

REVIEWS.

Lehrbuch der Kristallphysik (mit Ausschluss der Kristallogptik). By WOLDEMAR VOIGT. Pp. xxiv + 964, with 213 text-figures and 1 table. (Leipzig and Berlin: B. G. Teubner. 1910. Price 30 marks.)

Prof. Voigt is widely known as one of the pioneers of the application of vectorial analysis to the study of the physical characters of a crystalline medium, and as the author of numerous papers on the subject that have appeared in various journals during the past thirty-six years, and no one is more obviously fitted to write a textbook on crystallographical physics. In this volume he gives a comprehensive survey of what is at the present time known of those properties of crystals, such as thermal dilation, elasticity, pyro- and piezo-electricity, and so on—which are passed over or only briefly alluded to in the ordinary textbooks; he has wisely excluded from his purview crystallographical optics, which is a subject large enough in itself to fill a volume, and is, moreover, adequately treated in other books.

Prof. Voigt views the subject from the theoretical standpoint, and the book will appeal mainly to mathematicians. The notation employed is not generally familiar, but the reader with a knowledge of the calculus will experience no difficulty in following the discussion, since the meaning of the notation is explained in the opening pages. The crystallographer would have liked fuller information regarding the not very extensive experimental work that has been done in this branch of physics; the results alone are given, and nothing is said about the methods adopted or the apparatus used. Further, recent work is not mentioned; for instance, no reference is made to Dr. Tutton's elaborate researches upon thermal dilation and elasticity. Except for this slight criticism, in the thoroughness with which it has been written the book leaves nothing to be desired, and as regards its scope it is unique; it is therefore likely to remain the standard textbook on this branch of physics for many years to come.

Die Kristallgruppen nebst ihren Beziehungen zu den Raumgittern. By E. SOMMERFELDT. Pp. viii + 79, with 14 stereoscopic illustrations and 50 figures. (Dresden: Theodor Steinkopff. 1911. Price 3 marks.)

The geometrical theory of crystal structure presents many difficulties to the student approaching it for the first time; drawings on paper are of limited assistance to visualizing a complex distribution in three dimensions, and some writers have veiled the subject in a cloud of mysterious mathematical symbols. It becomes increasingly evident that crystallography is a branch of science of far-reaching importance, and some knowledge of it is required by workers in science who have had no profound mathematical training. An understanding of the theory of crystal structure is of great help to a proper appreciation of the properties of crystals.

For reasons such as these Prof. Sommerfeldt's little book will be welcomed. In it he gives in simple language an account of the leading features of the subject. He bases the discussion upon Bravais's space-lattices, and we may call attention to the excellent stereoscopic views of the models of the lattices in Prof. von Groth's laboratory at Munich, which will prove of great assistance to students who have not access to such models. From these simple distributions the reader passes on to more complex arrangements, which are grouped together according to the system to which they may be assigned, beginning with the lowest, the triclinic. In each section the characteristic polyhedral forms are first considered, and next the types of structure with rotational symmetry, including Sohncke's point-systems; the types resulting from the introduction of mirror-image symmetry are only lightly touched upon. Except in the case of the regular system, the text is elucidated by means of diagrams. For the first time, we believe, in any German textbook, Barlow's elegant theory of close-packing finds a place, and Prof. Sommerfeldt specifically dwells in the preface to the book upon its simplicity and importance.

The Mineral Kingdom. By Dr. R. BRAUNS. Translated, with additions, by L. J. SPENCER. 4to, Parts 1 to 16, pp. 296, with 218 text-figures and 50 plates. (Stuttgart: Fritz Lehmann;¹ London: Williams & Norgate. 1908-1911. Price 2s. each part.)

First published in German in 1903-4, Dr. Brauns's work 'Das

¹ The publication of the remaining nine parts has been taken over by J. F. Schreiber of Esslingen a. N.

Mineralreich' has since appeared in three other European languages. We now have to welcome an English edition at the hands of the translator of Max Bauer's 'Edelsteinkunde'.

The work is not a textbook of mineralogy. Its abundance of accurate information is given simply and clearly, and the style of the book, aided by the beautiful coloured plates, is calculated to appeal not only to the mineralogist, but to all lovers of the beauties of Nature.

In order to give the beginner an insight into the underlying principles of crystallography, and perhaps to persuade him to seek a more thorough knowledge of these principles from textbooks, there has been written the General Part. This deals with the limits of the mineral kingdom, the distinction between minerals and rocks, the crystal-systems, varieties of crystal-growth, and, very briefly, with the physical and chemical characters of crystals.

The part dealing with the crystal-systems is well done and illustrated with good text-figures. The rhombohedral system is included in the hexagonal, and, while three systems of crystallographic notation are described, that of Naumann is selected as being more easily comprehended. The definition of a crystal as 'a body bounded on all sides by plane faces, and of such a form as is assumed by the substance itself' is open to criticism.

Part II deals with the Ores and their associates, with which are included sulphur and meteorites; it occupies 127 pages and is illustrated by 39 plates. The minerals used as ores of any one metal are all treated together, after which a brief account is given of the methods of working the ores, the applications of the metal, and in several cases its production in various countries during recent years. The principal characters whereby the different ores can be identified are clearly set forth, and abundant facts of an historical nature add greatly to the interest of the book. The classification here adopted is one to be strongly recommended in all books on minerals which aim at being of a popular nature, especially when, as is the case here, striking cases of polymorphism and of isomorphous series are pointed out and the real importance of crystal-form is carefully emphasized.

Part III is devoted to the Precious Stones and related minerals. It commences with several pages on the forms and methods of cutting and counterfeiting precious stones, and some interesting notes of an historical character. The descriptions of the several minerals consist of crystallographic details, the chief optical characters, and methods of identification, and an account of the history and occurrences of the stones.

The coloured plates are a great feature of the book, and the specimens figured, being taken from the best German collections, are of great interest.

The work of translation has been done in a manner which leaves nothing to be desired, and the numerous additions in the text and in the tables of analyses and annual productions of metals have done much to bring the book up to date.

W. C. S.