

most animated gathering of the black elves of old, hurrying to and fro for the accomplishment of some important mission, ere dreaded Day begins”.

There are notes on the tremendous flights of the Arctic tern, supposedly from Pole to Pole. The following quotation is made from Forbush. “The Arctic tern is one of the most remarkable birds of the world. It is the long-distance champion of avian migration. It nests at least as far north as the most northern Eskimos live, while in winter its tireless pinions beat along the distant shores of unexplored lands of the Antarctic continent. It sees more hours of daylight and sunlight than any other creature on earth. On the arrival of the species at its northernmost nesting-site the midnight sun is shining and it never sets during the tern’s stay; while for two months of its Antarctic sojourn the bird sees no sunset. For about eight months of the year it has twenty-four hours of daylight, and during the other four months more daylight than darkness. According to Professor Cooke the Arctic tern makes a round trip of 22,000 miles between its farthest north and farthest south.”

Another great ocean wanderer is *Puffinus gravis*, the greater shearwater, which, from its only known breeding haunts on the islands of the Tristan da Cunha group, ranges far. During its winter, which is the northern hemisphere summer, vast numbers of these shearwaters are to be found on the Grand Banks of Newfoundland and elsewhere in North Atlantic fishing grounds.

The beautiful colour plates which were a feature of the two original volumes are again reproduced. Peruvian boobies are seen at their nesting ledges, and there is a striking illustration of the fairy tern, a bird described by the author as “most ethereal of sea birds, delicate and gentle. Their plumage is white, but with subtle ivory or creamy tones, and with a barely perceptible reddish gleam visible in certain lights on the feathers of the belly.” The ornithologist will spend many happy hours with these two volumes.

SETON GORDON

CRYSTALS AND X-RAYS

Crystals and X-Rays
By Dr. K. Lonsdale. Pp. viii+199+13 plates.
(London: G. Bell and Sons, Ltd., 1948.) 21s. net.

THE subject of X-ray crystallography has long outgrown the stage when it could be treated adequately in a single book. Since the early works of the Braggs and of Wyckoff, a large number of more specialized monographs have appeared which discuss in detail various aspects of the subject, such as the geometrical interpretation of X-ray photographs, optical principles, etc. In spite of this development, the need for a single text which covers the whole subject in broad outline still remains. It has, in fact, become more important, in view of the large and ever-increasing circle of workers who use the method in numerous branches of science and technology. For them it is essential that some general treatment of the subject in all its aspects should be available, so that they may grasp its significance and potentialities before applying it to their special problems.

This purpose might be well served by a good popular account of the subject, or by a book which introduces all the essential aspects and treats them

briefly and concisely. In a sense these two approaches are combined in Dr. Kathleen Lonsdale’s book. Although written in a popular style, it goes far beyond a popular treatment, and there are some sections which will certainly not be fully appreciated by the beginner. These sections, however, greatly increase the real value of the book and make it one which can be studied with profit by all the specialists in this field as well as by the novices. No one has made so many original contributions of first-rate importance to the subject as Dr. Lonsdale, and the publication of the present brief survey is an event of importance in science.

The book begins with a historical introduction dealing particularly with the state of knowledge at the time of the Laue experiment in 1912. There is an admirable and authoritative account of this famous experiment, which contains much information not generally known. One feels, however, that the achievements of chemistry up to 1912 are not quite fully appreciated. The new discovery soon transformed the science of inorganic chemistry; but it should be noted that, in the field of organic chemistry even at that date, the relative positions of the atoms in some 200,000 different kinds of molecule were accurately known.

The generation and properties of X-rays are next discussed, and, in spite of the popular style, this is not a very easy chapter to read. It is full of useful practical advice, based on long experience. The treatment of the geometry of crystals which follows is essentially descriptive rather than explanatory. The reasons for the limitation of the symmetry elements in crystals to certain simple types are mentioned; but no rigorous derivation is attempted.

The chapters which follow deal with geometrical structure determination and with the calculation of atomic and electronic distributions. These are definitely not easy chapters and are scarcely suitable for beginners. A number of advanced topics are discussed, and the brief paragraphs on intensity formulæ, Fourier synthesis and Patterson synthesis can scarcely do more than list the formulæ required. There are, however, many excellent illustrations showing the application of the various methods to structural problems.

The chapter on extra-structural studies gives an up-to-date account of primary and secondary extinction effects, illustrated by the beautiful divergent-beam methods developed by the author. The discussion on temperature effects similarly includes a brilliant survey of very recent work on diffuse reflexions for which Dr. Lonsdale herself has also been so largely responsible.

In the last chapter, which deals with the importance of the study of crystals, an amazing variety of topics are crowded together in small compass. These include interatomic and intermolecular forces, atomic radii, random and defect structures, mesomerism, hydrogen bonds, molecular compounds, fibrous and globular proteins, as well as metal and alloy structures. Many of these subjects are of great interest and importance to the chemist; but he will read with some astonishment about the part played by P^{5+} and N^{5+} ions in inorganic chemistry. It seems a pity that a more complete account of some of these important applications could not be given; but if the reader is stimulated to search elsewhere for further information, then perhaps one of the main purposes of the book will have been served.

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