PROCEEDINGS OF THE AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS, VOL. I, NO. 2, PP. 55-91

Published @ 2017 Trieste Publishing Pty Ltd

ISBN 9780649232642

Proceedings of the American Society of Biological Chemists, Vol. I, No. 2, pp. 55-91 by Various

Edited by Trieste Publishing Pty Ltd.
Cover @ 2017

www.triestepublishing.com

VARIOUS

PROCEEDINGS OF THE AMERICAN SOCIETY OF BIOLOGICAL CHEMISTS, VOL. I, NO. 2, PP. 55-91

Trieste

CONTENTS

Officers and Council of the American Society of Biological Chemists

1908-1909

President—John J. Abel

Vice-President—Otto Folin

Treasurer—Lafayette B. Mendel

Secretary—William J. Gies

Council—John J. Abel, Otto Folin, William J. Gies, A. B. Macallum, Albert P. Mathews, Lafayette B. Mendel, Frederick G. Novy.

[*Reprinted from* SCIENCE, *N. S., Vol. XXVII., No. 685, Pages 241–254, February 14, 1908.*]

SOME OF THE PRESENT-DAY PROBLEMS OF BIOLOGICAL CHEMISTRY*

DURING the past few decades there has been gradually developing in the biological world a clearer recognition of the importance of a study of function, coupled with a fuller appreciation of the great diversity of the processes characteristic of life. It has come to be the fashion for naturalists—who up to comparatively recent times were content mainly to study form and structure—to turn their attention to observation of function, to learn how and why certain things are accomplished. Each decade has witnessed a broadening of the point of view; in botany, zoology, paleontology and geology new methods of investigation have been gradually applied, new relationships have been established, and the study of life, past and present, has taken on a new and broader significance. The Mendelian law and the present theories of genetics; the facts of modern cytology and the theories of heredity consequent thereto; the present-day experiments in breeding and variation with the conclusions to be drawn therefrom; the

* Address of the president of the American Society of Biological Chemists and Chairman of the Biological Section of the American Chemical Society, at the joint meeting in Chicago, January 1, 1908.

modern methods and theories of physiology in general; are the natural outcome of a progressive scientific activity where the study of function has come to occupy a prominent position and where the experimental method is being largely applied in biology as in the physical sciences.

The historical and descriptive study of biology has been gradually giving place to experiment. The zoologist is no longer content with systematic work, with the naming and classifying of species and genera, but he seeks to understand the chemical and physical changes that occur in growth, development, old age, death, etc.; or, in other words, he would know the cause or causes of these phenomena. He would understand the reason for things that occur during life, and with that end in view he turns to the experimental method, just as in physics and chemistry experimental or analytical study is made use of in the solving of problems that pertain to these sciences.

In botany, attention is being more and more directed to the study of plant physiology, with its chemical and physical problems. It is not enough to know that some species of fungi, for example, become black at a certain stage of their growth, but we need the explanation of the cause. The enzyme is to be detected and isolated, and the substance or substances upon which it acts identified. So, too, the many phenomena connected with the growth, nutrition and pathology of plants interest us, but knowledge of what is actually occurring can only be had by application of chemical methods. Systemic study of plants and animals will always be important, but if we are to have adequate explanation of the hundred and one phenomena characteristic of living forms we must turn our attention to experimental methods, as is being so largely done at the present time throughout the biological world, with due regard also to possible chemical transformations and reactions, that may be symbolical of broader changes in function and structure.

Descriptive embryology may tell us much regarding development, may show us the many different stages through which the egg, after fertilization, passes on its way to the full-fledged organism, but we gain thereby little or no insight into the causes that are operating to accomplish the ultimate end. We may well conjecture that in fertilization the spermatozoon brings in some chemical elements that constitute the exciting cause of cell division. Assuming such to be the case, we may ask whether it is a ferment substance of the ordinary enzyme type, or whether substances of a totally different character are involved. The answer to this question, however, does not concern us now; but that such a question is pertinent clearly suggests how the cause of cell cleavage may possibly be sought for in chemical or physico-chemical reactions incited by the admixture of germ and sperm substance.

It is well understood to-day that all the phenomena of life are to be explained on the basis of chemical and physical laws, and it is partly because of a clear recognition of this fact that biological chemistry has finally attained the eminence it has now reached as a division of biology; a branch of study that promises much in the ultimate explanation of many of the most intricate of the present-day problems of life. There is another reason why biological chemistry has shown such remarkable development during the past decades, and that is because of the direct aid it has furnished, and still promises to furnish, to physiology and to both experimental and practical medicine. Physiology as an independent science, having to do with the study of function, has grown in keeping with the increasing demand for wider knowledge of the processes of life, and this has led quite naturally to a broader recognition of the importance of the chemical side of physiology, since the physical side has been found inadequate to explain all the varied phenomena of living organisms. As a result, physiological chemistry has developed by leaps and bounds, until to-day special laboratories and journals devoted to this subject are to be found on all sides.

Again, in bacteriology, and in medicine in general, the applications of chemistry are so numerous and so fruitful in results that it is no longer necessary to defend the position of physiological or biological chemistry as a leading factor in the development of knowledge in these subjects. Sooner or later, in almost every problem that presents itself, we are brought face to face with some form of chemical reaction, or some chemical substance, upon which hinges the explanation of the phenomenon in question. Under the broad term of biological chemistry, we are dealing with a subject which, directly and indirectly, concerns itself with the chemical processes of living organisms, and as these are as many and varied as the organisms themselves, it is plain to see that the field is broad and one beset with many difficulties.

The very breadth of our field makes it clear that there will be diversity of opinion regarding the relative importance of the present-day problems in our science. To one man, quite naturally, a certain line of investigation will appeal most strongly, while to another a totally different set of problems will be suggested as the more important and promising. To one, questions of chemical structure and their bearing upon the processes of metabolism will prove most attractive; to another, questions of physico-chemical nature in their relationship to physiological processes in general will appeal most strongly; while to a third, the chemical dynamics or kinetics of physiological processes, the action of inorganic salts and their respective ions upon protoplasmic activity, etc., will seem the more promising field of work. In this latter field, we all recognize the great value of the results obtained in the laboratories here at Chicago, with equal recognition of the broad influence which the theories and conclusions drawn therefrom by Loeb, Mathews and others, have had upon the development and progress of this branch of our science.

Understanding fully the natural tendency of chemists and physiologists to differ somewhat in their estimate of the relative value of the different subjects calling for investigation, we may still, I think, readily select for discussion a certain number of problems in biological chemistry which we shall all recognize as being preeminently important to-day, and the settlement of which would go far toward giving a clearer understanding of many of the functions of the body. Among these problems stands out with startling distinctness the question of the chemical constitution of protein material. To the chemical mind interested in biological matters there is no problem that can overshadow this one in importance. As the basis of cell protoplasm of all kinds, protein stands forth as the one substance or class of substances absolutely essential for life. It is the chemical nucleus or pivot around which revolves a multitude of reactions characteristic of biological phenomena. In all the metabolic processes of animals and plants protein in some form plays a conspicuous part, and its many katabolic or decomposition products testify both to its complexity of structure and to the great diversity of reactions that may accompany its disintegration.

Nowhere is there to be found a better illustration of the physiological power which may reside in a certain definite grouping of elements than is seen in the case of protein. Gelatin, which resembles albumin in its superficial reactions and which contains approximately the same amount of nitrogen, is, as we know, quite incapable of taking the place of albumin in supplying the needs of the body for protein food. Yet, gelatin yields on decomposition many of the disintegration products furnished by albumin. Still, there are differences in the character and