Book Reviews

X-Rays and Gamma Rays

The Encyclopedia of X-Rays and Gamma Rays. George L. Clark, Ed. Reinhold, New York; Chapman and Hall, London, 1963. xxviii + 1149 pp. Illus. $35.

Within the past few years George L. Clark has edited several encyclopedias—*Encyclopedia of Chemistry, Encyclopedia of Microscopy,* and *Encyclopedia of Spectroscopy*. Now we have *The Encyclopedia of X-Rays and Gamma Rays*. The field of x-rays, particularly x-ray diffraction, is Clark's specialty, and so one would expect a very good job here. Massive (1149 pages) and weighty (6 lb) though the encyclopedia is, this expectation unfortunately is not realized. There are some very good articles in the encyclopedia. Unfortunately, however, there are also all too many very bad ones, and they tend to outweigh the good ones. I cannot attempt to evaluate all of the articles—there are about 400 of them—but I have looked at every page.

For whom is this encyclopedia written? I cannot tell. Some of the articles are extremely elementary; some are so difficult that they are beyond my comprehension. An encyclopedia is as good as its index, because only through the index can one hope to find the information one seeks. Unfortunately the index is extremely poor. If we look up "uroliths" in the index, we are referred to page 178. A much better article on the same subject appears on page 589, but one would never find it by using the index. If we are interested in "balanced filters" the index refers us to only a brief paragraph on page 246, but there is a good treatment in another article on page 391. There seem to be no articles on space groups, space lattices, symmetry elements, the Mössbauer effect, anomalous dispersion or virus structures. Although we can learn, by referring to the index, that a kX unit is 1.00202 Å, nowhere can we discover why we are plagued by kX units.

Many articles are devoted to trivia. Thus, we have more than a column and a half devoted to "Titania–Opacified Enamel Diffraction Analysis" (p. 1052). It is not quite clear why articles of this character belong in an encyclopedia. There cannot have been too serious an attempt at editorial supervision. Extensive duplication is found throughout the volume, and from time to time we are treated to some real nonsense. At the bottom of the first column on page 110 we learn that x-rays can be "monochromatized by a two-slit collimater." On page 242, under a discussion of the Laue method, we are seriously told that "Front-reflection photographs may be used for identification while back-reflection photographs may be used for precision lattice constant measurements."

In the preface (p. xv) Clark says ". . . it would have been foolhardy to try to reproduce the very extensive material and tables on Space Groups . . . [since they are covered so competently in the] *International Tables of Crystal Structures*. I agree. But, in view of this, why devote 12 pages to three and four place tables of wavelengths when better five and six place tables are available in the *International Tables for X-Ray Crystallography?*

It really is a pity; there is much good material here. Proper editorial supervision could have cut this six-pound volume down to four, and the thoughtful expansion of the index from 10 to 25 pages would have enhanced the usefulness of the encyclopedia tremendously.

One is accustomed to blurbs on the jackets of books, which somewhat exaggerate the quality of the book's contents. The blurb on this book jacket starts with the following sentence: "The world's foremost authorities on radiation science have pooled their vast wealth of experience into this major scientific encyclopedia." I cannot accept Clark's statement on the first page of the preface: "With very few exceptions the list of authors in the following pages is the 'Who's Who' of radiation science in the world." My own list would have very little overlap with the list of contributors to this encyclopedia.

Technically the *Encyclopedia* is a good job. The printing is clean, as is the reproduction of the many photos and figures. The binding seems sturdy enough to stand heavy use. Unfortunately, while undoubtedly many copies will be bought, not too many of them will be heavily used; a few futile tries at finding what one wants will be, for most users, discouraging enough. I cannot recommend this book.

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Rutherford Jubilee

Rutherford at Manchester. J. B. Birks, Ed. Heywood, London, 1962; Benjamin, New York, 1963. x + 364 pp. Illus. $12.50.

The Rutherford Jubilee International Conference was held in September 1961 at Victoria University (Manchester) to mark the 50th anniversary of the Rutherford scattering law and the discovery of the atomic nucleus. This volume includes the lectures that four of Rutherford's former colleagues (E. Marsden, C. Darwin, E. N. da C. Andrade, and N. Bohr) delivered at the commemorative session, Rutherford memorial lectures given in the past (by H. R. Robinson, A. S. Russell, and P. M. S. Blackett), and selected reprints of early work concerned with the discovery of the nucleus.

The lectures yield a clear picture of Rutherford as a scientist and a research director—so clear, in fact, that the reader almost feels that he personally participated in the Manchester program. The events leading up to the discovery of the nucleus, and the subsequent development of Bohr's atomic theory, are traced with such care that the book will be indispensable to anyone deeply interested in the history of science.

Because several years separated the original delivery of some of the lectures, there is a good deal of repetition.

Thus, similar accounts of Rutherford's early life are told in many of the papers. It is, of course, easy to skim over this duplicated material rather quickly. It is sometimes even rather interesting to note the minor variations in the same anecdotes.

A few fragments from Rutherford's correspondence are preserved in this book. The exchange with Schuster in which Rutherford discussed a possible move from McGill to Manchester will strike a familiar chord for any modern academician who has been through the same process. Rutherford's early comments on Bohr's work in atomic structure will no doubt amuse every reader.

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Metallurgy

Radioactive Tracers in Physical Metallurgy. C. Leymonie. Translated from *Les Traceurs Radioactifs en Métallurgie Physique* (Paris, 1960) by Vernon Griffiths. Wiley, New York, 1963. xiv + 208 pp. Illus. $8.50.

In view of the numerous potential applications of radioisotopes to the solution of metallurgical research problems, it is perhaps surprising that a book on the subject has not been published previously. Undoubtedly, a comprehensive and critical exposition of the usefulness and the limitations of the methods, the design of experiments using tracers, the techniques for handling radioactive material, and related topics, would constitute a valuable addition to the book shelves of many metallurgists.

Those who are searching for a single source of such information are likely to be disappointed with this volume. The chapters on the nature of radioactive isotopes, the properties of their radiations, and the measurement of radiation and the general discussion of tracers in metallurgy are very brief (only 38 pages). Although this material provides a well-written introduction to the subject, anyone who contemplates using tracers for the first time will need to seek additional sources of information and guidance.

The section on diffusion is somewhat more comprehensive. Following the brief chapter that surveys the field, there is an extensive discussion of various methods of measuring diffusion coefficients; this examination is particularly valuable because it considers some clever Russian developments with which many Western workers are not familiar. A rather detailed review of the results of tracer diffusion studies is followed by a quite extensive discussion of grain boundary diffusion. The treatments of surface diffusion of metalloids in metals, and diffusion in liquid metals are very brief, a reflection of the rather limited amount of work in these areas.

Finally, there are three sections which describe the use of tracers in studies of segregation, surface reactions, and vapor-solid equilibria. Each section is characterized by the completeness of its review of published work, but each lacks a critical evaluation of the topic considered.

In summary, the book provides a good introduction to the language and basic concepts of radioactivity, and an extensive compilation of published metallurgical research in which tracers have been used. Its value will be largely as a guide to published literature rather than as a source of detailed instructions for using tracers in research.

The translation into English, with several exceptions, follows the original French edition with reasonable accuracy. Unfortunately, there is a disappointingly, almost an inexcusably, large number of minor typographical errors; in this sense the editing of the translation leaves much to be desired.

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Conference Report

Fracture of Solids. Proceedings of a conference held at Maple Valley, Washington, August 1962. D. C. Drucker and J. J. Gilman, Eds. Interscience (Wiley), New York, 1963. x + 708 pp. Illus. $28.

The fracture of materials is not only of vital technical importance but also represents a fascinating scientific problem. Consequently, a prodigious amount of energy and funds have been expended in attempts to secure a satisfactory rationale for this phenomenon, from both a theoretical and an experimental viewpoint, and a wealth of publications in the technical literature record this search. Despite considerable progress, the present state of the art is unsettled; this situation is reflected in the proceedings of this conference, which was held only 3 years subsequent to a similar international meeting.

The volume is divided into four sections: Continuum Mechanics, Microstructural Phenomena, Atomistic Mechanics, and Environmental Effects. Each section commences with a thoroughly annotated and comprehensive survey of the subject, written by a recognized authority, and is followed by a group of from four to seven invited research papers. The latter are essentially unrelated and deal with narrower aspects of the topic, although some of them include significant literature reviews. An excellent balance was maintained between the space devoted to the continuum and the atomistic viewpoints. The logical order in which the content is presented attests to editorial care, although two characteristics, which appear to be unavoidable in any compilation of this type, are present—on one hand, overlap and, on the other, isolation. It is also significant that all sections incorporate both theoretical and experimental results, although, quite naturally, the former dominates the continuum area, while the latter overshadows the investigations into microstructure and environment. The vast majority of the contributions are from the United States, with a smaller representation from Japan and England.

As in the past, the major objectives of the investigators were concerned with the development of criteria for both the nucleation and the propagation of cracks. This is pursued on the basis of stress and energy determinations, in the first section, utilizing the results of elasticity and plasticity theory; by means of microscopic examination in the second, where a distinction is made between brittle cleavage and fatigue fracture and ductile and creep rupture; and by the dislocation mechanisms in the section on atomistic mechanics. A distinct measure of progress in the field is the fact that the present contributions evidence a much greater cross-pollination (or perhaps mutual tolerance) between the continuum and atomistic approaches than is evident in even recent publications, an indication that the gap between these views is gradually narrowing.

The volume will be a valuable addition to the library of anyone who is