

Chemistry of the Amino Acids. Volumes 1, 2, and 3. By JESSE P. GREENSTEIN and MILTON WINITZ, Laboratory of Biochemistry, National Cancer Institute, National Institutes of Health, Public Health Service, United States Department of Health, Education and Welfare. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1961. xxi, xi and xiii + 2872 pp. 16 × 23.5 cm. Price, \$100.00.

One cannot leaf through the pages of these three remarkable volumes without a feeling of deep regret that they represent the final activity of their distinguished senior author. Jesse Greenstein's death when all but the last few sections of Volume III were in typescript, and the whole of Volume I was in page proof was tragic. The book is his monument, the record of a busy lifetime intelligently divided between scholarly study of the literature and brilliant personal investigation at the laboratory bench. It reminds us only too poignantly that self-sacrifice in the cause of science can go no further.

There is no question but that the Greenstein and Winitz monograph will for many years be the fundamental publication in its field. Investigators and students to whom this book is available will have little need, in searching the literature of amino acid chemistry, to go further than to review the indexes of *Chemical Abstracts* from 1959 on and then turn to it. The more than 6,500 references it contains furnish a complete key to the literature of the subject from the earliest discoveries and observations to the present day, and only when the full detail on some point has become essential will one need to turn to the library.

The book is organized so as to lead from the general to the particular. Volume I deals with matters that concern all amino acids. It contains chapters on nomenclature, configurational relationships, nutrition, physical chemistry, thermodynamics and solubility, combination of amino acids with metals and salts, and general methods of synthesis and resolution. Volume II deals with the synthesis of peptides, with details of analytical methods including microbiological and chromatographic techniques, with sequence analysis of peptides, with optical properties including absorption at all useful wave lengths, and with the enzymes that have been found to have value in the study of peptides and amino acids. Volume III takes up the amino acids one by one, those of importance in ordinary protein chemistry first, and then the scores of unusual amino acids that are not involved in the structure of proteins, but which have been prepared by synthesis or are found in nature either free in extracts of animal or plant tissues, or combined in hormones or antibiotics, or in unique peptides. These amino acids are classified according to chemical structure so that analogous substances are brought together for discussion.

The treatment of each topic is fundamentally historical. The earliest observations are outlined and, where of unusual significance or perspicacity, are discussed in detail. The sequence of events is then noted and the reader is led up to the most recent investigations in which the problem is either solved or its present status is clearly described. Characteristic of the book is the assembly into tabular form of data that illustrate significant points. There are many of these, but mention should be made of a table with 99 entries which shows the physical properties of all of the peptides synthesized by the Fischer school by aminolysis of α -halogen acid intermediates, of a table 37 pages long which gives the melting points, specific rotations and the references to all of the well-characterized acylated peptide esters in the literature, and also of one almost as long which gives similar data for all known amino acid and peptide amides. This is encyclopedic treatment; if an amino acid or peptide derivative of any kind has been prepared and its properties recorded, the fact and the reference to it can be readily found. If it is not shown in one or other of the tables, or referred to in the text, one can be as nearly certain as is necessary that the substance has not hitherto been made.

In preparing many of these tables, the authors have made use of a system of abbreviations for the names of the amino acids and their derivatives which they have developed from the early suggestions of Brand and Edsall. These abbreviations are clear, specific and accurate, and are readily understood at a glance. They save a great deal of space. However, the authors have properly restricted the use of abbreviations to the tables; full chemical names are used in

the text, an example of good judgment and good taste that could be widely imitated with benefit to biochemical writing in general. The chemical nomenclature is accurate and authoritative and is a model of clarity.

In the discussions, the text is supported by carefully drawn and clearly printed structural formulas and reaction sequences. Moreover, care has been taken that these aids to understanding are to be found on the page where they belong. One rarely needs to turn the page to see the formulas of the substances being discussed.

At the end of many of the sections dealing with reactions of the more general type is a brief paragraph under the heading "Scope and Limitations." Here the authors warn of instances where the reaction may fail of its object, and offer advice founded on experience on how the desired end may be achieved. These statements are of the utmost value to the investigator.

Also characteristic of the book are the innumerable illustrative procedures. These give precise laboratory directions with yields for the preparation of special reagents, enzyme concentrates, derivatives of amino acids or peptides, of peptides, and of the amino acids themselves either by isolation from hydrolysates of proteins or by synthesis, and also for the resolution of racemic products and for analytical or assay methods. Most of these descriptions bear the unmistakable stamp of personal experience in the hands of the authors and their associates with corresponding assurance of their reliability.

It is a reviewer's obligation to search for and point out deficiencies and errors. Very few of the latter were found. Much of the book is straightforward organic chemistry illustrated by reaction equations and chemical structures. The present younger generation trained in modern concepts of chemical reaction mechanisms will find few attempts to account in these terms for the transformations that are described. Experts in the physical chemistry of amino acids may find the treatment of these aspects of the subject disappointingly brief, although it is by no means superficial. Protein chemists, especially those concerned with enzymes, will sometimes wish that the authors, after having led up to some important matter in this field, would go on instead of referring the reader to a review article where a full discussion may be found. But these are minor matters most of which can be accounted for by the limitations of space which apply as rigidly to a three-volume monograph as they do to a journal article. The subject matter of the book is amino acids and simple peptides, and the authors restrict themselves carefully to these topics.

One further matter should be mentioned, however; the price. It is regrettably high; 2872 pages for \$100.00 is three and a half cents a page which takes this monograph out of the textbook class entirely. On the other hand, the book undoubtedly was expensive to produce and the publishers have spared little in their job of book-making. It will for many years be an essential text in the libraries of departments of biochemistry, notwithstanding its cost.

THE CONNECTICUT AGRICULTURAL
EXPERIMENTAL STATION
NEW HAVEN, CONNECTICUT

II. B. VICKERY

Modern Nuclear Technology: A Survey for Industry and Business. Edited by MARK M. MILLS (deceased), Deputy Director, Lawrence Radiation Laboratory at Livermore, California, ARTHUR T. BIEHL, MB Associates, Danville, California, Former Lecturer in Nuclear Engineering, University of California, Berkeley, Former Vice President and Technical Director, Aerojet-General Nucleonics, San Ramon, California, and ROBERT MAINHARDT, MB Associates, Danville, California, Former Vice President and General Manager, Aerojet-General Nucleonics, San Ramon, California. McGraw-Hill Book Co., Inc., 330 West 42nd Street, New York 36, N. Y. 1960. ix + 336 pp. 16 × 23.5 cm. Price, \$9.50.

This is a worthwhile book. It will be useful to a broader group of chemists and scientists in general than the title and subtitle would suggest. Even for many engaged in active research in various areas of nuclear science, this book should provide an interesting and factual source of information concerning the current status of the nuclear reactor field, especially in the area of central station power.

The jacket points out that "the material contained in this book is, for the most part, the result of a series of lectures given under the Engineering Extension Program of the University of California in Berkeley during the summers of 1956 and 1957. This course, entitled 'A Survey of Nuclear Engineering for Management,' consisted of lectures presented by approximately twenty guest speakers—all specialists in the field." At least several of the eighteen chapters have been updated to about 1959. The presentation is directed toward the industrialist who has an engineering degree but has not been actively engaged in engineering for five to ten years. Accordingly, the general level of presentation is relatively unsophisticated. This should not detract from its value to most non-experts in nuclear reactors.

The book is divided into four parts, plus an introductory history of atomic energy by Edward Teller. Part I, *Nuclear Energy—Basics* and Part II, *Nuclear Energy—Applications*, are about one hundred pages each. Part III, *Nuclear Energy—Safety*, which includes a chapter on medical aspects of radiation, and Part IV, *Nuclear Energy—the Future*, are each about fifty pages in length. More than half of Part IV is devoted to a chapter on controlled-fusion power.

Parts I and II include chapters on fundamental principles of nuclear reactors, breeder and converter reactors, the production and processing of nuclear materials, economics of nuclear power, research reactors, sodium-graphite and organic-moderated reactors, and industrial uses of isotopes. There is a chapter dealing specifically with the Shippingport Atomic Power Station.

As a result of the multiplicity of authors there is some non-uniformity in presentation and some overlapping in coverage as well as areas of non-coverage. However, these are only minor drawbacks in a generally valuable book.

CHEMISTRY DIVISION
ARGONNE NATIONAL LABORATORY W. M. MANNING
9700 S. CASS AVENUE
ARGONNE, ILLINOIS

The Enzymes. Second Edition, Completely Revised. Volume 4. Hydrolytic Cleavage (Part A). Peptide Bond Cleavage, Other C-N Bond Cleavage. Glycoside Bond Cleavage. Carboxyl Ester Cleavage. Edited by PAUL D. BOYER, Department of Physiological Chemistry, University of Minnesota, Minneapolis, Minnesota, HENRY LARDY, Institute for Enzyme Research, University of Wisconsin, Madison, Wisconsin, and KARL MYRBÄCK, Institute for Organic Chemistry and Biochemistry, University of Stockholm, Stockholm, Sweden. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. xx + 631 pp. 16 × 23.5 cm. Price, \$18.00.

Volume IV contains an interesting and useful collection of articles on specific hydrolytic enzymes. The treatment of the chemical and physical properties of these proteins is for the most part excellent. However, there is as yet not enough known about the catalytic properties of these enzymes to write an integrated book in this field. The Editors provide some cohesion by organizing this book into sections. These are introduced by the following chapters: "Peptide Bond Cleavage," "Other C-N Bond Hydrolyses," "Cleavage of O- and S-Glycosidic Bonds," and "Carboxyl Ester Cleavage." Each contains a brief and concise survey of the enzymes discussed in the respective sections.

The chapters entitled: "Carboxypeptidases A and B," "Leucine Aminopeptidase," "Pepsin," "Chymotrypsin," "Papain," "Thrombin," "α-Amylase" and "Lysozyme" are all authoritative, complete and up-to-date. A great deal has been done to ascertain the purity of the enzymes discussed in these chapters, and the work on the chemical and physical characterization of these proteins is impressive. Equally well written, but dealing with less well characterized enzymes are the chapters: "Bacterial and Mold Proteases," "Urease," "Arginase," "Penicillinase," "Adenylic Deaminase," "β-Galactosidase," "β-Amylase" and "Acetylcholinesterase." Included in these chapters, together with the usual review of the literature, are many satisfying discussions and provocative speculations. Among these is a discussion of the effect of substrate binding on acetylcholinesterase-catalyzed reactions, an account of the activation of procarboxypeptidase A, and speculations on the mechanism of action of leucine aminopeptidase, pepsin, α-amylase and β-galactosidase.

The following chapters describe for the most part semi-quantitative observations on enzymes of questionable homogeneity and poor characterization: "Invertase," "Cathepsins," "Glutaminase," "Plasmin," "Other Glucosidases," "β-Glucuronidase," "Hyaluronidases," "Neuraminidases," "Fatty Acid Esterases of Low Eserine Sensitivity and Related Enzymes," "Butyryl- and Propionylcholinesterases and Related Types of Eserine-Sensitive Esterases" and "Phospholipases."

The book is valuable in directing attention to rich areas of research of varying complexity, suitable for both the physical scientist and the biologist. Volume IV of "The Enzymes" belongs in every biochemistry and chemistry library. It is recommended to all enzymologists, to those interested in the special topics covered, and to all students of molecular biology.

DEPARTMENT OF BIOCHEMISTRY
CORNELL UNIVERSITY
ITHACA, NEW YORK

GEORGE P. HESS

Organic Electronic Spectral Data. Volume I. 1946-1952. MORTIMER J. KAMLET, Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. xiv + 1208 pp. 16 × 23.5 cm. Single copy price: \$28.50; Subscription price: \$25.00.

Organic Electronic Spectral Data. Volume II. 1953-1955. HERBERT E. UNGNADE, Editor. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1960. x + 919 pp. 16 × 23.5 cm. Single copy price: \$17.50; Subscription price \$15.00.

The systematic documentation of molecular spectra is becoming a problem of rapidly increasing magnitude, and electronic and vibrational spectra are now recognized as the principal physical characteristics of organic molecules. Much of this information is first reported as incidental detail in publications that are not written with the spectroscopic interest specifically in mind, and the difficulties in extracting the information from the original sources are such that the organic chemist often finds it quicker to determine the spectrum anew. This of course is only possible if he has the reference compound on his laboratory shelf, and laboratory shelves have limited capacities.

A search of the decennial and annual indexes of "Chemical Abstracts" is the classical method of extracting spectral data from the literature. Prior to 1958, "Chemical Abstracts" listed all types of molecular spectra collectively under the single heading "Spectra," but, at the suggestion of the Commission on Molecular Structure and Spectroscopy of IUPAC, a more detailed form of indexing has now been adopted. Beginning with Volume 52, "Chemical Abstracts" classifies spectra into subsections "infrared," "visible and ultraviolet," "Raman," etc. While the "Chemical Abstract" index and the "Chemisches Zentralblatt" index provide machinery for the extraction of spectral data from the literature, they do not adequately meet the requirements of the chemical spectroscopist. He needs a more concentrated source reference and preferably one which is immediately available beside his spectrometer. For vibrational spectra this problem presents extreme difficulty. The necessary information is too complex to be presented in numerical form without resort to digital tapes or punched cards. The storage of infrared data therefore calls for electronic or mechanical storage systems or bulky graphical presentation. It is difficult to visualize how the systematic collation of vibrational spectra can ever be achieved in book form; catalogs and atlases of infrared spectra will unavoidably be limited to selected groups of compounds.

Electronic spectra of liquids and solutions are much simpler and the characterizing features of the most complex spectra (e.g., phenanthrene) can be recorded by about 24 pieces of information (12 band positions and 12 intensities). A complete summary of the electronic spectra of organic compounds, in the ranges currently useful to organic chemists, is therefore a practical possibility. In the volumes which we are reviewing, Dr. Kamlet and Dr. Ungnade, with the assistance of some fifty collaborators, have brought together data based on a review of 50,000 electronic spectra extracted from 10,000 references. This was initially started in 1956 as a volunteer co-operative project, and a year later it was incorporated as Organic Electronic Spectral Data