series of studies in the broader area of Manpower Resources And Economic Growth, carried out by the Conservation of Human Resources Project at Columbia University under the sponsorship of the United States Department of Labor. The author, Professor James W. Kuhn, cites an impressive list of references to individuals prominently involved in the development of nuclear power who contributed information and viewpoints summarized in the book.

The author presents an interesting and essentially correct narration of the manpower problems that arose in the prosecution of the historic Manhattan Project during the war years. This reviewer, as the first director of the Metallurgical Laboratory at the University of Chicago, and first director of research at Clinton Laboratories in Oak Ridge, was privileged to have some of the first headaches that accrued from early attempts to forge the first large-scale multidiscipline approach to the many complex and urgent problems that faced the plutonium part of the project. The initial allergy between scientsits and engineers was only lightly concealed at the startup of activities at Clinton Laboratories in the autum of 1943, and, in fact, formed the basis for the organization set up to cope with it. This antagonism, however, disappeared progressively as each group learned to appreciate the talents and contributions of the other, and never constituted any serious deterrent to the accomplishment of laboratory objectives.

The large efflux of technical personnel from project laboratories at the end of the war caused a temporary dip in the nuclear manpower curve which, however, began to turn upward again with the generation of new peacetime projects. The advent of the nuclear power industry created a pressing need for massive manpower training in all aspects of nuclear technology. The author outlines how this need was met by training courses set up by the Atomic Energy Commission at its national laboratories and elsewhere. Neither the electrical equipment industry nor the electric utilities, who were the natural beneficiaries of the biggest peacetime fallout from the wartime nuclear effort, realized the magnitude of the manpower transition that would be required to make nuclear power an economic reality. This is understandable in the case of the utilities, at least, which had never had much occasion to develop any extensive research or engineering staffs. The major portion of this book is devoted to a recitation of the many problems involved in this nuclear manpower transition which is still going on as more companies embark on nuclear power plant operation. The licensing and regulation process makes it mandatory for each company wanting to build and operate such a plant to have a full understanding of its characteristics, and to assume full responsibility for the public safety aspects of its operation. Competent engineering staffs have had to be developed accordingly.

Professor Kuhn's book contains little that is new to any who have been actively associated with the developing nuclear technology for any considerable length of time, but it recapitulates the many facets of the manpower problem in an interesting and thorough manner which will make it worthwhile reading even for the "old-timers." The adequacy of the supply and capability of technical personnel to meet future needs of a rapidly escalating nuclear power industry is still a relevant and timely subject, as evidenced by the fact that it constituted the main theme of the Eighth Annual Nuclear Education Conference held late in January 1967, at the Argonne National Laboratory.

The book contains a few errors, but not many. Probably its most unforgivable one, in the eyes of the Atomic Industrial Forum, is to call that distinguished study and discussion group a "trade association." The author's style of presentation makes easy and interesting reading which the reviewer recommends to everyone newly embarked on a career in nuclear power.

Dr. Richard L. Doan is one of the "old-timers" in atomic energy, having served on the Manhattan Project at Chicago and Oak Ridge during the war years, spent 12 years as manager of the atomic energy division of Phillips Petroleum Company at the National Reactor Testing Station in Idaho, and recently completed 2½ years as Director of Reactor Licensing in the Regulatory Branch of the Atomic Energy Commission. He was a member of the Advisory Committee on Reactor Safeguards for nine years, and participated in all three international atoms-for-peace conferences in Geneva, Switzerland. He is a fellow of the American Nuclear Society and the American Physical Society, and was a 1963 recipient of an AEC citation for meritorious service.

A LACK OF UNITY

Title Progress in Nuclear Energy, Series IX, Analytical Chemistry, Volume 7

Editors H. A. Elion and D. C. Stewart

Publisher Pergamon Press, 1966

Pages v + 288

Price $14.00

Reviewer Clemens Auerbach

The latest volume in this well-known series consists of five chapters: 1) Electron diffraction techniques and their applications to the study of surface structure, by Raymond K. Hart, 2) Liquid scintillator solutions in nuclear physics and nuclear chemistry, by Donald L. Horrocks, 3) In-line analytical instrumentation of nuclear fuel reprocessing plants, by C. R. McGowan and J. K. Foreman, 4) Part I: A table of coefficients for the microprobe analyst, by R. D. Dewey, Part II: Tables of x-ray data, R. D. Dewey, R. S. Mapes, and T. W. Reynolds, and 5) The ion microprobe mass spectrometer, by A. E. Barrington, R. F. K. Herzog, and W. P. Poschenrieder.

In addition to the wide diversity of topics represented, the chapters differ appreciably in overall approach, scope, and length. Chapters 1, 2, and 5 deal with specific modern instrumental techniques which have recently come into their own. Chapter 2 (90 pages) is a thorough and ex-

haustive review article, which will appeal to readers at all levels of involvement in nuclear techniques. Chapter 5 (32 pages), despite the specialized title, succeeds admirably in establishing the proper perspective by constantly evaluating the technique in terms of some of its competitors. Chapter 1 is perhaps the least successful of the three; although it is well written and concise, I doubt that its 20 pages will succeed in imparting more than a superficial taste of this complex subject to readers not already conversant with the pertinent concepts and terminology.

Chapter 3 (66 pages) represents an interesting and authoritative discussion of the various problems connected with in-line analytical instrumentation and some of their solutions. Although the choice of some of the topics may seem arbitrary, this is probably unavoidable; on the whole, the authors cannot be commended too highly for their perseverance in extracting some of this important information from its scattered sources, not always easy of access, and assembling it in this fashion. Continued effort along these lines may go far in minimizing costly duplication in the development of analytical instrument systems for industry. The two parts of Chap. 4 (66 pages) consist of a variety of tables for converting microprobe instrument readings to concentration, along with a detailed explanation of their derivations and uses.

While conceding the high quality of the individual contributions, I am somewhat disappointed by what impresses me as the lack of a unified viewpoint. It has been demonstrated in many instances in recent years (including Series IX!) that effective editorial planning can produce a review volume which evokes in the qualified reader a sense of "unity in diversity," despite a wide range of topics. By contrast, this book impresses me as merely an arbitrary collection of chapters, with the combination of Chaps. 1, 2, and 5 establishing one viewpoint and Chap. 3 a rather different one; as for Chap. 4, it is difficult to see how anyone but a practicing microprobe analyst will profit from it.

It is to be hoped that future volumes in Series IX will show a degree of editorial direction to match the superior quality of the individual contributions, as some of the predecessors of this volume have done.

Clemens Auerbach has been a member of the Analytical Chemistry Group in the Nuclear Engineering Department of Brookhaven National Laboratory since 1956. He received his PhD degree in chemistry from Harvard University in 1951. His specialty is electroanalytical chemistry with emphasis on polarography and coulometry.

PRICE A PITY

Title Single Crystal Diffractometry

Authors U. W. Arndt and B. T. M. Willis

Publisher Cambridge University Press, 1966

Pages xv + 331, 125 illustrations

Price $15.00

Reviewer Walter C. Hamilton

In the past decade, the science of crystallography has experienced an unprecedented growth in its ability to provide rapidly the answers to many difficult questions in biology, chemistry, and physics. One of the factors which has been of great importance in this growth is the increasing displacement of photographic film, as the data collection medium, by particle counters used in connection with a mechanical device—the diffractometer—for orienting the crystal and moving the counters. These diffractometers are being operated increasingly with the aid of black boxes chock full of automation of the most sophisticated design.

Arndt and Willis have been for several years in the forefront of that small army of crystallographer-engineers whose efforts in developing this equipment have had such an enormous impact on the work of their colleagues. They are thus eminently qualified to write an introductory book on the subject of single crystal diffractometry. They have done a creditable job.

The authors do not describe their intended audience in the preface, but one may judge from the content of the book that its greatest readership will be found among those scientists of some crystallographic experience who are on the verge of changing from photographic to counter methods. These readers should know their trade well, for much of the material is presented with far too much brevity to be useful to the rank beginner. The text is relatively free from what the authors describe as "reprehensible jargon;" the phrase "staticized in the store" is attributed to a computer engineer. Nevertheless, the reader is assumed to have some familiarity with the modern instruments of physics.

For the reader experienced in diffractometry, the felicitous style leads to an enjoyable reading experience. Except for a few small instances, it does not extend the bounds of his own knowledge.

Chapter 1 is an "Introduction" which provides some background and motivation, plus a rather interesting analysis of the economics of data collection. American readers will look enviously at the quoted technician's salary of £800 ($2240).

Chapter 2 is a rather lengthy discourse on "Diffraction Geometry" which presents standard material in a standard way, but which is superior to most texts in the adequacy of its drawings. This section stops disappointingly short of a proper conclusion by not presenting the trigonometric formalism necessary for setting a crystal in an arbitrary orientation on a four-circle diffractometer. This is information without which such an instrument cannot be satisfactorily used, and its omission is curious. The lack of matrix notation throughout this section makes the simple mathematics somewhat cumbersome.

Chapter 3, "The Design of Diffractometers," includes excellent descriptions of the two machines with which the authors have been most intimately involved and gives some interesting insight into the factors which influenced their designs.

Chapter 4 contains one of the best treatments of "Dectectors" to be found in any crystallographic text. It includes a tantalizing introduction to coordinate detectors which may represent the next big development in x-ray and neutron-data collection.