

Of the three major sections into which the subject matter of this volume is divided, the first and predominant portion is devoted to methods of separation and identification of radioisotopes, sample preparation, the behavior of trace concentrations of elements in phase separations, isotope dilution methods and activation analysis. A concluding section deals with the biological effects of radiation and radioactive materials and suggests precautionary measures for handling radioactive substances. These safety rules appear to be adequate for activities up to about the millicurie level.

The second division of this volume is devoted to counting equipment. The physical principles of the operation of ionization chambers, scintillation counters, crystal counters and spark counters are treated in some detail. There are useful discussions of scattering and counting yields, background corrections, and of the statistical evaluation of counting data.

The concluding portion of this "Handbuch" deals somewhat briefly with the use of photographic methods in radiochemistry.

After an introductory section on the photographic process itself, the authors discuss the properties of various commercially available emulsions in terms of their applicability to the study of different types of radioactive decay. Directions are given for the development and fixation of plates and films and for their microscopic examination. The attention of the reader is directed to errors arising in photographic methods from fogging, fading, shrinkage and distortion of the emulsion.

A final section discusses some of the applications of the methods of autoradiography to radiochemistry.

Volume II of "Mikrochemischen Methoden" can be strongly recommended to all who have an interest in the practical application of radiochemistry to chemical research. An especially valuable feature of this volume is its thorough documentation, which extends to more than 2000 references.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIFORNIA  
B. B. CUNNINGHAM

**Calcul des Fonctions D'Onde Moléculaire.** Centre National de la Recherche Scientifique, 13, Quai Anatole France, Paris 7, France. 1958. 415 pp. 16 × 24.5 cm. Price, 3,400 Fr.

This volume consists of a collection of about thirty-five papers, on the general subject of molecular wave functions. The papers were presented at a colloquium sponsored by the Centre National de la Recherche Scientifique of France. Comments and discussion by members of the colloquium are included. The papers give a comprehensive view of current applications of quantum mechanics to general problems of molecular structures, and of application to selected specific cases. The volume is attractively bound and it is clearly printed on good quality paper.

DEPARTMENT OF CHEMISTRY  
UNIVERSITY OF ROCHESTER  
ROCHESTER, NEW YORK  
A. B. F. DUNCAN

**Organic Syntheses with Isotopes. Part II. Organic Compounds Labeled with Isotopes of the Halogens, Hydrogen, Nitrogen, Oxygen, Phosphorus, and Sulfur.** By ARTHUR MURRAY, III, and D. LLOYD WILLIAMS, University of California, Los Alamos Scientific Laboratory, Los Alamos, New Mexico. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1958. ix + pp. 1147-2096. 15.5 × 23.5 cm. Price, \$25.00.

The first part of this volume, which dealt with compounds of isotopic carbon, was reviewed in an earlier issue (THIS JOURNAL, 81, 2030 (1959)). Most of the remarks made in the earlier review are also applicable to Part II. The entire volume represents an excellent contribution to chemical literature.

Part II, and only Part II, contains the index for the entire volume. This index, which appears to be very complete, follows *Chemical Abstracts* usage with the addition of isotopic designations.

In Part II, as in Part I, the authors have attempted "to treat all labeling syntheses mentioned in the literature

through 1955." Descriptions of syntheses are presented in sufficient detail so that preparations may be carried out without further recourse to the literature. In addition, for the isotopes of hydrogen, the halogens and oxygen, there are tables listing exchange reactions that have been used to synthesize compounds containing these isotopes.

A major fraction of Part II, some 450 pages, is concerned with the hydrogen isotopes, but tritium syntheses take up only 50 pages of this section. The book was written before the recent upsurge of tritium's popularity, mostly occasioned by Wiltzsch's discovery that organic compounds can be labeled by simple exposure to tritium gas. However, anyone who wishes a specific labeling of either hydrogen isotope in a given molecule will find it worthwhile to read the synthetic procedures that are outlined in this book.

This volume (both parts) should be in all chemical libraries. Its price is so high (\$50.00), however, that it will have a limited appeal to individual purchasers.

RADIATION LABORATORY  
UNIVERSITY OF CALIFORNIA  
BERKELEY, CALIF.  
RICHARD M. LEMMON

**Catalysis. Alkylation, Isomerization, Polymerization, Cracking and Hydroreforming.** Volume IV. Edited by PAUL H. EMMETT, W. R. Grace, Professor of Chemistry, The Johns Hopkins University, Baltimore, Maryland, Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1958. vi + 706 pp. 16.5 × 23.5 cm. Price, \$19.50.

The first five volumes of this series dealt primarily with the fundamental theories and mechanisms of catalysis. Volume VI is designated as "hydrocarbon catalysis" and it is concerned with some of the more important catalytic reactions pertaining to petroleum refining and petrochemicals.

The chapters consist of: 1. Catalytic Alkylation of Paraffins (42 pages) by R. M. Kennedy; 2. Catalytic Isomerization of Hydrocarbons (148 pages) by F. E. Condon; 3. Mechanism of Polymer Formation and Decomposition (150 pages) by R. Simha and L. A. Wall; 4. Polymerization of Olefins (66 pages) by A. G. Oblad, G. A. Mills and H. Heinemann; 5. Catalytic Cracking (87 pages) by H. E. Voge; and 6. Catalytic Reforming of Pure Hydrocarbons and Petroleum Naphthas (194 pages) by G. F. Ciapetta, R. M. Dobres and R. W. Baker.

All the chapters were written by recognized experts and all of the chapters with the exception of Chapter 3 deal with strictly catalytic reactions. It is to the credit of the Editor that he was able to embrace in this volume the various reactions which use catalysts which act in part at least by virtue of their acidic properties.

The chapter on Isomerization is probably one of the most comprehensive review articles in this field and it deserves special commendation.

In the chapter on Catalytic Cracking prime attention was paid to the basic knowledge of the reaction and to the theories which explain the reaction. The chemistry of the cracking catalyst was purposely omitted as it is to be discussed in another volume of this series.

Catalytic Reforming consists of three parts. Parts 1 and 2 deal with the reactions of pure hydrocarbons in the presence of metal oxides and in the presence of dual function catalysts. The third part summarizes the characteristics of the various commercial processes. The authors undertook a painstaking job in classifying and summarizing the various papers published on this subject. Although hydroforming reactions are of the most important catalytic reactions in the field of petroleum, relatively little attention was paid to the mechanism of these reactions. For that reason probably this chapter did not dwell too much upon the mechanism of hydroisomerization. It is regrettable that throughout the chapter degrees Centigrade and Fahrenheit were used interchangeably.

Chapter 3 deals with reactions involving large molecules; their formation and their breakdown. The chapter is very well and clearly written and presents an excellent summary of this subject. Most of the reactions discussed in this chapter are concerned with free radical initiated polymerization. For that reason it is debatable whether these reactions could be classified as catalytic. The inclusion, however, of "non-catalytic" polymerization reactions next to "catalytic"

reactions permits a clearer comparison between the two reactions.

Volume VI is highly recommended to all those who are concerned with petroleum hydrocarbons and catalysis and it is an indispensable book for all those who deal with the field of petrochemistry.

THE IPATIEFF HIGH PRESSURE AND  
CATALYTIC LABORATORY  
DEPARTMENT OF CHEMISTRY  
NORTHWESTERN UNIVERSITY  
EVANSTON, ILLINOIS

HERMAN PINES

**Fortschritte der Physikalischen Chemie.** Band 4. Gleichgewichts- und Wachstumsformen von Kristallen. By DR. B. HONIGMANN, Wissenschaftlicher Oberassistent am Fritz-Haber-Institut der Max-Planck-Gesellschaft Berlin-Dahlem. Dr. Dietrich Steinkopff Verlag, Holzhofallee 35, Darmstadt, Germany. 1958. xii + 161 pp. 15.5 × 23 cm. Price, M D 26.

Research and application of solids depend to a high degree on our knowledge of the fundamental processes of crystal growth and the technical preparation of single crystals of the desired quality and size. Neither of these problems is solved at present. On the other hand, the demand for new and better crystals grows rapidly. The importance and interest in single crystals is clearly demonstrated by the number of important conferences held and books published on this subject in recent years. The present book is another valuable contribution in the field of crystal growth. The scope of the book is limited to the treatment of crystal habits in the equilibrium and growing states. In the first chapter the definitions and concepts of nucleation and habits of crystals are given. In the second chapter is given a short description of crystal growth from the vapor, solution and melt. The third chapter gives the experimental data of crystal habits of covalent and ionic crystals and the influence of additives. In chapter four the experimental methods for determination of crystal habits and in chapter five methods for study of single faces are given. In the last and the longest chapter the theories of crystal habits according to Gibbs, Vollmer, Kossel, Stranski, Kaischew and others are presented. Unfortunately, some of the new results published recently, *e.g.*, by Chalmers, Sears and others, which belong to this field, are missing. This book should be very useful to anyone interested in the study or preparation of crystals.

LABORATORY FOR INSULATION RESEARCH  
MASSACHUSETTS INSTITUTE OF TECHNOLOGY  
CAMBRIDGE, MASSACHUSETTS

ALEXANDER SMAKULA

**Der lichtelektrische Effekt und seine Anwendungen.** Edited by DR. H. SIMON, Professor an der Humboldt-Universität und stellv. Direktor des Instituts für Festkörperforschung der Deutschen Akademie der Wissenschaften zu Berlin, and DR. R. SUHRMANN, o. Professor und Direktor des Instituts für physikalische Chemie und Elektrochemie der Technischen Hochschule Hannover. Springer-Verlag, Heidelberger Platz 3, Berlin-Wilmersdorf, Germany. 1958. xii + 747 pp. 16.5 × 23.5 cm. Price, DM 97.50.

The senior authors of this book, Professors H. Simon of Berlin and R. Suhrmann of Hannover, have attempted in one volume a complete presentation of all available information concerning the photoelectric effect and its various applications to basic research and to technology. In order to cope with the complexity of such a task, five specialists have contributed the 12 chapters of the Book.

In a brief "Introduction," Chapter I (6 pages), R. Suhrmann describes the various photoelectric effects based on phenomenology rather than on modern theory of solid state physics. His use of the term photo-electromotive force, for example, in this connection is confusing and basically meaningless (43 basic references).

From the point of view of the researcher, the next two chapters constitute the important part of the book.

In Chapter II (133 pages), on "The Laws of the External Photoelectric Effect," R. Suhrmann tries to organize an enormous amount of data into a reasonably self-consistent and readable presentation of the material, a herculean and perhaps somewhat thankless task in the absence of a suffi-

ciently detailed general theory. The work of R. H. Fowler and L. A. DuBridge, which describes the photoelectric effect in pure metals near threshold, is admirably presented in its complete form, including all necessary tables.

Temperature dependence of photoemission, energy distributions of ejected electrons, correlations between optical properties of photocathodes (reflected and absorbed light intensities, polarization, etc.) and photoelectric yields—all these phenomena are treated in such a manner as to be of great aid to the beginning researcher in this field. Unavoidable discrepancies in published photo-yield measurements on the same, presumably pure, photo-cathode materials are valiantly dealt with, perhaps in excessive detail. For the beginning student it will be difficult not to be confused by the mass of experimental data concerned with crystal structure, with adsorbed foreign atoms, molecules and ions, with monomolecular and thick layers, etc., and with all their combined subtle and, in many instances, little-understood influences on the measured yields. The interpretation of an equally large number of data for composite photocathodes is closely related to the above problems with the same attendant difficulties.

Perhaps a greater selectivity of the literature discussed here might have improved the readability of this chapter. In spite of this, Professor Suhrmann did succeed in acquainting the reader with the published work on the subject matter and with its manifold problems (249 references).

"Internal Photoeffects" are treated by K. W. Böer in Chapter III (82 pages). Actually, the title is slightly misleading in as much as the work is primarily concerned with a very lucid and easy to read introduction to the concepts of solid state physics, including energy band models, crystal defects, significance of donor and acceptor mechanisms, electron excitation and recombination, and others. These phenomena are discussed systematically in terms of the important experimental parameters and supported with carefully selected data. The internal photoeffects are briefly discussed within this framework (277 references).

In Chapter IV (71 pages), H. Simon discusses the "Construction of Photocells for the External Photoeffect." Various laboratory techniques are described, in some instances perhaps unnecessarily detailed for students in U. S. universities who to-day are very rarely concerned with individual preparation of vacuum greases. Data on principally German-manufactured glasses are presented, followed by descriptions on how to produce pure metals and pure gases in the laboratory. The manufacture of some important complex photocathodes is explained in useful detail (104 references).

Chapter V (34 pages), also by H. Simon, deals in a similar manner with the "Construction of Photo-Resistive Cells (semiconductors)," with stress on selenium, thallium sulfide, lead sulfide and potassium sulfide. Additional information on spectral sensitivity, particularly in at least approximate absolute units, would have been useful (101 references).

"Secondary Electron Amplification" is discussed by F. Eckart in Chapter VI (51 pages). The yield factor as a function of primary electron energy is presented for a variety of surfaces in the form of curves and summarized in a well-referenced table. This is followed by details on construction and properties of some special compounds and alloys of high yield, such as silver-magnesium and copper-beryllium. Different mechanical forms of multipliers, with and without focusing properties, are described together with spectral sensitivity, amplification factor, dark current, noise, and other properties. A final table lists more commercially available photomultiplier tubes than this reviewer ever knew existed. All their important characteristics are included (223 references, with titles!).

In Chapter VII (132 pages), W. Leo and R. Suhrmann are describing "Methods and Apparatus for Photoelectric Measurements." A good deal of space is devoted primarily to classical electrical and electronic measuring techniques, containing some useful hints. In contrast, the remainder of the chapter goes into worthwhile detail with respect to the procedures necessary for the determination of both relative and absolute spectral sensitivity curves (115 references).

The "Applications of the Photocell to Photometry" are discussed by W. Leo and R. Suhrmann in Chapter VIII (88 pages, 91 references).

"Applications of the Photocell in Electron-Optical Image Tubes and in X-Ray Image Amplifiers" are briefly treated by F. Eckart in Chapter IX (35 pages). The basic aspects