

heading of meteorological optics—halos, the rainbow, coronas, scintillation—are dealt with, although necessarily very incompletely, yet almost too fully in view of the character of the book. Indeed, although for the first principles of the subject one is referred to an elementary treatise (this volume opens with a general exposition of the Gauss theory), its chief fault lies in the extent of the ground covered. On every topic it leaves the reader with a tantalising thirst for more information. It is, perhaps, only on the theory of caustics, here treated with exceptional fullness, that one comes away satisfied.

This is only to repeat that it is a text-book designed for class use. Such a book, which treats the theory from the point of view of a close interest in the practical questions involved, is undoubtedly stimulating and of high value in the hands of a capable teacher.

CHEMICAL CRYSTALLOGRAPHY.

Chemische Krystallographie. By Prof. P. Groth. Vol. ii., Die anorganischen Oxo- und Sulfosalze. Pp. vii+914; with 522 figures. (Leipzig: Wilhelm Engelmann, 1908.) Price 34 marks.

WITH this, the second, volume, Prof. von Groth completes that half of his great work which deals with inorganic salts. The fact that it has appeared within two years of the publication of the first volume is, even when every allowance is made for the assistance which we believe has been placed at his disposal, eloquent testimony to the remarkable industry displayed by the author. To absorb, digest, and arrange in orderly sequence such a mass of data is a gigantic task, and such rapid progress demands unremitting labour and indomitable perseverance. To the great services rendered by Prof. Groth to mineralogy and crystallography, and to those pre-eminent qualifications which mark him out as the obvious man to plan and carry through this important work, Dr. Tutton, in writing of the opening volume (*NATURE*, 1907, vol. lxxv., p. 529), has referred in graceful and felicitous language. The present writer, who was privileged to serve his novitiate in mineralogical science in Prof. Groth's laboratory at Munich, feels it would be presumption on his part to add anything to those words beyond his cordial agreement with them.

To state that Prof. Groth's "Chemical Crystallography" meets a long-felt want is but a trite and inadequate way of expressing the situation. For years past, students of crystallised substances which are known to occur in nature have, in the well-known and invaluable "System of Mineralogy," which Prof. E. S. Dana prepared as the sixth edition of his father's successive treatises on mineralogy, had before them a coherent arrangement of minerals based upon their chemical and crystallographical properties, and they could readily ascertain what precisely was known with regard to the crystalline characters of any species. Prof. Groth himself has provided an admirable bird's-eye view of the grouping of minerals in his handy "Tabellarische Übersicht der Mineralien,"

and Prof. C. Hintze is rapidly nearing the final parts of his exhaustive "Handbuch." But the researches of chemists in the laboratory have brought about the formation of a vast number of crystallised substances which have never been found in nature, mostly because of their want of durability for some reason or other, and every year the need for a work that should group together all known crystallised substances, however formed, and give full details of their physical characters, has grown more urgent.

The general arrangement of the substances is exactly the same as that devised by the author in the "Tabellarische Übersicht" mentioned above. The nomenclature is chemical, but the mineral names of the natural species are given in brackets. For each species are given as far as possible the physical characters, viz. the specific gravity; the morphological constants—the axial ratios and the interaxial angles when differing from right angles—the type of crystalline symmetry, the mode of twinning, the directions of cleavage, and the indices of the forms which have been observed; the optical characters, including the principal indices of refraction for light of certain standard wave-lengths, the orientation of the optical indicatrix with regard to the crystal, the angle between the optic axes in the case of biaxial crystals, and occasionally the alteration in these constants caused by a rise of temperature. For artificial salts and mineral species recently discovered the information is somewhat amplified; the calculated and observed values of the principal measured angles are quoted, and illustrations of typical crystals are added, the authority for the determinations and the reference to the original paper being always stated. Dr. Tutton's classical researches upon certain salts of the alkali metals, potassium, rubidium, caesium, and thallium, and of the ammonium radicle, may be cited as examples of an ideal crystallographical investigation; for the care in assuring purity of material, the high standard of the apparatus used, the pains taken in the observations, and the completeness of the determinations, they stand alone. But although it is rarely possible to obtain crystals large or perfect enough for such accurate work, it is not too much to say that at least the morphological constants of every crystallised substance should be determined, since such a determination, even when the dimensions of the crystals do not exceed half a millimetre, presents no serious difficulty with the instruments now available.

Prof. Groth prefaces each group with an introduction, in which, with his customary clearness of exposition, he discusses the relations subsisting between the component members, and indicates gaps in the data or doubtful points which call for further investigation. These illuminating discussions add greatly to the value and importance of the work, and impart to it an interest and a fascination that would be wanting in a dry compendium of figures and facts.

It would be impossible within the limits at our disposal to attempt any detailed discussion or give more than a broad outline of the contents of the present volume. It is devoted to the oxo- and sulfo-salts, and includes such important groups as cyanates,

nitrites, nitrates, perchlorates, carbonates, silicates, sulphites, sulphates, polythionates, borates, phosphites, and phosphates, and, of course, the groups analogous to each of those mentioned; the sulphates, with their companion compounds, fill more than a third of the volume. A complete index giving the chemical and mineral names is appended. G. F. H. S.

NATURAL HISTORY OF TIERRA DEL FUEGO.

The Birds of Tierra del Fuego. By Richard Crawshay. Pp. xl+158; illustrated. (London: Bernard Quaritch, 1907.) Price 3l. 13s. 6d. net.

IT was by accident and not by design that Mr. Crawshay visited Tierra del Fuego, and, spending six months there, has been able to give us this sumptuous natural history of a little-known land. His book was badly wanted, for the author is probably right when he doubts "if there is another land on earth concerning which more misconception prevails." From the description given it does not seem a very pleasant place to live in.

"It commonly freezes at midsummer. . . . There is the wind from the everlasting snows and glaciers, always blowing with terrific force and with cutting keenness, yet how invigorating and fragrant with forest and peat and seaweed."

Yet the author expresses himself fascinated by the country, and while allowing that it is no place for weaklings and for those who cling to luxury, he claims that, however rigorous the climate is, it is healthy. This seems to have been its character always, for Sir John Narborough is quoted as writing in 1670, "A man hath an excellent stomach here. I can eat foxes and kites as savourily as if it were mutton. Nothing comes amiss to our stomachs." This is saying a good deal.

Although the title of this fine volume would lead one to expect only an account of the birds, we referred to it just now advisedly as a natural history of the country. For the "preface" (which might perhaps have been more properly the "introduction") contains an excellent and most interesting account of the physical conditions of this remote spot, including the geology, botany (the flora is very much more extensive than might be imagined), the mammals (including the native races of man), fishes, insects, crustaceans, molluscs, &c. There appears to be only one reptile—a little green lizard—and no amphibian.

The birds dealt with in this work do not claim to represent every species occurring in Tierra del Fuego; but they are, the author believes, the most comprehensive collection yet made in the island, and include many recorded from there for the first time. Seventy-nine species are enumerated in the classified list or "index." The orders most numerously represented by species are Passeres, Limicolæ and Anseres. Psittaci and Pici are represented only by a single species. The woodpecker—a splendid scarlet-headed bird—does not seem to be common. The existence of a parrot in these high latitudes as reported by the early voyagers was for a long time discredited. It is common in flocks in the more open portions of the

forest to the south of Useless Bay, but seems to be local and difficult to find. The majority of the species are, however, only summer visitors, and some of these we remember as winter visitors to Uruguay. Five species of goose visit the country or are resident therein, some of which "could hardly be numbered in figures short of millions." An account is naturally to be found of the race horse, loggerhead, or steamer duck, which has constituted one of the wonders of these waters from the time of the earliest navigators, and has been the subject of much controversy.

So little has been observed of the birds of Tierra del Fuego in the country that it was at first surprising to see so large a book on the subject. But the author has quoted very extensively from the writings of Azara, D'Orbigny, Darwin, Gould, and other voyagers and naturalists, although for the most part their accounts of the species treated of relate to other parts of South America and even more distant parts of the world. For instance, although the cosmopolitan barn owl is only doubtfully included, nearly six pages are devoted to it, and the article includes Waterton's well-known account of it in Yorkshire. In this way the author has given his readers a fairly complete and always interesting account of the birds on his list, a fact that will be much appreciated by those interested in birds and living in those remote regions into whose hands the book may by good fortune come.

The volume is well illustrated by twenty-one coloured plates of birds by Mr. Keulemans, and twenty-three plates of scenery and bird haunts, also a map.

OUR BOOK SHELF.

Handbook for Egypt and the Sudan. Edited by H. R. Hall. Eleventh edition, revised, largely re-written and augmented. Pp. xiv+613; with 58 maps and plans. (London: Edward Stanford, 1907.) Price 14s.

THE first edition of this work—"Murray's Egypt"—appeared so far back as 1847, and was a reprint of Sir Gardner Wilkinson's earlier book, "Modern Egypt and Thebes," which had been revised by that great pioneer in Egyptian studies so as to meet, so far as possible, the requirements of a guide-book. From time to time since 1847 additions were made to the original edition, and in 1873, and again in 1880, it was thoroughly re-cast by the Rev. Greville Chester, the Rev. W. J. Loftie, Mr. Mitchell, and Mr. Phéné Spiers, the latter of whom contributed many new architectural plans. Then followed the editions of 1896 and 1900, edited and revised by Miss Mary Brodrick, with the help of Prof. Sayce and Capt. H. G. Lyons, the director of the Geological and Land Surveys of Egypt. Unfortunately, these last two editions—the ninth and tenth—contained numerous errors and were far from satisfactory, so it is now a pleasure to be able to record the appearance of a new edition, under the editorship of Mr. H. R. Hall, which fully maintains the high standard of Wilkinson's original "Handbook for Travellers in Egypt."

Mr. Hall has thoroughly revised the archaeological part of the work. The old division into two parts has been abolished. Many paragraphs have been with advantage deleted and new ones inserted. Several sections have been re-arranged and re-cast, while