

regulation and demonstrates how individual pieces of work are carried out, the information even in the most recent papers chosen now lags behind our present knowledge as the result of the process of second publication. As all the original articles are in journals that are readily available it is doubtful if collections of papers of this kind can ever be as effective as the critical teacher or the well balanced review. Indeed, the comment in the preface that "there are now just beginning to appear exciting research reports which lead one to believe that we may be close to discovering how plant hormones control growth and development" may well leave the reader in a state of over-long suspended optimism.

DAHPNE J. OSBORNE

PHOTOLUMINESCENCE

Photoluminescence of Solutions with Applications to Photochemistry and Analytical Chemistry

By C. A. Parker. Pp. xvi + 544. (Elsevier: Amsterdam, London and New York, 1968.) 230s.

THIS book is a valuable and timely contribution to the literature; it contains a lucid account of recent developments in the field of photoluminescence, and comprehensive information on experimental methods. The first two chapters deal with the basic principles relating to the processes of light absorption and emission by molecules in solution, and include accounts of fluorescence, both prompt and delayed, of phosphorescence, and of the kinetics of photoluminescence. The emphasis is on the quantitative information about these phenomena which can be derived from experimental measurements. The chapter on experimental methods contains detailed information on methods of measuring light by physical and chemical methods and, in particular, on methods of measuring fluorescent and phosphorescent quantum yields and lifetimes. Practical information about the use of ancillary equipment such as monochromators and photomultiplier tubes is given, and the principles underlying their operation are outlined. Finally, there are two chapters on the applications of the measurement of photoluminescence. The first includes topics of general interest such as the determination of parameters of the excited states of a molecule, the study of chemical equilibria in the excited state, and the formation and fluorescence of excited dimers. The second describes the applications to analytical chemistry. After a critical examination of the meaning of the term "sensitivity" and a discussion of the relationship between luminescence and molecular structure, the applications to the analysis of organic and inorganic materials are considered. Attention to detail is evident throughout the book in the careful definitions of terms used, the cross-referencing and the comprehensive indices.

The object of the book is said to be "to collect the important recent materials, together with the well established principles, into one volume that will at the same time serve the beginner as a logical course of instruction and provide the expert with a source of reference". The author succeeds admirably in this ambitious project. The beginner will find a clear reliable account of the basic principles and a critical summing up of the present state of knowledge, including, where appropriate, a historical account of developments. Anyone carrying out research on the quantitative aspects of photochemistry will find invaluable information, of a kind which is often difficult to obtain and assess, about equipment and experimental techniques. The analyst will find, in addition, a guide to the kinds of analytical problem which can be solved by the measurement of photoluminescence. This book is likely to become a standard reference in its field. It is a pity that the extraordinarily high price virtually puts it out of reach of individual buyers.

M. I. CHRISTIE

NEW WAYS OF SEEING CRYSTALS

Molecular Crystals

Their Transforms and Diffuse Scattering. By José Luis and Marisa Amorós. (Wiley Monographs in Crystallography.) Pp. xxi + 479. (Wiley: New York and London, 1968.) 210s.

"A SCIENCE which hesitates to forget its founders is lost", and crystallography, in proof of its vitality, has almost discarded all traces of its mineralogical origins. It is now common, even for first-year undergraduate students, to begin crystallography with the Fourier transform—in the guise of "the one-dimensional diffraction grating and the ripple tank"—instead of with the traditional stereographic and gnomonic projections.

José Luis and Marisa Amorós have produced for the new men a really excellent book about the thermal vibrations of molecular crystals and the ways in which these vibrations can be studied by X-ray diffraction. Actual experimental methods of obtaining the data are not included. The authors have not neglected the possibilities of electron and neutron diffraction, but there is simply a dearth of results in these promising fields.

The subject under discussion is indeed a hard and superficially unattractive one and many, including the reviewer, have been daunted by the high ratio of mathematics to physics in earlier textbooks. The authors have clearly taken special pains to reach the readers' understanding by all routes. The whole subject, from the diffraction by a single atom to the diffuse scattering of X-rays by thermal waves in hexamine crystals, is illustrated by the transforms produced by computation and by various optical analogies (the optical diffractometer, the Von Eller machine and the folding machine or "Q-integrator"). These illustrations are compared with pictures obtained experimentally from real materials.

After the introduction to transforms, "the actual X-ray diffuse scattering, as it is observed in molecular crystals, and its application are discussed. The continuous diffuse scattering typical of molecular crystals is analysed by the difference Fourier transform method and its relations with the crystal structure are described. The method is also extended to crystal structure determination. The theory of thermal waves is logically included, and the application of the theory to the determination of the elastic constants and molecular forces is given. Temperature dependence of the diffuse scattering is treated and the phenomenon of the inversion of the diffuse scattering is discussed. The effect of polymorphic transitions and the scattering appearing at the transition temperature is treated theoretically and experimentally".

The book fully satisfies four criteria for a good scientific text: (a) familiar material is re-presented in a unifying and illuminating form—the informed reader does not skip the preliminaries because these afford new views of what was only partly understood; (b) a physical understanding of the processes at work is inculcated—this is done by a suitable mixture of mathematical analysis, results of commutation, physical analogies and illustrations of individual cases; (c) a considerable volume of the author's own experimental work is described and is presented here in organized form; and (d) it is demonstrated that the subject is an open one, new problems and potentialities being implicitly suggested.

We see here where the science of crystallography is going. After the question, "What is the structure of this crystal?" we are now able to deal more completely with the next questions—"How does this crystal work?" and "Why is it like this and not otherwise?"

This is an advanced text, but it is to be hoped that the readers will now filter its approach and insights into their own research and teaching.

A. L. MACKAY