
 BOOK REVIEWS

The Statistical Approach to X-Ray Structure Analysis. By VLADIMIR VAND and RAY PEPINSKY. X-Ray and Crystal Analysis Laboratory, Department of Physics, The Pennsylvania State University, State College, Pennsylvania. 1953. xvi + 98 pp. 21.5 × 28 cm. Price, \$1.50.

This little volume is primarily devoted to a critical examination of the method recently proposed by H. Hauptmann and J. Karle for a direct mathematical solution of the phase problem in crystallography. The procedure involves application of the statistical random walk problem to structure factor equations to determine the probability of a given sign assignment. In view of the far reaching consequence of such a general solution, this critique will be of considerable interest to X-ray analysts. Its contents are presented in a concise manner, appropriately written for those familiar with the various techniques used in solution of the structure problem from X-ray data.

While the authors emphasize that the Hauptmann-Karle approach is of considerable value and has given new insight to the phase problem, they present evidence to show that the statistical approach is not reliable except in special cases and disagree strongly with the claim that it gives a general solution for all centrosymmetric space groups, provided the number of observed structure factors is sufficiently great.

The formulas given by Hauptmann and Karle are transformed "into a form more suitable for practical computation." Alternate methods of derivation of the probability distribution functions are presented which point up the relation of these equations to Patterson and Harker functions and provide a better basis for understanding the meaning and limitations of the statistical relations. The statistical treatment is interpreted as corresponding to a "probability sharpening" of Patterson peaks with the origin removed; this leads to convergence of the structure to that of the highest peaks of a Patterson and hence gives the correct answer only if the Patterson function resembles the actual structure. A hypothetical structure with four atoms in the unit cell, space group $P1$, in which the statistical method does not give the correct result is discussed in some detail. An analysis of the success of the statistical method in deriving the naphthalene structure is presented.

Extension of the statistical treatment has led authors to new functions which give better representations of the structure of naphthalene than the conventional projections. They suggest that further study will be necessary to show whether these functions will be generally useful in the determination of more complex structures. In their view, however, the statistical approach in its present form cannot be relied upon to furnish a correct solution of the phase problem.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF WASHINGTON
SEATTLE 5, WASHINGTON

N. W. GREGORY

Advances in Enzymology and Related Subjects of Biochemistry. Volume 14. Edited by F. F. NORD, Fordham University, New York, N. Y. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1953. x + 470 pp. 16.5 × 23.5 cm. Price, \$9.25.

Contributions in this volume from the United States, Germany, France, Austria and the Argentine continue to make the "Advances" an international journal. Bücher surveys the difficult problem of energy transport in the living cell. Several theories and models are considered and critically evaluated. A clear style and good organization make this a very readable chapter. Snell and Brown deal with pantethine and related forms in the lactobacillus bulgaricus factor (LBF). The related forms are mixed disulfides of pantethine. Preparation of LBF from culture filtrates, identification and synthesis are described. Pantethine is formed from coenzyme A by the action of intestinal phosphatase. Lerner's article on phenylalanine and tyrosine

metabolism brings home the fact that in spite of much work the conversion of tyrosine to melamine in the mammalian skin is still incompletely understood. The review deals with a great variety of subjects, such as the chemical reactions involved in homogentisic acid, thyroxine and adrenalin formation as well as the question of hormonal control of melanin formation and the loss of certain enzymes in men with abnormalities of metabolism of tyrosine and phenylalanine. Sizer deals with a related subject, the action of tyrosinase and peroxidase on proteins. A number of hormones and enzymes are inactivated by tyrosinase while others are not, though in the latter case there is evidence that they too are oxidized. Langenbeck discusses the covalent intermediaries which have been shown to be formed between catalyst (or coenzyme) and substrate in certain non-enzymatic or enzymatic reactions. It is believed that the enzyme protein (apoenzyme) activates the coenzyme and determines the specificity of the reaction. Leloir's article on isomerases, mutases and related enzymes is an excellent resumé of a field to which he has contributed so much by the discovery of the coenzymes glucose-1,6-diphosphate and uridine diphosphate glucose.

Hoffmann-Ostenhof in a long article has again attempted the impossible, a systematic nomenclature of enzymes. The classification and names of the enzymes are based on the reactions catalyzed by them. Trouble arises when mechanisms are assumed in disregard of experimental evidence, *i.e.*, the starch phosphorylases are lumped with sucrose phosphorylase and called amylose-transglucosidases. Hexokinase would have to be renamed ATP → hexose (rather than glucose) transphosphatase. The author writes for this enzyme a freely reversible reaction, as he also does for *Q*-enzyme, renamed amylose → amylopectin transglucosidase. In the reviewer's opinion our knowledge of enzyme mechanisms is still so incomplete that it is best to desist from classifications as they are here attempted.

The last three articles deal with related subjects. Desnuelle discusses techniques used in the elucidation of protein structure, Zittle deals with adsorption of proteins on a variety of substances and the methods of elution. Many examples of successful chromatographic separation of proteins are collected. Schwimmer and Pardee deal with methods of isolation of enzymes; they state that 72 enzymes have been obtained in the crystalline state.

The volume contains a cumulative index for Volumes I-XIV.

DEPARTMENT OF BIOLOGICAL CHEMISTRY
WASHINGTON UNIVERSITY
ST. LOUIS, MISSOURI
GERTY T. CORI

The Chemical Structure of Proteins. A Ciba Foundation Symposium held 1st to 3rd December, 1952. Edited by G. E. W. WOLSTENHOLME, O.B.E., M.S., M.B., B.Ch. and MARGARET P. CAMERON, M.A., A.B.L.S. Little, Brown and Company, Boston, Massachusetts. 1954. x + 222 pp. 21 × 14.5 cm. Price, \$6.00.

This book comprises the papers and informal general discussions given at the Ciba Foundation's symposium on "The Chemical Structure of Proteins." The methods discussed herein have mainly been developed within the last few years. The critical discussion of the usefulness and specificity of these methods in protein chemistry adds greatly to the value of this book.

The first three chapters deal with the purification of proteins, in particular by the methods of column and partition chromatography. Many chapters are devoted to a critical survey of C and N end-group analyses, both by chemical and enzymatic means. The problems of the partial hydrolysis of proteins and the subsequent separation of the resultant peptides are also considered. The book ends with a discussion of chemical and electron microscope studies on the structure of collagen.

These papers are all written by authorities in their fields, and they therefore provide excellent introductions to the