BIOLOGICAL OXIDATION

Biological Oxidation. By CARL OPPENHEIMER and KURT G. STERN, with the collaboration of W. ROMAN. 276 pp. Bibliography of 1,383 references. The Hague: Dr. W. JUNK. New York: Nordemann Publishing Co., Inc.

THIS book is an entirely revised edition of one particular section of the senior author's (O.) comprehensive book, "The Ferments and Their Effects," which has been for several decades the guiding comprehensive work on enzymes. At a time when the knowledge about enzymes seemed to have just reached a level such as to justify the writing of a special section on enzymes in the frame of a text-book of biochemistry, Oppenheimer published the first edition of the book and brought it up to date in five successive editions. In this book the author not only organized the ever-increasing material but also largely contributed to the establishment of fundamental concepts and nomenclature of which a great deal is now in common use. A supplement to the fifth edition of this book, published in 1937, is the basis of the present book. It has been revised and supplemented by Kurt G. Stern, who not only has contributed a creditable amount of valuable experimental work in this field but also has shown on several occasions his ability in writing well-organized reviews. He is especially responsible for the chapters on redox potentials in heterogeneous systems; affinity and rate of reactions; the semi-quinones as intermediate steps of oxidation; photochemistry of the respiratory enzymes, yellow enzymes, carboxylase, protein bearers of enzymes and other topics of the most recent origin.

The vast material deposited in the ever-increasing amount of literature of the last few years has been exhaustively utilized in this book and organized in a systematic way. The authors are very well conscious of the fact that the present state of the theory and the system of the book derived from it, are just strong enough for the practical purpose of holding the material together, giving every experimental observation its proper place within the book and alleviating the enumeration and discussion of the vast material; yet that this system is not rigid, but flexible according to further discoveries.

The general part (pp. 1–123) is essentially concerned with the theory of oxidation-reduction. Here, the contrast between Warburg's theory of activation of oxygen and Wieland's theory of activation of hydrogen, and the reconciliation of the two by the unitarian theory, plays an important role. The special part (pp. 123–275) is essentially descriptive and contains such chapters as "the hemin systems," the "vitazymes," a name by which the authors comprise such enzymes as, for instance, alloxanthin enzymes and ascorbic acid; the "Nucleotide coenzymes and enzymes," the "quinoid mesocatalysts," such as Pyocyanine, Phthiocol.

The last chapter, on "Cell Respiration," is comparatively short (28 pp). It is obviously not considered as the topic proper of the book. Cell respiration, indeed, is the integration of all such individual enzymatic reactions as are dealt with in the preceding sections of the book. The problem of respiration, being a coordinate act of the organism, is a part rather of physiology; the main part of the book, however, consists, as it were, of a dissection of that coherent action of the living cell into the elementary, individual partial chemical reactions each of which requires a special study even without regard as to how it is interwoven with others for the purpose of respiration as a whole.

It may be mentioned that some of the few mathematical formulae occurring in the book, namely, in the chapter on two-step oxidation, are misprinted (p. 103).

The book will be a real help for those working experimentally in the field of cellular oxidation and reduction, and an instructive and comprehensive book for physiologists and biologists in general.

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REPORTS

RADIOACTIVE STANDARDS[1]

A SERIES of radioactive standards are being prepared under the direction of the Committee on Standards of Radioactivity of the National Research Council. These standards will be deposited at the National Bureau of Standards in Washington, D. C., to be issued as working standards to investigators who may desire them.

The standards under preparation at present are:

(1) *Radium Standards:*
  (a) 100 cc solutions sealed in 200 cc Pyrex flasks containing 10^{-9} and 10^{-11} grams of radium to be used as emanation standards either directly or by subdilution.
  (b) 5 cc solutions sealed in Pyrex ampoules containing, 0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10, 20, 50 and 100 micrograms of radium to be used as gamma ray standards. If desired, these may be obtained in sets of 13 with two each of the 0.2, 2 and 20 microgram standards.

(2) *Thorium Standards:*
  Sealed ampoules containing sublimed $ThCl_4$.

[1] This work is being supported in part by a generous grant from the American Philosophical Society to the Massachusetts Institute of Technology.

These may be used in preparing standard thorium solutions. Directions for use will be furnished with the standards.

(3) *Standard Rock Samples:*

The following rocks, ground to pass 40-mesh screen and be retained on 100-mesh screen, are available in 100-gram samples.

Quartzite (Virginia)
Triassic diabase (Virginia)
Milford granite (Massachusetts)
Chelmsford granite (Massachusetts)
Gabbro-diorite (Massachusetts)
Columbia River Basalt (Idaho)
Berea sandstone (Ohio)
Dunite (North Carolina)
Carthage granite (Missouri)
Carthage limestone (Missouri)
Deccan Trap (India)
Kimberlite (South Africa)

These samples of rock will be analyzed for radium and thorium content and are intended for use as working standards to check methods used in extraction of radon and thoron from rock samples. They may be used for direct fusion in the electric furnace or for carbonate fusion.

All the above samples will be analyzed at a number of laboratories equipped to make such measurements and ultimately certificates will be issued by the National Bureau of Standards. This work is in progress but will require considerable time for its completion so that final figures are available only for a part of the samples at the present time.

Accurate knowledge of the radioactive content of the materials of the earth's crust is of primary importance in many phases of geology, geophysics and cosmology. Reliable radioactive standards are also essential in studies of radium and thorium poisoning and in biological and medical investigations using the technique of radioactive indicators or internal artificial radioactivity therapy. For the latter purposes calibrated standard sources of β-rays will be made available.

It is hoped that the standards which have been prepared by the committee will provide all workers in these fields with a common basis for comparison of measurements and also improve the accuracy of all measurements of this type. It is likely that they will have other applications, and the committee would appreciate hearing from interested persons who may desire similar standards for their work. The committee is also glad to cooperate as far as possible in aiding investigators to use these standards to the best advantage and welcomes specific inquiries regarding their use. It is urged that any suggestions regarding other desirable radioactive standards, not at present available, be submitted promptly to the committee. In particular, it will facilitate the work of the committee if those laboratories and individuals which can make use of these standards advise the committee of their probable requirements.

Communications may be addressed to the chairman, Professor Robley D. Evans, Department of Physics, Massachusetts Institute of Technology, Cambridge, Massachusetts.

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SPECIAL ARTICLES

REVERSIBLE INHIBITION OF TOBACCO MOSAIC VIRUS IN LIVING CELLS WITH 0.0002 MOLAR SODIUM CYANIDE

MOST studies on inactivation of plant viruses have been carried out *in vitro*.[1,2,3,4] Such data have furnished valuable information as to reactive groups in virus molecules. Little is known, however, of the possibilities of reversible inactivation of virus mechanisms in living cells. Such information should aid in elucidating the substrates and reactions involved in virus multiplication.

Woods[5] was the first to call attention to the abnormal oxidase and peroxidase content of virus-infected tissues. A further investigation of the relation between certain oxidation catalysts and the virus mechanism has led in part to the work reported here. Detailed studies have shown that protoplasmic streaming in leaf cells of tobacco is *oxygen sensitive*. In a given leaf the rate of streaming can be reversibly and characteristically inhibited by sodium cyanide. A 0.0002 M solution of sodium cyanide is as effective in inhibiting the rate of protoplasmic streaming as is a 0.02 M concentration. These concentrations of cyanide also inhibit the action of tobacco peroxidase and catalase. The inhibiting effect of cyanide on the hemin-containing respiratory catalysts is well known.[6]

It was found that tobacco leaf tissue could be kept alive over 36 hours in 0.0002 M sodium cyanide by

[1] W. M. Stanley, *Phytopath.*, 25: 899–921, 1935.
[2] R. Best, *Annals of Appl. Biol.*, 23: 759–780, 1936.
[3] A. F. Ross and W. M. Stanley, *Proc. Soc. Expt. Biol. and Med. (N. Y.)*, 38: 260–263, 1938.
[4] W. B. Allington, *Phytopath.*, 28: 902–918, 1938.
[5] A. F. Woods, *Centralbl. Bakt. u. Par.*, 5: 745–754, 1899.
[6] C. Oppenheimer and K. G. Stern, "Biological Oxidation," The Hague, 1939.