less, in these days of ever increasing specialization within the science of biochemistry, a volume such as this is of considerable value in stimulating the broad viewpoint so absent in modern production line research.

The articles themselves are well written, by authorities in the various fields, although a few might have been deleted to avoid repetition or published more profitably elsewhere. The section on histo- and cytochemistry, for example, is dealt with in great and useful detail by its author elsewhere in book form. The review on enzyme activity in frozen vegetable tissue is extremely specialized and probably of little use to the average reader. In general, however, the subjects have been wisely chosen and this volume will occupy, with its fellows, an important place in any library of general biochemistry.

C. B. ANFINSEN

Harvard Medical School

Chemical Constitution and Biological Activity. W. A. Sexton. London, W.C.2, Engl.: E. & F. N. Spon, 1949. 412 pp. 55s. net.

For countless generations, in attempting to study the essence of nature and natural phenomena, scientists have been drawn to the problems of structure and its functional concomitants. Aristotle, in the *Metaphysics,* stated that if we search for the elements of existing things without distinguishing the many senses in which things exist, we cannot find them. One of these senses in which things exist is that derived from their acting on or being acted upon by other elements, and although Aristotle felt it impossible to discover what "acting" or "being acted on" is made of, in recent years it is this very aspect of scientific inquiry that has advanced considerably—particularly in one of its most complex aspects, that of interaction in the living organism.

The present volume has been designed to provide a glimpse into the many problems involved in the relationship between the chemical constitution of substances and their action upon living cells. It is made up of two sections: the first, a brief consideration of some of the chemical compounds and processes that play a general role in biological activity; the second, short discussions of subjects "chosen as far as possible in order to provide illustrations of the principles outlined in the earlier chapters." The latter include vitamin B_{12}, various growth factors, choline and its derivatives, cancer problems, and antigens and antibodies.

Of necessity in a book of this nature, there must be many omissions. Perhaps it would be more effective to limit one's dissertation in this field either to a more or less complete discussion of the fundamental principles involved, or to a few of the specific topics now being assiduously investigated. As it is, from either the chemist's or biologist's point of view the book is sketchy and sometimes disturbingly incomplete. Critical examination of some of the discussions reveals certain peculiarities—for example, the complete acceptance of some questionable concepts concerning the role of acetylcholine in nervous system activity. The meagerness of such sections as that on surface-active agents cannot go unnoticed, nor would one object to mention of other points, such as Pauling's theory of enzyme specificity, changes in electronic configuration, and the biological variables involved in the structure-activity relationship.

Admittedly, integration of our knowledge in this borderline field of biochemistry is essential, and is indeed a monumental task for any one author. Despite its inadequacies, this book should help investigators in many fields of research to broaden their outlook, and to cross some of the imaginary walls erected between so many fields of inquiry. Although the bibliography stops at 1947, the work demonstrates an ever strengthening trend in investigation leading rapidly to the acceptance of physicists, chemists, and biologists in each other's laboratories.

ROBERT G. GRENELL

University of Maryland

Metabolism and Function: A Collection of Papers Dedicated to Otto Meyerhof on the Occasion of His 65th Birthday. D. Nachmansohn, Ed. New York: Elsevier Publ., 1950. 348 pp. $7.00.

Investigators in the fields of biological science are indeed fortunate to have available this collection of 38 papers written by friends, associates, and former students of Prof. Meyerhof, on the occasion of his 65th birthday. Among these distinguished investigators are five who have won the Nobel prize. The various authors bring together and organize research evolving from the important researches of Meyerhof, Warburg, and Hill. The guiding and fundamental work of these masters is reflected and interwoven in each paper.

Building on the foundations of Pasteur, Buchner, and Harden and Young, Meyerhof developed many fundamental principles, such as the extraction of the glycolytic enzyme system from muscle, the discovery that some phosphorylated compounds are rich in energy, and the clarification of the Pasteur reaction. These discoveries have made possible exact measurements and have stimulated biochemistry and physiology for a generation, and will continue to exert their influence as these sciences develop.

The book begins with an excellent tribute to Prof. Meyerhof by his pupil, David Nachmansohn. The papers are then arranged in four groups: Part I, Muscle; Part II, Nerve; Part III, Drug Action; and Part IV, Intermediate Metabolism. Most of the papers have a concise summary in three languages. All but two papers have a selected list of references at the end.

Part I. Muscle. The first paper, by A. V. Hill, "A Challenge to Biochemists," begins with the charming history of his friendship with Meyerhof, and leads gradually into a discussion on the course of events in normal muscular contraction which he and Meyerhof did so much to develop and which he summarizes very concisely.

Through all the papers that follow and in many of the references cited, we see the development of the Meyerhof-Warburg-Hill discoveries. The paper by Hans H. Weber, entitled "Muskelproteine," reviews information on muscle proteins and presents new facts on L-myosin and actin. M. Dubuisson, in "Modifications dans la structure physico-chimique de l'édifice contractile au cours du cycle

de la contraction musculaire'' discusses the contractile apparatus of muscle. A. Szent-Györgyi has a brilliant paper on ''Actomyosin and Muscular Contraction'' by ATP. D. M. Needham has written a critical review on ''Myosin and adenosinetriphosphate in relation to muscle contraction.'' W. F. H. M. Mommaerts, in ''A consideration of experimental facts pertaining to the primary reaction in muscular activity,'' has given a survey of recent developments. Saul Korey discusses ''Some factors influencing the contractility of a nonconducting fiber preparation.''

Part II. Nerve. In the second part Francis O. Schmitt discusses ''Morphology in muscle and nerve physiology,'' and analyzes x-ray and electron microscope techniques. David Nachmansohn, in his ''Studies on permeability in relation to nerve function. I. Axonal conduction and synaptic transmission,'' has presented an excellent analysis of this field. Meyerhof's approach to the study of muscular contraction has also proved valuable in the study of nerve function. M. A. Rothenberg, in ''Studies on permeability in relation to nerve function. II. Ionic movements across axonal membranes,'' points out that studies on the permeability of the giant axon of the squid to potassium indicate that a dynamic, rather than a static equilibrium, exists. Calcium and sodium have also been studied. R. W. Gerard and R. W. Doty discuss ''Nerve conduction without increased oxygen consumption: the action of azide and fluoroacetate.'' Harold E. Himwich, in ''Some evidence on the functional organization of the brain,'' points out that the brain is not a static structure. Alexander von Muralt, in ''The development of muscle-chemistry, a lesson in neurophysiology,'' summarizes the present position in this field.

Part III. Drug Action. H. Blaschko, in ''Substrate specificity of amino-acid decarboxylases,'' studies the decarboxylation by bacterial and mammalian enzymes of a number of amino acids. Chalmers L. Gemmill reviews ''Glycolysis in pharmacology.'' R. Meier and H. J. Bein, in their paper ''Zur Charakterisierung der Spezifität pharmakologischer Wirkungen und des sie bedingenden Rezeptorsystems des Substrates,'' have given a thorough discussion of significant problems in this field.

Part IV. Intermediate Metabolism. L. Michaelis and S. H. Wollman present ''Free radicals derived from tocopherol and related substances.'' Carl F. Cori, Sidney F. Velick, and Gerty T. Cori, in ''The combination of diphosphopyridine nucleotide with glyceraldehyde phosphate dehydrogenase,'' discuss the theory that ''glyceraldehyde phosphate dehyrogenase from rabbit muscles contains two catalytic sites, having dissociation constants with DPN that differ by a factor of 100 or more.'' Carl Neuberg has an excellent article entitled ''Gärung und phytochemische Reduktion''; L. Genevois, ''Essais de bilans de la fermentation alcoolique due aux cellules de levures''; Wilhelm Kiessling, ''Triosephosphorsäure als Intermediärprodukt bei der Zuckergärung mit intakter Hefe''; Gerda Dangschat and Hermann O. L. Fischer, ''Configurational relationships between naturally occurring cyclic plant acids and glucose''; Allan L. Grafflin and Severo Ochoa, ''Partial purification of isocitric dehydrogenase and oxalosuccinic carboxylase''; E. Racker, ''Spectrophotometric measurements of the enzymatic formation of fumaric acid *cis*-aconitic acids''; George Wald, ''The interconversion of the retinenes and vitamins A *in vitro*''; Paul Ohlmeyer, ''Experimentelle Bindung von Eiweisskörpern an Zellkerne und Nukleinsäuren''; Herman M. Kalckar, ''The biological incorporation of purines and pyrimidines into nucleosides and nucleic acid''; René Wurmser and Sabine Filitti-Wurmser, ''L'énergie de formation des complexes dissociables enzyme-substrat et antigène-anticorps''; Bernadette Bergeret, Fernande Chatagner, and Claude Fromageot, ''Nécessité d'un coenzyme pour le fonctionnement de la désulfinicase''; H. A. Krebs, ''Body size and tissue respiration''; André Lwoff, Hélène Ionesco, and Antoinette Gutmann, ''Synthèse et utilisation de l'amidon chez un flagellé sans chlorophylle incapable d'utiliser les sucres''; Gilbert Ashwell and Zacharias Dische, ''Inhibition of the metabolism of nucleated red cells by intracellular ions and its relation to intracellular structural factors''; E. Boyland, ''The biochemistry of abnormalities in cell division''; Fritz Lipmann and L. Constance Tuttle, ''Lipase-catalysed condensation of fatty acids with hydroxylamine''; Shlomo Hestrin, ''Acylation reactions mediated by purified acetylcholine esterase II''; Einar Lundsgaard, ''Observations on a factor determining the metabolic rate of the liver''; and Erik Jacobsen, ''Is acetaldehyde an intermediary product in normal metabolism?''

The final paper, ''The quantum efficiency of photosynthesis,'' by Otto Warburg, Dean Burk, Victor Schocken, and Sterling B. Hendricks, is a classic contribution to science. This work was carried out in the U. S. It is an extension and verification of Warburg's earlier work, clarifying one of the most fundamental problems confronting biochemistry.

The book includes an excellent frontispiece photograph of Prof. Meyerhof and an early photograph of A. V. Hill and Meyerhof together. There are photographs of Meyerhof's laboratories in Berlin in 1928 and in Heidelberg in 1931. On page 338, there is a photograph of Otto Warburg and Dean Burk at work together in Bethesda, and on page 347 a photograph of a group of Prof. Meyerhof's students at the Kaiser Wilhelm Institut für Biologie at Berlin-Dahlem. This page also contains a photograph of Meyerhof and Hill and a group of Meyerhof's students, taken in 1931, at the Kaiser Wilhelm Institut für Medizinische Forschung at Heidelberg. On page 348, there is a picture of the Kaiser Wilhelm Institut für Medizinische Forschung, Heidelberg, and on the lower part of the page a photograph taken at Woods Hole, July 1949, of a group of authors consisting of Meyerhof, Warburg, Neuberg, Burk, Szent-Györgyi, Nachmansohn, Wald, and Korey.

The papers presented in this volume give the outline of a vast structure based in good measure on the fundamental work of Prof. Meyerhof, who won the Nobel prize in 1923 for his distinguished researches on intermediary metabolism in active and resting muscle. Progress in biochemistry and physiology has been greatly speeded by the strong flow of ideas generated in his laboratories.

Finally, one is tempted to philosophize concerning the effect of leadership and organization on scientific productivity. Freedom to carry on activities, uninhibited by administrative formalities and restrictions, with provision of excellent assistance and facilities like those at Berlin and Heidelberg, and a supreme interest in the work being done were significant factors in developing the environment in which creative ability could so flourish.

CHARLES N. FREY

Standard Brands Incorporated

Vitamin Methods, Vol. 1. Paul György, Ed. New York: Academic Press, 1950. 571 pp. $10.00.

The first volume of the treatise on vitamin methods deals with the physical, chemical, and microbiological methods of vitamin assay. The presentation of material has been built around the methods employed for assay, rather than around the assays for a specific vitamin. This permits a discussion of principles involved for each type of assay, which is followed by a discussion of variations in technique for the individual vitamins. Most techniques are given in sufficient detail to be used without consulting additional reference sources. Animal assay methods are to be given in a second volume.

The book is divided into five sections dealing with physical, chemical, microchemical, and microbiological methods of assay, and the use of optical instruments in vitamin assays. In the section on physical methods, assays are described for vitamin A and provitamins A by the ultraviolet absorption spectra technique. The difficulties encountered in the application of this method to the assay of vitamins D, E, K, and B_6 are discussed. Fluorometric assay methods for vitamin A, thiamine, riboflavin, and ß-pyracin are given. Chemical methods are described for vitamin A and carotene, vitamins D, E, and K, thiamine, niacin and niacinamide, pyridoxine, choline, inositol, *p*-aminobenzoic acid, ascorbic acid, and pteroylglutamic acid and related folic acid compounds. Microchemical methods are given for vitamin A and carotene, ascorbic acid, riboflavin, phosphatase, iron, and protein.

The microbiological assay section discusses methods utilizing lactic acid bacteria, yeasts, *Neurospora* mutants, and miscellaneous microorganisms. A particularly useful section gives, in two tables with reference keys, a cross index of vitamin assays, the test organisms, and a key to the details of assay procedure. Another table summarizes the preferred method of assay for each vitamin. Assay methods for *p*-aminobenzoic acid, biotin, choline, folic acid, inositol, nicotinic acid, pantothenic acid, riboflavin, thiamine, and vitamin B_6 are described.

The section on the use of optical instruments should be of value to those selecting apparatus for vitamin assays.

MARY S. SHORB

University of Maryland

Antibiotics. George W. Irving, Jr. and Horace T. Herrick, Eds. Brooklyn, N. Y.: Chemical Publishing, 1949. 273 pp. $6.75.

In the period September 1946–January 1947 the U. S. Department of Agriculture Graduate School sponsored a series of lectures entitled "Progress in the Field of Antibiotics." These lectures (with the exception of three dealing with restricted material on penicillin) have been collected as chapters in *Antibiotics.*

Four chapters are devoted to penicillin. These cover the early history, the wartime developments in England and in this country, the government certification program, the development of high-yielding strains of *Penicillin,* and the advances in commercial production of penicillin. It is regrettable that the lectures dealing with the chemistry and synthesis of penicillin and the production of new penicillins biosynthetically could not be included to round out this section. The clinical uses of penicillin and streptomycin are covered in one chapter, and in another the chemistry of streptomycin is presented in the form of charts and equations. Other chapters deal with gramicidin and tyrothricin, the chemical aspects of antibiotics other than those already mentioned, and the use of antibiotics in veterinary medicine. Four chapters deal with the production of antibiotics by microorganisms, basidiomycetes, actinomycetes, and higher plants.

Each chapter is written by a man who has made major contributions in the antibiotic field. The subjects are necessarily covered in a general way, and results rather than methods are emphasized. Thus, little or no mention is made of the techniques of screening microorganisms for antibiotic-producers, of isolation methods such as adsorption, and partition chromatography, of means of characterizing new antibiotics such as paper chromatography and the Craig countercurrent distribution technique. The various chapters do present in an interesting way the general picture of the development and status of antibiotic research up to January 1947. Selected bibliographical references afford a convenient entry to the literature for those who want more detail.

This book should provide an interesting introduction for those who are not familiar with the antibiotic field and a convenient reference source for those who are.

H. E. CARTER

University of Illinois

Genetics, Paleontology, and Evolution. Glenn L. Jepsen, Ernst Mayr, and George Gaylord Simpson, Eds. Princeton, N. J.: Princeton Univ. Press, 1949. 474 pp. $6.00.

This is a collection of papers presented at the Princeton Bicentennial Conference on Genetics, Paleontology, and Evolution. The conference was arranged by the Committee on Common Problems of Genetics, Paleontology, and Systematics, of the National Research Council, and was held on January 2–4, 1947, under the directorship of Prof. Glenn L. Jepsen.