

Chapters are included on application of diffraction, fluorescence and absorption for purposes of chemical analysis. Information to be gained in the study of deformation and stress measurement is described.

The book is well illustrated and well written. It will be found very useful by students of X-ray diffraction.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF WASHINGTON  
SEATTLE, WASHINGTON

N. W. GREGORY

**Advances in Catalysis and Related Subjects.** Volume VIII. Edited by W. S. FRANKENBURG, Lancaster, Pennsylvania; V. I. KOMAREWSKY, Chicago, Illinois; and E. K. RIDEAL, London, England. Academic Press, Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y., 1956. viii + 353 pp. 16 × 23 cm. Price \$10.00.

This book is another distinguished volume in a series already known for its reliability and usefulness. Recognized authorities have written each of the seven chapters: 1. "Current Problems of Heterogeneous Catalysis," by J. Arvid Hedvall, contains a survey of the fields in catalysis which at present show promise of yielding important new developments. Attention is directed to defect structures, ferromagnetic and ferroelectric Curie points, crystalline transitions in catalyst phases, photoadsorption, etc. 2. "Adsorption Phenomena," by J. H. DeBoer, comprises 133 pages and is the major chapter of the present volume. The article, indicating that there is no clear line of demarcation between physical and chemical adsorption, covers the theory of both, in as quantitative a manner as present knowledge will permit. A bibliography of 407 entries provides an excellent introduction to the periodical literature. 3. "Activation of Molecular Hydrogen by Homogeneous Catalysts," by S. W. Weller and S. A. Mills, is a detailed critical analysis of the mechanisms by which hydrogen dissociates and becomes available for reaction in systems of (a) cuprous salts in quinoline, (b) cuprous and silver salts in pyridine and dodecylamine, (c) cupric and mercuric salts in aqueous solution, (d) ethylene-platinous chloride, (e) cobalt carbonyl, (f) certain bases of miscellaneous composition. This study is directed toward the elucidation of the mechanism of activation of hydrogen as it proceeds on heterogeneous catalysts. 4. "Catalytic Synthesis of Ketones," by V. I. Komarewsky and J. R. Coley, emphasizes the aldol and Tishchenko ester condensations as methods of synthesizing ketones in contrast to the better known and more widely used dehydrogenation of secondary alcohols and decarboxylation condensations. 5. "Polymerization of Olefins from Cracked Gases," by Edwin K. Jones, is a summary of modern industrial practice in catalytic polymerization of olefins. It covers such subjects as process variables, catalysts, catalyst poisons, feed stocks and products. 6. "Coal-Hydrogenation Vapor-Phase Catalysts," by E. E. Donath, describes the development of catalysts based on molybdenum, tungsten and nickel in Germany and elsewhere for the hydrogenation of tars, heavy oil, and middle oil produced by the action of hydrogen on coal. 7. "The Kinetics of the Cracking of Cumene by Silica-Alumina Catalysts," by Charles D. Prater and Rudolph M. Lago, is a detailed analysis of published kinetic data on the cracking of cumene, combined with additional experimental data and a determination of the true kinetics at the active sites.

Catalytic chemistry is a broad and yet poorly understood field of science. Contributions to this field come from such widely different fields as chemical kinetics, thermodynamics, photochemistry, magnetism, crystallography, solid state physics, chemical engineering, aerodynamics, hydrodynamics, atomic physics, quantum mechanics, various types of spectroscopy, organic chemistry, tracer chemistry and surface chemistry. Recent theoretical and experimental developments in these sciences have stimulated the science of catalysis to rapid growth. The present volume of "Advances in Catalysis" together with its predecessors provides an indispensable focus where new developments and techniques as they apply to catalysis are summarized and critically evaluated. The twelve pages of subject and author index aid in making this book a useful reference work. Scientists working in the field of catalysis should

have ready access to this and the earlier volumes of "Advances in Catalysis."

BUREAU OF MINES, REGION V  
DIVISION OF SOLID FUELS TECHNOLOGY  
BRANCH OF COAL-TO-OIL RESEARCH  
BRUCETON, PA.

L. J. E. HOFER

**Progress in Nuclear Energy. Series III. Volume I. Process Chemistry.** By F. R. BRUCE, Oak Ridge National Laboratory, J. M. FLETCHER, A.E.R.E., Harwell, H. H. HYMAN, and J. J. KATZ, Argonne National Laboratory, Editors. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y., 1956. xii + 407 pp. 16 × 23.5 cm. Price, \$12.00.

Chemists and chemical engineers should find this volume an extremely informative account of the accomplishments in chemical technology attained by various individuals and laboratories working in the atomic energy field.

To date, both professional people and the public have been treated to numerous popularized accounts of reactor designs and applications, while the equally fascinating aspects of chemical reprocessing have been dealt with only occasionally. It is understandable that this situation should prevail, since the focal point for any reactor power cycle is the "reactor." When reactors are employed to produce fissile materials, chemical processing is a required step in the process. The future role of reprocessing in a power generation cycle is not at all clear at the moment, since metallurgists, physicists and reactor engineers will set their sights on a degree of fuel burnout that will allow ashes to be "shoveled out" of the reactor periodically without the need for reprocessing. Many reactor engineers will agree that vastly improved chemical reprocessing techniques could influence the choice of the best power reactor cycle. For many applications, a cheap and effective chemical process could obviate the need for expensive high-integrity fuel or costly reactor design features required to assure prolonged operation without refueling. As reactor engineers, physicists and metallurgists gain knowledge on the problems of high burn-up reactor operation, and chemists and engineers continue their advance toward more economical reprocessing methods, we may well see a more effective integration of the reactor and separations technologies in future reactor power cycles.

Process Chemistry should provide an excellent educational review and background for those who simply want to keep abreast of developments and for those who now may be actively involved in power reactor engineering and economics. The volume is neither a textbook nor a handbook. It is a blend of both chemistry and engineering as applied to chemical processing of irradiated fissionable materials. The scope of treatment includes laboratory, pilot-plant, and full-scale activities for both research- and development-type experimentation. The volume contains 22 papers presented by English and American scientists and specialists at the August, 1953, International Conference for the Peaceful Uses of Atomic Energy at Geneva. Many of these have been updated and appropriately modified. In addition, 14 papers have been added by the editors to provide a balanced treatment of the subject and to include some of the more advanced concepts that were not included at the "Geneva" meeting. Thirteen of the papers are by English authors and the volume is a result of joint editorship of U.S. and U.K. scientists together with an editorial advisory board that is composed of specialists from many other countries involved in the peacetime applications of atomic energy.

Broadly, the volume describes chemical processes for the purification of uranium and thorium ores, the separation of the fissile materials following irradiation of uranium and thorium fuel elements, and the disposal and/or recovery of the waste fission products. The papers leave no doubt that at present, solvent extraction is a well-demonstrated unit operation for separating and decontaminating the key products of irradiation. Readers should be impressed by the versatility and flexibility of this technique and will probably conclude that additional applications should be possible in areas of activity other than those in the nuclear field. It would be reasonable to expect that many of the chemical principles and unit operations discussed might be applied effectively to isolate and produce extremely pure materials for specialty use. The solvent extraction processes presented are indeed designed to achieve sharp separation and

extremely good purification. The editors also provide a glimpse into the future of dry-chemical and pyrometallurgical techniques as applied to reprocessing and also give the reader a brief, but extremely effective, history of the early Bismuth Phosphate process which was the first separations method to be applied on a plant scale for the recovery of plutonium.

Those who give the volume the attention it deserves will find that they must mentally "shift gears" as they progress through the chapters, since the scope of detail and methods of discussion and presentation naturally reflect the dissimilar individual characteristics of the authors. Nevertheless, the work is a significant contribution in that it represents a first step of a much larger job of systematically organizing and presenting in textbook or handbook form much of the excellent and extensive information that now can be made available in the area of chemical reprocessing of nuclear materials.

GENERAL ELECTRIC CO.  
RICHLAND, WASHINGTON

R. B. RICHARDS

**Comprehensive Inorganic Chemistry.** Volume Five. M. CANNON SNEED, Professor Emeritus of Chemistry, School of Chemistry, University of Minnesota, and ROBERT C. BRASTED, Associate Professor of Chemistry, School of Chemistry, University of Minnesota, Editors. **Nitrogen, Phosphorus, Arsenic, Antimony, and Bismuth.** BY HARRY H. SISLER. **Nonaqueous Chemistry.** BY ALFRED R. PRAY. D. Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1956. x + 214 pp. 16 × 23.5 cm. Price, \$5.00.

According to the editors, "Comprehensive Inorganic Chemistry is an eleven-volume reference work on the chemical elements and their inorganic compounds. It is comprehensive in the extensiveness of the fields covered rather than in the fullness of their treatment. . . . Their purpose is to serve as a ready reference to those engaged in chemical manufacture and development and to those in advanced studies in chemistry in institutions of higher learning. To meet the requirements of these groups, emphasis is placed largely on chemical properties and relationships and their interpretation in terms of theoretical concepts of atomic and molecular structure, the deductions from the periodic system, and the basic ideas relating to electrolytes."

These general objectives are realized successfully in Volume V. The treatment is more advanced than that characteristic of a good text at the general chemistry level, and yet it is not encyclopedic. It will serve well for a rapid survey of the areas that are discussed, and the references cited will guide readers to more intensive reading in the original literature. The discussion is well organized, clearly presented, and bears the mark of careful editing. Only a moderate number of minor errors are apparent.

Part I is introduced by a summary of the general characteristics of the elements of the nitrogen family, including a catalog of their isotopes. Chapter 1 consists of 94 pages covering the chemistry of nitrogen and its compounds. An adequate discussion of the element is followed by a good summary of the hydronitrogens which emphasizes the ammonia acid-base system. The author then describes the oxides, oxyacids, halides and sulfides of nitrogen. Regrettably, there is no discussion of the important topic of cyanogen and the inorganic cyanides, a subject which seems to be regarded by many writers of inorganic works to be outside the field. Although some 173 footnotes deal with literature references, a more thorough documentation would have made the treatment more valuable to those who will want to do more intensive reading.

The 46 pages of Chapter 2 survey the chemistry of phosphorus, arsenic, antimony and bismuth, with emphasis on phosphorus compounds. This chapter presents the main characteristics of this family of elements, but here again one wishes that the 45 footnotes concerned with references had been greatly augmented to encourage further reading.

Under the heading "Nonaqueous Chemistry," Part II affords 48 pages in which a general discussion of non-aqueous solvents and solutions is followed by a rather extensive survey of ammonia as a solvent and of typical reactions in liquid ammonia. Finally, the very limited available knowledge of solutions in acetic acid, hydrogen cyanide, sulfur dioxide, phosgene and selenium oxychloride is re-

viewed. This material is well chosen to follow the general discussion of nitrogen chemistry in Part I and should stimulate readers to investigate further the interesting possibilities of non-aqueous solutions. The extensive documentation provided by 193 footnotes will make it easy to consult the original literature. A serious omission is the lack of tabulations of the physical properties of phosgene and selenium oxychloride. These would have given the reader a better idea of the solvent possibilities of these less familiar liquids. Also some discussion of the structures of all of the solvents described would have made their behavior more understandable.

This volume is a welcome addition to the literature of inorganic chemistry, where good survey treatments have been sadly lacking.

CORNELL UNIVERSITY  
ITHACA, N. Y.

A. W. LAUBENGAYER

**The Chemical Constitution of Natural Fats.** Third Edition Revised. BY T. P. HILDITCH, C.B.E., D.Sc. (Lond.), F.R.I.C., F.R.S., Professor Emeritus in the University of Liverpool. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1956. xix + 664 pp. 16.5 × 24.5 cm. Price, \$16.00.

"This book, which first appeared in 1940, was revised in its second edition, published in 1947, which included the results of subsequent investigations on fats up to about 1945. Since then, much has been added in several notable respects to our knowledge of natural fats and their components, and it has been necessary, in preparing a further edition, to make extensive alterations to the book as originally published in 1940. Its general plan, however, has been left unaltered." Thus the author describes his undertaking in the preface to his third edition.

The general plan followed throughout the various editions of the book has been to approach the study of natural fats from the standpoints of (a) the component fatty acids, and (b) the component glycerides. Following the introductory chapter, are three chapters devoted to fatty acid composition. These chapters take up in order the fats from aquatic flora and fauna, fats of land animals, and vegetable fats. The next three chapters deal with the component glycerides. A discussion of methodology and interpretation of results is followed by a rather detailed survey of the glyceride compositions of individual vegetable and animal fats. The author notes in his preface that these three chapters have been entirely rewritten because of recent advances. A glance at the lists of references reveals that a large part of the work is from the laboratories of the author and his associates. The last four chapters are concerned, respectively, with possible mechanisms of biosynthesis of fats; structures of individual fatty acids; synthetic glycerides, naturally occurring higher alcohols, and acyl ethers of glycerol; and analytical techniques.

For those with a purely academic interest in fats, the book develops the thesis that related flora and fauna have fats of similar composition. There is a definite trend toward simplification in the fats of both plants and animals as the evolutionary scale is ascended. The distribution of fatty acids among the various glyceride molecules tends to be "even" rather than "random," although there are exceptions.

Persons actively engaged in research in the field of fat composition will be interested in the large amount of information that has been assembled. This volume is 20% larger than the previous edition. Documentation is thorough; several thousand literature references are cited. An author index would have been helpful, but the subject indices will usually suffice to locate a particular reference.

A weakness of the book is that only the three chapters on glyceride composition were completely rewritten. Some of the other sections suffer because new material was added to the essentially unchanged original text, and obsolete or erroneous information was not always deleted. For example, one notes on page 563 that over 20% of the alcohols of wool wax belong to aliphatic series that contain both even and odd numbers of carbon atoms. Contradictory statements retained from the previous edition occur on page 487. "The wax aliphatic alcohols. . . are confined to members which contain an even number of carbon atoms in the molecule," and on page 489, "Wool wax. . . consists of