

Reduction of 17 α -hydroxypregnenolone diacetate with lithium aluminum deuteride and then acetylation afforded Ia, m.p. and mixed m.p. with the H-analog 198–201.5° (the infrared spectra are different), found: C, 71.61; H/D, 8.96. Refluxed with activated zinc in xylene, Ia gave 17 β -deuterioisopregnenolone acetate (III), m.p. and mixed m.p. 166–168.5°, α_D -138° CHCl₃; found: C, 76.67; H/D 9.74. The n.m.r. spectrum of III shows two acetyl peaks. In the infrared spectra III lacks a band at 1170 cm.⁻¹ which appears in the spectrum of the hydrogen analog. Heated with sodium methoxide in methanol, III is isomerized with loss of deuterium to pregnenolone acetate, m.p. and mixed m.p. 140–146° (identical infrared spectra).

Hydrolysis of 17 α -hydroxypregnenolone 20-ethyl-eneketal with H₂O¹⁸ (purity 80%) afforded 20-O¹⁸-17 α -hydroxypregnenolone; λ 1655s cm.⁻¹ (C=O¹⁸), 1690w cm.⁻¹ (C=O¹⁶). Reduction with lithium aluminum hydride followed by acetylation gave Ib, m.p. 188–194°. When refluxed with activated zinc in xylene, Ib gave 20-O¹⁸-isopregnenolone acetate, m.p. 166–169°; λ 1680m cm.⁻¹ (C=O¹⁸), 1715w cm.⁻¹ (C=O¹⁶), 1740s cm.⁻¹ (acetate).

17 α -Hydroxypregnenolone was converted into the tetrahydropyranyl ether (m.p. 188–195°, found: C, 74.76; H, 9.74), which on reduction with lithium aluminum hydride gave the 20-epimeric diols: V, m.p. 186–189° (found: C, 74.42; H,

10.14), and VI, m.p. 181–182.5° (found: C, 74.21; H, 9.99). The mixture of V and VI shows a m.p. depression. The 20-monotosylate of V, m.p. 112–113° dec. (found: C, 68.31; H, 8.49) when heated with methanolic potassium hydroxide gave the oxide IV, m.p. 132.5–134° (found: C, 77.63; H, 9.86). When refluxed with activated zinc in xylene, IV afforded no isopregnenolone derivative.

Although Wagle's ionic mechanism seems to fit these results well, it probably is not fully correct since the Serini reaction proceeds also in the presence of dibenzoyl peroxide instead of activated zinc and it is inhibited completely by hydroquinone or by exclusion of atmospheric oxygen. These facts suggest that an oxygen radical participates in the Serini reaction.

Acknowledgments.—This work was supported by grants from the National Cancer Institute of the National Institutes of Health (CY 1696 Endo), the National Science Foundation, Research Corporation, and the Higgins Fund of Harvard University.

CHEMICAL INSTITUTE
FACULTY OF SCIENCE
NAGOYA UNIVERSITY
CHIKUSA, NAGOYA, JAPAN
CHEMICAL LABORATORY
HARVARD UNIVERSITY
CAMBRIDGE, MASSACHUSETTS

TOSHIO GOTO

LOUIS F. FIESER

RECEIVED NOVEMBER 25, 1960

BOOK REVIEWS

Studies in Crystal Physics. Reprinted from RESEARCH, Vol. 11, 1958. By M. A. JASWON, M.A., Ph.D., Reader in Mathematics, Imperial College of Science and Technology, London. Butterworth and Co. (Canada), Ltd., 1367 Danforth Avenue, Toronto 6, Ontario, Canada. 1959. 42 pp. 18 X 24 cm. Price, \$2.25.

This refreshingly written pamphlet on several unusual aspects of Solid State Physics is based in part on the scientific papers published by the author in the last five years or so. The first four chapters are reprinted from the periodical Research; the fifth has been added to round off the story. The Chapters are: (1) Some Properties of Crystal Lattices, (2) Imperfections in Nearly Perfect Crystals, (3) X-ray Diffraction by Imperfect Crystals, (4) The Martensite Phase Change in Metals, (5) The Thermodynamic Behaviour of Solids.

The topics are treated on simplified models and with mathematics used by way of illustration rather than for derivation; wherever possible, the argument is a physical one. This makes for interesting reading, to those who are acquainted with the subject. A reader knowing nothing whatever of the topic may find himself baffled by the introduction of some terms without adequate definition, for instance on p. 9 'Edge Dislocation' (which was previously spoken of simply as 'Dislocation'), or 'Screw Dislocation' (mentioned on p. 8 but nowhere defined). Most illustrations are schematic and to the point. In Fig. 12, p. 20, back reflection rings at approximately the same angle obtained on steel with radiations of wave lengths 1.8 Å. (Co) and 0.7 Å. (Mo) can obviously not both be indexed (310) as the legend purports.

In spite of such minor defects, the author's stimulating discussion throughout, and in particular of twinning in crystals, the Austenite-Martensite transformation and the thermodynamics of first and second order transitions in metal crystals can be warmly recommended.

The book is obtainable for sh 10/6 = \$1.47 at English booksellers. Why is the Canadian publishing house permitted to surcharge this by 53%?

19 FORDYCE ROAD
NEW MILFORD, CONN.

P. P. EWALD

A Statistical Manual for Chemists. By EDWARD L. BAUER, Winthrop Laboratories, Rensselaer, New York. Academic Press Inc., 111 Fifth Avenue, New York 3, N. Y. 1960. x + 156 pp. 13.5 X 21 cm. Price, \$4.75.

The author states (p. v) that, "this book was written for chemists who perform experiments, make measurements, and interpret data." It is not meant to be a complete text on statistics, but rather a manual for the working chemist. Use is made of methods of calculation (involving ranges) which require only addition, subtraction and the ability to use the slide rule.

The first chapter on fundamentals discusses experimental error, the normal distribution and "students" *t*-distribution. Examples are given to show how to compute the range, the variance and the standard deviation for small groups of data.

A chapter on the average discusses the problem of replication and shows how to compute confidence limits for an average. Data are divided into *k* small groups with *n* individuals per group. (*k* = 5; 2 < *n* < 10.) Ranges of the subgroups are computed and confidence limits set about the grand average using a table of factors corresponding to *k*, *n* and (1 - α) probability levels of 95 or 99%.

A chapter on experimental design and the analysis of variance gives a detailed explanation on how to compute and interpret the ANOVA for a two factor experiment with replication. Models and basic assumptions are listed and discussed. In the final section of this chapter the author suggests that much of the tedium of computing ANOVA

tables can be lessened by using ranges instead of variances. This may be true for simple ANOVA tables. It is not so true for the more complex experiments as can be seen in the author's examples of 3-factor ANOVA tables (pp. 70-84).

The remainder of the book is an explanation of how to use ranges, in place of variances, in all kinds of statistical tests of significance. Chapters are devoted to the comparison of two averages, simple and complex factorial experiments and linear regression.

The final chapters are on sampling and the control of routine analyses. The statistical aspects of attribute and variable sampling are discussed; but little help is given to solve the practical problems of sampling for chemical analysis. The use of control charts and the Studentized range to help control routine analyses is explained.

A great many numerical examples are worked out in detail throughout the entire book to illustrate the statistical techniques.

The following tables are given in the appendix

- I Factors for Confidence Limits of an Average (using-ranges)
- II Factors for Confidence Limits for Individuals (using ranges)
- III Values for $L = (\bar{x}_1 - \bar{x}_2)/R$ which will be exceeded with a probability P
- IV Values of $M = (\bar{x}_1 - \bar{x}_2)/(R_1 + R_2)$ which will be exceeded with a probability P
- V and VI Factors to Estimate Standard Deviation from Range
- VII Critical Values of the Studentized Range
- VIII Critical Values of F
- IX Factors for Computing Control Chart Limits

The author hopes (p. v) that this manual will serve as a statistical primer; but it is doubtful whether the chemist, with no prior knowledge of statistical methodology, will succeed in learning to use it correctly, by himself. The chemist, already well trained in conventional methods of computing ANOVA, may not want to take time to learn how to use ranges in place of variations. However, the book may be useful to the chemist who has some background in statistics and is willing to take time to learn how to use the range methods explained in the book.

APPLIED MATHEMATICS SECTION
MANAGEMENT SYSTEMS DEVELOPMENT DEPARTMENT
EASTMAN KODAK COMPANY GRANT WERNIMONT
ROCHESTER 4, NEW YORK

The Neurochemistry of Nucleotides and Amino Acids. A Symposium of the Section on Neurochemistry, American Academy of Neurology. Edited by ROSCOE O. BRADY, M.D., and DONALD B. TOWER, M.D., National Institute of Neurological Diseases and Blindness, Bethesda, Maryland. John Wiley and Sons, Inc., 440 Fourth Ave., New York 16, N. Y. 15.5 × 23.5 cm. Price, \$10.00.

This title is either forward looking or misleading. The first symposium reviews, to 1958, recent elucidations of metabolic functions of nucleotides of uracil, guanine and cytosine. Classes of compounds emphasized are present in, but not necessarily peculiar to, brain. D. R. Sanadi, in particular, emphasizes the importance of high purity preparations in detection of the roles of catalytic quantities of nucleotides of the various bases. The long known high proportion of nucleotides of guanine in the brain, and the fact that nucleosides of the pyrimidines can play a role in maintaining electrical activity in brain, remain the most unique observations. The character of the ribonucleic acid-like material in the Nissl substance receives attention.

The second symposium better justifies the title. There is considerable evidence for some unique roles for certain amino acids in neural tissues. The pertinent metabolism of phenylalanine and tyrosine, of tryptophan and serotonin, and of glutamic acid and β -aminobutyric acid are thoroughly reviewed.

The volume suffers from the pernicious habit of liberal "coding" with abbreviations which divert the reader from the context. Nomenclature errors are even found in titles (and are objected to in an authors' footnote on page 28).

SLOAN-KETTERING DIVISION OF
CORNELL UNIVERSITY MEDICAL COLLEGE
NEW YORK, NEW YORK GEORGE BOSWORTH BROWN

Quantum Chemistry. Methods and Applications. By R. DAUDEL, R. LEFEBVRE and C. MOSER, Centre de Mécanique Ondulatoire Appliquée du Centre National de la Recherche Scientifique, Paris. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y., 1959. xiii + 572 pp. 16 × 23.5 cm. Price, \$14.50.

It is a pleasure to see at last a book with the title "Quantum Chemistry" that deals primarily with the application of quantum theory to chemical problems, rather than to spectroscopy and atomic structure. A book of this kind is urgently needed since the subject has developed rapidly in recent years. This book by three distinguished experts in the field is clearly an attempt to meet this need.

The book falls into two parts. The first thirteen chapters deal with the simple Hückel treatment and its application to specific problems of chemistry; there are chapters on interatomic distances, bond angles, dipole moments; on bond dissociation, resonance and ionization energies; on chemical reactivity, reaction rates equilibria, molecular spectra and biological applications. The second part deals with modern orbital theory, covering the present position in a very satisfactory manner. Most of the more important recent developments are discussed, including the Pariser-Parr treatment and Moffitt's atoms-in-molecules method. The presentation is clear and the book well produced.

The main failing of the book—and this unfortunately a serious one—is a lack of references to recent work on the chemical applications of quantum theory. Out of about 300 references in the first part of the book only some 25 are to papers published since 1952—and there are serious omissions before that. The situation is made worse by the randomness of the cover; partisanship would at least have ensured an up-to-date account of one point of view. One particularly unfortunate consequence is the omission of any reference to crystal field theory or the MO treatment of transition metal complexes; even ferrocene escapes mention. The whole of this field has developed largely in the last eight years.

Criticism could also be leveled at the general account of quantum theory in chapters 14-16 (125 pages of text). This would not be an adequate preparation for a reader unversed in quantum theory who wanted to read the chapters dealing with the mathematics of MO theory; since there are numerous good text books on quantum theory available, the space could have been better used either on a more detailed account of the techniques of calculation or on such recent topics as transition metal complexes, magnetic resonance spectroscopy and optical activity.

Nevertheless this is a useful contribution to the chemical literature, containing much material that has never before appeared in book form. It can be recommended to all chemists interested in the field.

DEPARTMENT OF CHEMISTRY
THE UNIVERSITY OF CHICAGO MICHAEL J. S. DEWAR
CHICAGO, ILLINOIS

Catalysis. Volume VII. Oxidation, Hydration, Dehydration and Cracking Catalysts. Edited by PAUL H. EMMETT, W. R. Grace Professor of Chemistry, The Johns Hopkins University, Baltimore, Maryland. Reinhold Publishing Corporation, 430 Park Avenue, New York 22, N. Y. 1960. vi + 378 pp. 16 × 23.5 cm. Price, \$13.50.

This volume completes a notable series of books entitled "Catalysis." The present book contains six chapters. The first chapter written by Ryland, Tamele and Wilson deals with cracking catalysts and presents a rather detailed description of their preparation, nature, and probable activity mechanisms. In chapter two Winfield discusses the mechanisms of catalytic dehydration and hydration with the aid of numerous reactions, catalysts, and tables. The last half of the book, comprising four chapters, has been written by Dixon and Longfield. Chapter three, covering nearly a hundred pages, is devoted to the vapor phase oxidation of hydrocarbons at solid surfaces. The behavior of numerous catalysts for the oxidation of such substances as benzene, naphthalene, toluene, ethylene, propylene, polynuclear and substituted aromatic hydrocarbons, naphthenes, terpenes and heterocyclic compounds is presented, with the aid of several tables. The effect of hydrocarbon structure is emphasized. In chapter four a number of