BOOK REVIEWS

MINERALS AND ROCKS, THEIR NATURE, OCCURRENCE AND USES, BY RUSSELL D. GEORGE. The Century Earth Science Series. Pp. 595, Pl. 48, Figs. 141. D. Appleton-Century Co. 1943. Price $6.00.

At first glance one is staggered by the encyclopedic scope of this volume, which runs to 568 pages, exclusive of glossary and index. A list of the main headings will show the ground covered:

Part I

Metallic Elements and Minerals

Chapter I	Materials of the earth and properties of minerals	9 pages
Chapter II	Metalliferous ore deposits	14 pages
Chapter III	Iron, steel and alloy metals	46 pages
Chapter IV	Major non-ferrous industrial metals	43 pages
Chapter V	Minor metals of increasing industrial value	20 pages
Chapter VI	Precious and semi-precious metals	15 pages
Chapter VII	Alkali metals	16 pages
Chapter VIII	Semi-metals	15 pages
Chapter IX	The radioactive series	13 pages
Chapter X	Minor metals of limited industrial value	8 pages

Part II

Nonmetallic Elements and Minerals

Chapter XI	Carbon and hydrocarbon minerals and rocks	35 pages
Chapter XII	Sulphur, phosphorus and the halogens	8 pages
Chapter XIII	Water and the atmosphere	8 pages
Chapter XIV	Gem minerals and semi-precious stones	11 pages

Part III

Rock-making minerals

Chapter XV	Important primary minerals	21 pages
Chapter XVI	Minor and secondary minerals	18 pages
Chapter XVII	Industrial uses of rock-making minerals	10 pages

Part IV

Determinative mineralogy

Chapter XVIII	Equipment and tests	4 pages
Chapter XIX	Identification of elements and minerals	26 pages
Chapter XX	Igneous rocks: general	15 pages
Chapter XXI	Igneous rock families	36 pages
Chapter XXII	Sedimentary rocks	22 pages
Clapter XXIII	Metamorphic rocks	8 pages
Chapter XXIV	Industrial uses of rocks	24 pages

Appendix: Materials classified by uses

It will obviously be impracticable to review in detail this mass of material, but the more important points may be touched upon. In general, the author and the publisher are to be complimented on the almost complete absence of typographical and subject matter errors. The outstanding fault is the entire lack of references to original sources, a lack whi.h limits

the value of the work for all but the most elementary purposes. It is true that such references, which might well have been grouped at the end of each chapter, would have expanded the already voluminous text, but some of the minor points could have been eliminated, and the added value of references would have more than compensated for any loss of material. Another unfortunate feature is in the drawings of crystals, many of which are made with curious orientations. Moreover, the appearance of the drawings is seriously impaired by poor draughtsmanship, resulting in uneven heaviness of lines, and unnecessary distortion of crystal faces, which mars the appearance of the whole production. The figures on pages 14, 17, and 19 are particular offenders in this respect, but faulty drawing and orientation persist throughout the text. This is the only obvious flaw in an otherwise excellently produced publication. There are numerous photographic reproductions illustrating mineral and rock types and occurrences, which form an excellent feature of the work.

The general physical properties of minerals are covered briefly but adequately. In the chapter on ore deposits the author outlines the occurrence of different types of deposits, illustrating with idealized diagrams, which might better have been taken from specific deposits, as was done for a few cases.

The ferrous metals and alloy metals, such as chromium, molybdenum, tungsten, etc., are dealt with first from the metallurgical standpoint, following which is a condensed mineralogical description of the compounds in which they occur. In these descriptions the composition of limonite is given without remark as if it were a single definite mineral rather than a group. Rare minerals, like pharmacosiderite, are described in unnecessary detail, and this emphasis on rare minerals is consistently applied throughout the book. On page 76 it is noted as "possible" that nickel occurs in pyrrhotite as grains of pentlandite, whereas in most occurrences this has been clearly demonstrated to be true.

The non-ferrous industrial metals are listed as including Cu, Pb, Zn, Cd, Sn, Al, Mg, Hg. Again, as with iron, many rare varieties are described, although there is an additional list merely mentioned by name.

There is an interesting chapter on minor metals which are of increasing economic value, such as Be, Ca, Sr, Ba, the radium group, and Nb, Ta, Ti, Zr, giving lists of their uses. In the chapter on precious metals, gold, silver and the platinum group are covered briefly.

The uses, sources, and mineralogic descriptions of the alkali metals, Li, Na, K, Rb, Cs, are given, even including the descriptions of many uncommon minerals. Under the semi-metals are treated As, Sb, Bi, Se, Te. The discussion of the radioactive series is more chemical than mineralogical, as is that of the group of rare elements in Chapter X which do not in general form distinctive minerals. These elements include gallium, indium, scandium, hafnium, etc., and the rare earths.

Under the non-metallic elements considerable space is devoted to carbon in the form of coal and peat, and petroleum, with a discussion of their origin, production, by-products and uses. Graphite and diamond receive brief mention. The chapter on sulphur, phosphorus, and the halogens is short, giving the chemical properties and uses of the elements, and descriptions of the definite minerals, when such occur. The chapter on atmospheric gases and water might very well have been omitted entirely. Under gem minerals is given the mineralogic descriptions of the principal precious and semi-precious stones, listing under each the names and properties of the sub-varieties, a very convenient arrangement in comparison with a purely alphabetical classification.

The rock-forming minerals are divided into the primary minerals, first of the igneous, then of the sedimentary rocks. Minor primary minerals, such as sphene, zircon, etc., are treated in the section with the secondary minerals. These should more fittingly have been

included as an appendix to the primary group. The secondary minerals are grouped as zeolites; minerals of weathering (such as the clays, etc.); minerals of metamorphism (not in general duplicating those also common in igneous or sedimentary rocks). No effort has been made to group stress and non-stress minerals. There is a separate chapter on the industrial uses of rock-forming minerals—quartz, mica, feldspars, clays, refractories, etc., to some extent duplicated in the section on the industrial uses of rocks.

Part IV lists and describes apparatus and reagents for simple determinative tests with blowpipe and chemicals, but does not attempt to give determinative tables, except one brief color and luster classification. There is the usual description of flame and bead colors, plaster tablet reactions, and an alphabetical list of the elements with tests for most of them.

The final section is the petrology of the common rocks, starting with a general outline of the formation of igneous rocks, their textures and occurrence, and a field classification modified from Cross, Iddings, Pirsson, Washington. Each group of the classification is then taken up in some detail with respect to its mineralogy. For the sedimentary rocks there is a good, brief statement of the conditions of weathering of older rocks, and transportation of the resulting materials. This is followed by the normal descriptive classification into subgroups, ending with chemical precipitates. Under metamorphic rocks, the metamorphic processes are outlined, in simple brief form; then follows a classification and description of types (as foliates or non-foliates, because of the occasional difficulty of determining the character of the parent rock).

In the chapter on industrial uses of rocks, building stones are treated at considerable length, covering strength, durability (with a rather detailed discussion of the causes of decomposition, especially in buildings), workability, color, etc. Cements, limes, plaster and clays are treated somewhat less fully.

An appendix, in which materials (mineral or elements) are grouped by uses, should be useful in some cases.

It seems that the author has tried to take in too much territory in too much detail, and the result has been an unwieldy volume, which on this account will be less useful than it might have been. Admittedly, setting the limit on volume and detail is a difficult problem, and Mr. George has done perhaps as well as possible with the ground he has covered. He has served a useful purpose at least in assembling under one cover a very considerable and varied supply of information.

JOSEPH MURDOCH

OPTICAL CRYSTALLOGRAPHY, BY ERNEST E. WAHLSTROM. v+206 pages. John Wiley and Sons, New York, **1943**. Price $3.00.

This little volume will be a welcome addition to the many books in this field. Its contribution lies almost wholly in the multitude of excellent two- and three-dimensional drawings which are by far the best the reviewer has seen.

As a textbook it has many weaknesses. The presentation of ray velocity surfaces, the Fresnel ellipsoid, the ovaloid, and Bertin's surface will unnecessarily confuse the student who finds it difficult enough to grasp the essential fundamentals without going so far afield. Twenty-nine of the two hundred and six pages are devoted to the determination of the optic sign, an incidental feature of the optical properties of a crystal, and the determination of the principal indices of refraction are correspondingly neglected. The method for the determination of the principal indices of refraction of a uniaxial crystal (page 87) applies only to crystals of low double refraction and is not applicable to most organic compounds which are characterized by high double refraction.

There are numerous errors such as the statement on page 79, "The quartz wedge re-

solves white light into its spectrum." The equations of the various optical surfaces are given in rectangular coordinates but on pages 65 and 142 the equations do not follow the text. Although perhaps not of major significance, these errors will confuse the student. However, the reviewer still believes that the experienced teacher can use this book to advantage because of the many excellent drawings it contains.

C. B. SLAWSON

NEW MINERAL NAMES

Hectorite

H. STRESE AND U. HOFMANN: Synthesis of magnesium silicate gels with two-dimensional regular structure. *Zeit. anorganische allgemeine Chemie*, **247**, 65–95 (1941).

The name hectorite is proposed for the magnesian bentonite from Hector, California, described by W. F. Foshag and A. O. Woodford, *Am. Mineral.*, **21**, 238–244 (1936). It is regarded as being the magnesium end-member of the montmorillonite group. *X*-ray data are given.

DISCUSSION: The name hectorite was proposed in 1882 for an alteration product of pyroxene, perhaps anthophyllite (see *Dana's System*, 6th Ed., p. 364). However, the name has not been used in this sense for many years.

MICHAEL FLEISCHER

Brammallite

F. A. BANNISTER: Brammallite (sodium-illite), a new mineral from Llandebie, South Wales. *Mineral. Mag.*, **26**, 304–307 (1943).

NAME: For Dr. Alfred Brammall.

CHEMICAL PROPERTIES: A member of the illite group of mica-like clay minerals, which contains more Na than K.

Analysis by M. H. Hey on 15 mg. gave Na_2O 5.22, K_2O 2.58%. (i.e. the full alkali content of paragonite. M. F.)

No measurable differences were found in the *x*-ray patterns of material heated to 700°.

PHYSICAL PROPERTIES: Occurs as white, compact tufts of elongated plates about $\frac{1}{2}$ mm. long. Optically biaxial, negative, $\alpha = 1.561 \pm .002$, $\gamma = 1.579 \pm .002$, 2 V large. The extinction is nearly parallel. Elongation positive. *X*-ray study gave $a = 5.2$, $b = 9.0$, c sin $\beta = 18.95$ Å. *X*-ray powder data are given.

OCCURRENCE: Occurs as fissure filling and surface coating on shale overlying coal-measures at Llandebie, South Wales.

M. F.

REDEFINITION OF SPECIES

Jacobsite, Vredenburgite

BRIAN MASON: Mineralogical aspects of the system FeO-Fe_2O_3-MnO-Mn_2O_3. *Geol. För. Förh.* (Stockholm), **65**, 97–180 (1943).

In a study of the system Fe_3O_4-Mn_3O_4, natural material in the range 54–91% Mn_3O_4 was found to consist of two phases: a tetragonal phase with 91% Mn_3O_4 and a cubic phase with 54% Mn_3O_4. It is suggested that the name vredenburgite should be used for all compositions within this range. These consist of oriented intergrowths formed by ex-solution.