BOOK REVIEWS

RÖNTGENKARTEI ZUR BESTIMMUNG VON TON- UND SEDIMENTMINERALEN, by HEINZ URBAN. Published by Verlag Gustav Feller-Nottuln, Kettwig/Ruhr, Germany. Pp. 37+iv+25 plates. (Publication No. 5 of *Opuscula Mineralogica et Geologica*, edited by Erwin Nickel, Münster.)

The theme of this work is the identification of clays and other fine grained minerals found in sediments by means of *x*-ray powder diagrams. The author is aware that other books on this subject have appeared in recent years, but he aims at remedying two deficiencies, namely (1) the lack of determinative tables and diagrams in the German language, and (2) the absence of a concise account suitable for the general worker rather than the specialist. The book covers about 60 minerals and besides the clay minerals it considers the more common oxides, hydroxides, carbonates and silicates found in fine grained sediments. Short notes on each mineral supplement the tables and diagrams and make the reader aware of some of the difficulties of the subject and of special auxiliary techniques. The data tables are printed on the backs of the corresponding diagrams which are collected together at the end of the book; the diagrams can be cut out to a standard size and arranged in the manner of a card index. This part of the book is clear and well written and fulfills the objective of a simple treatment for the general worker.The reviewer considers that a mentally-active worker would soon become aware of the complexities of the subject and would then turn to one or other of the more specialized texts which are available.

The introductory section of the book dealing with the determination of *d*-values from film measurements is very poorly written; in places it is both misleading and incorrect. The correction of film distances, A, in the Straumanis method is given as follows:

$$A \text{ (corrected)} = A \text{ (measured)} + K_2$$

and

$$K_2 = (P - U)/P$$

where P and U are the ideal and measured lengths corresponding to a 2θ range of 180°. Thus K_2 is a dimensionless ratio and incompatible with the first equation. The text says that K_2 must be expressed as a *percentage* of A (measured), which also is incorrect. The correct statement is: $K_2=[(P\text{-}U)/U]A$ (measured). In any case, this way of stating the correction is needlessly cumbersome, since all that is required is

$$A \text{ (corrected)} = A \text{ (measured)} \times P/U.$$

The description of the correction for specimen thickness is equally bad.

Turning next to the important question of wavelengths and units, we look for clear guidance on the use of kX and Å units. The account given is incorrect and confusing. The author distinguishes between the Å unit and a metrical unit, 10^{-8} cm.; the relation between them is given as 1 Å = 1.00202 metrical Å units. The metrical Å unit (we are told) is designated KX in American literature. An adjacent table of wavelengths gives for Cu(K_α) the value of 1.539 A units (not Å units). The author may like to know that 1 Å = 10^{-8} cm., and that the X-unit, first used by Siegbahn about 1923, is defined as 1/3029.04 of the effective (200) spacing of calcite at 18° C., so that 1kX unit is approximately 1 Å or 10^{-8} cm. To convert values in kX to values in Å units, the kX *value* is multiplied by 1.00202. Therefore 1 Å = (1/1.00202) kX *units:* the kX *unit* is larger than the Å *unit,* so that any distance expressed in kX units has a smaller numerical value than the same distance expressed in Å *units.*

The reviewer considers that the first section of this book should be re-written.

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GEOLOGIE DER SCHWEIZERALPEN, by J. CADISCH AND E. NIGGLI. Wepf & Co., Basel, 1953. 44.- SFr.

Although, sensu latu, the term geology includes petrology as well, the new edition of Cadisch's Geology of the Swiss Alps could be called: Geology and petrology of the Swiss Alps since the co-author, Prof. E. Niggli from the University of Leiden is a petrologist. Dr. J. Cadisch is professor of geology at the University of Bern. Whereas the first edition (1934) was basically a textbook, the new edition is more a handbook. The individual sections are written in such a way that they can be read and used separately and special care has been taken to refer to the important literature. For the following reasons the excellent section on petrology and mineralogy is of interest to the American mineralogist and petrologist. The summary on the petrology of igneous rocks (p. 21–80) and of metamorphic rocks (p. 80–119) of the Alps is the best, the most complete and up to date outline on this subject. It is not only a perfect review of what has been done so far, but also a good program for future research. The same is true for the section on sedimentary rocks (p. 120–188) and the rest of the book.

The whole volume (including 491 pages, with 59 figures) is very well illustrated and has remarkably few printing errors. It contains three sections: I. Introduction and generalities. (p. 1–20). II. The "building materials" of the Swiss Alps (rocks, stratigraphy and tectonics). III. The landscapes (tectonics and morphology) of the Swiss Alps (p. 290–444).

The section by Prof. E. Niggli includes outlines on the petrochemistry of igneous and metamorphic rocks of the Swiss Alps (by tectonic and/or regional units, partly as syntheses which, in this book, are published for the first time). Included is also a brief summary on the famous fissure minerals (Kluftmineralien which are thoroughly described in the new book by Prof. Parker, printed by the same editors). It represents an almost complete coverage of the newer and, to a certain extent, also of the older literature. It is the most up to date guide to the literature and the problems of alpine petrology and mineralogy (and geology!), and should, therefore, be highly recommended to the American worker interested in this subject.

There is one thing which is almost completely left out and which especially the economic geologist and mineralogist will miss: a brief summary on alpine ore deposits. Ore deposits connected with ophiolites are practically the only ones mentioned. Although almost all ore deposits of the Swiss alps are not commercially important, they are, genetically and mineralogically, extremely interesting. Moreover, they play a rather important role in the discussion on the genesis of many gneisses and granites (palingenesis versus juvenile). Schneiderhöhn, in a recent publication, classifies most alpine ore deposits as being reworked paleozoic or even older deposits, whereas P. Niggli (in his unpublished guide for a field trip to Austria) presented many strong arguments for a young, alpine age of most alpine ore deposits. It is certain that a careful re-study of the very numerous though small ore deposits could be used as one of the keys to many unsolved problems on alpine petrogenesis.

In the section on petrology and mineralogy of Swiss alpine igneous rocks there are two things which must impress the reader. *Firstly:* there is probably no other mountain belt in the world where the classical tools of the petrologist have been applied so thoroughly and carefully: the hammer and the map, the microscope and the chemical analysis. *Secondly:* it is remarkable, too, that, since Professor Niggli set this tradition in the twenties, many workers have, again and again, correlated these observations to the newest data of physical-chemistry.

On the other hand, it becomes obvious that other methods should be applied as well—many of which have been developed only recently and afford partly a close team work between different universities, the industry and the state (because the equipment needed is very expensive).

Some of these newer methods are: spectroscopic analysis of rocks and minerals (for trace element geology), mass spectroscopy (for isotope geology), age determinations, radioactivity measurements, assaying of ore deposits, drilling (for solving problems of tectonics, stratigraphy and economic geology), field-emission microscopy, electron diffraction, and reflection-electron microscopy (for studies of solid surfaces); differential thermal analyses, etc. It is obvious throughout the book (although hardly ever mentioned) that many problems of alpine geology will never be solved without the application of one or more of these modern methods. To mention just two examples: (1) A relatively small number of age determinations could solve quite a number of very vital problems, such as the age of the volcanic rocks in the Taveyannaz-sandstone, the age of the intrusive members of many nappes, of the Casanna-schists, etc. (2) Whereas the geochemistry of the major elements of Swiss rocks, minerals and soils is relatively well known, the trace element geology is far behind. Yet, it is well known that many rocks and stratigraphic units can only be differentiated and/or genetically understood with the help of trace element composition.

At any rate, there is no better reference book and guide to alpine petrology and mineralogy than the new, completely revised edition of "Geologie der Schweizeralpen."

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A FIELD GUIDE TO ROCKS AND MINERALS, by Frederick H. Pough, xv+333 pp. Houghton Mifflin Company, Boston, Massachusetts, 1953. Price $3.75.

This book is a most useful companion to the previously published members of the Peterson Field Guide Series. It is divided into two parts: I. An Introduction to the Study of Rocks and Minerals, which contains chapters on Your Mineral Collection, Rocks and Minerals and Where to Find Them, Physical Properties of Minerals, and Tests, Techniques, and Tips. II. Mineral Descriptions. A useful glossay, a selected bibliography, and an index are appended.

There are 34 figures, 254 photographs (72 in color), 228 crystal drawings, and 2 endpaper diagrams. The photographs of the minerals, especially those in color, are the best this reviewer has seen. The minerals are pictured against an enhancing background of variously colored, uniformly ribbed corduroy which provides a scale for size. Crystal drawings, usually showing two different habits, accompany each of the photographs. The photographs of the rocks are not as well done; in particular those appearing on Plate 1 do not seem to be in true color, and no scale has been provided as for the minerals.

A great amount of useful knowledge has been packed into this small (19×12 cm.) book. It is primarily intended to serve as a practical field guide for the amateur mineralogist-collector, but it will be appreciated by the professional mineralogists who lack perfect memories. There are presented many interesting and little-known facts about minerals; there is more data on luminescence than is usually found in other sources. Several new diagnostic tests are presented, especially those utilizing the color of fluorescence after ignition. The inclusion of Herman-Mauguin space-group symbols, while not essential in an elementary work, none the less consumes very little space. The minerals described (nearly 250) have been wisely selected and include as many, or more than the average collector is likely to find.

Since there are no determinative tables, the book must be read through completely to be of most use. With such a readable account as this, however, that can hardly be considered as a chore. In short the amateur or professional mineralogist will find the book a convenient and valuable guide.

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GEOGRAPHICAL ESSAYS, by WILLIAM MORRIS DAVIS. Dover Publications, Inc., New York, 1954. vi+777 pages. Price $5.50.

Between 1889 and 1906, William Morris Davis published a series of essays, written in his very readable style, in several different domestic and foreign journals. These essays dealt with various aspects of geography—its place in both primary and secondary schools and in universities; the teaching of geography, methods and the use of field work and models; geography as a study of land forms and how they originated; the history of rivers; glacial sculpture of mountains and many others. Realizing the value of these writings of his teacher and colleague, Douglas Johnson gathered together the ones that he considered most representative, grouped them for content, edited them to a certain extent (with W.M.D.'s approval), and published them in 1909. The volume was well received and in the past 45 years, it has stood the test of time and proved that the subject matter is sound, hat the author was a master at presenting it and that the editor recognized both of these hings.

The present volume is an unabridged republication of the original. It is divided into two parts: Part I comprises 12 Educational Essays containing some articles on the techniques of teaching geography and others consisting of material for use by teachers of geography. Part II—Physiographic Essays, reproduces the classic essays on The Geographic Cycle (The Cycle of Erosion), Complications of the Geographic Cycle, the Geographic Cycle in an Arid Climate, The Plains of Marine and Sub-Aerial Denudation, The Peneplain, and Base-Level, Grade, and Peneplain, in which Davis laid the theoretical foundations of modern Geomorphology (which he preferred to call Physiography), and established the nomenclature that, with very minor changes and additions, is in use to-day. The other eight essays of Part II are regional applications of the principles laid down in the first six. The original journal references are given with the titles in the Table of Contents.

It is appropriate that this series of classic essays should be republished when geomorphology is being established as a full-fledged branch of geology and is aiding in the solution of such diverse problems as the ages of the Tertiary and Quaternary basalts in Iceland, the origin and the uranium content of the land phosphate of Florida, and the relation between ground-water circulation and the depth of secondary enrichment of copper deposits in southern Arizona.

It is unfortunate that such an important book, even though it is a reprint, should be on inferior paper, be poorly bound and have the author's name spelled "Davies" on the shelf back.

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PROBLEMS OF CLAY AND LATERITE GENESIS. A Symposium of *A.I.M.E.* (1951) x+244 pp. 63 text figs., 6×9, Cloth. *American Institute of Mining and Metallurgical Engineers*, New York City (1952), $6.00 ($4.20 to *A.I.M.E.* Members).

This book is a collection of papers presented at the symposium.

"The genetic significance of mineralogy," by A. F. Frederickson, is an attempt at a graphical representation of the origin of the four groups of minerals that make up clay and laterite deposits: (*a*) aluminum hydroxide minerals, (*b*) iron oxide and hydroxide minerals, (*c*) titanium oxide minerals, and (*d*) the clay minerals. These graphs are based on laboratory data and description of the field occurrences of these minerals.

"Origin of the Arkansas bauxite deposits," by Mackenzie Gordon, Jr., and J. I. Tracey, Jr. This is a well organized, nicely illustrated, and interestingly written account of the genesis of these deposits. An excellent description is given of the stratigraphy of the four types of deposits. The figures and photomicrographs are well chosen to illustrate the data on which the origin of the deposits is based.

"Examples of bauxite deposits illustrating variations in origin," by E. C. Harder, presents a critical survey of the derivation of bauxite from various kinds of rocks. Harder discusses the derivation of bauxites from: (*a*) rocks rich in alkali-aluminum silicates, (*b*) limestone, (*c*) sedimentary clays, (*d*) intermediate and basic igneous rocks, (*e*) rocks of moderate alumina content. This section contains a handy summary description of noteworthy bauxite deposits in various parts of the world. A vertical section showing the lithologic relationship is given for each type of bauxite genesis.

"Investigations on cold-precipitated hydrated ferric oxide and its origin in clays," is treated by R. C. Mackenzie. This substance is of widespread occurrence in soil clays. The method of preparation of this substance and characteristic differential thermal analysis curves and *x*-ray data are given.

"Studies in the system alumina-silica-water," by Rustum Roy and E. F. Osborn, presents a summary of their data on this system as derived from hydrothermal synthesis studies. Univariant equilibrium curves for the system are given along with the composition triangles containing the stable phase assemblages.

"Mineralogy and origin of the Mercer fireclay of north-central Pennsylvania," by R. C. Bolger and J. H. Weitz, describes the occurrence of the diaspore and boehmite-rich members of the Mercer group. Particular emphasis is placed on the genesis of the "high-alumina" fireclays. A paragenetic chart is presented for the 10 minerals of the Mercer fireclay.

"The structure of hydrous aluminum oxides and hydroxides," by W. O. Milligan and J. L. McAtee, summarizes the status of the *x*-ray data on gibbsite, bayerite, boehmite, and diaspore and discusses the alumina that is amorphous to *x*-rays.

Professor Ernest A. Hauser has written two chapters for this volume. The first, entitled "Genesis of clay minerals," presents a theory of origin of clay minerals based on concepts of the physical chemistry of colloidal materials. Professor Hauser is not satisfied with the present concept of the origin of clays as residual materials or as transported clays. He believes that colloidal phenomena are more important than most geologists and mineralogists will admit. The second chapter concerns the Kisameet Bay clay deposit of British Columbia. The clay material is very fine grained, and its mineralogy has not been completely characterized.

Professor Georges Millot of the University of Nancy, France, has written a very interesting chapter, "Prospecting for useful clays in relation with their conditions of genesis," explaining the observations he has made in this field and his method of interpretation.

"Observations on the origin of Missouri high-alumina clays," is written by W. D. Keller. On the basis of new geologic evidence—the discovery of a Pennsylvanian rock cover lying undisturbed over high-alumina clay—and on physico-chemical considerations, Professor Keller has proposed a new theory of origin for the diaspore and boehmite-rich clays. Diaspore and boehmite were formed under reducing conditions possibly at or under the ground-water table. They "are not laterites in the sense that gibbsite is, which forms in a strong oxidizing leaching environment."

In "New clay mineral evidence concerning the diagenesis of some Missouri fireclays," by John F. Burst, *x*-ray powder diffraction studies of a Missouri plastic fireclay show that the major clay mineral, although a member of the kaolinite group, is not kaolinite. The data are best reconciled with an alternate stacking of the lower and upper silica sheets, originally proposed by Gruner in his study of dickite. Burst suggests that this major clay mineral is a new mineral.

"Interrelationships of structure and genesis in the kaolinite group," was contributed by Thomas F. Bates. This is a discussion of some of the available data bearing on the genesis of kaolinite, endellite, halloysite, and allophane. A diagram showing the stability of endellite and halloysite as a function of vapor pressure and as a function of the temperature is used in these interpretations.

"The genesis and morphology of the alumina-rich laterite clays," by G. Donald Sherman, is a discussion of the weathering of the basaltic rocks of the Hawaiian Islands under several different sets of climatic conditions with the production of lateritic deposits. Rainfall is considered to be a dominant factor in the laterization process.

"Occurrence and exploration of Georgia's kaolin deposits," by T. L. Kesler, is a description of the geology of the clay deposits and the methods of prospecting. The need for a new theory of origin of the kaolinite deposits is presented.

The concluding chapter is by Ralph E. Grim and is entitled "Recent advances in clay mineral technology." This is a well integrated summary of recent work on clay minerals as applied to problems in ceramics, the oil industry, soil mechanics, bonding clays, and the alteration zones around ore deposits.

A record of the discussion that followed the presentation of these papers is made a part of the book.

The reviewer strongly recommends this book to those working with clays and to teachers in the earth sciences.

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ZUR GEOLOGIE, PETROGRAPHIE UND MINERALOGIE DES WESTHARZES. Vereinigung der Freunde der Mineralogie und Geologie; Rossdorf bei Darmstadt. 55 pages, 1954.

This paper-bound pamphlet, a collection of 11 papers on the geology, petrography and mineralogy of the western Harz Mountains, Germany, each paper by a different author, was issued in connection with the annual meeting of the Society of the Friends of Mineralogy and Geology of Rossdorf near Darmstadt at Clausthal-Zellerfeld in the Harz Mountains in 1954. Among the features described are the rocks of the Harzburg gabbro massif (A. Werner), stratigraphy and tectonics (W. Schriel), tectonic setting and fold patterns of the upper Harz (W. Schwan), the Rotliegende in the southern Harz (Th. Kruckow), magmatic rocks (W. E. Tröger), a cross section of the west Harz (W. Simon), the Rammelsberg ore deposit (E. Kraume), the lead-zinc veins of the upper Harz (E. Hüttenhain), the veins of St. Andreasberg (A. Wilke), the iron ore deposits of the upper Harz (Fr. Buschendorf), and a brief history of upper Harz mining and mining towns (A. Riechers). There also are included a short introductory statement (The Harz—a geological treasure), a tribute to Friedrich Adolph Roemer (1809–1869)—from collector to investigator, and a selected bibliography of geologic literature on the Harz.

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URAN. DIE METALLISCHEN ROHSTOFFE, 10. Heft, by E. KOHL, edited by Ferdinand Friedensburg. 234 pages, 23 figures, 35 tables. 1954. Ferdinand Enke Verlag, Hasenbergsteige 3 (14a), Stuttgart-W., Germany. Paper cover DM 26.00, linen cover DM 29.00.

This is volume ten, on Uranium, of the well known encyclopedic series on metallic raw materials. The book consists of two parts: Part I—General, and Part II—Deposits by individual countries. In the first section the various chapters are on properties, occurrence and origin—minerals, rocks, mineral and ore deposits (primary, secondary, radioactive waters and gases, helium occurrence), prospecting and mining, preparation and uses, history, market conditions and value, supply, and production. In Part II deposits in 62 countries are described.

The description of the minerals that contain uranium is poor—consisting of six brief

tables which are incomplete and which list varieties and some inadequately known members. Other minerals in which uranium may be a minor but significant constituent, such as apatite or zircon, are not mentioned. The discussion of the various types of deposits is also very brief. The most valuable section of the book is Part II in which deposits are described individually, by countries and each country is followed by a list of references. Most of the descriptions are relatively up to date.

Doubtless this book, because it is a modern summary of known deposits available, will receive widespread reference use among geologists and mining engineers.

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GEOLOGIE UND PETROGRAPHIE DER ERGUSSGESTEINE IM VERRUCANO DES GLARNER FREIBERGES, by G. Christian Amstutz. Vulkaninstitut Immanuel Friedlaender, Min.-Petro. Inst. Eidge. Tech. Hochschule Zürich. Nr. 5. 149 pp. 12 plates. Zürich (1954).

This is a beautifully prepared study of the volcanic rocks of the Glarner Freiberg, Switzerland—mainly spilites, keratophyres, rhyolites and acid tuffs. Most of the monograph deals with the petrography of these rocks, but other chapters consider their occurrence, chemistry, classification and radioactivity. The writer concludes that primary spilite-keratophyre provinces exist, but on the origin of spilites he straddles—saying his ideas lie between those who regard spilites as strictly magmatic and those who believe them strictly metasomatic.

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STRUCTURE REPORTS FOR 1950. Vol. 13. General Editor A. J. C. Wilson; Section Editors: N. C. Baenziger (Metals), J. M. Bijvoet (Inorganic Compounds), J. Monteath Robertson (Organic Compounds). Published for the *International Union of Crystallography*. N.V.A. Oosthoek's Uitgevers Mij., Utrecht, Holland. viii+644 pp. (1954). Price 80.- Dutch florins, postpaid. Alternative: Polycrystal Book Service, 84 Livingston St., Brooklyn 1, N. Y. $21.50.

The great importance and value of these *Structure Reports* have been fully established by the earlier volumes 10, 11 and 12, and no additional comments are necessary. It is gratifying that the editors and co-workers are able to carry on with this undertaking which is so extremely useful to all workers in the many fields where crystal structure is of importance.

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