BOOK REVIEWS

ROCK FORMING MINERALS, Vol. 1, ORTHO- AND RING SILICATES, by W. A. Deer, R. A. Howie, and J. Zussman. John Wiley & Sons, Inc., New York, N. Y. vi+333 pages, 88 figures and 53 tables, 1962, $15.50.

"Rock Forming Minerals" has been planned as a five-volume reference work for students and research scientists. It is in the tradition of the classic works of Rosenbusch and Iddings. Volume 1 treats the ortho- and ring silicates. In all, some 41 species are described in detail. Where applicable, the end-members of solid solution series are treated as a group and then individually. Each description contains a discussion of structure, chemistry, optical and physical properties, distinguishing features and paragenesis. The olivine, humite, garnet, epidote and melilite groups are considered. The minerals included are zircon, sphene, vesuvianite, sillimanite, kyanite, andalusite, topaz, staurolite, chloritoid, datolite, sapphirine, lawsonite, pumpellyite, beryl, cordierite, tourmaline and axinite.

The tabular summaries of optical data and the figures, composed of crystal drawings with superimposed optical orientation, will make this book handy and convenient for those engaged in laboratory investigations. In connection with the section on structure, x-ray data useful for determining the composition of a solid solution in terms of end-members, such as forsterite and fayalite, are given. Reference is generally made to the literature for the x-ray powder diffraction data.

The present-day approach to mineralogy through the relation of crystal structure studies to physical and chemical properties is exceptionally well presented. Thermochemical data are given when they add to the interpretation of the properties as in the olivines and melilites. Data on synthetic systems, chiefly phase-rule studies, form the basis of interpreting composition of complex minerals.

The excellent sections on chemistry, alteration and paragenesis will be especially welcomed by students of chemical petrology and geochemistry. Here phase-rule studies and field relationship are correlated.

The modern approach, the interesting and enthusiastic style of the authors enliven this work and relieve it from the necessary tedium of pure description.

The price of this book, $15.50 for 340 pages, is lamentable. It will remove it from the textbook category, where it rightfully belongs. The limited budgets of small college libraries will be strained by its purchase. Possible solutions to the problem may be the issue of a single volume made up of the five parts, or a paper-back edition. Something should be done to put valuable texts such as this into the hands of students!

George T. Faust

GEOLOGY AND EARTH SCIENCES SOURCEBOOK FOR ELEMENTARY AND SECONDARY SCHOOLS, edited by Robert L. Heller. 496 pp. Holt, Rinehart and Winston, Inc., 1962, $2.40.

This long-needed sourcebook, prepared under the guidance of the American Geological Institute, National Academy of Sciences—National Research Council, is the direct result of a teaching resources development writing conference held on the campus of the University of Minnesota, Duluth Branch, in the summer of 1958. The conference was attended by thirty-three professional geologists, mineralogists, oceanographers, astronomers and public and parochial school science teachers and principals. Those parts of the sourcebook not completed satisfactorily during the six-week-long conference were subsequently either completed or partially rewritten by a team of some thirteen other geologists representing pertinent branches of the field.

The sourcebook is meant to be used by science teachers in conjunction with other sources of subject material; it is chiefly concerned not with the basic facts but with the

very sort of information so hard for a teacher to find; namely, suggestions for projects and demonstrations on the various aspects of earth science, and the major distributors of film strips, movie films, slides, maps, rocks, minerals, and fossils of which the average teacher is unaware. Many teachers of elementary geology and mineralogy on the college level can learn much from a perusal of this sourcebook. As there are suggestions made for various levels of schooling, most professional geologists and mineralogists, at first glance, will find particular demonstrations and statements with which they might find fault, but the general reaction this reviewer has toward the book is that it fills a large need and does it remarkably well.

The low cost of this sourcebook puts it well within the reach of all, and cost should in no way prevent all science teachers throughout the country from having this volume on their personal bookshelves.

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VOLCANOES: IN HISTORY, IN THEORY, IN ERUPTION, by FRED M. BULLARD, University of Texas Press, Austin, 1962. 441 pp. $7.50.

This book will be of interest to the layman as well as to the scientist. It is written in a very readable, nontechnical style. The detailed history of some of the classical volcanoes will serve as documentary information to geologists and petrologists.

The book is in three parts, the first of which summarizes the history of the science of volcanology and presents general information about the materials given off during volcanic eruptions.

Dr. Bullard discusses five main types of volcanic eruptions in the second part of the book, called the Pelean, Vulcanian, Strombolian, Hawaiian and Icelandic types. A specific volcano is considered in detail as typical of each type. This is the main part of the book. It is well illustrated with photographs, diagrams and excellent maps. The 1902 eruption of Pelea is discussed from eye-witness accounts. The history of Vesuvius since 79 A.D. is outlined in considerable detail. The volcanoes, Volcano and Stromboli, are also considered at length, based in part on personal observations by Dr. Bullard.

The recent activities of both Mauna Loa and Kilauea are summarized in the discussion of Hawaiian type eruptions. Fissure eruptions which have produced the great lava plateaus of the world are described as the Icelandic type of eruption. There is a brief summary of some of the volcanoes in Iceland.

The final section of the book deals with volcanic cycles, the birth of new volcanoes, man's use of geothermal energy and a discussion of the relation of volcanoes to the major crustal features of the earth. A discussion of the activity of Kilauea, Etna and Vesuvius illustrates examples of volcanic cycles. An extended account of Paricutin volcano in Mexico is given as an example of a new volcano born in historic time. At the end of the book Dr. Bullard includes a short glossary of terms and a very useful bibliography.

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VOLCANOES AND THEIR ACTIVITY, by A. RITTMANN. Translated from the second German edition by E. A. Vincent. Interscience Publishers, New York, 1962, xiv+305 pp., 113 figs. and 1 plate.

If, as some reviewers have stated, this is the best available book on volcanoes, volcanology is in a very sad state indeed; for about one-half of it is worthless, and the rest disappointing. The worthless part, which begins on page 166 and extends to page 290, covers the physicochemical properties of magmas, and the mechanism of eruptions, with the formation of geosynclines, continental drift and the origin of meteorites thrown in for good

measure. To quote all the obscure, inaccurate, or incorrect statements would require many (in fact, almost 124) pages; as examples the reader may turn to the explanation on page 166 of what is meant by the solubility of a gas in a liquid, or to the definition on page 216 of the energy content of a given volume of magma, which is said to consist of 1) the amount of heat the magma is capable of giving off, and 2) "the total sum of the vapor pressures which are developed during cooling . . . this sum is expressed by the integrated vapor pressure curve." On page 245 we find that "a prerequisite for hydrostatic equilibrium is that the density increases with depth . . . ; (it) is quite different from isostatic equilibrium." Again (page 245) "geothermal equilibrium is a dynamic equilibrium which is achieved if the outward-directed heat flow remains constant, which would clearly only be the case if a constant temperature obtained at all corresponding depths in the geoid." Such loose wording and awkward physical concepts do not lead to a very accurate picture of volcanic activity.

The first part of the book, which is concerned with descriptive matters, is good but disappointing in being incomplete in coverage and parochial in outlook. A casual reader might well doubt that any interesting volcano exists outside of Italy. A striking feature is the almost complete absence of quantitative data. Although gases are stated to be the main cause of volcanism ("volcanicity is a process of devolatilization") the book contains not a single chemical analysis of volcanic gases (the composition of the Larderello "vapor" is given on p. 7), nor any estimate of the amount of gases carried by magmas. Temperature measurements on lava flows are hardly mentioned at all. The reader must be satisfied with the statement that "large magma reservoirs must persist for a very long time."

Perhaps the most irritating feature of the book is the dogmatic manner in which most statements are made. On page 209, for instance, we are flatly informed that "olivine basalt magma is quite incapable of breaking through to the surface under its own power, unless wide open fissures are available to it as channels along which it can rise. This raises the question of how such abyssal fissures, of whose existence there can be no doubt, have their origin." At the very outset (Introduction, p. xiii), we learn that "a wealth of geological evidence indicates that the earth was once in a molten state," but we are never told (for a good reason) what that evidence is. No mention is made of the fact that not everybody believes Professor Rittmann's theory (inherited, presumably, from a hypothesis that Daly later abandoned, because of contrary experimental evidence) that the whole mantle is really a liquid to which pressure imparts the necessary elastic properties.

The book contains no bibliographical references, an omission that is probably symptomatic of the author's lack of concern for facts, as opposed to dogmatic oversimplification. The first (German) edition, which appeared in 1936, was in many ways much more satisfactory; at least it could readily be excused for ignoring most of the work done since then. The present edition sets volcanology back a good 30 years.

JOHN VERHOOGEN

AUTHIGENIC MINERALS IN SEDIMENTARY ROCKS, by G. I. TEODOROVICH, Consultants Bureau, New York. xi+120 pages, $22.50.

This translation of Teodorovich's 1958 text is basically a compilation of the characteristics of the more common authigenic sedimentary minerals. Chapter 3, comprising over 70% of the text, describes in some detail silica, carbonate, silicate, oxide, sulfide, phosphate, sulfate, soluble salts and native element minerals. There are many references in this section, and atomic structure diagrams are common.

Chapter 1 (7 pages) is a brief and general summary of the chemical environments of deposition of authigenic minerals; Chapter 2 (9 pages) is a review of the Russian literature on deposition and diagenesis, and Chapters 4 and 5 (13 pages) consider colloidal principles and sedimentary colloidal systems.

The book will be a valuable reference to sedimentation, since it is a modern mineralogical text dealing solely with sedimentary authigenic minerals. Chapters 1 and 2 are valuable summaries of the Russian literature, but Chapters 4 and 5 are of little use. Unfortunately the book is awkward to handle because of its large size, and the type is not easy on the eyes. The references are rather numerous, and only a few cited in the text are not listed.

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THEORETICAL PETROLOGY, A TEXTBOOK ON THE ORIGIN AND EVOLUTION OF ROCKS, by TOM F. W. BARTH. 2nd Edition. John Wiley & Sons, New York. 416 pp.+xi, $12.75, 1962.

The first edition of this book was reviewed in *The American Mineralogist* **37,** 1067–1068, 1952. The plan of the new edition generally follows that of the first. The book still has four main sections: Part I—Physics and chemistry of the earth; Part II—Sedimentary rocks; Part III—Igneous rocks; Part IV—Metamorphic rocks. Added have been: Part V—Geochemical cycles (14 pages) and an Appendix—Thermodynamics as a help in the study or rocks. This last represents the collection of thermodynamic data previously scattered throughout the book. The general organization of each of the Parts remains much the same, but most of the chapters have been entirely rewritten. Many new data, theories and ideas are discussed and yet, as Barth says in his preface, "But so fast is the progress in the field that many statements in this second edition are already superseded by new knowledge made available in the last six months." Nevertheless, Professor Barth has been outstandingly successful in preparing this modern summation of petrogeneses. The book is still lopsided: the volume and level of discussion of sedimentary petrology fall considerably below those on the other two rock groups. For these, however, the advanced student will find no better general reference work, nor one more "copius" (p. 52). The price, also, is more copious, nearly double that of first edition.

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PUBLICATIONS RECEIVED

ANORTHOSITE AND RELATED ROCKS ALONG THE SAN ANDREAS FAULT, SOUTHERN CALIFORNIA, by JOHN C. CROWELL AND JOHN W. R. WALKER. *Univ. Calif. Publ. in Geol. Sci.* **40**(4), 219–288, 1962. On basis of field relations and petrography two occurrences of Precambrian anorthosite are correlated. They are now separated by strike slip on the San Andreas fault system.

LATE CENOZOIC GEOLOGY OF McGEE MOUNTAIN, MONO COUNTY, CALIFORNIA, by WILLIAM C. PUTNAM. *Univ. Calif. Publ. in Geol. Sci.* **40**(3), 181–218, 1962. Four glacial stages are represented and described, and it is concluded that the principal Sierra Nevada uplift occurred during the Pleistocene.

FIELD GUIDE TO THE CENTRAL PORTION OF THE SOUTHERN ADIRONDACKS, by JAMES F. DAVIS. *N. Y. Mus. and Sci. Service, Educ. Leaflet Ser.* **12,** 34 pp. Road logs for a two-day field trip plus descriptions of the Barton garnet deposit of the Sanford Hill-MacIntyre ilmenite-magnetite deposit and a bibliography.

MINERALS IN THE INFRARED . . . A CRITICAL BIBLIOGRAPHY, by R. J. P. LYON. *Stanford Res. Inst.* 76 pp. $1.00.

CLAY SCIENCE, Vol. **1,** (5), pp. 89–126, 1962. *The Clay Research Group of Japan.* Contains five articles on: *x*-ray powder patterns of hydromuscovites; grinding changes in pyrophyllite; DTA of Fe chlorites, *x*-ray and infrared identification of kaolin minerals; and structural anomalies of cristobalite from fired kaolinite.