later). All these data indicate that vitamin B_{12} is a co-factor for the incorporation of amino acids into protein–protein biosynthesis. A study of the distribution of radioactivity among the liver subcellular fractions following injection of 1 microcurie of Co^{60}-labeled vitamin B_{12} showed a high percentage of radioactivity in the microsomes (46%) and the supernatant fraction (25%) as related to the radioactivity of all the fractions. This high percentage in these fractions most implicated in protein synthesis is in agreement with the hypothesis that vitamin B_{12} is a co-factor for protein synthesis indicated by the amino acid incorporation studies. Work on the isolation of the enzyme containing B_{12} is in progress.

This work was supported in part by a grant-in-aid from the National Vitamin Foundation, New York. We are grateful to Dr. C. Rosenblum of Merck and Co., Inc., for a generous gift of Co^{60}-labeled vitamin B_{12}.

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RECEIVED JUNE 7, 1957

BOOK REVIEWS

Lectures in Immunochemistry. By MICHAEL HEIDELBERGER, Emeritus Professor of Immunochemistry, College of Physicians and Surgeons, Columbia University, New York; Visiting Professor, Institute of Microbiology, Rutgers University, New Brunswick, New Jersey. Academic Press, Inc., Publishers, 111 Fifth Avenue, New York 3, N. Y. 1956. ix + 150 pp. 14.5 × 22 cm. Price, $4.00.

The author of this short volume is a chemist who began his distinguished scientific career at the Rockefeller Institute for Medical Research in 1912. It was he who, together with the great bacteriologist Oswald T. Avery, isolated the capsular polysaccharides of several pneumococcal types and showed that they were endowed with immunological specificity. This was an achievement of no small magnitude, as subsequent events revealed.

Immunology was a lively field of investigation during the two decades prior to this discovery. Although the science was relatively new, chemists were already beginning to make important contributions to an understanding of the processes involved in immune phenomena. The monumental work of Karl Landsteiner concerning the specificity of proteins, and his discovery of the specific blood groups, an achievement for which he later received the Nobel Prize, were but two of the great contributions of this period. The classical studies of Arrhenius and of Madson on the quantitative aspects of the toxin-antitoxin reaction had brought a new interpretation of a phenomenon which, but a few years before, had scarcely been conceived of as a chemical reaction.

The discovery in the early twenties of the specific bacterial polysaccharides and of the role which they played in antipneumococcal immunity added a new, imposing milestone to the progress which both the chemist and the bacteriologist have made to our understanding of immune reactions.

Six of the lectures found in this volume, delivered in 1954 at the University of Tokyo, are a summation of the contributions which the author has made to the modern field of chemical immunology. These lectures deal for the most part with his quantitative studies on the precipitin and agglutination reactions, with the chemical nature of complement, and its role in the hemolytic system, and with the relationship between the chemical constitution and specificity of proteins and of carbohydrates. Three other lectures are included in the volume. Two of these, delivered in Europe, have to do with an evaluation of antipneumococcal immunity in humans following administration of the pneumococcal polysaccharides, while the third, delivered in New Brunswick, New Jersey, presents a study of the serological properties of native and denatured proteins.

For those who wish to obtain a broad background in the field of chemical immunology and a knowledge of the developments which have occurred in this field during the past several decades, or for those who wish to gain a broad scope in this specialized and many faceted field of biochemistry, this is not the book. However, for those who wish to learn something of the individual contributions of a contemporary and distinguished biochemist in a rapidly expanding field the volume is to be recommended warmly, although it is regrettable that many of the statements in the lectures, and in particular those regarding the work of others, are not better documented.

THE ROCKEFELLER INSTITUTE FOR MEDICAL RESEARCH
NEW YORK, N. Y. WALTHER F. GOEBEL

Enzyme Antigen and Virus. A Study of Macromolecular Pattern in Action. By F. MACFARLANE BURNET, Kt., F.R.S., F.R.C.P. Cambridge University Press, American Branch, 32 East 57th Street, New York 22, N. Y. 1956. viii + 193 pp. 13 × 18.5 cm. Price $3.50.

This monograph is an extension and revision of the author's earlier monograph ("The Production of Antibodies"[1]). It is concerned with the process of biological replication of specific patterns. Burnet is primarily interested in the replication of active proteins and presents evidence for the thesis that protein is synthesized by or on a RNA template. The content of the monograph is best summarized by the titles of the chapters and their contents.

I. Introduction: Enzyme Action and Protein Synthesis. (1) Enzyme specificity; (2) Adaptive enzymes in microorganisms; (3) Chemical aspects of the biosynthesis of protein; (4) The nature of adaptive enzyme synthesis.

II. Antibody Production. (1) The self-marker concept; (2) Antibody production after the elimination of antigen; (3) The site of antibody production; (4) Theoretical approach to antibody production; (5) Weaknesses of the present hypothesis.

III. The Self-marker Hypothesis in Relation to Cellular Proliferation and Control. (1) Immunological aspects of tumour transplantation; (2) The implications of cutaneous sensitization to simple compounds; (3) Application of Weiss's concepts of cell control to the self-marker hypothesis; (4) Summary.

IV. Virus Multiplication. Influenza Virus Multiplication: (1) Nucleic acid in relation to influenza virus; (2) An attempted visualization of the structure of influenza virus particles; (3) Process of infection; (4) Interference; (5) Incompleteness; (6) The dynamics of influenza virus multiplication in the allantoic cavity; (7) Recombination phenomena; (8) Mutation; (9) Summary.

V. The Scope of Biological Generalization. (1) Information theory in biology; (2) The application of pattern concepts to biological problems.

The monograph outlines very effectively much of the current thought on protein synthesis, antibody production and virus multiplication and, as a monograph should, it presents

(1) F. M. Burnet and F. Fenner, "The Production of Antibodies," Macmillan, Melbourne, 1949.