

The hydrogen bonds satisfactorily account for the binding together of the crystal.

Although the structure has not yet been completely checked by quantitative comparisons of intensities, particularly with regard to the  $\gamma$

parameters, it is probably substantially correct.

THE GATES AND CRELLIN LABORATORIES OF CHEMISTRY  
CALIFORNIA INSTITUTE OF TECHNOLOGY  
PASADENA, CALIFORNIA

EDWARD W. HUGHES

WALTER J. MOORE

(National Research Fellow 1940-1941)

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## NEW BOOKS

**Thorpe's Dictionary of Applied Chemistry.** By JOCELYN FIELD THORPE and M. A. WHITELEY, Assisted by Eminent Contributors. Fourth Edition (Revised and Enlarged), Vol. V, FEH.-Glass, including an Abridged Index to Volumes I-V of the New Edition. Longmans, Green and Company, Inc., 55 Fifth Avenue, New York, N. Y., 1942. xxiii + 610 pp. With illustrations. 15.5 × 23 cm. Price, \$25.00.

The earlier volumes of this Fourth Edition have already been reviewed in *THIS JOURNAL* (59, 2477; 61, 222; 62, 237; 63, 884). This fifth volume of 609 pages covers a part of the alphabet which required 275 pages in the earlier edition. The new edition is almost completely rewritten. There has been a noticeable deterioration in the quality of the paper which is far from uniform in color and texture in the different parts of the book. But there has been no deterioration in the quality of the text. This excellent book has been issued promptly in spite of difficulties modestly described, "When, owing to war conditions, the work of the Dictionary could no longer be carried on in London it was transferred to the University Chemical Laboratory, Cambridge." Another obstacle was the death of the Editor-in-Chief, Sir Jocelyn Thorpe, which occurred on June 10, 1940, the day of publication of Volume IV of the Dictionary. M. A. Whiteley, formerly Associate Editor, has had the editorial responsibility for the completion of this volume, which, however, was well advanced at the time of the death of Sir Jocelyn Thorpe. It is a pleasure to express appreciation and admiration for the typically British determination to carry on successfully in spite of hindrances which would stop many a less resolute people.

GRINNELL JONES

**Liebig and after Liebig.** A Century of Progress in Agricultural Chemistry. Publication of the American Association for the Advancement of Science, No. 16. Publication Committee; CHARLES A. BROWNE, Chairman, RICHARD BRADFIELD, HUBERT B. VICKERY. Edited by FOREST RAY MOULTON. American Association for the Advancement of Science, Smithsonian Institution Building, Washington, D. C., 1942. 111 pp. 19.5 × 26.5 cm.

The ten papers which make up this volume constitute a well-integrated account of the announced subject of the book, namely, of a century of progress in agricultural

chemistry. The Introduction by Charles A. Browne on "Justus von Liebig—Man and Teacher" is followed by Section I, "Organic Chemistry, Enzymes and Nutrition," which contains four papers, "Liebig's Influence in the Promotion of Agricultural Chemical Research" by Henry R. Kraybill, "Liebig and the Chemistry of Proteins" by Hubert B. Vickery, "Liebig and the Chemistry of Enzymes and Fermentation" by Arnold K. Ball, and "Liebig and the Chemistry of Animal Nutrition" by Paul E. Howe, and Section II, "Soils, Fertilizers and the Mineral Requirements of Plants," which contains five papers, "Liebig and the Chemistry of the Soil" by Richard Bradfield, "Liebig—The Humus Theory and the Role of Humus in Plant Nutrition" by Selman A. Waksman, "Liebig and the Chemistry of Mineral Fertilizers" by Harry A. Curtis, Liebig and the Law of the Minimum" by Charles A. Browne, and "Liebig and the Mineral Requirements of Plants as Indicated by Means of Solution Cultures" by Burton Livingston. For the chemist who is not familiar with the subject of agricultural chemistry, the book will supply an interesting introduction to it, a general account of the field and of the manner in which it has been cultivated and made to fructify. It is a book which is not by any means to be reserved for the library of the specialist.

The book is clearly printed, two columns to the page, and is fully documented. It is illustrated with five pictures and ten diagrams.

TENNEY L. DAVIS

**The Amphoteric Properties of Proteins.** Vol. XLI, Art. 4 of the Annals of the New York Academy of Sciences. By R. Keith Cannon, A. Kibrick, John G. Kirkwood, L. G. Longworth, A. H. Palmer and Jacinto Steinhardt. The New York Academy of Sciences, care of the American Museum of Natural History, New York, N. Y. 87 pp. Price \$1.25. This monograph is one of several, which if purchased as a set, may be had at a reduced price.

This contribution to protein literature consists of a series of papers presented at a recent symposium sponsored by the New York Academy of Sciences. It conforms to the usual high standards of other symposia sponsored by this Academy.

The first paper of the series, titled "The Amphoteric Properties of Egg Albumin," by Cannon, Kibrick and Palmer "is devoted to a discussion of the contribution

which electrode titrations may make to the quantitative definition of the amphoteric properties of a protein." A considerable body of data showing the effect of the protein concentration, temperature, ionic strength, and nature of the added ions upon the titration curve of acid or base bound *vs.* pH is presented for egg albumin solutions. The discussion of these results correlates the observed titration curves with those estimated on the basis of amino-acid composition studies. In the studies of the effect of added electrolyte, it is found that the slopes of the titration curves vary with ionic strength but are nearly independent of the nature of the ions present, while the isoionic point depends upon both the nature and concentration of the ions present. These empirical results are considered in terms of the Linderström-Lang electrostatic theory, and may be quantitatively reconciled only if certain empirical corrections are applied.

Longworth's contribution, "The Influence of pH on the Mobility and Diffusion of Ovalbumin" attempts a correlation of mobilities with other physical properties. He presents mobility and diffusion constant measurements over a wide pH range of from 1.8 to 12.8. All buffers used were monovalent, and of 0.1 ionic strength. Protein concentrations were about one-half per cent. These values are compared with net charges as estimated from the titration data of Cannon, Kibrick and Palmer. A study of the ratio of charge (as estimated from titration measurements) to mobility showed that this quantity "is sufficiently constant to warrant the conclusion that, except for minor secondary effects, the mobility of ovalbumin is proportional to the number of equivalents of acid bound by the protein at constant ionic strength at any pH within its stability range." The observed value for this ratio does not agree with that computed from the measured frictional coefficient and molecular weight, however, and this discrepancy is discussed. Dr. Longworth's paper also contains a rather detailed discussion of certain problems relating to the computation of mobilities from electrophoretic patterns.

The paper of Steinhardt on "Participation of Anions in the Combination of Proteins with Acids" describes an extensive study of "the combination of wool with nineteen different acids," and attempts to "establish a quantitative measure of the relative affinities of the anions of various strong acids for proteins on the basis of a small number of measurements of acid combined and pH." Steinhardt points out that certain advantages gained by using a protein such as wool keratin, makes possible the analysis of the specific anion effects. A variation in affinity of several thousand fold in going from hydrochloric acid to picric and flavianic acids is postulated. Data showing a similar variation of affinities computed from measurements upon egg albumin solution are also given, although these data are of considerably less quantitative nature. The nature of these protein-anion combinations and other possible significance is also discussed.

A final paper by Kirkwood, "Acid-Base Equilibrium in Solutions of Ampholytes," outlines methods and presents tables which make possible the calculation of the charge

separation, or dipole moment, of dipolar ions from measurements of  $\Delta p_K$ , defined as  $\log_{10} K_2^0/K_2$  where  $K_2^0$  and  $K_2$  are the acid ionization equilibrium constants for the ionization of  $HZ^{0+}$  and  $HZ$ , respectively. Here  $Z^0$  and  $Z^-$  differ in structure only by the negative charge. Charge separations are presented for some seven amino acids and peptides, using  $NH_3^+-RCOO^-$  for  $HZ$  and  $NH_3^+-RCOO-CH_3$  for  $HZ^{0+}$ . Extensions of these simple relations to models containing arbitrary numbers of acidic and basic groups are presented.

J. L. ONCLEY

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## BOOKS RECEIVED

July 10, 1942-August 10, 1942

FREDERICK BERNHEIM. "The Interaction of Drugs and Cell Catalysts." Burgess Publishing Company, 426 South Sixth Street, Minneapolis, Minn. 85 pp. \$2.25.

M. J. BUERGER. "X-Ray Crystallography." John Wiley and Sons, Inc., 440 Fourth Avenue, New York, N. Y. 531 pp. \$6.50.

GUSTAV EGLOFF, GEORGE HULLA and V. I. KOMAREWSKY. "Isomerization of Pure Hydrocarbons." (A. C. S. Monograph Series.) Reinhold Publishing Corporation, 330 West 42nd Street, New York, N. Y. 499 pp. \$9.00.

WILLIAM F. EHRET, Editor. "Physical Science." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 639 pp. \$3.90.

H. W. HAGGARD and E. M. JELLINEK. "Alcohol Explored." (American Association for the Advancement of Science Series.) Doubleday, Doran and Company, Inc., Garden City, New York, N. Y. 297 pp. \$2.75.

WILLIAM HAYNES. "The Stone That Burns." D. Van Nostrand Company, Inc., 250 Fourth Avenue, New York, N. Y. 345 pp. Illustrated. \$3.75.

MERLE RANDALL and LEONA ESTHER YOUNG. "Elementary Physical Chemistry." Randall and Sons, 2512 Etna Street, Berkeley, California. 455 pp. \$4.50.

HUGH STOTT TAYLOR, ERNEST O. LAWRENCE and IRVING LANGMUIR. "Molecular Films, the Cyclotron and the New Biology." Rutgers University Press, New Brunswick, New Jersey. 95 pp. \$1.25.

EDWARD STAUNTON WEST. "Physical Chemistry for Students of Biochemistry and Medicine." The Macmillan Company, 60 Fifth Avenue, New York, N. Y. 368 pp. \$5.75.

"The Entire Electromagnetic Spectrum (Chart)." Compiled by Westinghouse Research Laboratories, East Pittsburgh, Pennsylvania. \$2.00. (Orders should be sent to Publications Section, 6-N-17, Westinghouse Electric and Manufacturing Company, East Pittsburgh, Pa. Glossy print of the seven-color electromagnetic spectrum chart available on request.)