BOOK REVIEWS

Polyamino Acids, Polypeptides, and Proteins. Proceedings of an International Symposium held at the University of Wisconsin, 1961. Edited by MARK A. STAHMANN. The University of Wisconsin Press, 430 Sterling Court, Madison 6, Wisconsin. 1962. 18 × 26 cm. 394 pp. Price, $8.00.

The papers assembled in this volume cover a broad cross section of the field of polypeptide and protein chemistry. There are six articles dealing with the synthesis and properties of polyamino acids and polypeptides, three on the kinetics of polymerization of N-carboxyamino acid anhydrides, eleven on the properties of polyamino acids in solution, five on polypeptide and protein structure, and eleven papers on the biological properties of polyamino acids. The discussion sections also serve a useful purpose in pointing up conflicts in interpretation of physical data. There is an excellent analysis of the relative merits of optical rotation and absorption in the deep ultraviolet as tools for the measurement of degree of helicity in polymers. The interesting properties of α-, β-, and γ-linked polymers of aspartic and glutamic acids are reviewed. The unusual linkages have been recently implicated in the structure of proteins such as collagen.

The format of the book is attractive, and there is a good index. Only four misprints were detected. There is little doubt that "Polyamino Acids, Polypeptides, and Proteins" will be an excellent supplement to earlier reviews of the field by Bamford, Elliott, and Hanby, and Katchalsky and Sela, and will be welcomed and widely used by protein chemists.

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Die Kinetik der Wirkung von Effektoren auf Stationäre Fermentsysteme. By HANS-DIETER OHLENBUSCH, Privatdozent für Physiologische Chemie an Der Universität Kiel. Springer-Verlag, Heidelberger Platz 3, 1 Berlin 31 (Wilmersdorf). 1962. 13.5 × 20.5 cm. 36 pp. Price, DM 9.80.

It is now generally recognized that the linear relations observed between rate and concentrations for many enzyme systems do not necessarily follow from the kinetic models used. In particular, for a system containing enzyme, E, substrate, S, and inhibitor or activator, I, which can form three complexes, ES, EI, and ESI, and which can lead to products from the decomposition of both ES and ESI, the general steady-state equation does not predict a linear relation between a simple function of rate and S or I concentration.

In order to explain linear plots of $1/v$ *vs.* $1/s$ it is necessary to pick a particular limiting case or else to derive the cumbersome general steady-state rate equation and see which factors can result in simplification. An analysis of the latter kind was carried out by Botts and Morales, in 1953, and is now extended by Ohlenbusch. He considers not only the limiting cases corresponding to "quasi-equilibrium" among complexes and classical inhibition types (competitive, noncompetitive, and uncompetitive) but also other combinations of individual rate constants which can result in linear plots. He concludes that the observation of a constant maximum rate and increased Michaelis constant upon addition of inhibitor probably results only from competitive inhibition, but that the other classical limiting cases can arise from a variety of causes.

This small volume discusses a very limited topic thoroughly. It is more like a theoretical paper one might expect to find in a journal, rather than like a full scale monograph. Most of the material is also available in an assortment of papers written in English.

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Handbuch der Physik. Band XIII. Thermodynamik, der Flüssigkeiten und Festkorper. By S. FLÜGGE. Springer-Verlag, Abteilung VI, 1 Berlin-Wilmersdorf, Heidelberger Platz 3, West-Berlin. 1962. 17 × 25.5 cm. 679 pp. Price, SM 198.

This volume of "The Handbook of Physics" contains only three articles. The first, by Münster, is itself of book length. This article has excellent discussions of the statistical theory of liquids and cooperative phenomena in crystals and of mixtures. As might be expected, there is great similarity with Professor Münster's earlier book on statistical thermodynamics, but much new material has been added. For example, there are accounts of the DeBoer cell cluster theory, the corresponding states theories of mixtures, an excellent treatment of ordering in solid solutions, etc. Surprisingly, there is relatively little overlap with the article by J. E. Mayer in the Handbook volume dealing with the thermodynamics of gases. It is too bad that the publication of the volume could not have been delayed a few months to allow amendation of the article: there are now available numerical solutions of the hypernetted chain and Percus Yevick equations which should be compared with the earlier theories of Kirkwood and Born and Green.

The second article by Staverman is much shorter and more nearly of the detailed review article style. It gives very good coverage of a wide variety of topics in polymer chemistry. I found the discussion of the relationship between the James and Guth and Flory theories of rubber elasticity particularly good.

The final article by Stevels deals with glass, a subject with which I am relatively unfamiliar. As nearly as I can judge, the coverage is extensive and the discussion of the relationship between the various structural theories (such as that of Zachariasen) and experiment is lucid. Anyone interested in the statistical thermodynamics of liquids and solutions (including solid solutions) would be well advised to obtain this volume for Munster's contribution alone. The articles on polymers and on glass are also very good and merit the attention of workers in these fields. The only caveat I can enter relates to the title of the volume. It is not at all clear to me that these three contributions constitute a representative description of the thermodynamics of condensed systems. Be that as it may, this volume is heartily recommended to all those whose interests touch upon the subjects considered.

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Methoden der Organischen Chemie. (Houben-Weyl). Vierte Völlig Neu Gestaltete Auflage. Herausgegeben von EUGEN MÜLLER, Tübingen unter Besonderer Mitwirkung von O. BAYER, Leverkusen, H. MEERWEIN, Marburg, and K. ZIEGLER, Mülheim. **Band XII/1. Organische Phosphorverbindungen Teil 1.** George Thieme Verlag, Herdweg 63, Stuttgart N. Germany, 1963. 18 × 26 cm. lxxii + 683 pp. Moleskin DM 166; Vorbestellpreis DM 149.40.

Not so many decades ago, phosphines and phosphonium compounds were noted mainly for their unpleasant qualities and for their value in illustrating the analogical consistency of the 5th group of the periodic table. In the currently appearing XIIth volume, 1st half, of the 4th edition of Houben-Weyl's "Methoden," as many as 40 pages are devoted to critical discussions and detailed descriptions of preparative procedures designed to make a variety of alkyl- and arylphosphines; of a sample of one hundred references taken from that section, 78 cited reports that had appeared after 1930 and the remaining 22 had been published before 1900. The preceding remarks call attention to the explosive growth of the field of organic phosphorus compounds, stimulated by new areas of theoretical interest, and a host of practical applications ranging from potent biological agents like insecticides, nucleotide coenzymes, and nucleic acids to flame-proofers, plasticizers, polymers, and lubricants.

The editors were both wise and fortunate in enlisting the collaboration of Dr. K. Sasse of Leverkusen to write the present volume of the compendium. The great diversity of phosphorus compounds necessitated strict systematization achieved by grouping according to compound type. Such a classification prevents the direct juxtaposition of similarities and analogies between and among representatives of different groups—a drawback minimized by the extensive cross-references and over-all continuity attributable to the unifying effect of one-man authorship.

Coverage is in keeping with the high standards of the previous volumes, as is the format. Readers will note that the book at hand is the first of two sections constituting Volume XII and is devoted to compounds that contain at least one C–P bond; whereas Part XII-2 is expected to treat derivatives of phosphorous and phosphoric acid, including, of course, the various phosphate esters that are of key importance in life processes.

A large fold-out table at the end of the volume grants rapid access to the nomenclature adopted (which differs slightly, for linguistic reasons, from that recommended by the I.U.P.A.C.) and to the classification of compounds by the criteria of formal valence, number of P–C and of P–O bonds. Moreover, chapters treating of a given class are indicated, greatly facilitating rapid

orientation in a complex area of preparative chemistry. Adequate warnings are given regarding both the flammability and the toxicities to be guarded against when handling phosphorus and its compounds.

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Ion Exchange Separations in Analytical Chemistry. By OLOF SAMUELSON, Professor of Engineering Chemistry, Chalmers University of Technology, Goteborg, Sweden. John Wiley and Sons, Inc., 440 Park Avenue S., New York 16, N. Y. 1963. 23.5 × 15.5 cm. 474 pp. Price, $9.50.

The use of ion exchange in analytical chemistry has increased tremendously during the last 10 years or so. The earlier book published by Samuelson, in 1953, "Ion Exchangers in Analytical Chemistry," has been partly responsible for this growth. Samuelson's latest book is an entirely new book and not merely a second edition of the earlier book.

"Ion Exchange Separations in Analytical Chemistry" is divided into three parts. The first part is concerned with the fundamental properties of ion exchange resins and with the principles and mechanisms of ion exchange. The second part deals with the technique of simple separations and of the general technique used in ion exchange chromatography. The third part covers applications, and has been restricted to separations used in determinations of inorganic substances.

This is essentially a practical book, although essential theory has not been slighted. The theory of ion exchange resins and equilibria is adequate and rather easy to follow. The chapter on application of plate theory to ion exchange presents information vital to the understanding of column separations. A short but interesting chapter on ion exchange in nonaqueous solutions is included.

The "applications" part alone is worth the price of the book. A chapter on metal separations is excellent and extensive (110 pages). Some general techniques for separation of metal ions are described, then methods for separation of groups of metals within the periodic table are given. A shorter chapter deals with the chromatographic separation of anions.

The literature coverage is excellent, but because of the time required for editing and publication, papers published within approximately the last two years are not mentioned. So long as research in analytical uses of ion exchange continues at such a rapid pace, it is hoped that the author will periodically bring his book up to date through revised editions.

This book is highly recommended to the chemist interested in the use of ion exchange in analysis and analytical separations. I feel that it is the best book available on this subject.

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Spectrometric Identification of Organic Compounds. By ROBERT M. SILVERSTEIN and G. CLAYTON BASSLER, both Senior Organic Chemists, Stanford Research Institute. John Wiley and Sons, Inc., 605 Third Avenue, New York 16, New York. 1963. 23.5 × 30.5 cm. 177 pp. Price, $8.50.

"Spectrometric Identification of Organic Compounds" is a pioneering effort to bring the classic organic qualitative analysis course abreast of modern research methods. The approach is radical—identification is based solely on spectrometric methods—chemical methods (including combustion analysis) are forsworn. Structures are arrived at solely on the basis of mass spectra, infrared spectra, nuclear magnetic resonance spectra, and ultraviolet spectra. It may be argued by the reader that "Spectrometric Identification of Organic Compounds" is not a replacement for qualitative organic analysis but rather a new instrumental analysis for organic chemists. It is this reviewers' emphatic opinion that this should not be the case. Identification of organic compounds in the research laboratory is now primarily a matter of physical methods.

The book consists of an introductory chapter, chapters on mass spectra, infrared spectra, nuclear magnetic resonance spectra, and ultraviolet spectra, a chapter with 20 sets of spectra with detailed analysis, a chapter containing 10 sets of spectra with Beilstein references to answers, and a chapter of 10 sets of spectra with no answers. The order of the various types of spectra gives an indication of the relative emphasis given to each. Mass spectra are made the basis of analysis. This emphasis on mass spectra will compensate in part for the lamentable lack of coverage of this topic in many courses dealing with physical methods. The decision to include a chapter tying together the various spectral methods by analysis of specific compounds was an excellent one. The corollary decision to reduce to a minimum specific examples in the first five chapters was exceedingly unfortunate.

The chapter on mass spectra contains a rather ponderous (in terms of chapter size) appendix of masses and isotopic abundance ratios for various combinations of carbon, hydrogen, nitrogen, and oxygen (mass 12–250) which is required for the problems. The discussion of mass spectrometry is quite satisfactory, but it would have been nice to have at least one example of the application of mass spectrometry to a complex molecule (such as one of the indole alkaloids).

The chapter on infrared spectrometry is quite good as an introduction to the subject. There is no mention of the relationship of infrared spectra to near infrared and Raman spectra. The examples of hydrogen bonding studies shown (p. 61) have the spectra upside down relative to other infrared spectra. This will be confusing to the student. Readers will miss an excellent follow-up to this introductory chapter since no reference is made to Nakanishi's book on infrared spectra.

The chief disadvantage of the chapter on nuclear magnetic resonance spectra is the lack of examples. Only three examples are shown and unfortunately the first two of these were run at 30 Mc. with benzene as reference standard. It would certainly have been better to replace these with 60 Mc. spectra calibrated relative to tetramethylsilane. Additional examples of spectra would have added clarity at several points in this chapter, for example, in the discussion (p. 81) of double-irradiation techniques. The coupling constants given as appendix D are somewhat dated and could have been brought up to date. One cannot help but deplore use of the term peaklets to designate small peaks in spectra, n.m.r., or otherwise.

The chapter on ultraviolet spectra is very satisfactory. It would seem desirable to have shown at least one ultraviolet spectrum to give the reader an appreciation of their general appearance. There is one serious omission in the coverage of ultraviolet spectra. No mention is made of the additivity principle in regard to the spectra of molecules containing two or more isolated chromophores.

Chapter six in which sets of spectra (MS, IR, NMR, and UV) for twenty compounds are analyzed in detail will be the most rewarding chapter for the student. If the reader solves these problems before consulting the analysis, he will be annoyed to find that for compound 4 (p. 115), "We overlook several minor peaks in the NMR spectrum as evidence of small amounts of an impurity," after he has been informed (p. 104), "The samples are quite pure."

The problems in chapters seven and eight are excellent and students approaching spectra for the first time will find them challenging. In problem 9 (p. 170) of chapter eight the P + 1 peak is 7.00% of the parent ion peak rather than 7.36% as given.

Over-all this is a good book and one which should be widely used. The level of the book is about right for the first year graduate student. More advanced students and chemists not familiar with spectrometric methods of organic chemical structure analysis will profit by studying it. Most organic chemists will find the problems a pleasantly amusing intellectual exercise. It should be emphasized that this book is an introduction to the application of spectrometric methods to structural problems. The serious student of organic chemistry must go deeper, especially in mass spectrometry and nuclear magnetic resonance spectroscopy.

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