are the prisms {110}, {120}, {210}; the brachydome {011}; and the macrodome {101}. The Chloride Cliff crystals show two types of habits: (1) nearly equidimensional crystals with the prisms and brachydome about equally developed (Figs. 1 and 3) which is the more common type; (2) the same faces are present, but elongated parallel to the *a* axis (Fig. 2). In distinction from the Gold Hill occurrence, the macrodome is entirely absent. Colorless crystals from Laurium also show two habits: type 1, prismatic parallel to *b*; and type 2, prismatic parallel to *c*. The Chloride Cliff mineral thus affords a new occurrence, and also a new habit for the species.

BOOK REVIEWS

INTERPRETATIVE PETROLOGY OF THE IGNEOUS ROCKS by HAROLD LATTIMORE ALLING. Octavo xv+353 pages, 48 figs., 11 plates. McGraw-Hill, New York, **1936.** Price $4.00.

This book has as its expressed aim the interpretation of the igneous rocks rather than their description and for the most part the plan is adhered to throughout.

The author begins, appropriately, by discussing the principles upon which interpretation must be based, the principles of chemical equilibrium. The treatment is necessarily brief, in some instances perhaps all too brief. In the discussion of the application of the phase rule (p. 13) only one condition, that of invariancy (in a condensed system), is described. It is doubtful whether the student will readily apprehend how the equation applies to the less simple univariant or divariant system, in other words to a system in which the degrees of freedom are greater than zero. It is unfortunate, too, that the author should make the statement "The phase rule enables the petrologist to predict the composition of igneous rocks in terms of components and hence the composition of minerals can be approximated when equilibria are complete." The plain fact is that the phase rule is only a mathematical equation, though a very useful one, and enables only the prediction of the *number* of phases that can coexist at equilibrium under given sets of conditions. The nature and composition of the phases can be determined only by the laborious process of experimental investigation of the equilibrium diagram.

In treating the change of composition of crystalline compounds during crystallization, from the point of view of reaction between liquid and crystals, the author has failed to grasp (p. 46) the reason why the reaction taking place at an incongruent melting point (peritectic point of the author) has been referred to as a discontinuous reaction. The term discontinuous was used by the reviewer to emphasize the discontinuous change of composition of the crystalline phase (phases) as contrasted with the continuous change of composition in a solid solution series. No question of the incongruent melting taking place at a definite temperature was involved for it is well known and has been observed in many systems that if the number of components and therefore the number of degrees of freedom are great enough, the incongruent melting takes place through a range of temperature. The characteristic feature, discontinuous change of *composition*, persists however.

The discussion of the various groups of rock-forming minerals giving range of chemical composition, the corresponding variation of physical properties and the determined diagrams of phase equilibrium occupies some 80 pages. This section will no doubt prove the most useful part of the book.

The chapter on the crystallization of magmas discusses the various views that have been expressed on this subject and makes some use of the equilibrium diagrams of investigated

silicate systems. In the use of these diagrams it would have been of great advantage to the student if the actual construction lines tracing the course of crystallization of individual mixtures had been shown on the diagram. Indeed the author himself has fallen into error for lack of such lines. Thus he says (p. 214) that in the albite-anorthite-diopside system the course of crystallization of a mixture in the plagioclase field "can be traced by drawing a construction line . . . perpendicularly to the isotherms." This is incorrect. Courses of crystallization are not perpendicular to isotherms except accidentally. Again, in discussing crystallization in the diopside-forsterite-silica system (pp. 216–217) and speaking of a melt "rich in Mg_2SiO_4, forsterite, and . . . indicated in Fig. 39 C by a dot in the lower left-hand corner of the triangle in the forsterite field" he says "The last liquid disappears and the whole consists of pyroxene, shown by a point on the peritectic line." It is impossible for a melt having the chosen composition to crystallize entirely to pyroxene. Moreover the compositions of pyroxenes are not given by points on the peritectic line (i.e. the forsterite-pyroxene boundary curve) but are given by points on the diopside-$MgSiO_3$ conjugation line, a line not shown in his diagram, Fig. 39 C.

In discussing magmatic differentiation the author sets down the various points of view that have been expressed. This is true also of his remarks upon assimilation. Here the application of the reviewer's "reaction principle" to the problem of assimilation is discussed, but unfortunately the application is not always correctly made. Thus on p. 246 the author says "Magmas dissolve minerals of inclusions that are higher in the reaction series" which is an incorrect statement of the reviewer's conclusion. On the other hand on p. 249 he says " . . . granitic magmas cannot *dissolve* basic rocks" which is a correct statement of the reviewer's conclusion regarding precisely the same set of conditions. In the intervening pages the reviewer's conclusions are sometimes correctly and again incorrectly stated.

The chapter on the origin of igneous rocks states briefly the principal views held as to the source of magmas, the nature of parental magmas and the manner in which various rocks have been derived therefrom. Here as in the section on magmatic differentiation, with which the subject-matter is naturally closely related, the author maintains a commendably judicial attitude.

The book is marred by many infelicities of expression, such as that on p. 21 "There are many minerals . . . which melt incongruently. Such an illustration is orthoclase," or again that on p. 336 where it is said of normative minerals " . . . their usefulness has been carried perhaps too far." Genuine naïveté resides in the attribution to Harker of the opinion that "hybrid rocks are barren *of minerals of economic importance.*"* Nevertheless the book accomplishes its purpose of gathering together in one place and in English a mass of information and expressions of opinion that are widely scattered in the literature in many languages and the student may well find it a useful addition to his texts on petrology.

NORMAN L. BOWEN

* Italics are the reviewer's.

THE STORY OF THE GEMS—A POPULAR HANDBOOK by HERBERT P. WHITLOCK. Octavo viii+206 pages, with two colored plates, many line drawings, and half-tone cuts. Lee Furman, Inc., New York, 1936. Price $3.50.

The author's long association with the American Museum of Natural History, as Curator of Minerals and Gems, has given him an unusual opportunity to study the desires of great masses of our population regarding gems. Based upon his varied experience, Dr. Whitlock has incorporated in this volume a large amount of interesting material not commonly found in similar books. Thus, there is special emphasis upon the history and use of gems, and many curious facts about them are included.

Following an introduction in which the important physical properties are briefly described, there are chapters on the Antique Use of Gems, Art of the Lapidary, Forms in which Gems are Cut, The Diamond, Famous Diamonds of the World, Precious Stones Other than the Diamond, Semiprecious Stones, Opaque and Ornamental Stones, Unusual Gem Stones, and Organic Products Used as Gems. There is also a well-selected bibliography, and a table summarizing the important properties of gems, which should prove useful in their determination. The text is well illustrated, and the author is to be commended for the many excellent half-tone cuts. The appearance of this volume is to be welcomed as a very helpful addition to the literature, in book form in the English language, on gem stones, in which there has been a growing public interest in recent years.

EDWARD H. KRAUS

MINERALOGIE by R. BRAUNS. Seventh revised edition. 146 pages, 132 figures. Sammlung Göschen. Walter de Gruyter, Berlin, **1936.** Price in cloth binding, 1.62 R.M.

This small but well-known manual on Mineralogy makes its appearance in a new revised edition. The presentation follows the general arrangement of the earlier issues with such changes and additions as to bring the book up-to-date, insofar as the limited space will permit.

About 40 pages are devoted to geometrical crystallography with descriptions and line drawings of the more common crystal forms; the physical and chemical properties of minerals, and methods of formation are discussed in 25 pages, while about half of the text, or 75 pages, are devoted to descriptions of over 100 minerals.

The book is intended to give the beginner a general survey of the subject and this purpose has been achieved as the author with his long experience as a teacher has made a wise selection and has presented the material clearly.

W. F. H.

PROCEEDINGS OF SOCIETIES

PHILADELPHIA MINERALOGICAL SOCIETY

Academy of Natural Sciences of Philadelphia, June 4, 1936

A stated meeting of the Society was called to order by Mr. Arndt; 39 members and 27 visitors being present. Experiences of the various members in collecting their most interesting specimens were described.

Field trips were reported by Mr. Morgan from the American Copper Mine, Somerville, N.J., (native copper specimens from dumps), Paterson, N.J., (analcite, natrolite, pectolite, prehnite), Strickland's Quarry (green tourmaline, columbite, garnet); and by Mr. Moyd, above the Easton Verdolite Quarry (smoky quartz).

W. H. FLACK, *Secretary*

Academy of Natural Sciences of Philadelphia, September 3, 1936

A stated meeting was called to order by President W. Arndt, 41 members and 18 visitors being present. The subject for the evening was "Reports of Summer Trips." The speakers and the localities visited included: Harold W. Arndt, Lake Clear and Cantley, Canada; Leonard A. Morgan, Moore Station, Blackwood and Kirby's Mills, N. J., Amelia Court House, Va., and Spruce Pine, N. C.; Edmund H. Cienkowski, western localities; Samuel G. Gordon, Joplin District; Albert Jehle, western localities; Joseph L. Gillson, Newfoundland to examine a fluorspar deposit; Louis Moyd, Goat Hill and Bernardsville,