# Book Reviews

**Chemistry of the Amino Acids**. vols. 1–3. Jesse P. Greenstein (deceased 12 Feb. 1959) and Milton Wintz. Wiley, New York, 1961. 2872 pp. Illus. $100.

These volumes represent a scholarly and complete but critical exposition of the organic and physical chemistry and the nutrition of the biologically important $\alpha$-amino acids. The first two volumes deal with $\alpha$-amino acids as a class of chemical compounds, and the third deals more specifically with the detailed history, reactions, synthesis, physical characteristics, and optical resolution of each individual amino acid and its more important derivatives. The subjects are developed historically and are brought up to the end of 1958 by extensive bibliographies which accompany each chapter. In addition to the intellectual development of the subjects, a large number of experimental procedures are illustrated, and enough technical details are provided to permit repetition in the laboratory.

The first two chapters deal with fundamental aspects of amino acids, such as their names and chemical structures, and with methods for their interconversion and for determining their absolute configuration. The significance of rotary dispersion curves of animo acids and of their copper complexes as a simple means of establishing configuration is emphasized, and theories of optical activity are presented. Amino acids in nutrition are traced from their early beginnings to their culmination in the classical contributions of W. C. Rose and his collaborators, which led to the isolation of threonine and to a clear distinction between dispensable and indispensable amino acids in man and in many other animal species. Many other related topics, for example, the parenteral feeding of amino acids and tissue culture, are discussed in a sufficiently comprehensive manner to provide a broad background for those interested in the more fundamental aspects of such subjects. Chapters 4 and 5 deal with amino acids as amphoteric electrolytes and as dipolar ions and with thermodynamics and solubility, respectively. The origin and significance of the various abbreviations used to designate dissociation constants and their interrelationships are clearly stated and should prove to be a boon, particularly to beginning students. The driving force of chemical reaction and the concept of free energy and its measurement and determination are presented with great clarity and should provide those without a background in physical chemistry a good perspective of the operation of these fundamental concepts. Chapter 6 reviews the importance of the coordinate covalent bond in amino acid, peptide, and protein chemistry; and chapters 8 and 9 provide discussions of the general and specific methods available for the synthesis and resolution of $\alpha$-amino acids.

The highly advanced state of development of synthetic peptide chemistry is presented in fascinating detail in chapter 10 (volume 2). Over 39 of the synthetic procedures available to the biorganic chemist are treated extensively and critically. The tremendous activity and success in peptide synthesis is indicated by some 80 pages of tables which the authors have devoted to physical constants of acylated peptide esters, acylamino acids and peptides, and esters of unacylated peptides and by the bibliography of over a thousand references. Since illustrative procedures are provided for nearly every synthetic method mentioned, this chapter will be of great value to the experimentalist as well as to those interested only in reviewing the accumulated knowledge of peptide synthesis.

Included under the discussion of general analytical procedures (in volume 2) are nine chapters on colorimetric methods, manometry, and titrimetry; isotope dilution; microbiological assay methods; chromatography; sequential analysis of peptides; spectrophotometry; optical rotation; and determination of optical and steric purity. The historical development of each subject is used as a means of presenting the theoretical aspects, and each subject is brought up to date. A wealth of detailed information is included under each title, and the interested reader can obtain much information concerning the theory as well as the many significant applications of the methods concerned. In the discussion of sequential analysis of peptides, for example, proofs of structure are presented for the simple, naturally occurring peptides like glutathione and carnosine, and probable peptide sequences are given for a number of proteins such as silk, wool, and lysozyme. The Sanger and Edman procedures and their limitations for the characterization of N-terminal sequences are discussed when applied to insulin and to a number of other proteins including $\beta$-lactoglobulin, ovalbumin, bovine serum albumin, various hemoglobins, wool keratin, $\alpha$-casein, papain, ribonuclease, carboxypepeptidase, and pepsin. Similar consideration is given to methods for determining C-terminal sequences, and the N- and C-terminal amino acids for many proteins are given in tabular form. The structure proof of insulin is given in detail, and sequence studies are also presented for many naturally occurring peptides such as phalloidin, the ergot alkaloids, tyrocidin, gramicidin, the bacitracins, corticotropin, glucagon, oxytocin, and vasopressin. In a similar way the detailed chemistry of several zymogens and the peptides released from them during activation are presented.

In chapter 20 of the second volume the authors are concerned with the enzymes used for optical resolution of the $\alpha$-amino acids and their derivatives and with the determination of optical purity. Methods of preparation are given for renal acylase I, renal acylase II, pancreatic carboxypeptidase, renal D-amino acid oxidase, snake venom L-amino acid oxidase, bacterial decarboxylases, hepatic arginase, and renal aminopeptidase and for their respective use. In contrast to the measurement of optical rotation or of other physical properties of amino acids, it is clear that such enzymic procedures provide the only definitive methods by which amino acid steric purity of the order of 99 percent or better can be established with certainty.

The historical development, isola-

tion, structure proof, synthesis, resolution, methods of racemization, infrared spectra of the individual amino acids are treated in 21 different chapters of volume 3. Similarly, 11 chapters are concerned with the preparation of amino acids not known to be bound in proteins of mammalian tissue. The latter include aliphatic straight-chain monoaminomonocarboxylic, aminopolycarboxylic, diaminomonocarboxylic, diaminodicarboxylic, imino, $\alpha$-alkyl amino, ($\beta$)-branched amino, $\alpha$-amino-$\omega$-hydroxy, sulfur-containing amino, ring-substituted $\alpha$-amino, and N-alkylated amino acids. These chapters provide an exhaustive and authoritative survey of the several aspects of the amino acids mentioned.

In this review I have attempted to indicate briefly something of the subject matter and the thoroughness of its presentation. The more extensive and exhaustive the coverage of an important subject, the more likely is a short review to appear superficial and even trivial. However this may be in the present instance, it seems clear that these volumes will occupy an important place as a reference source for many specialists and for biochemists and biologists in general. The authors state in the preface that they "have been entranced by the spectacle of the many and diverse phenomena" associated with the behavior, properties, and biological duties performed by the $\alpha$-amino acids. Biochemists and many others will benefit immeasurably because the authors were not only entranced but were highly discerning, skillful, and thorough in recording their extensive observations.

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**The Physico-chemical Constants of Binary Systems in Concentrated Solutions.** vol. 3, *Systems with Metallic Compounds.* xiii + 1322 pp. $36. vol. 4, *Systems with Inorganic + Compounds* (excepting metallic derivations). xi + 1332 pp. $39. Jean Timmermans. Interscience, New York, 1960.

With the appearance of volumes 3 and 4, this tabulation of the physical constants of concentrated solutions of two substances is complete. Volumes 1 and 2, which cover systems of two organic compounds, were reviewed in *Science* [**131**, 97 (1960)]. Volume 3 covers systems of two inorganic compounds, and volume 4 contains data on systems of one organic plus one inorganic compound, the references to the literature, and a 230-page formula index for the whole set.

The survey is noncritical and appears to cover the literature up to 1956. The bibliography is easy to use once the system of interest has been located in the tables. Finding a system is no easy task, however, for the only index provided is a formula index, and it is hopelessly inadequate. For example, under $C_2H_6O$ appears the entry "ethyl alcohol" followed simply by about 200 page numbers that give no clue as to the nature of the second component. Under such circumstances the reader is practically forced to a page-by-page search through one or more of the thousand-odd page volumes to find specific data, if indeed they are present at all. Although the over-all organization ameliorates this situation somewhat, by no means do the volumes comprise a handy reference work.

While there is no doubt that this set will prove useful to specialists concerned with the properties of binary systems, poor indexing and the failure to evaluate discordant sets of data greatly diminish the value of the work for general reference purposes.

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**Radiation Protection and Recovery.** Alexander Hollaender, Ed. Pergamon, New York, 1960. v + 392 pp. Illus. $12.50.

Many efforts have been made to develop effective chemical and physiological-biological means to counteract the damaging effects of ionizing radiations. Often the situation appeared confused, the possibilities limited, practical applications doubtful. However, persistent work in the field has changed this picture. Today the multiplicity of approaches appears, in retrospect, more uniform than anticipated, and in the proper arrangement of the scientific facts an impressive inventory of the present state of the art can be presented. This is exactly what Hollaender does. The book's 12 chapters cover the protection of macromolecules and different biological systems, the experimental treatment of acute whole-body radiation injury in mammals, recovery phenomena, and photo-reactivation. The stimulation given to biology and medicine—for example, Lorenz's classical bone marrow experiment and its implications to tissue transplantation techniques, to immunological problems and related phenomena—becomes obvious.

Historical remarks, cleverly inserted, vivify the presentation; their value might have been increased by more detailed consultation of the reports of the Atomic Energy Commission and other governmental agencies—for example the protective action of cysteine on the synthesis of desoxyribonucleic acid in the intestinal mucosa of x-irradiated rats was reported in 1952, long before rediscovery of the effect in 1958. But perhaps it is such facts that make reading the book so interesting. The volume stimulates and it challenges. The pioneer in the field starts to revise old and to look for new ideas and interpretations; the newcomer accepts gratefully the tremendous background information presented by the different contributions and so well selected by the editor.

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**Handbook of Microbiology.** Morris B. Jacobs and Maurice J. Gerstein. Van Nostrand, Princeton, N.J., 1960. x + 322 pp. Illus. $8.50.

Compiled from contemporary literature and arranged in 38 alphabetically organized, so-called "tables," this book provides data for professional work in microbiology. Although it attempts a broad coverage of bacteriology, there is little on viruses, and protozoology per se is omitted. The 150-page, first table, which describes 160 species of bacteria, leaves out several important species—for example, *Salmonella paratyphi* and *Haemophilus ducreyi*—and includes a few of slight importance—for example, *Spirillum volutans* and *Pseudomonas ovalis.* Synonyms should have been included, and space could have been saved by a different arrangement: more than 30 lines are used for the fermentation reactions of *Acetobacter aceti.*

The classes, orders, suborders, families, and genera of bacteria, rickettsia, and viruses according to *Bergey's Manual* (1957) are listed, but I see no need for including Krassilnikov's classification (1949). Table 6 allots 21