BOOK REVIEWS

THE SYSTEM OF MINERALOGY OF JAMES DWIGHT DANA AND EDWARD SALISBURY DANA, Yale University, 1837–1892, seventh edition, entirely rewritten and greatly enlarged, by CHARLES PALACHE, HARRY BERMAN, and CLIFFORD FRONDEL, Harvard University; volume I, elements, sulfides, sulfosalts, oxides. New York (John Wiley & Sons), London (Chapman & Hall) 1944, xi+834 pages, many figures. $6\frac{1}{4}\times 9\frac{1}{4}$ inches. Price $10.00.

To most of us *Dana's System* has always meant the *Descriptive Mineralogy* of E. S. Dana (1892), which proved so complete and accurate and judicious a compilation that it gained something of the authority and even the finality of Holy Writ. But this *Dana* was the sixth version of a work by J. D. Dana, originally published in 1837 and five times revised, sometimes with radical changes, in the ensuing period of five and fifty years. A comparison of the first edition with the sixth shows how greatly mineralogy developed in the intervening years, and the rows of volumes that have been added to the journals of mineralogy since 1892 show that there has been no abatement, rather an increase, in the rate of this development in the last half century.

The authors of the first volume of the new *Dana* were thus faced with the huge task of covering at a single stride at least as much as the Dana's did in five. At the outset they decided that the general form of the new work should follow that of the last *System*. The conception of a mineral species remains essentially unchanged, and the description of a species follows the traditional general order: crystallography, physical properties, chemical properties, occurrences.

But in detail we find many differences from the old system. Dana's inflexible system of species numbers, which gave the impression of finality, are replaced by an elastic system of numbers, usually four integers, such as 2613, meaning Class 2 (Sulfides), Type 6 (AX), Group 1 (Galena Group), Species 3 (Altaite). The specific name is followed by a revised and extended synonymy. The thoroughly revised geometrical crystallography is presented in a form designed to meet the needs of two-circle and single-circle goniometry. Improved angular values, supported by many new measurements, from the Harvard Laboratory and from the notebooks of the late Henri Ungemach, are frequently combined with new settings conforming to x-ray results, to give new geometrical elements and calculated angles. The many excellent crystal drawings are new or redrawn, if necessary in new positions. X-ray results are limited to the space-group of the atomic structure (in Hermann-Mauguin notation), the absolute and relative dimensions of the unit cell (to compare with the geometrical elements), and its atomic content (to compare with the simplest mineral composition).

The physical properties include many improved measurements of specific gravity (made with Berman's serviceable micro-balance), and the principal optical properties of opaque minerals in polished sections. The optical properties of non-opaque minerals are given in a separate section, using X, Y, Z, O, E, for vibration directions and n for refractive index, dispensing with α, β, γ, ω, ϵ, and employing r and v instead of ρ and v for axial dispersion. The chemical properties include the chemical formula written in the form $A_mB_n\cdots$, the calculated composition, selected analyses, and notes on the chemical varieties, using Schaller's chemical qualifiers with the name of the species (*mercurian silver*) in place of varietal names (*arquerite*), and thus relegating many varietal names to the

synonymy. The notes on selected occurrences often include remarks on the probable mode of origin. The authorities for all the important observations are given in the reference section, with supplementary data, lists of rare and uncertain forms, transformation formulae, and remarks on problematical matters.

In modifying the mineral classification to suit the needs of modern crystal chemistry Dana's classes (elements, sulfides, . . .) are essentially retained while substantial changes are introduced in the subdivision of the classes into chemical types (A_mX_p or $A_mB_nX_p$), series of minerals with serial properties, or groups of more or less related species. Within each class the types are arranged in order of decreasing $m:p$ or $(m+n):p$, that is in decreasing ratio of metallic to non-metallic elements; and thus the system commences with gold rather than with diamond. As in the old *Dana* the authors' decisions on the validity of mineral names can be inferred from the typography, in which, in a general way, four degrees can be discerned: established species of complete individuality; minerals which for some reason fall short of full-rank species; ill-defined and doubtful substances; and discredited names and synonyms.

These are but some of the changes that appear in the new *System*; others will be apparent when studying the introduction and the specific descriptions, where extensive changes and additions will be found. Without question every mineralogist will welcome the appearance of the first volume of the new work, in which he will find a critical appraisal, selection, and arrangement of factual mineralogy backed by the leading school in the United States. Those engaged in intensive mineralogical work will also turn to the references for direct leads to the more important sources. In this connection it should be mentioned that, although references as late as 1943 are included, unusual difficulties and delays in preparing and publishing the work appear to have led to the occasional omission or insufficient consideration of still earlier results; these can be quickly found in the recent volumes of *Mineralogical Abstracts*.

It would be surprising if a work which endeavors to bridge so large a gap at a difficult time, both in the development of mineralogy and in world affairs, did not show some signs of these disturbing influences and evoke some criticism or dissent on one score or another. Here we shall leave such matters aside and join the mineralogical profession in offering to Emeritus Professor Palache and his associates the warmest congratulations in bringing the first volume of their great work to completion, and expressing the hope that the succeeding volumes on the mineral salts and silicates will follow in the not too distant future.

In conclusion we refer with great regret to the accidental death of Harry Berman, which was reported shortly after the announcement of the publication of the work to which he had devoted himself and would have carried on to completion.

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PHOTOMICROGRAPHY IN THEORY AND PRACTICE, by CHARLES PATTEN SHILLABER. New York, John Wiley and Sons (1944). Pp. vii+773; figs. 291. Price $10.00.

The subject matter of this book is divided into eight chapters, with each chapter subdivided into sections for ready cross reference.

Chapter 1 discusses the mechanics of the microscope in a complete and understandable manner. All types of modern research and petrographic microscopes are described and illustrated.

Chapter 2 covers the large range of methods of lighting used with the microscope, together with photometric and other lamp data.

Chapter 3, extending over 137 pages, is devoted to a discussion of light waves and optical paths through various media and through a simple lens. This is followed by a detailed description and evaluation of microscope objectives together with their care and cleaning.

Chapter 4 deals with oculars and condensers. Dark-field methods are briefly explained for use with biological specimens and for photographing crystals. Also described are the correct condensers used in ultraviolet work and for demonstrating fluorescence.

Chapter 5 takes up the subject of optical filters with a discussion of their selection, use and care. The control of glare from the microscope and outside sources is extensively dealt with.

Chapter 6 is devoted to the camera and also to photosensitive materials and formulae. Simple vertical cameras as well as the larger and more expensive horizontal types are illustrated and briefly described. Comparison illustrations are used to show the effect of formulae on graininess in the film.

Chapter 7 deals with use and application in photography of various mounting media, stains, reagents and solvents. A 14 page table is provided giving the composition and use of some important etching agents used in metallography.

Chapter 8 presents in 47 pages, an analysis of practical photomicrographical problems. Many illustrations are used to show what may be accomplished in photographing difficult materials.

A glossary of optical terms used in Microscopy is appended. The index is very well organized.

The author states that the material is basic and that the book is largely a book of reference. The mineralogists who employ photography will find this book a valuable aid, written in a concise but complete style. Research workers and students who desire to improve their methods of making photomicrographs will find here a very stimulating book to add to their library.

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NEW MINERAL NAMES

Eckermannite

OLGE J. ADAMSON, Eckermannite, a new alkali amphibole: *Geol. För. Förh.*, **64**, 329–334 (1942); through *Chem. Zentr.* **1943**, I, 2078.

CHEMICAL PROPERTIES: Analysis gave SiO_2 56.45, TiO_2 0.39, Al_2O_3 5.47, Fe_2O_3 9.49, FeO 1.90, MnO 0.52, ZnO 0.67, MgO 9.43, CaO 0.35, Na_2O 11.30, K_2O 2.41, H_2O 0.33, F 2.69; sum $101.30-(O=F_2)$ $1.09=100.21\%$. This corresponds to $Na_4Mg_2AlFe(Si_4O_{11})_2(O, OH, F)_2$.