BOOK REVIEWS

THE INTERPRETATION OF *X*-RAY DIFFRACTION PHOTOGRAPHS, by N. M. F. HENRY, H. LIPSON AND W. A. WOOSTER, MacMillan and Co., London, 1951, ix+258 pages, price 42 shillings. (American price $8.50, obtained from D. Van Nostrand Co., Inc., New York, N. Y.)

This book is intended "to help students and research workers to understand the theory and practice of the interpretation of *x*-ray diffraction photographs." The discussion is carried up to the subject of crystal-structure determination but does not include more than passing reference to space groups and their recognition by means of *x*-ray diffraction. Had a chapter on space groups been included, and it would have required no more space than that devoted to Laue photographs in the present volume, all materials needed preparatory to crystal structure work would have been brought together. The omission is the more regrettable because the authors state that "a sufficient number of tables has been included to facilitate calculations without the necessity of a reference book." Many who do not embark upon crystal structure work do attempt the determination of space groups and a statement of the space group, now considered part of a complete mineral description, is to be found in several recently published mineralogical reference books.

What seems to this reviewer the pedagogical excellence of Henry, Lipson and Wooster's book is probably due in part to the fact that the authors have been associated with the very thorough course in crystallography which has been offered at the University of Cambridge for many years. The book has many fine features. It is clearly written and very well illustrated. There are diagrams on almost every page and many points are illuminated by detailed discussion of examples. The reciprocal lattice is used extensively. "Much material is presented in a geometrical way, as it has been found that this is the most suitable method of teaching crystallography." A few problems for students are included and carefully worded answers are given in an appendix. A pleasing and novel feature is the reference list which has been arranged to serve as a name index. An appropriate statement about the relation between kX and Å units is made in chapter 2. Nevertheless kX units are called Å units in the first ten chapters, while Å units proper are used in chapters 11 to 17. It is to be feared that this will perpetuate the existing confusion as few will read or remember the authors' note explaining the curious manner in which they have dealt with this problem.

The emphasis is obviously determined by British conditions and especially by the experience of the authors. This will restrict the usefulness of the book in the United States. Charts for the interpretation of single crystal patterns are based on a camera radius of 3 cm. By photographic reduction they may be adapted to the 57.3 mm. diameter commonly used. The scant space given to important modern techniques widely used in this country is a lack not so easily overcome. The precession method is barely mentioned and the equi-inclination Weissenberg method receives only 2 paragraphs of discussion while many pages are devoted to methods that will be considered obsolete by some.

Gypsum is used as an example in a number of chapters and finally in chapter 10 the problem of transformation of axes and face indices is illustrated by gypsum. Here the authors have neglected to consider the problem of the "right setting" and have mentioned only three of the many settings that have been used for gypsum. Among these the oldest setting, that of Haüy, and the setting corresponding to the shortest possible *a* and *c* axes are not included. The authors have here missed a fine opportunity to exploit fully the example they have used in several chapters.

The shortcomings of this book will not seriously impair its value to those many people who have need to acquaint themselves with the subject it treats. It is to be hoped that a

new edition will soon be called for and that the authors will then bring the book fully up to date. In the meantime this first edition can be heartily recommended to anyone requiring a clear explanation of the use of x-ray diffraction photographs.

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GEOLOGIE, MINERALOGIE UND LAGERSTÄTTENLEHRE, by PAUL KUKUK, vii+306 pages; 370 figs., Springer Verlag, Berlin, 1951. Price, DM 28.50.

This book is designed to fill the need for brief yet comprehensive German textbooks of geology, mineralogy and ore deposits. It is intended primarily for pupils and teachers in mining and technical schools, but mining engineers, mine surveyors and officials, and others interested in mining geology will find it helpful.

Part I is a 137-page treatment of the fundamentals of physical and historical geology. The section on physical geology is introduced by a very brief discussion of the structure of the earth and isostasy. Twenty-four pages are devoted to a general description of igneous rocks, sedimentary rocks, and the "crystalline schists," with another 16 pages devoted to rock structure. The Rosenbusch classification of igneous rocks is followed, even to giving different names to volcanic rocks of the same composition according to whether they are pre-Tertiary or younger. A very simple descriptive classification of sedimentary rocks is used and only a few of the more important types of metamorphic rocks are mentioned.

Ground water and springs are briefly discussed at the end of the section. Geological forces and their operation are classified into surface and "inner" phenomena, and merit a 41-page discussion.

In the section on historical geology there is a 2-page synopsis of the plant and animal kingdoms and a 2-page tabular summary of geologic history giving eras, periods, approximate ages in years and the development of plant and animal life. There follows a 37-page cursory outline of the geologic periods with 40 illustrations of typical sedimentary rocks and fossils.

Part II is a 73-page treatise on mineralogy. Crystallography is allotted but 3 pages. All of the crystal systems are illustrated with axes and angles, but the more important crystal forms are given for the isometric system only. Physical and chemical properties of minerals, origin of minerals, and crystal structure are given very little space. Optical properties are not discussed, and origin of minerals is summarized on a single page. The major part of this section is given to some 90 descriptions of species of rock forming, gangue and ore minerals in more or less detail, with respect to composition, properties, occurrence and use. About 25 others are mentioned but not described.

Part III, the economic geology section, consists of 86 pages of description and discussion of the coal, ore, salt, and oil deposits of Germany, giving geographical distribution, external form, relation to country rock, genesis, use and estimates of reserves. Geophysical methods of prospecting are outlined in slightly less than two pages.

At the end of the section occurrences of industrial minerals (graphite, fluorite, barite, gypsum, magnesite, etc.), building stones, clay, natural gas, and precious stones are mentioned very briefly.

The work of many authors is referred to in the text, but references are limited to a single page at the end of the book of the more important sources of material. There is a 10-page subject index.

Kukuk certainly attained his objective of presenting briefly and concisely a tremendous amount of information. Most sections are probably adequately treated for the audience to which the work is addressed, but several subjects are touched so lightly that it appears to the reviewer they might better have been expanded or omitted entirely. For example,

the section on crystallography would have been much more useful if the symmetry and principal forms of the other systems had been outlined; this would have required only 3 or 4 pages more to treat them the same way the isometric system is described. There is little point to discussing crystal structure and x-ray patterns in a work of this kind; one page is certainly too little space to give any useful idea of these subjects. It would seem that in a book in which so much emphasis is placed on useful mineral deposits more than two pages could have been profitably devoted to geophysical prospecting, and geochemical prospecting might have been mentioned.

Neither the preparation nor interpretation of topographic or geologic maps is mentioned in the part on geology. However, simple geologic maps of some of the German mining districts are given in the part on ore deposits.

Part I (geology) emphasizes processes and other information of interest to mining men, engineers, and other practical scientists, which probably explains the omission or extremely brief treatment of many subjects to which considerable attention is given in most textbooks of geology. For example, the only reference to the ocean is a one-page discussion of marine abrasion and the only reference to deserts is by implication in the outline of the work of wind. Soil creep and landslide phenomena are not mentioned at all.

The book is very well illustrated with excellent photographs and diagrams. It is well bound in cloth and should prove to be a compact and handy reference work for mining men as well as a textbook for students of mining geology and related branches of earth science. It touches a wider range of subjects than do most textbooks of geology and so should prove useful to non-Germans in acquiring a larger vocabulary of German terms by reading of a single small volume.

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GUIDE TO GEOLOGIC LITERATURE, by RICHARD M. PEARL, xi+239 pages, McGraw-Hill Book Co. Inc., New York, N. Y., 1951. Price, $3.75.

The scope of Pearl's book is a good deal broader than is indicated by the title. After a brief introduction (Part I, 13 pp.) in which the problem is stated there is a 33 page treatment of library facilities (Part II) with chapters on Arrangement of the library, Library catalogues, Indexing and Library services. Most of this information is of a general nature and applies to any kind of library reference. However, library catalogues of special interest to geologists and libraries well-known for geologic and geographic research are listed specifically, although most of these libraries are among the most important for a wide variety of subjects.

Part III is a 146-page discussion of the kinds of geologic literature. There are 13 chapters, each of which is devoted to a type of publication. Most of these types are well recognized, but some of them, such as newspapers and city and county bulletins are not commonly thought of as sources of geologic material. In most of the chapters of Part III, especially those on Index guides and bibliographies, Abstracts, and Periodicals, much information is given about the literature of chemistry, physics, geography, agriculture, general science, and other subjects even further afield from geology.

Interesting and useful information about federal and state agencies, which one would hardly expect to find in a book on geologic literature is included in the chapters on the publications of those agencies. For example, an organization chart and list of regional headquarters is given for the U. S. Bureau of Mines (but not for the U. S. Geological Survey); the regional offices of the Soil Conservation Service (Agriculture) are given; the divisions of the National Bureau of Standards and its series of publications (most of which have very little to do with geology) are listed; all state and territorial geological

surveys, bureaus of mines, and agricultural experiment stations are listed with their addresses and additional information is given about the first two.

This breadth of treatment makes the book especially useful to those geologists who are not well acquainted with the literature of the related natural sciences or with some of the more obscure types of geologic or "borderline" material. However, the inclusion of so much extraneous material, rambling treatment, and repetition combine to make the book much longer than appears really necessary for a treatise of this kind. It also suffers from lack of organization, poor definition, hazy classification, and inaccuracies. Much of the reference material would have been more useful had the presentation been in list form, with notes, rather than being scattered throughout the text.

Of the inaccuracies and omissions noted the following appear to be of sufficient interest to merit mention in a review.

On p. 84 the information about volume numbers of the *American Journal of Science* is incomplete; after vol. 36 of Series 5 there is a break, the next volume going to the "whole number" 237 (1939), and since then the volumes have been numbered consecutively one per year instead of 2 per year as previously. The whole volume number of the reference near the bottom of the page should be 236, not 216.

Similarly the information (pp. 125–126) on the volumes and numbering of the *Transactions of the American Geophysical Union* is in error. Since 1945 (Vol. 26) they have been issued as a regular bimonthly journal. Before that time they were not assigned volume numbers, but were designated as reports of annual meetings.

On p. 125 the statement that "N.R.C. Committee Reports are not available for general distribution," is erroneous because many of the longer and more useful reports such as the one issued each year by the Committee on Geologic Time are for sale to anyone interested. On p. 203 the address of the National Geographic Society should be Washington, D. C., instead of New York.

The coverage of this book is so broad and comprehensive, that the omission of several better known reference works is all the more striking. In the treatment of bibliographies it probably would have been well to list at least one on petroleum, for example, De Golyer and Vance, *Bibliography on the Petroleum Industry*, Texas A. and M. College, Bull. 83,730, p., 1944. Also Mark Pangborn's *The Earth for the Layman*, Amer. Geol. Inst., Rep. No. 2, 50 p., Washington, 1950, would be a useful addition. Although Lahee's *Field Geology* (McGraw-Hill, N. Y., 1941) is not called a handbook in its title it certainly is one in content and treatment and therefore should have been included in the list of such books on p. 171. It probably would have been worthwhile to list on p. 90 the 26 most important geologic periodicals referred to there. In the same chapter the new journal *Geochimica et Cosmochimica Acta* might also have been mentioned.

On p. 122 there is a list of publications of the National Bureau of Standards which omits their important *Journal of Research*. "Open file reports" form an increasingly important part of the out-put of the U. S. Geological Survey, yet these are not mentioned either under U. S. Government Documents or under "Unpublished Manuscripts." On pp. 174–175 there is a list of English-foreign-language geologic dictionaries; in the experience of the reviewer, other technical dictionaries, a few of which are given here, are more useful to and more widely used among geologists, although most of the titles do not indicate that geologic terms are included:

"German-English Dictionary for Chemists" by Austin M. Patterson, John Wiley and Sons, Inc., New York 3d ed., 1950, 541 pp.

"French-English Dictionary for Chemists" by Austin M. Patterson, John Wiley and Sons, Inc., New York, 1921, 384 pp.

"German-English Science Dictionary" by Louis De Vries, McGraw-Hill Book Co., New York, 1939, 473 pp.

"French-English Science Dictionary" by Louis De Vries, McGraw-Hill Book Co., New York, 1940, 546 pp.

"Engineer's Dictionary—Spanish-English and English-Spanish" by Louis A. Rabb, John Wiley and Sons, Inc., New York, 1949, 664 pp.

"Russian-English Technical and Chemical Dictionary" by Ludmilla Ignatiev Callaham, John Wiley and Sons, Inc., New York, 1947, 794 pp.

Recently three more good technical dictionaries have appeared that should be useful for geologists:

"German-English Technical and Engineering Dictionary" by Louis De Vries, McGraw-Hill Book Co., New York, 1950, 928 pp.

"Diccionario Minero-Metalúrgico-Geológico-Mineralógico-Petrográfico (English-Spanish-French-German-Russian) by Alejandro Novitsky, Buenos Aires, 1951, 309 pp. quarto.

"Tekniikan Sanasto (Technical Vocabulary, German-English-Finnish-Swedish-Russian)," Kustannusos akeyhtiö Otavan Kirjapaino, Helsinki, 1950, 1518 pp. (exclusive of index, which is a separate volume).

The analysis of unpublished research in geologic science mentioned on p. 193 has now been published as Report No. 3 of the American Geological Institute (Washington, D. C.) with the title "Non-Industrial Research in the Geological Sciences, 1950." It lists 3048 projects in 80 mimeographed pages. A companion volume, "Current Research in the Geological Sciences in Canada, 1950–51" compiled by J. F. Henderson, was published in Ottawa in 1951 by the Geological Survey of Canada. It has 54 pages and lists 548 projects.

Pearl's book has an unusually comprehensive index of 27 pages for 212 text pages. Some omissions, however, are inevitable. For example, there is no entry "Interlibrary loan" or "Loan, interlibrary" or "Library, loans" although the subject is treated in some detail. There are no index references to the British colonies listed at the bottom of p. 156.

Guidebooks to the literature of most of the other natural sciences have long been available. With the growing importance of Geology for the national economy and the increasing complexity of published material the appearance of *Guide to Geologic Literature* is very timely. Such a compendium will be valuable not only to students who are getting acquainted with the literature, but also to more experienced geologists who thought they already knew most of the field.

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GEOMETRISCHE KRISTALLOGRAPHIE UND KRISTALLOPTIK UND DEREN ARBEITSMETHODEN, by FRANZ RAAZ AND HERMANN TERTSCH (Second Edition), x+215 pages, Springer-Verlag, 1951. (Price, paper-bound, $4.50).

The first edition of this textbook (1939) appears to have been very well received by colleges in German-speaking countries, which calls for a revised edition. However, the second edition is practically a reprint of the first; table of contents, pagination, figures and index are practically identical in the two editions. Only very minor changes or additions have been made; for example, there are two three-line supplementary statements on p. x, and in the discussion of universal stage technique a reference to the excellent treatment of the subject by Berek has been added.

Part I is a 123-page straightforward treatment by Franz Raaz of geometrical crystallography (crystal morphology). Fundamental laws of crystallography, Methods of representing crystals graphically, Crystal symmetry, Development of the 32 crystal classes, Description of the forms in the individual crystal systems, Development of twins, and Crystal structure are discussed in that order.

Part II, by Hermann Tertsch, is an 85-page outline of crystal optics in which Fundamentals of the optical character of crystals, Polarizing microscopes, Crystals showing optical rotation, and Influence (of temperature, pressure, etc.) on the optical characters of cystals are discussed in that order.

This is a very compact, and for the most part accurate, textbook of crystallography and crystal optics. However, there are a number of things that might have been changed with advantage in a "revised" edition. Some of the illustrations (e.g. Fig. 24, an 1893 model of a two circle goniometer) are even further out of date than they were in 1939; there is little point to having two identical illustrations like Figs. 36 and 74. On p. 164, par. 5 the author fails to recognize that in a random section of a uniaxial mineral one direction always gives the true value of ω. In the first paragraph of p. 172 the U.M. series of objectives made by Leitz might have been mentioned. They have initial magnifications up to 30 X with the universal stage and in large part overcome the difficulty mentioned here. The directions for use of the universal stage on pp. 172–173 are simplified and abbreviated to the point of inaccuracy in some respects. For example, in par. 2, p. 172, the statement is made that if a mineral grain remains dark between crossed nicols during rotation about either horizontal axis it is isotropic. This is usually, but by no means always, the case. Grains, or sections, of uniaxial and biaxial crystals in certain orientations will behave in this manner. Likewise, the descriptions of measuring uniaxial and biaxial crystals are so generalized that they do not take care of all possible initial orientations. In the reviewer's opinion this section should either have been expanded considerably or just a reference given to adequate treatments of the subject.

The book is well illustrated, is printed on good paper and presents an over-all pleasing effect. Particularly attractive are the pictures showing crystal models, or drawings of crystals, alongside crystals of minerals showing the same form(s). The discussions of skiodromes and of Bertin surfaces are much more complete and satisfactory than those found in most English textbooks. The reviewer is completely in sympathy with Tertsch's use of ω and ϵ and α, β and γ to denote the indices of refraction of uniaxial and biaxial cyrstals, respectively. Used in this connection they are entirely unambiguous; if this usage could be made universal it would eliminate a great deal of uncertainty of meaning and awkwardness of expression in many American and English textbooks and articles.

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ELEMENTS OF OPTICAL MINERALOGY. PART II—DESCRIPTION OF MINERALS, by A. N. WINCHELL WITH COLLABORATION OF HORACE WINCHELL, 4th Edition, 1951, viii plus 551 pp., 6 by 9 inches, 427 figs. Cloth. Price $12.50. John Wiley and Sons, Inc., 440 Fourth Ave., N. Y. 16, N. Y. The publishers have issued an errata sheet, free on request.

This book is a thoroughly revised edition of the well-known and widely used reference work of A. N. Winchell. According to the publishers, the volume of new data and descriptions have been expanded by about 25 per cent. There is an increase of 92 pages over the third edition. All those who use this book will be greatly indebted to the Winchells for a valuable, handy, and usable reference book that is indispensable in the laboratory.

The authors have combed the scientific literature so well that the book contains all of the latest data available to them at the time of preparation.

Having stated unequivocally the importance of this work to mineralogists, I now present a critique of its contents:

Immediately following the table of contents is a very useful summary of abbreviations and symbols. The statements on page xiv that:

N_x ..... α of German writers
N_y ..... β of German writers
N_z ..... γ of German writers

apparently changes the nationality of many residents of the United States and Great Britain.

A *Special Notice* is printed on pages xv and xvi for users of this volume. First, there has been a complete change in symbolism for the indices of refraction—the N_g, N_m, N_p, N_o, and N_e are now replaced by N_z, N_y, N_x, N_0, and N_E. Although this is a very great concession on the part of the senior author, nevertheless, it establishes a new set of symbols. It is to be regretted that the authors did not accept one of the existing sets of symbols. Second, a very commendable usage has been introduced, in treating the data for extinction angles, by adopting Schuster's rule which heretofore has been followed largely in describing feldspar crystals.

The introduction to the book is an illustrated section on Drawings, Projections, and Diagrams. This chapter is too brief to be of great service to readers. Thus, the whole section on the Spherical Projection could be eliminated. The section on the Stereographic Projection should be greatly expanded to show students and others just how optical data are plotted in a stereographic projection. Reference to the treatment in Johannsen's "Manual of Petrographic Methods," Boeke's "Die Anwendung der stereographischen Projektion bei kristallographischen Untersuchungen" and F. C. Phillips "An Introduction to Crystallography" would have been helpful. The section on Gnomonic Projection could be eliminated.

An error present in earlier editions of this book and in "The Microscopic Characters of Artificial Inorganic Solid Substances or Artificial Minerals" is continued here and appears on page 10. The composition of point P_3 is incorrectly given. It should be 50 per cent B, 30 per cent A, and 20 per cent D. There is no component E in this hypothetical system.

The main part of the book is called the "Description of Minerals" and comprises ten parts; I. Elements; II. Halides; III. Sulfides; IV. Oxides; V. Carbonates, Nitrates, and Iodates; VI. Other mineral Carbon Compounds; VII. Borates; VIII. Sulfates, etc.; IX. Phosphates, etc.; X. Silicates. These major divisions in the classification are further subdivided on the basis of chemical and structural principles. The subjects covered for each substance are given below together with comments.

(1) *Name, Crystal class name, Chemical formula, Crystallographic elements of crystallization*

The crystal class names used are those of Groth modified by Rogers. The authors are to be congratulated on this choice which is almost universal today.

(2) *Composition*

(3) *Structure*

This includes the space group, sides of the unit cell, and the number of formula atoms in the unit cell. The errata sheet contains many corrections to these data. Professor D. J. Fisher, in a review in *Jour. Geol.*, 59, no. 4, pp. 402–407, 1951, gives a large number of corrections covering the structural data.

(4) *Physical characters*

Crystal habit, twinning, parting, cleavage, hardness, specific gravity, fusibility, solubility, magnetism are given where data are available.

(5) *Optical Properties*

These are given in detail for opaque and non-opaque minerals. The reflection per-

centages of Schneiderhöhn and Ramdohr and others are given for opaque minerals. The data of R. Bailly on the optical properties in the infra-red have also been added.

(6) *Alteration*

(7) *Occurrence*

This subject receives a very uneven treatment. For some minerals, such as lazulite and scorodite, no localities are given. For others, such as molybdenite, as many as three localities are given. In other references, the given localities are so general as to be of slight value. Thus, borax is stated to occur in "certain salt deposits, as in Tibet and California"; chrysoberyl "found in pegmatite in New England, etc., also in micaceous schists in the Urals, also in alluvial deposits in Brazil or Ceylon"; turquoise, "found in veins in trachyte in Persia, in copper ore deposits, as in Chile." The choice of localities is not always based on the size of the deposit, its fame, nor on the quality of the material for research purposes. This reviewer believes that localities for optically and chemically described material are very helpful for those who are teaching or engaged in research, and should be given in some detail.

(8) *Diagnostic characteristics*

Illustrations

Many new graphs relating optical properties to composition are given in this book. Not all will agree with the basis for the construction of a number of these graphs: but, as the Winchells state on page xiv that some of these graphs must be considered *"rather crude approximations,"* it will be up to the reader to evaluate these charts. Nineteen photomicrographs are included, but unfortunately no locality is given with any of these illustrations.

Classification

The classification is strongly influenced by the two leading modern treatises, Dana's "System of Mineralogy," 7th Edition, and Hugo Strunz' "Mineralogische Tabellen."

The chapter on the silicates has an eight page introduction to the classification of these minerals which is based on crystallo-chemical considerations. The classification adopted is that of Hugo Strunz with the addition of M. Fleischer's class of cyclosilicates for minerals having rings of tetrahedrons in their structure. Quartz, tridymite, cristobalite, and opal are classed as tectosilicates.

General Comments

There are a number of matters concerning nomenclature, classification, and interpretation in this book which are totally at variance with the opinions of many mineralogists. Only a few of these differences are presented here:

In the preface on page vi, one reads with surprise the statement "This concept that one mineral may vary in composition *is a new one;* indeed, at the start of this century most mineralogists believed that any one mineral had one fixed composition, and . . . " (the italics are the reviewer's). It apparently needs to be re-emphasized that Yale University was a stronghold, in the United States, in the study of the variation in the physical properties of minerals with a variation in chemical composition. Thus, in the *American Journal of Science* in 1894, Penfield presented a paper "On the crystallization of herderite" in which he relates change of optical properties to substitution of OH for F; this was followed by one entitled "On the chemical composition and related physical properties of topaz." In 1895, Penfield and Pratt discussed "The effect of the mutual replacement of manganese

and iron on the optical properties of lithiophyllite and triphyllite. In 1896, Penfield and Forbes wrote on "Fayalite from Rockport, Massachusetts," and on the "Optical properties of the chrysolite-fayalite group and of monticellite." These contributions serve to illustrate the point that the variation in the chemical composition of minerals was well recognized in the 1890's. Ford continued such studies at Yale and Penfield's influence also took a firm hold elsewhere, as at the U. S. Geological Survey and the Geophysical Laboratory.

(2) In speaking of *solid solution* relationships between fluorite, YF_3, and CeF_3, one is led to believe that there is a difference between the synonyms, *crystal solution* and *mix-crystals*. The usage of the synonyms elsewhere in the book is confusing. It would be better to select one term for solid solution and adhere to the usage.

(3) The coverage of the feldspar group, 59 pages, is very detailed. Although reference is made to the work of Dittler and Köhler, and Köhler and Tertsch on the character of high-temperature feldspars, no attempt is made to interpret these papers or to treat the modern developments in this field. Considering the importance of recent investigations, this section is somewhat disappointing.

(4) The statements "The hydration of feldspars may lead to the formation of sericite, kaolinite, zeolites or similar minerals," p. 261, and "By hydration muscovite alters to damourite or hydromica," p. 368, and similar statements in the book are not in keeping with the advances in physical chemistry in the last thirty years. The process of alteration is far more complex than simple hydration.

(5) The treatment of the clay minerals is very disappointing. A large amount of careful work has been done on the minerals of the montmorillonite group. Figure 275 is of little use. The formulas for the montmorillonite group are difficult to interpret since a large number of proposed formulas have been suggested in an effort to include the variable interlayer water as a part of the formula. Thus, the generally accepted formulas of Ross and Hendricks have not been adopted. The usage of the term "leverrierite" is in error. Leverrierite is a synonym of kaolinite. Miloschite has been shown by Grim and Rowland to be a mixture. The clay mineral brammallite is a true hydromica, a sodium-rich variety, and is most certainly not to be classified with paragonite. In the classification of the montmorillonite group on page 398, canbyite is included under nontronite; but on page 400, in the description of canbyite, it is stated to be related to kaolinite. This is very confusing. In footnote 156 on page 399, it is stated that "Saponite and sauconite are included here (although anhydrous) because they are so closely related to montmorillonite." Ross clearly showed from his analyses that these minerals are hydrous and he demonstrated unquestionably that they are members of the montmorillonite group.

There is no treatment of the hydromica group. Hydromica, as such, is mentioned under the alteration of muscovite on page 368. Bravaisite is relegated to a footnote on page 377, while the group name "illite" is not even listed. No mention is made of glimmerton. Damourite, a variety of muscovite, is made the equivalent of hydromica.

(6) The system of nomenclature followed by A. N. Winchell for a series of minerals composed of two end-members will not find general acceptance. The definition is as follows: "The name for a mineral species is a name which applies to all variations in composition which are possible in the given phase; it is a name of a natural unit." Thus the mineral *enstenite* applies to the entire series of orthorhombic pyroxenes from $MgSiO_3$ to $FeSiO_3$, and hypersthene and enstatite are considered as mere varieties or subspecies. Other examples of this are:

The mineral triphyllite includes the variety lithiophyllite
The mineral barytocelestite includes the varieties barite and celestite
The mineral alum includes the varieties potassalumite and tschermigite
The mineral scorodite includes the varieties scorodite and mansfieldite

The mineral variscite includes the varieties variscite and strengite
The mineral triploidite includes the varieties triploidite and wolfeite
The mineral childrenite includes the varieties childrenite and eosphorite

But note that:

(1) Phosphosiderite and metavariscite are given equal status.
(2) Rockbridgeite and frondelite are given equal status.
(3) The members of the vivianite group are broken down into six types.

This attempt, by Professor A. N. Winchell, to be logical in problems of nomenclature has led to some illogical results.

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ROCKS AND MINERALS, Vol. 26, Nos. 9–10, September–October, 1951. 25TH ANNIVERSARY ISSUE.

A noteworthy effort toward bridging the gap between the interests of professional and amateur mineralogists is the 25th Anniversary Issue of *Rocks and Minerals*, edited by Clifford Frondel and Arthur Montgomery and presented as a tribute to the editor and publisher, Peter Zodac. Contributors include Arthur Montgomery, Henry S. Canby, Charles Palache, Charles R. Toothaker, Richard V. Gaines, the late Lloyd W. Fisher, A. Pabst, C. D. Woodhouse, M. Vonsen, George Switzer, Samuel G. Gordon, Mark C. Bandy, David M. Seaman, Arthur J. Boucot, and Elmer B. Rowley.

Articles of particular readability and interest to the reviewer are those by Gaines, The Sapphire Mines of Kashmir, and by Bandy, The Ribaue—Alto Ligonha Pegmatite District, Portugese East Africa. Both of these articles present new information on what were heretofore largely unknown mineral districts. Most of the articles are well written and both line drawings and plates are far above average for a publication of this general rank. The co-editors deserve the thanks of all mineralogical enthusiasts for their unstinting efforts toward making the Anniversary Issue completely effective and worthwhile.

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PHASE TRANSFORMATIONS IN SOLIDS, by R. SMOLUCHOWSKI AND OTHERS, ix+659 pp., 92 figs., New York, John Wiley & Sons Inc. (1951). $9.50.

This book is most difficult to review. It consists of seventeen unrelated essays on seventeen aspects of phase transformations in solids. All are of high quality, by authors of recognized authority, and each would merit an individual discussion.

Some are purely theoretical, and of these "On the General Theory of Phase Transitions" by Laszlo Tisza appealed to the reviewer as of special interest. More specific are the essays by Kracek, Schairer, and Weyl respectively on one-component silicate systems, two-component silicate systems, and glasses. The several essays dealing with transformations in metals are excellent.

The book can unhesitatingly be recommended.

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