special advantages of neutron diffraction. Here, and throughout the rest of the book, appropriate comparisons are made between neutron and x-ray methods.

Chapters 2-5, comprising slightly more than half of the book, show how the facility of neutron diffraction for determining the parameters of light atoms, especially hydrogen atoms, in the presence of heavy atoms has been exploited. The chapter headings are: "Hydrogen Bonds in Inorganic Compounds"; "Hydrogen Atoms in Organic Compounds and Determinations of Molecular Structure"; "Heavy Element Compounds of Carbon, Nitrogen, and Oxygen"; and "Metal Hydrides and Ammonium Compounds".

Chapter 6, "Compounds Which Include Neighboring Elements," discusses research in which differences of scattering amplitudes among elements with nearly the same atomic numbers have been used to study chemical ordering in alloys of the transition elements and in spinels.

Chapter 7, "Magnetic Materials: An Outline," is extremely brief, because the author regards this application "not primarily of chemical interest;" but it serves to outline the principal application of neutron diffraction in physics. It shows the use that has been made of magnetic scattering of neutrons to study the locations, orientations and magnitudes of the magnetic moments in ferro-, antiferro-, and ferrimagnetic materials.

"The Study of Liquids and Gases" is the title of Chapter 8. The isotropic character of the neutron-scattering amplitudes and the low-absorption coefficients of most materials for neutrons are stressed as advantages.

Generally, the relative degrees of emphasis on the various topics discussed seem appropriate. The very brief treatment of principles in Chapter 1 and in other sections where theory is discussed does appear inconsistent with the statement in the publisher's introduction that "particular importance has been given to the exposition of the fundamental bases of each topic and to the development of the theoretical aspects;" but it is more consistent with the statement in the author's own Preface that his "main aim is to describe the new knowledge which has been obtained." The decision to limit sharply discussion of the nature of crystal structure analysis has led to some oversimplification and lack of clarity. For example, the term "thermal motion ellipsoid" is used in the book without any explanation of its meaning. Again, the single paragraph devoted to the phase problem (p. 28) implies, incorrectly, that 'trial-and-error' methods of solution are the only ones available. The reviewer feels that the author has missed an opportunity to be helpfully informative by electing not to discuss the phase problem in more detail, particularly for neutron analysis when the approximate structure is not already known. Such a discussion would have relevance to the matter of the choice of subjects for study by neutron diffraction, specifically to the fact that nearly always one chooses crystals whose structures are already approximately or partly known from previous x-ray work.

Unfortunately, the author could not include the results of recent neutron analyses based on three-dimensional data. The book discusses only a single study of this type. To this reviewer's certain knowledge, twelve structures have been refined from three-dimensional data, and at least three sets of data have been collected for other structures. The development of automatic methods of data collection, predicted in the book, is now a fact, and one of the greatest significance for applications of neutron diffraction.

The author is in error when he states (p. 42) that there are hydrogen bonds in the crystal structure of lithium hydroxide. A typographical error results in the representation of two different quantities in Equation 1, 4, 1 by the same character.

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About the Reviewer: George M. Brown is in the neutron-diffraction group of the Oak Ridge National Laboratory's Chemistry Division. He was on the staff of the Chemistry Department of the University of Maryland from 1947 to 1959, when he moved to his present position. He has also been a visiting research fellow at the California Institute of Technology. His research interests are in the field of determination of crystal and molecular structures by x-ray and neutron-diffraction methods.

Advances in Nuclear Science and Technology, Vols. 1 and 2. Edited by Ernest J. Henley and Herbert Kouts. Academic Press. Volume 1 (1962) 355 pp. $12.00, Volume 2 (1964), 378 pp. $14.00.

The volumes are the first of an annual series, each volume containing several separate articles on selected fields of nuclear science and technology. The editors' stated objective is to provide 'authoritative, coherent, complete, and critical review articles covering every phase of the nuclear industry other than pure mathematics, theoretical physics, and radiation biology and medicine.'

Volume 1 contains seven articles. "Thermo-

dynamic Analysis of Nuclear Power Stations" by Seymour Baron discusses basic thermodynamic principles, traces the recent development of fossil-fuel power plants, and proceeds to consideration of special requirements of power-generating equipment for nuclear plants.

"The GBSR: A Graphite Moderated Boiling Water Steam Superheat Reactor" by L. S. Mims and D. J. Stoker describes a design study of a pressure-tube reactor, with saturated steam generated in one region and superheat developed in another region. The suitability of an article on a design concept, for this series, may be debatable. Interesting concepts, of which there are many, may or may not become 'advances' to be described in future volumes.

"Radiation-Induced Graft Polymerization" by George Odian and Horace W. Chandler describes techniques and mechanisms of graft polymerization. The influence of polymer structure and additives, and the effects of grafts on important commercial polymeric materials are discussed.

"Diffusion in Uranium, its Alloys, and Compounds" by Steven J. Rothman, is a comprehensive summary of the state of present knowledge, including a short section on diffusion in UO_2. The article contains 33 figures, 22 of them showing plots of diffusion data.

"Performance Characteristics of Large Boiling Water Reactors" by G. M. Roy and E. S. Beckjord is a description of physics tests, dynamic analysis, and operating tests on the Dresden reactor to explore the stability and other operating characteristics of the reactor.

"Economics of Nuclear Power" by John E. Ullmann is a somewhat philosophical consideration of the factors that will affect the future of atomic power.

"Chemonuclear Reactors and Chemical Processing" by Meyer Steinberg discusses use of fission-fragment recoil for manufacture of industrial chemicals. The paper describes the mechanism of the reactions and gives experimental data on which the processes are based. The main topics of the paper are conceptional designs of unconventional nuclear reactors suitable for production, chemical processing, and economic studies.

Volume 2 begins with "Reactor Transfer Functions" by Cesar Sastre. The paper outlines the general theory of the transfer function and describes its application to reactors.

"Heat Exchangers in Nuclear Power Plants" by George T. Lewis, Jr., Michael Zizza and Paul DeRienzo contains a general review of heat-exchanger types, design calculations, design criteria and cost.

"The Formation of Free Radicals in Polymers by Radiation, Their Reactions and Reactivities" by M. G. Ormerod describes formation, detection, and stability of radicals. Radical reactions and their behavior in important polymers are discussed in some detail. The effects of gases and additives on polymer radicals are also covered.

"Measurements of Reactor Parameters in Subcritical and Critical Assemblies" by Irving Kaplan compares reactor parameters as measured in various subcritical assemblies (exponential, miniature, and the Hanford Physical Constants Test Reactor) with those measured in critical assemblies. The general conclusion is that, with properly conducted experiments, good agreement can be expected.

"Scattering of Thermal Neutrons from Solids and their Thermalization Near Equilibrium" by L. S. Kothari and V. P. Duggal is an extensive review (117 pp) of the subject, including theoretical development and experimental data. The article is more in the nature of a specialized treatise than the other articles.

"Some Aspects of the Use of Digital Computers in Nuclear Reactor Design" by Bernard W. Roos and Ward C. Sangren reviews the development of digital computers and describes their general features and their role in reactor design. The use of codes for diffusion, transport, and kinetics calculations is discussed at length, and their use for other reactor calculations is discussed briefly. The article concludes with representative lists of codes.

The two volumes provide a good sampling of developments of the past few years in selected fields. No attempt is made to review developments of the preceding year outside of the selected fields. The editors have a difficult task in providing balanced coverage of topics—readers generally will agree that most of the topics are timely and appropriate.

The format is consistent and pleasing. All authors introduce their subjects effectively; the articles are well organized, with center headings and side headings, and ample lists of references. The author index is complete and the subject index adequate.

The volumes are a worthwhile addition to the literature, and the series will appeal to those of us who desire to keep informed, more than superficially, on current developments in fields other than our own.

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About the Reviewer: Harold Etherington is a consultant on atomic energy. He was a member of the Power Pile Division at Oak Ridge National

Laboratory from 1946 to 1948, becoming director of the division in 1948. From 1948 to 1953 he was at Argonne National Laboratory as Director of the Naval Reactor and Reactor Engineering Divisions. From 1953 to 1959 he was with the ACF Industries, Inc., becoming Vice-President of the Nuclear Products-Erco Division. From 1959 to 1963 he was with Allis-Chalmers Manufacturing Company, with the final position of General Manager of the Atomic Energy Division.

Erratum

Two figures in the paper, "Development of Fueled Graphite Containing Pyrolytic-Carbon-Coated Carbide Particles for Nonpurged, Gas-Cooled Reactor Systems," by F. L. Carlsen Jr., E. S. Bomar, and W. R. Harms, which appears on page 180 of the October 1964 issue were printed wrongly. The half-tone prints of figures two and nine should be interchanged.