

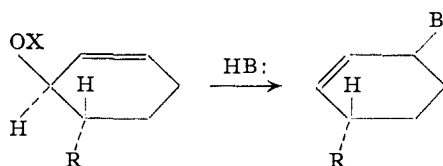
ty-four to seventy-two hours. The unsaturated amines which were formed in good yield were reduced catalytically to the corresponding cyclohexyl compounds. Conversion in high yields to pure picrates, picrolonates and methiodides demonstrated that in each instance a *single isomer had been formed in the displacement reaction*. This single isomer was shown in each of the three cases studied to be a *trans*-4-(1-piperidyl)-alkylcyclohexane by infrared evidence as well as by direct comparison with the proper derivatives of the authentic reference compound (methyl: picrate, m.p. 153.3–154.3°; picrolonate, m.p. 188.5–188.9°; methiodide, m.p. 239.4–239.7°; isopropyl: picrate, m.p. 123.5–124.2°; picrolonate, m.p. 174.7–

175.1°; methiodide, m.p. 250.2–250.4°; *t*-butyl: picrate, m.p. 166.5–167.5°; picrolonate, m.p. 199.4–199.9°; methiodide, m.p. 253.0–253.2°). *The reaction followed bimolecular kinetics in each case as demonstrated by the use of the van't Hoff differential method.*⁴ *The cis relationship of the entering and departing groups is thus demonstrated in the S_N2' reaction.*^{5,6}

(4) K. J. Laidler, "Chemical Kinetics," McGraw-Hill Book Co., Inc., New York, N. Y., 1950, pp. 14–15.

(5) The possibility that the ester might rearrange before displacement was ruled out by isolation of the original ester in a state of purity from incomplete reactions.

(6) The steric results are in agreement with the ideas of Winstein and of Young: see W. G. Young, I. D. Webb and H. L. Goering, reference 1.



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BOOK REVIEWS

Polysaccharide Chemistry. By ROY LESTER WHISTLER, Professor of Biochemistry and Assistant Head, Department of Agricultural Chemistry, Purdue University, Lafayette, Indiana, and CHARLES LOUIS SMART, Purdue University, Lafayette, Indiana. Academic Press, Inc., 125 East 23rd Street, New York 10, N. Y. 1953. xv + 493 pp. 16 × 23.5 cm. Price \$10.80.

Polysaccharide chemistry stands as an interesting record of man's inquisitiveness. It reveals that in this area his unquenchable and inexhaustible curiosity runs the gamut from the albumin glands of the vineyard snail (*Helix pomatia*) to the antigens which enable human beings to be separated into blood groups. Along the way, to select but a few examples, he has asked searching questions about red and brown algae, timothy pollen, gastric mucosa, slippery elm mucilage, lobster shells, wing remains of *Coleoptera* from the middle Eocene Period, chondroinhalacia, and type-specificity and virulence of pneumococci. Huge industries, based on starch and cellulose, prove once again that academic thirst for knowledge can lead to the market place.

There has long been a need to have the entire field of polysaccharides presented as a unified division of carbohydrate chemistry, and the authors merit praise and thanks for their achievement. This compilation of information will enable workers in apparently unrelated spheres of work to see their common ground and techniques, and it will save much time and effort for those who desire a compact presentation of subject matter as well as a guide to significant publications. The authors have made judicious selections from the extensive literature of cellulose, starch and pectic substances.

The first chapter, consisting of twenty-six pages, deals with the occurrence, nomenclature and classification of polysaccharides. Detailed tables summarize the classes of substances which are to be treated in later chapters. The second chapter condenses a vast amount of information regarding methods of analysis and proofs of structure. In the next thirty-three chapters each family of polysaccharides is systematically developed under the subdivisions of Occurrence, Preparation, Composition and Structure, Properties, Derivatives and Uses.

Abridgment and terseness are functional necessities in a book of this size, but condensation is carried to such an extent in the description of laboratory methods that the uninitiated reader may be beguiled into thinking that a pro-

cedure which in reality is difficult or which has pitfalls, is easy to carry out. The authors obviously and for good reason decided mainly to give the reader reassurance that methods are available, and where to find them. For useful information and critical evaluations, however, the original literature will have to be consulted. An example of this is the statement: "Xylose may be quantitatively and selectively fermented in the presence of other sugars." At times the authors are disarmingly uninformative, and the reader will, to use a theatrical term, do a "double-take." This is illustrated by the following: "Analysis of agar containing plants are sometimes in error because the raw material may not be uniform." The reviewer's favorite is found on page 334. "The acid pulp from the (Tamarind) seeds has been used for many years in the making of preserves and in the preparation of a cooling laxative drink."

There are evidences in the book that a balanced picture of the average reader was a matter of editorial concern because tritylation is explained parenthetically "with triphenylchloromethane." On the other hand, on page 105 the chemical formula of *bis*-chloromethylsulfone is uniquely presented in place of the name of the compound. However, on page 425 it is assumed that the word *bleb* is part of the vocabulary of that average reader. The most mysterious editorial decision is to list Anonymous in the author index.

These are minor criticisms of an excellent book. The important thing to bear in mind is that the authors have eminently succeeded in their objectives, and that there is now a book on polysaccharides which should be widely read and used.

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LOUIS SATTLER

Structure of Metals—Crystallographic Methods, Principles, and Data. Second Edition. By CHARLES S. BARRETT, Ph.D., Professor, Institute for the Study of Metals, University of Chicago. McGraw-Hill Book Company, Inc., 330 West 42nd Street, New York 36, N. Y. 1952. xvi + 661 pp. 16.5 × 23.5 cm. Price, \$10.00.

The laudable plan of Dr. Barrett's book consists of background chapters on crystallography, X-ray diffraction, re-

sults of structural studies applied to metals, and the electronic theory of metals. Use is made of this background material in discussing such properties of metals as electrical properties, plastic deformation, dislocations, disorders, cold working, annealing and age hardening. Within this framework the reader gets a surprisingly wide survey of problems which arise in the science and use of metals and alloys.

Indeed the breadth which the book attempts is also its chief weakness. In 169 pages of text, plus 31 pages of appendices nearly every aspect of X-ray diffraction is mentioned, including X-RAC and the Karle-Hauptman treatment of the phase angle problem. The elements of the subject are, however, slighted to such an extent that it seems inconceivable that the book could serve as an introductory text in X-ray crystallography, as the author suggests.

The rest of the book is similar, with, in my opinion, too much emphasis on complete coverage, too little on solid development. Occasionally the author resorts to paragraph by paragraph review of conflicting explanations of complex phenomena, unrelieved by critical comment. Perhaps occasionally the stage and pace of development makes this inevitable, but it makes for dull reading.

Fortunately the book contains rather full references to important papers in the original literature. It should provide a valuable starting point for someone interested in a survey of any of the problems presented.

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Statistical Methods for Chemical Experimentation. By W. L. GORE, E. I. du Pont de Nemours and Company, Wilmington, Delaware. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1952. xi + 210 pp. 13 × 18.5 cm. Price, \$3.50.

Mr. Gore deserves credit for being one of the voices "crying in the wilderness" evangelizing the relevancy and value of statistical design to problems encountered in chemical research. The book is written on the premise that "none of the current books on statistical methods which has come to my attention gives an adequate description of how the present knowledge on design of experiments can be applied in chemical investigations." It "is not intended as a treatise on probability theory, or even as a catalogue of statistical techniques. It is, rather, a collection of the methods most commonly employed in our work. No attempt has been made to show the origin or mathematical relationships of the formulae used."

To be commended are: brevity, the novel gas law example of dividends to be gained from use of factorial design; provocative suggestion of use of 2 × 2 Latin squares to condense experimentation (the reader should keep in mind however that this is at the expense of sacrificing the separate determination of interactions for which the factorial design is advocated); factorial study of flexural strengths; good examples in the chapter on Attribute Statistics. An interesting *modus operandi* is proposed for the systematic assessment of factors to discard in a multiple regression analysis. While there is no fool-proof method of dropping variables *believed* to be unimportant, still the procedure advocated may be considered to represent a working compromise where it is physically impossible to retain all variables. It is felt that the book would represent a worthwhile supplement to a chemist's library on statistics.

The author was ostensibly not cognizant of all the current books on his subject, extant at the date of his preface. His writing off of Brownlee (1947) as a condensation "from a study of statistical tests and papers rather than from experience in using the methods" seems inappropriately ungracious when one recalls that Brownlee is also full of applications to chemical technology. Although the chapter on Design of Experiments constitutes one third of the text, it is suggested that a beginner would be wise to supplement his reading if he wishes to avoid experimentation which answers trivial questions only.

An uncertainty in several places as to which *F* ratio to choose for the correct significance test portrays the belief of the author that a statistical analysis is a subjective art. This unfortunately counteracts the greatest talking point for use of statistical design; *i.e.*, that it enables one to set up a self-contained experiment from which he may draw objective conclusions not dependent upon authority of past

workers who may have a vested interest in the outcome. If the author had taken into consideration the use of variance components, as introduced by Brownlee and extended by another author, there would have been no need for this expressed ambiguity in significance testing.

An omission of documentation has the effect on several occasions of subjecting a trusting reader to the risk of accepting procedures which may be controversial. Points on which statisticians may be unhappy are: the philosophical validity of the sequential technique of experimentation; careless use of transformations without taking account of necessary reweighting; arbitrary choice of addition constant as unity in making a logarithmic transformation; failure to correct *t* in examples from 2 to the value corresponding to the number of degrees of freedom actually used (despite a footnote admitting the desirability of this correction); rejection of use of lumped variance although admitting that it is the rigorously correct quantity; invalid method of factorizing chi-square (sum of single degrees of freedom does not equal total for 7 degrees of freedom as obtained by recognized method); remarkable definition of orthogonality.

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Structure Reports for 1949. Volume 12. General Editor: A. J. C. WILSON, University College, Cardiff, Great Britain. Section Editors: C. S. BARRETT (Metals), J. M. BRYVOET (Inorganic Compounds), J. MONTBATH ROBERTSON (Organic Compounds). Published for the International Union of Crystallography by N. V. A. Oosthoek's Uitgevers Mij, Utrecht, Holland. viii + 478 pp. Illustrated. 15.5 × 24.5 cm. Price, \$11.88 (45 guilders).

The second volume in the new "Structure Reports" series, covering the period 1948-1949 (Volume 12) has appeared, and, like the first (Volume 11) is to be highly commended. The series is a continuation with modifications of the old Struktur-bericht, discontinued in 1940. Apparently Volumes 10 and 13 are now in preparation.

Structure Reports is divided into sections dealing with metals, inorganic compounds and organic compounds, with separate teams of editor and abstracters for each section. An individual report of structure is, where practicable, arranged with topics in the order: name, formula, papers reported, unit cell, space group, atomic positions and parameters, interatomic and intermolecular distances, material, discussion, details of analysis, references. Sometimes there are editorial comments (which appear to be made with both frankness and authority). The reports are intended to present only the material of structural interest in a given paper, abstracted so that "material of great interest from other standpoints may be ignored entirely, or dismissed in a few indicative words." Actually, the abstracters have in many cases been generous in interpreting the prohibition.

Although no systematic indexing procedure is used in the Inorganic Compounds and Organic Compounds Sections, the material is artfully arranged, so as to invite browsing. To make it easy to look up a given compound, comprehensive chemical name and formula indexes are included. A criticism levelled at Volume 11, that much material outside the range 1947-1948 was used, is not applicable here. Moreover a Corrigenda for Volume 11 is given on p. 478.

The editors and abstracters are performing an extremely valuable service. In fact, one imagines that the most serious difficulty is the job of working forward to the present and backward to 1939 before another interruption.

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An Advanced Treatise on Physical Chemistry. Volume Three. The Properties of Solids. By J. R. PARTINGTON, M.B.E., D.Sc., Emeritus Professor of Chemistry in the University of London. Longmans, Green and Co., Inc., 55 Fifth Avenue, New York 3, N. Y. 1952. lx + 639 pp. 17 × 25.5 cm. Price, \$14.00.

The topics covered in this volume, and the number of pages devoted to each topic, are as follows: General Prop-

erties of Solids (12), Crystals (39), Crystal Lattices and Space Groups (63), Isomorphism (27), Density of Solids (21), Elastic Properties of Solids (38), Tensile Strength of Solids (31), Hardness (11), Surface Energy of Solids (5), Viscosity of Solids (5), Thermal Expansion of Solids (11), Specific Heat of Solids (57), Theory of Solid State (89), Thermal Conductivity of Solids (51), Fusion (94), Vectors and Tensors (41), The Complex Variable (16), and The Calculus of Variations (25). The present volume covers mechanical and thermal properties only, optical and electrical properties being treated in the forthcoming Vol. IV. Granting that "—the theoretical physicist will probably not feel much interest in the specific heat of tobacco or coal ash, but these are quite important to the kind of reader for whom the book is intended—," the treatment of the topics listed is superb. The text marches steadily through obscure historical detail with many a reproof aimed at some poor colleague departed or still here, with lucid description of ancient and modern experimental devices, with ingenuous examination of long forgotten theories, and finally with a brilliant presentation of the results of modern theory.

But who is this "kind of reader for whom the book is intended"? It might be expected that other works on advanced physical chemistry would cover essentially the same ground. But Taylor and Glasstone in published and projected volumes overlap the present volume in fewer than 200 pages and then with the aid of five authors and a trifling few hundred references. Partington has 15,511 references (his count) in this Volume alone!

In the official announcement of a famous university this reviewer finds many courses on advanced physical chemistry but none covering more than a small fraction of the 650 pages in this volume. Under the Department of Applied Science he finds three courses "Introduction to Solid State Physics," "Advanced Thermodynamics," and "The Solid State," where Partington would be useful.

There is only one word which accurately characterizes

this work and that word is "monumental." If Partington were not also the author of a well known text on inorganic chemistry he might properly be called the "Mellor of physical chemistry." In fact the resemblance to Mellor is the only major criticism to be offered. There is a tendency, like Mellor, to lack critical selectivity, the text sometimes becomes a sequence of abstracts of abstracts (p. 141), there are over ten pages of densely packed general references on specific heats, and seven more on thermal conductivity; the subject of ferroelectricity, to be treated more fully (God help us!) in Vol. IV, is here slighted (p. 406) with a mere 150 references; the list of literature abbreviations alone takes 30 pages plus 3 pages of errata from previous volumes. Volume I started bravely with 18,000 references, Vol. II fell to 11,000, if Vol. IV is comparable with the first three it will take the average chemist some twenty-four years to read all these references. And yet Professor Partington has apparently decided to ignore solutions, kinetics, and chemical thermodynamics.

In spite of all this the work does not often relax into a "Handbuch" style. It is replete with pithy remarks: on the omission of publishers' names on book references—because librarians inform the author that they have no bibliographic value; on symbols—"in a large work—an author cannot change his symbols every time a new committee reports"; on the lack of a name index—because there are so many names; on T. W. Richards views (p. 343) on atomic compressibility—Partington doesn't like them. Here, perhaps, and occasionally elsewhere, we have the impression of a rather cranky old man needlessly lambasting an outmoded idea.

In view of the neatness with which Professor Partington chops off the heads of earlier reviewers (p. lx) this one hesitates to point out specific errors. Trzebiatowski is misspelled on p. 3 ref. 7.

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