

PHYSICAL AND CHEMICAL TABLES FOR X-RAY CRYSTALLOGRAPHY

International Tables for X-ray Crystallography
General Editor: Dame Kathleen Lonsdale. Vol. 3:
Physical and Chemical Tables. Edited by Caroline H.
Macgillavry and Gerard D. Rieck. Pp. xvi + 362. (Bir-
mingham: The Kynoch Press, 1962. Published for the
International Union of Crystallography.) 115s.

THE fifty years which have elapsed since the discovery of X-ray diffraction by crystals have witnessed the development of X-ray crystallographic techniques as a structure-determining tool of unprecedented power and catholicity of application. By it the complexities of mineral structures have been rationalized, the exotic configurations of natural products elucidated and the elaborate architecture of the giant globular proteins mapped out. Fortunately, it was recognized early that this diversity would make discipline in the presentation of results, and uniformity of nomenclature and convention particularly desirable. The first attempt to provide such an authoritative basis was by the *Internationale Tabellen zur Bestimmung von Kristallstrukturen* of 1935. In 1946 the International Union of Crystallography decided on a complete revision and extension of these tables under the general editorship of Dame Kathleen Lonsdale. Two volumes, one on space groups, one with mathematical tables, have already appeared; Volume 3, dealing with physical and chemical tables, represents the completion of the 1946 project.

Section 1 describes the general physical properties (morphological, mechanical, optical, magnetic, electrical and thermodynamic) which should be determined in a preliminary investigation of any crystal; it provides data on immersion media for measurement of refractive indices and detailed methods for determining crystal density. The preparation, mounting and setting of crystal specimens is also discussed. Section 2 is concerned with data needed for analysing basic interaction of X-rays and crystals: tables of wave-lengths and absorption edges are followed by lists of filters, monochromators and standard crystals the diffraction spacings of which can be used for calibration. A set of best values of the universal physical constants is provided together with a valuable resolution of the confusing situation about the use and standardization of Å, A and X units. Section 3 is concerned with the next phase of an X-ray crystallographic investigation: the measurement of photographically and counter recorded intensities and their correction for the effects of absorption of the radiation by the specimen. Atomic scattering factors for all the elements are collected together and a critical appraisal of the methods used to derive them is provided. Other sections provide important interatomic distances determined in inorganic, organic and metallic systems; deal with small-angle scattering, texture and line-broadening analysis in polycrystalline material; and catalogue the precautions to be taken against radiation injury.

Unlike the two preceding volumes these tables are concerned with experimental techniques and data from physical measurement. Discussion of the former is necessarily prone to the vagaries of subjective appraisal and the latter will have to be amended as better results become available. This volume does not, therefore, have the air of authoritative finality possessed by its more mathematical predecessors, but its comprehensiveness and the sound judgment in appropriately weighting the various topics is a triumph for its Dutch editors, Prof. Caroline Macgillavry and Dr. Gerard Rieck, and their assistants.

No X-ray crystallographical laboratory worthy of the name will fail to add this magnificently printed and luxuriously bound volume to the two they already should possess.

STRUTHER ARNOTT

NITROGEN RELATIONS OF PLANTS

Nitrogen Metabolism in Plants

By H. S. McKee. Pp. 728. (Oxford and London: Clarendon Press: Oxford University Press, 1962.) £5 5s.

PRIOR to the publication of this large and important new book, Dr. McKee, now of the Division of Plant Industry, Commonwealth Scientific and Industrial Research Organization, Canberra, had already a reputation as the writer of valuable review articles on nitrogen metabolism in plants which have appeared at intervals over the past twenty-five years and have been indispensable to workers in that field. This book represents a synthesis of these earlier reviews, now brought up to date and extended by a widening of the field covered and by the incorporation of historical matter.

As might be anticipated, the main sequence of treatment is to proceed from the uptake of nitrogen compounds from the soil and their transformation within the plant to the occurrence, biosynthesis and breakdown of amino-acids and amides, leading to the composition and synthesis of proteins and of alkaloids. Valuable chapters on the storage and transport of nitrogenous substances in the plant and on the nitrogen-cycle are included, as well as a substantial treatment of the biological fixation of nitrogen, extending to sixty-three pages.

Dr. McKee writes interestingly, with a historical approach, one effect of the citation of so many old writings being that the bibliography and author index together account for some two hundred and fifty pages. Some of the material that he has gleaned from these older sources is of considerable interest, as, for example, is a report (of which I myself anyway was unaware) of the occurrence of root nodules on a species of *Rhamnus*. In other cases the reader is left in doubt whether an old paper is worth hunting for: thus he is not told whether any attempt to maintain aseptic conditions was made in nineteenth-century work alleged to show uptake of amino-acids by higher plants. In a few instances there is a lack of balance between the old and the new. Thus quotations from a highly conjectural paper dated 1829 are prominent in a short account of carnivorous plants, while there is no reference to the invaluable monograph by Lloyd published in 1942. It could also be considered an omission that, though the preparation of food protein from leaves is mentioned, no references are cited in this connexion. As examples of a tendency to repetition may be noted similar statements concerning the form of nitrogen in snow on pp. 437 and 440, the constitution of insulin on pp. 301 and 351, the origin of combined nitrogen in sedimentary rocks on p. 434 (the same information is given twice on that page), and fixation in *Cycas* nodules on pp. 45 and 71.

For the most part Dr. McKee is very well informed, but on p. 78 it is wrongly stated that Pommer classed as a fungus the organism which he recently isolated from alder nodules and held to be the true endophyte. Though he felt unable to decide its precise systematic position, Pommer thought that the isolate was probably an actinomyceete or related organism. The description on p. 114 of the content of an article by Cheniae and Evans on nitrate reductase is inaccurate; moreover, if this enzyme does form part of the fixation mechanism it seems more likely to me that oxidized forms of nitrogen will precede rather than follow ammonia formation. Very few misprints have been noted. The text would have been brightened by a few illustrations.

Despite these minor strictures, with which not all readers may agree, there is no doubt that this volume will make a very valuable addition to the libraries of the many institutions and individuals interested in the nitrogen relations of plants. It would indeed be a tribute to the industry of one man that he should even attempt to