careers. An attempt is now being made for the first time in our history also to locate and select a small number of capable young men and women each year who can be assisted in their training for scientific careers at colleges and technical schools of their own choice. In a technological world they, too, are an important adjunct to the wartime and peacetime strength of the our nation.

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SCIENTIFIC BOOKS

THE PRODUCTION OF ANTIBODIES

The Production of Antibodies. By F. F. BURNET, with the collaboration of M. FREEMAN, A. V. JACKSON and DORA BUSH. Melbourne: Macmillan and Company, Ltd. 1941. $2.50.

THIS short monograph of 76 pages is a noteworthy attempt to integrate modern concepts of biology, immunochemistry and protein chemistry toward the formulation of a realistic hypothesis of the *in vivo* synthesis of antibodies. Although published nearly four years ago, a belated review of this work hardly requires justification, since the ideas expressed by the authors have maintained their value and importance in the face of more recent discussions of this lively problem. Indeed, it appears that this monograph has escaped the attention it deserves, for recent reviews and monographs dealing with immunochemistry have either omitted mention of it or given only passing reference.

Following an introductory discussion of the general character of antibodies more biological aspects of their general immunological functions are reviewed in chapters II to V. These include considerations of the rate and extent of antibody formation in the blood of actively and passively immunized animals; of the evidence for qualitative differences among antibody molecules produced against the same antigen in a single animal; and of the qualitative changes in antibodies during prolonged immunization. Original experimental data are incorporated in the review of these problems, as well as in a comprehensive, yet concise discussion of the site of antibody production (chapter VI). The latter leads the authors to conclude that antibody is produced by the very phacogytic cells of the reticulo-endothelial system (spleen, liver, bone marrow, lymph nodes) which ingest the antigen. Although difficult to prove experimentally, the view is advanced that antibody production may continue in the absence of antigen, an argument which is fundamental to the general thesis which the authors finally propose. Chapter IX draws further factual and presumptive evidence, from considerations of the tuberculin type of sensitization to bacterial products, for the belief that the very reticulo-endothelial cells which are involved in disintegration of the antigens likewise are effective in antibody production.

In chapter X a theory of antibody production is developed, based on seven principal conclusions derived from the preceding discussion, and viewed in the light of modern concepts of protein structure and protein synthesis. The authors emphatically criticize the claims for reality of the Haurowitz-Mudd "template" theory, according to which antibody globulin is synthesized in direct spatial contact with the antigen molecule, resulting in the development of complementary patches to the determinant groups of the antigen. They deny any real physico-chemical basis for believing that simple juxtaposition of the growing globulin molecule to the antigen would result in the development of complementary pattern, particularly since the very argument has been used by virus workers, "to show that protein synthesized in contact with a pattern (virus protein) will produce not a complementary pattern but a replica of the original pattern."

In the author's hypothesis the Bergmann-Niemann concept of the dual proteolytic and protein-synthetic activity of intracellular enzymes occupies a central portion. However, instead of invoking an organizer to control the regular addition of amino acid residues or protein fragments, they consider the intracellular proteins to be endowed with enzymatic activity in such a way as to provide a pattern and a "scaffold" on which the new protein is constructed. Unlike the proteins of the extracellular secretions, these intracellular proteins are self-synthesizing according to their own pattern. Applying these ideas to the intracellular proteins of the reticulo-endothelial system, the thesis is developed that, in the absence of antigenic stimulus, normal globulins are produced by these cells and liberated eventually into the blood and lymph. However, upon contact with any foreign antigen, such modifications of the intracellular proteinases take place, simultaneously with the destruction of the antigenic particle, as is required for an effective hydrolytic action on the foreign antigen. This modification in structure and activity of the enzymes is believed to result in the synthesis of modified globulins (antibody) and to persist, even in the absence of further contacts with the antigen. Gradually, however, the original impression will be eliminated, regressively, and ultimately, normal globulin will again be produced. It is emphasized that these processes should not be considered to result merely from spatial con-

tact with the antigen but rather as an adaptive process analogous to that involved in the production of adaptive bacterial enzymes.

This general hypothesis provides a rational explanation for the formation of cross-reactive antibodies upon prolonged immunization with a single antigen: More extensive contact with the antigen enhances the opportunity for more intimate regions of the antigen to impress specific modifications on the proteinase system. Also, antigen fragments produced by the hydrolytic action of the proteinases may themselves impress their mark. Conversely, the formation of low-grade antibodies during the transition period of decreasing antibody titer may be assumed to occur as in the absence of further antigenic stimuli, the intracellular enzymes gradually return to their normal specificity.

It is obvious that a large part of the ideas expressed in this monograph is speculative and requires experimental testing. However, the general picture which the authors present is congruous and a rich source for thought on this stimulating problem.

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MUSHROOMS

Mushrooms of the Great Lakes Region. By VERNE OVID GRAHAM. Illustrated. Pp. vii + 390. Chicago Academy of Sciences and the Chicago Natural History Museum.

UNDER the title "Mushrooms of the Great Lakes Region" Verne Ovid Graham, honorary curator of mycology in the Chicago Academy of Sciences, has issued a volume on the higher fungi of that region. The title "Mushrooms" is a little misleading, for it is not strictly a mushroom book as that term is ordinarily used. It is rather a descriptive list of all the higher fungi, Ascomycetes and Basidiomycetes, known to occur in that region. Although it must necessarily be very incomplete, it will doubtless serve as an aid to students in identifying the more common species of fungi, the purpose for which it was evidently intended.

FRED J. SEAVER

SELECTED EXPERIMENTS IN CHEMISTRY

Selected Experiments from Laboratory Manual for Introductory College Chemistry. By J. A. BABOR and A. LEHRMAN. New York: Thomas Y. Crowell Company. 64 pages. 29 figs. 1944. $1.00.

THIS is a reprint of thirty-eight of the experiments which the authors first published in 1941. There is one new experiment on the preparation of copper, lead and antimony from their ores, and two new experiments on a qualitative analysis for thirteen cations. Teachers of accelerated courses desiring an abridged manual of the conventional experiments in general chemistry, with questions and problems to fill in and tear out, will find this edition handy.

HUBERT N. ALYEA

PRINCETON, N. J.

REPORTS

THE SOUTHERN RESEARCH INSTITUTE

IN March of this year the Southern Research Institute will begin an active research program in its laboratories in Birmingham. This is the culmination of years of study and preparation on the part of a number of southern industrialists who long have realized the importance of scientific research in the development of the economy of the southern part of the United States. In studying the need for research facilities in the South, it was found that although southern universities and colleges are well prepared for teaching the natural sciences and for undertaking certain fundamental research projects, generally there has been a deficiency in research facilities available for solving industrial problems on behalf of private enterprise.

The Alabama Research Institute was incorporated in 1941, and recently became the Southern Research Institute to conform more properly with its region-wide function. The institute is a non-profit corporation. Its purpose is to assist industry in creating new and improved products; to make research facilities available to existing establishments which do not have the equipment and specialized personnel to undertake the solution of their own technological problems; and to afford facilities to those industries which, although having well-equipped laboratories of their own, find it advantageous from time to time to have certain types of research work done in an atmosphere removed from the distractions incident to their own production problems.

On entering into a research agreement with the institute, the sponsor will set forth the objectives of the project and establish a fund for its prosecution. The institute will select from its staff suitably qualified personnel or employ research men specialized in a particular field who will be assigned to that research project. The sponsor of the project will pay into the institute a sum of money commensurate with the purpose of the investigation for the agreed period, and all salaries and expenses connected therewith and all spe-