

BOOK REVIEWS

Ultrasonics. By P. VIGOUREUX, D.Sc., Royal Naval Scientific Service. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1951. vi + 163 pp. 16 × 25 cm. Price, \$4.00.

The field of ultrasonics is another striking example illustrating the way in which technical applications provide a stimulus for basic research. Especially during the last war in solving the problems of underwater sounding and tracking, ultrasonics was established as a military aid as important as radar. This one use has justified extensive research on the basic aspects of the propagation and absorption of sound in the range beyond the audible limit, an inquiry which has finally led to studies of sound at frequencies as high as 100 megacycles per second and to the discovery of many interesting relations between the absorption of ultrasound and molecular structure.

It is the discussion of this absorption which makes Vigoureux's book of special interest to chemists. In the words of the introduction of another recent book with the same title by B. Carlin (McGraw-Hill Book Co., Inc., 1949) the tendency of previous discussions has been to "lean toward the practical and engineering sides," because of the importance of the many technical applications which, in addition to sounding and tracking, include signalling, materials testing, dispersion, coagulation, degassing and many others. By contrast, in the words of the introduction to Vigoureux's book, "the object . . . is to introduce the reader to the technique and to the simpler aspects of the theory of propagation of ultrasonics in fluids."

The main body of the text is divided into five chapters with the titles, Generation, Propagation, Observation, Gases and Liquids. At the end there is a bibliography of approximately 300 papers primarily in the interval 1939 to 1950, the earlier references having been covered by the reviews of Bergmann and Richards. Within the limits of 140 pages it is possible to give only an introduction to each of the fields listed in the chapter headings. As such, the material is well selected, clearly presented and illustrated by excellent drawings and by photographs of ultrasonic phenomena. The chapters on gases and liquids stress the relationships between adsorption frequencies and chemical structure, well documented with curves, tables and detailed discussion for dozens of compounds. One concludes that this field contains many new possibilities for physico-chemical research, such as the catalytic effect of energy absorption concentrated at specific characteristic frequencies in the ultrasonic range, and the information from such absorption which may be a valuable aid in extending our knowledge of the nature of the liquid state.

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The Enzymes. Chemistry and Mechanism of Action.

Volume I, Part 1. Edited by JAMES B. SUMNER, Laboratory of Enzyme Chemistry, Cornell University, Ithaca, New York, and KARL MYRBÄCK, Institute for Organic Chemistry and Biochemistry, University of Stockholm, Sweden. Academic Press, Inc., 125 East 23rd Street, New York 10, N. Y. 1950. xvii + 724 pp. 16.5 × 23.5 cm. Price, \$13.50.

This is the first part of a new encyclopedic work which will consist of 78 Chapters in two volumes, four parts, and will deal with most important aspects of enzymes in the broader sense. The completed work will contain discussions written by 75 authors, all authorities in their given field.

In treating a subject as broad in aspects and rich in detail as the chemistry and mechanism of the action of enzymes, one has the choice of two different types of approaches. First, one person can undertake to cover the field, coordinate the information exactly but obviously only in part with high competence. Even in the late twenties it took the genius of Carl Oppenheimer to do a thorough job of dealing

with enzymes *in toto*. The tremendous developments in this branch of learning during the past thirty years makes such an approach by now impossible. Thus only the second, the encyclopedic, approach remains as a practical way of dealing with enzymology. This results in the breaking up of the subject into fairly clearly defined specific topics, a treatment which has at least two major disadvantages. First, in the broad interrelation of various enzymes, in their similarities and dissimilarities many details are lost since they will not logically fall into any given specification. Further, a certain extent of overlapping and repetition is unavoidable although the different viewpoints represented by the various authors make such discussions of closely related subjects most interesting and useful.

The 19 topics treated in this first part of the work cover a wide range. The first 8 Chapters discuss the broader aspects of enzymes like history, nomenclature, general properties, kinetics, adaptation, inhibition, specificity and relation to other biological factors. The following discussions deal with specific enzymes and enzyme systems. In this part the enzymes hydrolyzing fats and esters; acetylcholine esterase and cholinesterase; enzymes acting on metaphosphate; sulfatases; invertase; α -D-glucosidases, β -glucosidase, the enzymes acting on galactosides, mannosides and thyoglycosides; β -glucuronidases and the amylases are dealt with.

It is impossible to evaluate in a brief review all these chapters. The organization of the individual discussions is clear and shows a surprising extent of uniformity. The general caliber of the discussions is high and the documentation adequate. The illustrations and printing are excellent.

The editors have clearly seen the possible limitations of such a book and should be congratulated on their courage in undertaking the organization and editing of this monumental work in spite of this. Once again, for a few years at least, chemists, physiologists and biologists will have an up-to-date comprehensive work to turn to for information on enzymes. All concerned with this subject will await eagerly the appearance of the rest of this work.

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The Enzymes. Chemistry and Mechanism of Action.

Volume I, Part 2. Edited by JAMES B. SUMNER, Laboratory of Enzyme Chemistry, Cornell University, Ithaca, New York, and KARL MYRBÄCK, Institute for Organic Chemistry and Biochemistry, University of Stockholm, Sweden. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1951. x + 725-1361 pp. 16.5 × 24 cm. Price, \$12.80.

This volume contains reviews on several enzymes to which important roles in metabolism have been assigned and which have been highly purified. Excellent chapters are those on *urease* by Sumner and *carbonic anhydrase* by Roughton. Knowledge of these two enzymes has been rounded out to a degree which makes it possible to write a good story about them. Urease is the first enzyme to be obtained in crystalline form and recognized as a protein. Although recently there have again appeared claims that certain enzymes are not protein, the generalization that enzymes are proteins has not yet been overthrown. The claim that carbonic anhydrase has been crystallized is open to doubt. *Fumarase* and *aconitase* (enzymes active in the "Krebs cycle") are clearly and concisely dealt with by Ochoa. Laki's claim of having crystallized fumarase is not accepted. Meyerhof writes about *enolase*, which he discovered with Lohmann, with whom he also showed that NaF poisons fermentation by inhibiting enolase. Warburg, who crystallized the enzyme showed that NaF inhibition is due to the formation of an inactive Mg-fluorophosphate-enzyme complex. The largest assignment, *proteolytic enzymes*, has been given to Emil Smith. He discusses at length his interesting theory

on the function of a metal (Co, Mg) to act as a bridge in forming the enzyme-substrate complex for aminopeptidases and extends his theory also to carboxypeptidase, where the evidence is not so clear. After Northrop and Kunitz's pioneer work in the crystallization of proteinases, there occurred somewhat of a lull in this field until recently, when very active research by several workers has brought to light many new and important facts. Study of the synthesis of the peptide bond by these "hydrolytic" enzymes, discovered by Bergmann is being resumed with new methods.

Arginase, discussed by D. M. Greenberg, is found in highest concentration in the livers of animals in which urea is the end product of protein metabolism. There seems to be good evidence that the concentration of the enzyme is controlled by steroids of the adrenal cortex. *Nucleolytic enzymes* are reviewed by Laskowski. Crystalline ribonuclease (Kunitz) is of outstanding purity. Crystalline deoxyribonuclease (Kunitz) as a protein and in its mechanism of activity is quite dissimilar from the former enzyme. Both enzymes are being used with considerable success in the elucidation of the structure of nucleic acids. Zeller enumerates enzymes present in bacterial and animal toxins. A good review of the starch-glycogen *phosphorylases* of animals and plants is given by Hassid, *et al.* Bacterial sucrose phosphorylase, which they discovered, has been shown by them to act also as a transglucosidase. An analogous enzyme does not seem to occur in higher plants, and it is probable that sucrose synthesis there proceeds by another mechanism. While P. P. Cohen discusses the criteria of purity of enzyme proteins, he nevertheless uses the term "highly purified" for *transaminases* consisting of amorphous protein fractions which hardly fulfill these criteria. Pyridoxal phosphate acts as coenzyme in the reaction between glutamic and pyruvic or glutamic and oxalacetic acid. The existence of transaminases which react with other amino acids, originally claimed by Braunstein, and later denied by several authors, seems now well established. The difficult subjects of *milk* and *blood clotting* are discussed by Berridge and Seegers, respectively. The former author has obtained rennin from calf's stomach in crystalline form. The chemical reactions involved in milk clotting with rennin, pepsin or chymotrypsin are as yet little understood. Some of the many substances involved in blood clotting or inhibiting it might be enzymes. Seeger's review brings home the fact of the complexity of the process. The great majority of the 314 references is to work published in the last decade. However, the final "diagram" on blood coagulation as given on page 1154 could almost have been drawn 20 or 30 years ago.

Abraham's short chapter on *penicillinase* is excellent. This bacterial enzyme converts penicillin to penicilloic acid. Penicillin sensitivity of bacteria is not solely determined by the amount of penicillinase they produce. The presence of *thiaminase* in the viscera of fishes is the cause of "Chostek paralysis" in foxes fed on raw fish, a vitamin deficiency disease prevented by cooking the fish. Harris gives a comprehensive review of the enzyme which also occurs in clams. It splits thiamine hydrolytically into its thiazole and pyrimidine portions. Fishman discusses the enzymes which break down mucopolysaccharides. Most important among them is the *hyaluronidase* complex, which is supposed to consist of at least two separate enzymes. A related enzyme is lysozyme, discovered in nasal mucus by Fleming and crystallized by Abraham and Robinson. It also occurs in egg white. *Transmethylases*, reviewed by Sourkes, are enzymes which carry CH_3 -groups from N to S, S to S, S to N, and N to N. Methionine, betaine and choline are products of methylation as well as donors of CH_3 -groups.

What is known about a number of enzymes has been collected: by Pigman (hemicellulases), Kertesz (pectic enzymes), Laskowski (allantoinase), Leuthardt (hippuricase, histidase and urocanase), Erkama and Virtanen (aspartase), Zittle (asparaginase and glutaminase), and Fromageot (desulfhydrases).

The statement on the dust cover: "a new encyclopedic work" seems justified. The book is not only of great value for reference purposes, but also provides informative reading to chemists and biologists. The tendency of most of the authors to enumerate work without weighing its importance is no doubt based on the wish to be fair and objective.

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Gmelin's Handbuch der anorganischen Chemie. (Gmelin's Handbook of Inorganic Chemistry). Eighth edition. System-Number 68, Platinum. Edited by E. H. ERICH PRIETZSCH. Issued by the Deutsche Chemische Gesellschaft. Verlag Chemie, GMBH, Hauptstrasse 127, 17a Weinheim an der Bergstrasse, Germany. 1951. xxii + pp. 533-718, 719-854. 17.5 × 25.5 cm. Price, DM 43, 36.-.

These two issues complete Part A of the section on platinum. No. 5 deals with the alloys of ruthenium, rhodium and palladium, and No. 6 similarly with the alloys of osmium, iridium and platinum. No. 6 contains a complete table of contents for Part A and a complete index of alloys.

The text maintains the high standards established for the earlier parts of this incredibly encyclopedic work with respect to completeness, thoroughness and clarity of presentation. The editors and publishers deserve all possible encouragement to complete the 8th edition of Gmelin as rapidly as possible.

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Advances in Protein Chemistry. Volume VI. Edited by M. L. ANSON, Thomas J. Lipton, Inc., Hoboken, New Jersey, JOHN T. EDSALL, Harvard University, Boston, Massachusetts, and KENNETH BAILEY, University of Cambridge, Cambridge, England. Academic Press, Inc., Publishers, 125 East 23rd Street, New York 10, N. Y. 1951. xi + 549 pp. 16.5 × 23.5 cm. Price, \$9.50.

This volume covers eight different subjects, only two of which are presented by foreign authors. The editors promise to endeavor to obtain contributors truly representative of the international character of research in protein chemistry and indicate that the next volume will contain five contributions from abroad. The present volume contains a Cumulative Index to the first five volumes, a feature which will make this series much more useful to its readers.

The first chapter on the electron microscopy of macromolecules is written by Ralph W. G. Wyckoff and contains a good description of the subject and many excellent electron micrographs of viruses and of other materials. Protein chemists are giving increasing attention to light scattering in protein solutions as a means of studying macromolecules. The chapter on this subject is written by Paul Doty and John T. Edsall and is one of the best, if not the best, chapter in the book. The subject is presented in a clear and thoroughly authoritative manner. Although considerable attention is devoted to theory, practical application and practical results are given adequate coverage. The third chapter is concerned with the synthetic poly- α -amino acids and is written by Ephraim Katchalski. Good discussions of synthetic procedures yielding poly- α -amino acids and of the properties of these acids, including their behavior towards proteolytic enzymes, are presented. Increased interest in conalbumin, egg-white antitrypsin, lysozyme, avidin and the lipoproteins of egg yolk, as well as the increased use of the chick embryo for the cultivation of viruses more than justify the inclusion of the chapter on egg proteins by Harry L. Fevold. The chapter is very well written and the subject matter is well selected and critically presented. Many biochemists will find this chapter most useful and of great interest.

The fourth chapter concerns the natural and artificially prepared iodinated proteins and is written by Jean Roche and Raymond Michel of the Collège de France. The orientation of this review is primarily biochemical in nature and the physiological activity of these substances is considered only briefly. The biochemistry emphasizes only those aspects which are concerned with the process of halogenation. The review is thus somewhat restricted, but it is nevertheless a most useful presentation for biochemists interested in iodoproteins. A considerable amount of material has been brought together and critically presented by Heinrich Waelsch in his review on glutamic acid and cerebral function. While the author deals mainly with observations of a biochemical nature on the role of glutamic acid metabolism in cerebral function he does touch on the controversial matter of the effects of the administration of glutamic acid to mentally defective subjects. The chapter on cross linkages in protein chemistry by Johan Bjorksten will

prove a disappointment to most readers for it consists largely of a long list of patents concerned with industrial applications. It would have been far better to have presented critical evaluations of the biochemical implications of about ten of the most interesting of the 333 patents which are listed. The final chapter on the relation of protein metabolism to disease by Herbert Pollock and Seymour L. Halpern contains an excellent discussion which centers about the central theme of the necessity of an adequate protein intake when serious illness, major surgery or severe trauma are involved. The book contains an author and a subject index. The typography, freedom from typographical errors and general construction of the book are maintained at the same high levels which have characterized earlier volumes of this series. The volume should be read by all interested in protein chemistry.

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The Vitamin B Complex. By F. A. ROBINSON, M.Sc.Tech. (Manchester), LL.B. (London), F.R.I.C. John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y., 1951. xi + 688 pp. 15 × 22 cm. Price, \$9.00.

Few students of vitamins will feel well qualified to appraise all chapters of this book. It covers a wide range of researches extending over a period of some 40 years which are reported in a very copious and diverse original literature. It touches on many fields of biology, chemistry and medicine and refers to a wide variety of experimental techniques. Good judgment in all of these matters can scarcely be expected in an author; even less in a humble reviewer.

The present reviewer can claim only a limited competence within his special experience, plus a long term reader's interest in the broad field. He has formed his opinion principally from a critical reading of the introduction and conclusion and the chapters on aneurine (thiamine), riboflavin, nicotinic acid and pantothenic acid. The other chapters have been read with equal interest though with less competence as to detail. Each of the B vitamins appears to have been treated with comparable thoroughness and in a consistent manner.

The work is a monumental one. A very large literature has been reviewed and summarized. Nothing of substantial importance within the reviewer's knowledge appears to have been missed. As a reference work this book will be invaluable to many hundreds or perhaps thousands of workers engaged in the vitamin field. Every research group in biochemistry or nutrition will want to have a copy at hand and will be grateful to the author for having produced it. It is well indexed both by authors and subjects. The printing and binding are excellent.

In writing such a book an author has the option of including a good deal of somewhat questionable matter from the literature or of being highly selective at some risk of error in judgment on his own part. Mr. Robinson has chosen the former, wisely perhaps in view of the unsettled state of much of the subject matter of which he writes. His choice involves a loss of readability on many pages of the book. It also thrusts upon the reader a responsibility for discrimination which he may be unprepared to exercise.

The discussion on pages 119-122 of the activity of compounds related to aneurine is a case in point. The tests of Schultz which are cited at length are insufficiently thorough to be worthy of the credence accorded them. They are a defense for I. G. Farben's previous unwarranted patent claims on a large category of compounds which really possess no antineuritic activity whatever.

Also it is startling to read on page 129 the statement "As it happens, maximum B₁ activity is not exhibited by the compound that Nature chose to use for this purpose. . . ." We suppose the author refers to the 2-ethyl vitamin which appears to be approximately as active as the natural compound but not more so.¹ The implication that an artificial substitute can surpass Nature at Nature's own game of metabolism requires most rigorous proof. One is led to fear that the author does not appreciate how unreliable and inexact are some of the methods of biological testing.

(1) G. A. Stein, W. L. Sampson, J. K. Cline and J. R. Stevens, *THIS JOURNAL*, 63, 2089 (1941).

The book is written rather more from the viewpoint of a compiler than from that of a critical contributor to the field, though the author's personal participation in the research which is outlined has doubtless done much to sharpen his judgments. On the whole the selection of material for emphasis has been good. The chapter on nicotinic acid is excellent in this respect. Elsewhere, discussion of the earlier literature, especially that related to aneurine, sometimes lacks discrimination between findings made with crude extracts as compared with later experiments performed with pure vitamins when these became available. More scrutiny of dates would sometimes be in order. The reporting of the occurrence of each of the B vitamins in foods is rather ill arranged for reference purposes.

Broadly, however, the author displays a good judgment and perspective throughout. This is well reflected both in the introduction and conclusion of the book and also in the summary statements which conclude many of the successive chapters.

Another book which Mr. Robinson presumably had not seen when this went to press is entitled "Biochemistry of the B Vitamins" by Williams, Eakin, Beerstecher and Shive. The approach and organization of this book is entirely different, being more critical and less comprehensive. The two books therefore supplement one another excellently.

As a matter of opinion the present reviewer thinks the title "The Vitamin B Complex" an unfortunate one. The term "complex" implies to the chemist a union of two or more substances in a single chemical compound. The B vitamins are not so bound together in Nature but the wide use of this term has conveyed the false idea of a single entity to many physicians, nurses and others less versed in the subject. Dr. Lepkovsky used to call it "the vitamin B perplex" and we can understand why. The use of the term "complex" has added to perplexity.

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BOOKS RECEIVED

November 10, 1951-December 10, 1951

KARL COHEN. "The Theory of Isotope Separation as Applied to the Large-scale Production of U²³⁵." McGraw-Hill Book Co., 330 West 42nd Street, New York 18, N. Y. 1951. 165 pp. \$2.00.

HARRY J. DEUEL, JR. "The Lipids—Their Chemistry and Biochemistry." Volume I, Chemistry. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1951. 982 pp. \$18.50.

ROBERT A. FRIEDEL AND MILTON ORCHIN. "Ultraviolet Spectra of Aromatic Compounds." John Wiley and Sons, Inc., 440 Fourth Avenue, New York 16, N. Y. 1951. 377 pp. \$10.00.

ROBERT S. HARRIS AND KENNETH V. THIMANN (edited by). "Vitamins and Hormones—Advances in Research and Applications." Volume IX. Academic Press, Inc., 125 East 23rd Street, New York 10, N. Y. 1951. 395 pp. \$8.00.

EDGARDO PACE. "Gli Ormoni." Ulrico Hoepli, Editore, Milan, Italy. 1952. 543 pp. L. 3500.

M. G. SEVAG. "Immuno-Catalysis and Related Fields of Bacteriology and Biochemistry." Second Edition. Charles C. Thomas, Publisher, 301 East Lawrence Avenue, Springfield, Illinois. 1951. 547 pp. \$12.00.

HUGH S. TAYLOR AND SAMUEL GLASSTONE (edited by). "A Treatise on Physical Chemistry, Volume Two, States of Matter." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York 3, N. Y. 1951. 701 pp. \$12.00.

LÉON VELLUZ (Editor). "Substances Naturelles de Synthèse." Volume III. Masson et Cie, Éditeurs, 120 Boulevard Saint-Germain, Paris 6^e, France. 1951. 156 pp. 1500 fr.