. LEE STOKES. Utah Geol. Soc., 115 pp., 18 figures, 5 plates, 2 tables, 1954. Distributed by Utah Geol. Mineral. Survey, Mines Bldg., Univ. Utah, Salt Lake City, Utah. $3.00.

This up-to-date guidebook to the geology and uranium deposits of the Thompson district (Grand Co.) and Big Indian-Lisbon Valley area (San Juan Co.) in southeastern Utah is divided into the following chapters: History of radium-uranium mining in the Plateau Province (R. Clare Coffin); Summary of events in the Colorado Plateau since 1924 (anonymous); Stratigraphy of the southeastern Utah uranium region (Wm. Lee Stokes); Structural features of southeastern Utah and adjacent parts of Colorado, New Mexico and Arizona (Eugene M. Shoemaker); The uranium mineralogy of the Colorado Plateau and adjacent regions (John W. Gruner); Geology and uranium deposits of the Thompson area, Grand County, Utah (Wm. Lee Stokes and C. M. Mobley); Ore deposits of the Big Indian Wash-Lisbon Valley area (Y. Wm. Isachsen); Side trip to Arches National Monument (U. S. Park Service); and Itinerary and road logs. With the wealth of detailed information it contains, this guidebook should prove invaluable to geologists and prospectors working in this and adjacent regions. Mineralogists will be particularly interested in Gruner's discussion of the mineralogical relations between the oxidized and unoxidized uranium ores.

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PRACTICAL REFRACTOMETRY BY MEANS OF THE MICROSCOPE, by ROY M. ALLEN. 76 pp., 15 fig., paper bound. R. P. Cargille Laboratories, Inc., 117 Liberty St., N. Y., N. Y. 1954. $1.00.

This is a handy manual that will be useful to all students of microscopic crystallography, mineralogy and petrography as well as to ceramicists and chemists, or anyone attempting to identify translucent crystalline materials by means of their optical properties under ordinary and polarized light. The discussion of refractive index determinations deals with indices of liquids, of solids and the various comparison techniques (Becke line, oblique illumination, half-illumination and Emmons double variation methods). Information follows on lighting sources, procedures for uniaxial and biaxial crystalline substances, dispersion and accuracy. A final section describes index liquids.

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DIE EIGENSCHAFTEN DER MINERALE, TEIL II, MINERALCHEMISCHE TABELLEN UND QUALITATIV-CHEMISCHE NACHWEISVERFAHREN, by ARNO SCHÜLLER. 602 pp. Akademie-Verlag, 39 Mohren Street, Berlin W. 8, Germany. 1954. DM42.00.

This voluminous work is essentially a series of mineral determinative tables based primarily on chemical composition, particularly on the recognition of one of the cations present. Parts I and II of Section *A* include general information on the calculation of mineral formulas from chemical analyses and examples of mineral determination with the help of multi-component-system diagrams. Part III is a group of chemical tables—colors in melts; borax and microcosmic salt bead colors; general solubilities of mineral groups in acids; colors of HCl solutions; tests for important cations with certain standard reagents; lists of reagents, both alphabetical and according to the elements for which they test; an alphabetical list of the elements, with symbols, atomic members and weights and atomic and

ionic radii; an alphabetical list of the cations and their ionic radii; several figures and a table showing size relations of atoms and ions; and chemical and physical periodic tables of the elements. Several of the figures, particularly figures 6*a* and 6*b*, are reduced to a point at which they cease to be useful. Section *A* concludes with a short list of references and with another of abbreviations employed in the mineral tables that follow.

Most of the mass of the book (522 pages) is included in the first part of Section *B*. Here are presented 49 subdivisions under the various main elements that form cations in minerals, arranged alphabetically (aluminum to zirconium). For each of these elements the following data are listed: atomic weight and number, valence, atomic and ionic radii, distribution of mineral species containing that element as a cation among the major groups of minerals (elements; sulfides; haloids and oxyhaloids; oxides and hydroxides; carbonates, borates and nitrates; sulfates, phosphate-haloid-sulfates; phosphates and arsenates; tungstates, molybdates, vanadates and uranates; silicates; and organic compounds), reactions in melts, characteristic crystal precipitate (with sketches of crystal shapes), characteristic color reactions, and flame colors. Thereafter are listed by groups the individual mineral species in which that element is a cation. For each species is given a brief description embodying composition, color, optical properties, hardness, specific gravity, crystal system and a short paragenetic designation. The volume concludes with a systematic listing of minerals by groups.

Patently the book represents a prodigious effort in compilation and arrangement of mineralogical data. Yet it can hardly be considered to serve adequately as a tool for mineral identification primarily by chemical techniques. For a great many species identification is much more rapidly advanced and facilitated if the major *anion* is first identified, for anion isomorphism is normally more restricted than cation isomorphism. For example, the book does not list borates under boron. Surely the initial recognition that a species is a sulfide, or a phosphate, or a carbonate is, for identification purposes, more useful than that it contains Mn, perhaps coupled with unknown amounts of Mg and Fe^2 as well.

The scheme of this book requires multitudinous repetition and duplication, both because of complex isomorphism and because of cations in various structural positions in complex minerals. Thus most aluminum silicates require entry under Al and at least one other element, and many species are listed in three places or even four. Extreme cases are represented by such a mineral as polymignite, which is repeated, properties and all, under Ca, Cb, Ce, Mn, Ta, Th, Ti, W and Zr.

Further burdening the task of identification is the retention of numerous varietal names, including some synonyms and some of trivial varieties (falkmanite, lotrite, oellacherite, keilhauite, lusakite, pyrrhite, magnesiumorthite, cleveite, etc.). The paragenetic assignment for some species is, of course, difficult to express adequately in a few words or even in several phrases and such curtailed genetic generalizations may be of little value as an identification aid. A mechanical shortcoming appears in the grouping of species under a series heading without a typographical break appearing at the end of the series (e.g. for Scapolites, under Ca, pp. 190–191).

The chief value of the book lies in its collection of information on chemical tests for the various elements. The arrangement of the tables is turgid and viscous and mineral identification by means of them will be difficult and hardly direct—rather by hint and anacoluthon.

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