Book Reviews

X-Ray Diffraction Procedures. For polycrystalline and amorphous materials. Harold P. Klug and Leroy E. Alexander. Wiley, New York; Chapman & Hall, London, 1954. xiii + 716 pp. Illus. $15.

In their preface, the authors point out the need for a comprehensive treatise on the practice and interpretation of x-ray diffraction techniques, designed to "serve as both manual and teacher for the plant worker, the graduate student, the research scientist, and others who wish to do experimental work in the field." In general, they have done a meritorious job in filling this need, and have succeeded in turning out a comprehensive handbook on powder diffraction procedures.

The first 160 pages are devoted to a discussion, in simple terms, of the basic concepts of crystallography, x-rays, and diffraction. The remaining 520 pages are devoted to the practical aspects of obtaining and interpreting powder diffraction information. Single crystal techniques are not discussed. There are sections on small-angle scattering and scattering from noncrystalline material; useful tables are listed in the appendixes, together with instructions for laying out an x-ray laboratory and for handling film. The authors discuss in detail the various types of powder cameras (70 pp.) and the Geiger-counter spectrometer (80 pp.). It is my opinion that too much emphasis has been placed on spectrometer techniques. Thus, although Klug and Alexander say that "focusing cameras are not an indispensable adjunct to a diversified diffraction laboratory"—certainly a fair statement—no such remark is made concerning the Geiger-counter spectrometer which, in view of its cost and lack of versatility, is even less indispensable.

The sections concerning the techniques of preparing and analyzing specimens are complete to the most trivial detail, and include designs for light boxes, measuring scales, and camera supports. On page 302, where a method of preparing a powder sample for spectrometer analysis is described (with complete illustrations), we are told that Scotch tape may be removed more easily if a tip of the tape has been doubled back, and are also told to trim off excess tape with scissors. This sort of trivia abounds throughout the book, and may indeed be welcomed by many novice laboratory technicians. However, a majority of readers who must pay $15 for the book will probably feel that a substantial saving could have been realized by judicious condensing and editing.

In view of the thoroughness with which the authors discuss the various experimental techniques, it is unfortunate that the material concerning the interpretation of the data—and, in particular, the precision determination of lattice constants—has been presented in a rather offhand fashion. Indeed, much of the material in this particular section is misleading. The least-squares method of refining lattice parameters is discussed with the apology that "it assigns equal weight to all reflections regardless of whether they can be measured with good or poor accuracy." This statement is particularly unfortunate since the very essence of a least-squares treatment is that it allows and, in fact, requires that observations be weighted in accordance with their uncertainties. In particular, the uncertainty in the observed value of sin θ for a particular powder reflection is, to the first approximation, proportional to cos θ. Thus, in the back reflection region the weighting becomes an extremely important consideration. The authors are also negligent in their discussion of probable errors. Thus, on page 487 data from GeO_2 is analyzed to yield best values for lattice parameters. This analysis is followed by the statement: "The precision in a_0 is of the order of ± 0.0002 A." It is unfortunate that Klug and Alexander have not seized upon their opportunity to resolve the confusion in the minds of many, many workers concerning the meaning and methods of evaluating uncertainties.

On the whole, the authors should be complimented on their results. The book should provide easy, informative reading for a large body of untrained technicians, as well as form a convenient reference for all workers in the field of powder diffraction. It is pleasing to find, under one cover, such diverse topics as the radial distribution treatment of diffraction data, determination of crystallite size, and a discussion of refraction effects. The figures and printing are good, and references are abundant. The price is high.

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Evolution as a Process. Julian Huxley, A. C. Hardy, and E. B. Ford, Eds. Macmillan, New York; Allen & Unwin, London, 1954. 367 pp. Illus. $4.25.

Although the first centenary of Darwin's *The Origin of Species* is less than 5 years distant, the problem of evolution has again become the focus of theoretical (or shall one say, philosophic) biology. A symposium on evolution, held under the auspices of the British Society of Experimental Biology and the Genetical Society, was published in 1953 [reviewed in *Science,* 119, 156 (1954)]. The symposium now under review has been organized by friends of Julian Huxley and dedicated to him on the occasion of his sixty-fifth birthday. Only three of the 19 contributors also participated in the first symposium.

The symposium covers a wide range of topics. Phylogeny building is represented by G. R. de Beer (discussing Hadzi's theory of the origin of Metazoa), A. C. Hardy (origin of the chordates), E. J. H. Corner (origin of the tropical rainforest flora), and J. Zuckerman (phylogeny of the primates, the Aus-