

## BOOK REVIEWS

HANDBOOK OF CHEMICAL MICROSCOPY, Volume 1. Principles and Use of Microscopes and Accessories. Physical Methods for the Study of Chemical Problems. Third Edition, by ÉMILE MONNIN CHAMOT and CLYDE WALTER MASON. John Wiley and Sons, Inc., New York, N. Y., 1958. xii+502 pages, 1 fold-in color plate Michel-Levy scale of birefringence, 125 Figures, Price, \$14.00.

Mineralogists, particularly those engaged in the study of chemicals, ceramic and similar products, will welcome the Third Edition of this well-known and most useful handbook. From a practical point of view, this book has two important and distinguishing features: (1) It contains many suggestions and remedies for the everyday as well as the unusual problems which face the practicing microscopist, and (2) It has several thousand literature references, many to special problems and applications, all arranged in convenient footnote form.

Several of the chapters of the Third Edition under review have been revised and modernized to a great extent from the previous edition (published in 1938); but, in some chapters, very few changes have been made. This edition contains a short chapter on the electron microscope. The discussion of the relation of optical properties to structure of crystals and aggregates has been enlarged and given chapter status; the added material is mostly basic crystallography. Newer techniques, such as phase contrast microscopy, are conveniently added to previously existing chapters.

In any attempt to completely modernize a textbook some of the older material might be expected to survive and we have no exception here. The reader will find several illustrations of somewhat antiquated equipment. In general, the illustrations are well chosen but this reviewer believes the petrographic microscope deserves more than a three-inch sketch (of an older model) especially when, for example, a photographic eyepiece and attached camera receive about one-half page. Some examples of past eras are still to be found within the text; for example, we might infer (p. 275) that the "cap" analyzer is still rather commonly used. These points are minor, especially when we consider that literature reference as late as 1958 are included.

The entire subject of optical crystallography is covered in about 50 pages, distributed among several chapters, in an order which would be unappealing to most mineralogists. Although all important subjects are covered, many are quite sketchy. The authors, however, do not intend their coverage to be adequate for all workers in the field and refer the reader to standard texts, many of them mineralogical. A new feature of the Third Edition is the Michel-Levy scale of birefringence provided by the Bausch and Lomb Optical Company and adapted from "Optical Mineralogy" by Rogers and Kerr. Unfortunately, the mineral names on the chart by Rogers and Kerr have been removed resulting in a chart with neither minerals nor chemical compounds illustrating the various birefringences. Under any condition, the usefulness of a Michel-Levy birefringence chart in this book is questionable.

There can be no doubt, however, that this book will be, quite deservedly, well received and continue to be one of the most widely used on the subject. In the opinion of the reviewer, this book illustrates the fact that mineralogists, with their superior training in petrographic methods, are far better equipped to tackle many problems in the general areas of chemical microscopy than are microscopists entering the field from other sciences. Teachers of optical mineralogy would do well to impress upon their students the value of the polarizing microscope in the ever increasingly important study of textiles, polymers, pigments, and other organic and inorganic materials of interest to industry.

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MINERALOGY AND GEOLOGY OF RADIOACTIVE RAW MATERIALS, by E. Wm. HEINRICH. 654 pp. McGraw-Hill Book Company, Inc., New York. \$14.50.

In the past ten years an ever increasing volume of descriptions of new uranium deposits, new uranium minerals, analytical data, hypotheses of origin, and guides for the prospector has been published. In this bulk of material much sound information was waiting to be sorted out and put together as in a giant jigsaw puzzle. In undertaking the tremendous task of evaluating, classifying, and summarizing this information Professor Heinrich has been highly successful. His book is very timely because sufficient source material is now available for a worthwhile summary, but most people interested in the overall picture of uranium geology cannot possibly obtain and assimilate all the source material. The publication comes at a time when the first great uranium prospecting boom has found an unexpectedly large supply of uranium and, within a few years, the development of atomic power now getting underway will probably require much more uranium and thorium.

The book of 654 pages includes a good section of about 150 pages on the descriptive mineralogy of uranium and thorium and associated rare earths and other elements, and a section of about 400 pages summarizing a great deal of information on the geology of radioactive deposits which are grouped under 12 main types. The last 100 pages includes a selected bibliography of more than 1,000 references, an index of radioactive and rare-earth mineral species, an index of localities, and a subject index. Many foreign references and papers and abstracts in the AEC reports or in publications outside the well-known mineralogical and geological journals give a wide scope to the bibliography. Only a few preliminary or premature publications might profitably be culled from the list.

The organization is excellent, with a logical sequence of presentation of the geochemistry of the radioactive elements, the mineralogy of uranium and thorium, including minerals with minor amounts of U and Th, and the geology of the various types of deposits. The geologic discussion proceeds from the occurrence of uranium and thorium in igneous rocks to radioactive pegmatite deposits, carbonatite and related deposits, pyrometamorphic and hypothermal deposits, mesothermal and epithermal deposits, epigenetic stratiform deposits in sedimentary rocks, uraniferous phosphorites, uraniferous marine black shales, placer deposits of radioactive minerals, radioactive hydrocarbons, and deposits formed by weathering and ground water. In general the classification of individual deposits is sound, but each reader of the book probably will argue with the placing of some of the deposits. Additional knowledge obtained after more extensive mining of some deposits probably will require changes in classification. For example, the reviewer does not agree with the contrast made between deposits in the Todilto limestone and those in the Morrison formation in the Grants area of New Mexico, nor with the interpretation of the Woodrow and Jackpile mines.

Photographs of outcrops, photomicrographs, and line drawings are used to good advantage. Tables of mineral data and characteristics of various types of deposits help the reader "see the woods for the trees."

To do his duty a reviewer is supposed to find some typographical error in a new book. This book has very few, but the mineral names thucholite, montroseite, and paramontroseite are consistently misspelled (10 to 20 times).

A wealth of material is packed into this large volume. A significant omission, however, is discussion of the geochemical processes controlling the transportation and deposition of uranium. The sections headed "geochemistry" cover chiefly trace element association in various mineral deposits. Little attention is paid to the solution chemistry of uranium or thorium as it may affect their mode of transportation or migration in near-surface deposits. Particularly, several references on uranyl-carbonate chemistry, which have contributed

to an understanding of uranium mobility, could have been added effectively.

This book is an excellent, useful, and readable summary of the present knowledge of the mineralogy and geologic occurrence of radioactive materials.

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