

## BOOK REVIEWS

AN INTRODUCTION TO MINERALOGY FOR GEOLOGISTS. By W. J. Phillips and N. Phillips, John Wiley and Sons, New York, 1980, xiv + 352 pages. cloth—\$49.50; paper—\$19.95.

This is a most unique and unusual introductory mineralogy textbook in several respects and as a result potential users may be either totally captivated by it or find it of very little potential class use. This reviewer is struck by both the unusual positive and negative aspects. Impressions of points of view of each are expressed in turn in the following.

First, the unique positive aspects: Conventional mineralogy texts are subdivided into sections dealing with subjects such as crystallography, physical properties, crystal chemistry, *etc.* Within each section there appears a complete discussion of the appropriate material. Subsequent chapters build on that material, with descriptions of minerals at the end which draw on the developed general theory. Not so in this text, for which the process might be described as one where the principles of mineralogy are in part derived, as was once originally done, through a set of observations on actual materials, albeit a carefully contrived set of observations designed to eliminate errors and false starts. Chapter 2, for example, is titled "The Symmetry of Crystals". However, the bulk of it is devoted to observations dealing only with crystals of gypsum, the cube, three other hexoctahedral isometric forms, pyritohedron and tetrahedron. Through these examples, the reader learns symmetry principles. Only in the last two or three pages are crystal classes, systems and conventional nomenclature introduced. An important aspect of this process is the large number of questions which are presented to the reader as an integral part of the text, while "Questions for recall and self-assessment" appear at the end of chapters. Where theory is not directly represented by photos and figures under discussion it is developed as an adjunct to or expansion of that material. For example, Pauling's rules are developed in part as a description and derivation of the crystal structure of NaCl (which in turn serves as an expansion of X-ray diffraction principles). In these ways and others, the reader is effectively drawn into the learning process in a manner which the more traditional presentational style cannot equal.

If ever there was a process which leads to a genuine intuitive understanding of principles, this kind of self-tutorial experience is it. Therefore it may be ideal for some instructors, especially those with limited laboratory models, *etc.* Sample chapter headings, chosen as representative examples include: 2. The Symmetry of Crystals. 4. The Internal Structures of Metals. 7. The Structures of Halite and Fluorite. 11. The Crystals of Zircon and Cassiterite from the tetragonal System. 16. Crystal Growth and twinned Crystals. 17. The Structures of the Common Silicate Minerals. All descriptions are accurate, easy to read, and reasonably complete. I found the discussion of X-ray diffraction and elements of structure analysis to be excellent, for example. These and related subjects are all presented in the same "learn by doing" way.

On the other hand, the subject matter deviates considerably in emphasis from recent trends. The emphasis is certainly on crystallography. However there is a great deal of morphological

crystallography, with much drawing of crystals, construction of stereographic projections and dealing with axial ratios. Although a certain amount is necessary for an understanding of basic relations, and to lead to a connection with principles of structure, it is over-emphasized here. Indeed the entire text is too strongly flavored with crystallography.

Important general subjects are almost entirely omitted. For example, substitution solid solution and other causes of variation in the chemistry of minerals is barely discussed, and then as a minor part of the description of olivine. Transformations are introduced only as a part of the description of the silica polymorphs and there is no mention of order-disorder transformations. Twinning is described but not from a genetic point of view. Phase diagrams are introduced in a cursory fashion with no significant discussion of phase equilibria. These and other important subjects are precisely those that lead to a understanding of mineral relations in terms of genetic variables—*P*, *T*, composition and time. It is those relations which the petrologist is especially in need of understanding in order to decipher the clues to rock genesis as represented in mineralogical features. Thus this textbook most certainly describes important *mineralogical* principles—especially crystallographic—which lead to an understanding of individual minerals, but I found it deficient in presenting those relations which are most needed by geologists. The title is misleading in that regard. Since the same can be said to some degree of most mineralogy texts, this may not be a critical factor for many potential users. There is no standard description of the properties of important minerals although the common silicates are described briefly. Some potential users will see this as a serious shortcoming, although it is easy to cure with another text.

This reviewer has a mixed response to the unique positive and negative features of this text. It is well written, nicely illustrated and provides the student, especially if he lacks laboratory materials, with an extraordinary opportunity to develop an intuitive understanding of principles, with emphasis on crystallography. Many important mineralogical principles are inadequately discussed however. These include, principally, features of minerals which relate to conditions of formation—precisely those of most interest to geologists. For this reason this text may be inadequate within conventional course structures in the United States.

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CLAY MINERALS by Ernő Nemeccz. Akadémiai Kiadó, Budapest, 1981. 547 pages with 217 figures, 126 tables. Price \$48.00

This book is an English translation, in excellent English with very few mistakes, of a book published originally in Hungarian under the title "Agyagásványok". The original publication date is not given but internal evidence suggests the early 1970's. An analysis of over 700 references shows that almost half belong to the period 1955-65 and fewer than 3% are post-1969. One wonders if it is useful to publish a book now so much out of date,

especially when several books covering similar ground have appeared recently. The author attaches much importance to presenting the various topics "in the context of their historical evolution." This results in much discussion of early views and gives the volume some importance from this standpoint.

The book is divided into three parts dealing respectively with the crystal structure and chemistry of clay minerals, their identification, and their formation in nature and in the laboratory. Part I (274 pages) opens with a discussion of the tetrahedral and octahedral sheets which together develop the layer structures of clay minerals. Within a few pages, however, without preliminary discussion of actual structures, it plunges into detailed arguments about such matters as  $06\ell$ ,  $\ell$  odd, reflections from micas, and  $b$  parameters of kandites (a term not now generally in use), smectites, etc., in relation to chemical compositions. To emphasize the complexity of clay mineral nomenclature, the chapter ends with 17 pages of all the mineral names which have appeared in the literature, many of which might now be left to die in peace. From here on, detailed descriptions of the various mineral groups with many tables of X-ray powder diffraction data are given: kaolinite and serpentine group minerals (60 p.), smectites and vermiculites (65 p.), micas (43 p.), chlorites (21 p.), interstratified minerals (14 p.), and so-called chain structures (6 p.). The last group, mainly sepiolite and palygorskite, are still valid phyllosilicates. Part II (80 pages) deals with the identification of clay minerals, mainly by X-ray powder diffraction analysis but DTA, IR, electron-optical and other data are mentioned. This section is well presented and my only criticism from a 1981 viewpoint is that rather little is said about interstratified minerals. Part III (152 pages) deals with the formation, synthesis and geology of clays and layer silicates. Ideas on chemical alteration of minerals, particularly feldspars, are discussed first and are followed by summaries of hydrothermal and attempted low-temperature syntheses of clay minerals. The pioneering studies of Bowen and Tuttle, Osborn and R. and D. M. Roy mainly in the 1950-55 period are summarized. The last section of this part, about 100 p., deals in detail with the various geological situations leading to the development of clay minerals. Since many of the occurrences described are in Hungary, this section may be the least dependent on the publication date of the original volume.

When this book was first published, sometime in the early 1970's as far as I can judge, it was an outstanding achievement and must have been of very great value to those who could read Hungarian. Unfortunately, relatively few of the world's scientists could read Hungarian. The need for a universal language for science is becoming increasingly recognized and the evidence presented in *Current Contents* and elsewhere shows that English is rapidly being used universally. If this volume had appeared in English a decade ago, it would have been widely acclaimed. For my own part, I will find it most useful for some of the historical accounts and for the descriptions of geological occurrences of clays.

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THERA AND THE AEGEAN WORLD Volume II. Papers and Proceedings of the Second International Scientific Congress, Santorini, Greece, August, 1978. Edited by C. Dumas. Humanities Press, Atlantic Highlands, New Jersey. Publisher: Thera and the Aegean World, London, 1980; 427 p.

Even with full cognizance of a general fascination concerning the major volcanic eruption on the island of Santorini (ancient Thera) in the Late Bronze Age, and of its possible basis for the Atlantis legend (e.g., *National Geographic Magazine*, May 1972), it is still almost overwhelming to consider the scope and quantity of natural science research that has focused on this small southern Aegean island over the past fifteen years. The most recent results of these multi-disciplinary studies are presented in *Thera and the Aegean World, Vol. II*, which completes publication of the proceedings of the Second International Congress held at Athens, Santorini, and Crete in August of 1978.

The late Spyridon Marinatos, dean of Greek archaeologists, was the catalyst and prime mover in applying the analytical techniques of volcanology, geochemistry, marine geology, petrology, botany, and pedology (among other disciplines), to reconstructing Thera's natural environment before, during, and following the early 15th century B.C. eruption and caldera formation. It was he who organized and convened the First International Congress on the volcano of Thera, held in September of 1969 (proceedings published in Athens in 1971). At that meeting geologists concentrated on defining the exact nature and duration of this particular eruption, while archaeologists debated the precise dating of the event. Much of the direction of the subsequent decade's research was suggested by the questions raised at this meeting.

Marinatos was killed in an accident at his excavation site on Thera in 1974, but scientific interest in studying the eruption and identifying its effects on Thera's populace, not to mention the Minoan civilization of Crete just 100 km to the south, continued unabated. Mr. P. Nomikos, head of a shipping firm and of a family long native to Santorini, organized and sponsored the Second International Congress.

Texts of most of the papers presented at the second congress were published immediately after the meeting (*Thera and the Aegean World, Vol. I*, Athens, 1978). The 77 papers appear under the general headings of "The orogenesis, plate tectonics, and early vulcanicity of the Aegean," "The geophysics and vulcanicity of the Bronze Age eruptive sequence," "Biosciences," "Chronology," as well as in a large section devoted to the archaeology of Marinatos' site at Akrotiri in particular and the Late Bronze Age of the Aegean in general. It must be realized that approximately one-third of Vol. II consists of the transcribed recordings of (very informative and often energetic) discussions that followed the oral presentations of most of the papers appearing in Vol. I. One cannot fully appreciate these discussions without having Vol. I at hand. Readers of this journal would find the following papers in Vol. I of special interest: Petrology and geochemistry of the metamorphic system of Santorini Island," (E. N. Davis and C. Bastas), "Primary basaltic magmas for the pre-caldera volcanic rocks of Santorini," (I. A. Nicholls), "Petrochemical study of the tephra sequence exposed in the Phira quarry," (C. J. Vitaliano, J. S. Fout, and D. B. Vitaliano), "Postvolcanic activity of the Santorini volcano and its influence on sedimentary ore formation," (G. Y. Butuzova), "Recent tuffitic sediments around Santorini, Part IV: Geochemistry of the iron-rich sediments from the Santorini volcano," (M. D. Peterson and G. Muller), and "Contribution to the mineralogy of the iron-rich mud sediments of Santorini," (E. Schroll).

Volume II also contains 23 new papers received after the publication of Vol. I. They deal with the regional tectonic framework of the Aegean, the energetics and mechanism of the

Late Bronze Age eruption, tephra deposits of that and of other Quaternary volcanic eruptions to be found around the shores and on the bottom of the Eastern Mediterranean, Quaternary plant assemblages of the southern Aegean, problems of radiocarbon dating the Minoan eruption, and the best summary to date of early lead and silver mining in the Aegean region (N. H. Gale).

The synthesis of natural scientific and archaeological data for Thera is not by any means complete. Geological and archaeological summaries in Vol. II acknowledge this, as well as the considerable progress that has been made since 1969 in formulating the right questions to ask.

The two volumes of *Thera and the Aegean World* are inseparable if the data of the Second Congress are to be of maximum usefulness as a reference work. The individual contributions

document studies in over a dozen disciplines; they are either specific to Santorini or cover the Aegean or Eastern Mediterranean. Most of the papers are well written and illustrated (even including some color drawings and photographs). Vol. II also includes a 1:20,000-scale geological map of Santorini (H. Pilcher and S. Kussmaul). But the full one hundred contributions should also be considered across disciplinary boundaries in order to appreciate the scope of these investigations, all directed toward reconstructing an integrated natural and cultural history of the 15th century B.C. eruption that has consistently captured the interest of specialist and layperson alike.

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