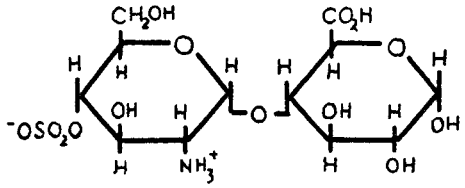
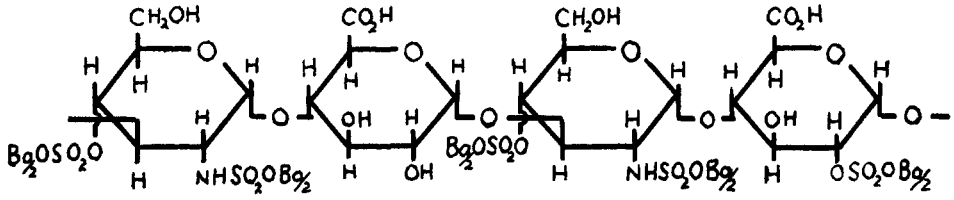


I



II

oxidant, 2; HCO_2H, 1; HCHO, 0; hexuronic acid (only) destroyed.

Favoring pyranoid rings, the above data indicate I as highly probable for heparosinsulfuric acid and II for barium acid heparinate. The amino groups in II are shown sulfated in view of the work of Jorpes and co-workers.[6] The strongly positive rotations of heparin and its derivatives make the α-D-linkages probable. The O-sulfate placement in the D-glucuronic acid component is limited to one of the four secondary hydroxyl groups. Alkali-treated heparin shows by periodate 2 α-glycol groups per tetrasaccharide unit. The inactivation of heparin by mild acidity with no sulfate loss and with the appearance of a free amino group[2,7] may be caused by sulfate migration from N to O (probably C-3 of the uronic acid), a postulation which will require additional experimental evidence.

(6) J. E. Jorpes, H. Boström and V. Mutt, *J. Biol. Chem.*, **183**, 607 (1950).

(7) M. L. Wolfrom and W. H. McNeely, THIS JOURNAL, **67**, 748 (1945).

DEPARTMENT OF CHEMISTRY
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RECEIVED OCTOBER 23, 1950

BOOK REVIEWS

Advances in Colloid Science. Volume III. Edited by H. MARK, Polymer Research Institute, Polytechnic Institute of Brooklyn, Brooklyn, New York and E. J. W. VERWEY, N. V. Philips Gloeilampenfabricken, Eindhoven, Holland. Interscience Publishers, Inc., 99 Livingston Street, Brooklyn 2, N. Y., 1950. xi + 384 pp. 16 × 23.5 cm. Price, $7.50.

This is the third volume of a series started in 1942. Inasmuch as the second volume appeared in 1946, the successive volumes have been published at four-year intervals. This perhaps constitutes about the right interval of time for the evaluation and recording of the major advances in a continuously expanding science. In the Preface of Volume I the editors expressed the hope that "Advances in Colloid Science could cover world wide developments." Owing to major disorganization, international in scope, the hope expressed could not be entirely fulfilled in any of the volumes to date. In the present volume, however, a gain in that direction has been made, for at least one-half of the contributors are from countries outside of the United States. As in the earlier volumes, the authors were selected because of their favorable reputation and close identification with the field in question. This volume consists of eight sections, the general contents of which are indicated below.

In the first section, "Atomic Forces and Adsorption" by J. H. deBoer, is given a masterful and well integrated presentation of fundamental concepts and theories relating to adsorption. This timely contribution should serve as a stimulating and helpful guide to the very great number of persons who are now working in the field of adsorption.

The second section, "Surface Chemistry and Colloids" by A. E. Alexander, treats of surface properties and of surface films as related to various colloidal systems. These topics are given detailed treatment with special consideration given to the application of surface chemistry to systems of proteins, polymers, foams, emulsions and pastes as well as to different biological systems. This contribution serves to bring out the importance of interfacial studies and the need of further researches pertaining to them.

A specialized treatment of "Quantitative Interpretation of the Electrophoretic Velocity of Colloids" by J. Th. G. Overbeck, emphasizes the important part that electrophoretic experiments have played in the development of colloid science. The author discusses the early work and the classical concepts of electrophoretic velocity as also the fundamental theories with formulations which must be considered. He believes that the inclusion of the "relaxation effect" in the theory of electrophoresis has strengthened the basis for estimating the Zeta potential from electrophoretic mobility. He emphasizes that more and better experimental data are needed and mentions types of investigations that should be productive of useful data.

A fairly short section on "Lyogels" by E. A. Hauser and D. S. LeBeau gives the various theories which have been presented for lyogel structure. A lyogel is defined by the authors as "a colloid semisolid system rich in liquid, its disperse phase characterized by a strong adsorptive capacity for the dispersion medium (solution). The liquid phase, which can be colloidal sol itself, must solvate but not dissolve the gel-forming colloid." It is gratifying to

have someone attempt a specific definition for this heretofore practically undefined, or at best, ill defined, term. Some of the properties of lyogels as thixotropy, dilatancy, rheopexy and elasticity are discussed with examples; special consideration being given to the lyogel polymers of rubber.

A section on "Ultra Centrifugal Sedimentation of Polymolecular Substances" by Per-Olof Kinell and Bengt G. Rånby, gives a fairly complete picture of the development and the present status of the ultracentrifuge as a tool for studying the properties of molecules, particularly of the high polymers in solution. A discussion was given of the work done and the conclusions reached in a study of the polymers of cellulose nitrate, methyl methacrylate and polystyrene. No other workers are in a better position to furnish more authoritative information on ultracentrifugal techniques and developments.

The section on "Fatigue Phenomena in High Polymers" by J. H. Dillen is the longest section. It covers approximately 100 pages and presents a fairly condensed, clearly presented, and reasonably complete treatment of the causes of, and tests for, fatigue in plastics. One hundred eighty-eight references are included. This section will be of special value to those interested in textiles.

The last section, "Flotation" by Strathmore R. B. Cooke, outlines and summarizes the more important principles underlying the process of flotation and indicates the more important recent contributions to the subject. While this section presents but little that, fundamentally, is really new, it does serve to give a good over-all picture of the present status of the flotation processes.

It is of interest to note that practically no specific subject treated in this volume had received treatment in either of the preceding volumes. This is gratifying and tends further to emphasize the very wide scope of this science.

There appears to be but little, if anything, that can be criticized in this book. Each section represents an important phase of colloid science, and each is so well written and is so clearly presented that anyone interested in the subjects must gain information and inspiration from reading them. This high quality is, of course, to be expected since each section was written by an outstanding authority in the field. This volume constitutes a valuable addition to, and a creditable extension of, Advances in Colloid Science.

The editors, as also the authors, are to be commended for making this worthwhile book available. Since this field is extensive, and its advance is continuous, it is to be hoped that additional volumes, with quality comparable to that of existing volumes, will continue to appear.

DEPARTMENT OF CHEMISTRY
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Elastomers and Plastomers. Their Chemistry, Physics, and Technology. Volume I. General Theory. Edited by R. HOUWINK, External Lecturer in the Technical University at Delft (Netherlands). Elsevier Publishing Company, Inc., 250 Fifth Avenue, New York 1, N. Y., 1950. xiv + 495 pp. 18 × 25 cm. Price, $7.00.

This book is the first of a three volume series, the other two being concerned solely with practical aspects of the subject. Volume I consists of ten chapters as follows: 1. Economic Aspects by H. A. Frank. 2. Organic Chemistry by C. Koningsberger. 3. Reaction Kinetics and Mechanism of Polyreactions by H. Wechsler, W. P. Hohenstein and H. Mark. 4. Molecular Constitution by G. J. van Amerongen. 5. Mechanical Properties by G. J. van Amerongen. 6. Physics and Structure by G. J. van Amerongen. 7. Electrophysics by L. Hartshorn. 8. Mechanical Operations by H. Gibello. 9. Polymer-Liquid Interaction by G. J. van Amerongen. 10. Plasticizers by R. S. Colborne.

The first chapter consists of statistical data of no more than casual interest to the scientist, and largely out of date or incomplete. The second presents an introductory account of the various types of polymers and polymerization reactions. The third chapter covers the kinetics of polymerization of unsaturated monomers comprehensively. The theory of absolute rates, copolymerization and cationic polymerization are discussed. Unfortunately, the more recent work of Smith and Ewart on emulsion polymerization mechanism apparently appeared too late (1948) to be included here in the discussion of heterogeneous polymerization.

The fourth chapter deals only with types of inter- and intramolecular forces involved and briefly with the morphology of polymers. The fifth chapter gives a good account of the current status of so-called second order transitions in polymers, the theory of rubber elasticity, plasticity and viscoelastic phenomena complete with a generous complement of the usual combinations of springs and dashpots. The chapter on "Physics and Structure" covers in introductory fashion X-ray methods, orientation and streaming birefringence, infrared and ultraviolet spectra, and permeability of polymers to gases as well. In Chapter 9 polymer solution thermodynamics, swelling and fractionation theory, osmometry, viscometry, light scattering and ultracentrifugation are discussed. The introduction of molecular weight determination methods so near the end of the book is regrettable. Chapters 5, 6 and 9 in the opinion of this reviewer are among the best which appear in this volume, however.

Chapters 7, 8 and 10 are written primarily from the point of view of the technologist. Chapter 8 gives a well illustrated discussion of procedures used in the fabrication of high polymers and can be recommended to the scientist who may be interested in the clever (and brutal) contrivances employed in fashioning useful objects from high polymers.

As is almost invariably true of books which consist of collections of chapters written by various authors, this one suffers from a certain unevenness. Some of the subject matter is developed descriptively without adequate accounts of basic theory and crucial experiments. This may be excused on account of the limited space allotted for treatment of fundamental aspects of the subject. Repetition of the same subject matter (*e. g.*, free radical polymerization, and solution thermodynamics) in different chapters, while certain other phases of the subject (network structures and gelation) scarcely are touched upon at all, is unfortunate. On the other hand, the exposition generally is clear and will be read with profit by newcomers to the field as well as by those working in one branch who seek familiarity with other lines of endeavor in the polymer field. The admixture of science and technology in a volume entitled "General Theory" may appear odd, and certainly is unconventional, but perhaps it is not without merit.

DEPARTMENT OF CHEMISTRY
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ITHACA, NEW YORK

Destillier- und Rektifiziertechnik. By DR.-ING. EMIL KIRSCHBAUM, Professor an der Technischen Hochschule in Karlsruhe. Springer-Verlag, Reichpietschufer 20, Berlin W 35, Germany. 1950. Zweite Auflage. xvi + 465 pp. mit. 294 abbildunger im text und 23 kurventafeln. 16 × 24 cm. Price, paper, DMark 45.—; bound, DMark 49.50.

This entire book might well be required reading for doctorate candidates in Chemical Engineering, and parts of the book would be similarly useful in the fields of physical and organic chemistry. Besides the training in language and the technical information acquired, the readers should end with a better understanding of how differently the same phenomena are approached and expressed in different parts of the world.

In spite of the omission of much that is in common use, the contents appear to bring together a more complete and thorough-going discussion than that of any other book on distillation. The reasoning and explanations are careful

and detailed, so that, assuming ability to read German, a novice will probably find the book helpful in gaining understanding of distillation theory.

Those regularly concerned with distillation problems should have the book at hand because of the help it might give in suggesting entirely new solutions to difficult problems. The importance of heat balances and heat transfer between phases is emphasized throughout, as would be expected from the background and other publications of the author.

Considerable new material has been added compared with the first German edition and its translation. Most notable are the discussions of flash and equilibrium distillation, of equilibrium in multicomponent mixtures, a comparison of batch and continuous distillation, and considerable new material on larger size packings and packed columns. Little is said of extractive distillation and holdup is not mentioned in connection with batch derivations.

The major subdivisions are theory (units, vapor-liquid equilibrium, partial condensation, and heats of vaporization); simple distillation; the rectifying column (basic theory and action, layout, theoretical plates, minimum reflux and heat consumption); continuous distillation; enthalpy concentration diagram; multicomponent separations; plate design and efficiency; packed columns; heat exchangers and controls (very brief). Molecular distillation is omitted.

The symbols and units will be a great trial to American readers, and the style may be disturbing to some. The binding and general appearance are typically European, but the printing and figures are of high quality. The large number of figures are a great aid in following the text. The graphs and tables of vapor–liquid equilibrium data for 158 binary systems are enough to justify possession of the book.

DEPARTMENT OF CHEMICAL ENGINEERING
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Advances in Protein Chemistry, Volume V. Edited by M. L. ANSON, Continental Foods, Inc., Hoboken, New Jersey, JOHN T. EDSALL, Harvard Medical School, Boston, Massachusetts, and KENNETH BAILEY, Associate Editor for the British Isles, Trinity College, Cambridge, England. Academic Press, Inc., Publishers, 125 East 23rd Street, New York, N. Y., 1949. ix + 481 pp. 15.5 × 23.5 cm. Price, $7.50.

The fifth volume of this series contains eight contributions covering broad aspects of protein chemistry of considerable importance to anyone interested in proteins. In every case the contribution is written in a most authoritative manner by individuals who have worked and achieved distinction in the area of investigation which is presented. The book carries an international flavor since four of the contributions are by authors residing in foreign countries. The first chapter on the synthesis of peptides by Fruton contains a wealth of information concerning this very important phase of protein chemistry. The second chapter on the amino acid composition of purified proteins by Tristram provides a critical analysis of methods and of the results that have been achieved. Here again there is an assemblage of a great mass of important data. Anyone interested in fundamental protein chemistry should read these two chapters.

The remaining six chapters are generally characterized by somewhat more specialized research areas. Allison describes the biological evaluation of proteins by means of several approaches in the third chapter. Chapter Four contains a thorough discussion of milk proteins by McMeekin and Polis. A very complete modern presentation of work on plant proteins, based largely on phylogenetic considerations, is given in the next chapter by Lugg. A chapter by Lundgren on synthetic fibers made from proteins contains a good discussion of the more fundamental aspects of problems related to fiber formation despite the intention to maintain a practical point of view. Another good example of a happy and instructive combination of practical and fundamental aspects is provided in the chapter on some protein–chemical aspects of tanning processes by Gustavson of the Swedish Tanning Research Institute. A short chapter on proteins, lipids and nucleic acids in cell structures and functions by Claude completes the book. Each chapter contains an instructive and detailed list of contents and an adequate list of references. The book as a whole contains good author and subject indexes. It is a relatively easy matter to find specialized information in any aspect of protein chemistry covered by the present reviews and this makes the book a very usable one. The book should be regarded as required reading for all who are interested in the broad aspects of protein chemistry despite the fact that some chapters are rather specialized.

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Analytical Absorption Spectroscopy. Edited by M. G. MELLON, Purdue University, Lafayette, Indiana. John Wiley & Sons, Inc., 440 Fourth Ave., New York, N. Y., 1950. vii + 618 pp. 15 × 23 cm. Price, $9.00.

This treatise on "Analytical Absorption Spectroscopy" is a co-authored compilation of nine chapters each by a separate authority, including the editor who has prepared the chapter on "General Principles." The authors of the separate sections are indicated, in this review, in parentheses following the titles of the sections. There is a better coördination and fusion of chapters in this compilation than is usually found in this type of multi-authored text. In some respects this had led to uniformity of presentation but when the presentation may be at variance with commonly accepted practice it becomes a little confusing, *i.e.*, transmittance rather than absorbance, with values from 0.01 to 0.95 in a logarithmic scale. This provides curves which are essentially on a linear absorbance scale but with minima where one usually expects maxima.

The reviewer does not concur with the editor's reasons that "since the measurements are physical and since physicists have recommended certain usage" a new and different nomenclature should be used. The fact is that the method is primarily used by chemists and biologists to whom the book is directed. The same arguments may apply to the medical use of microscopes. As an example, the consideration of absorbance in solution, A_s, as a special case of absorbance, A, serves to complicate rather than simplify chemical presentation. The general use of new and unusual nomenclature and symbols, as if they were commonly accepted and without an adequate explanation as to the reason for their use in place of commonly accepted terminology is not easily accepted by the reader.

1. The introductory chapter on "Chemistry: Preparation of Systems for Absorptimetric Measurement" (by M. L. Moss) considers the chemical problems involved in colorimetry and the form of material for analysis with special considerations as to complex formation, interfering materials and stability of absorbing materials.

2. In a discussion on "Physics: General Principles of Absorptimetric Measurements" (by M. G. Mellon) the editor considers nomenclature, form of presentation and the origin of absorption spectra in chemical compounds.

3. "Color Comparimeters" (by W. B. Fortune) considers the application of colorimeters for color matching and pH determination.

4. "Filter Photometers" (by R. H. Müller) presents the intermediate approach to spectrophotometry through the use of transmission filters to simulate a partial spectral dispersion of the radiant energy of the source.

5. "Spectrophotometers: Ultraviolet and Visible Regions" (by K. S. Gibson) includes an extension of the

absorption laws in Chapter 2 and a general discussion of accuracy, calibration and instrumental errors as well as instrument design and operation.

6. "Photographic Methods" (by E. R. Holiday) is the only chapter using the more widely adopted terminology of the literature, such as ϵ for molar extinction. The effectiveness of this chapter is somewhat reduced in importance by the recent advances in photoelectric spectrophotometers, although for certain studies in resolution of band absorption one may still have to rely on photographic methods and procedures which have been described in some detail.

7. "Applications of Ultraviolet and Visual Spectrophotometric Data" (by E. I. Stearns) although following the nomenclature of the editor's chapter presents data in a functional ordinate and abscissa which may be difficult to transfer to other data. With the exception of the use of transmittance rather than absorbance in the analytical comparison of concentration and identity, there is not a serious objection to the system used provided it is known and understood by the reader. Most of the discussion deals with solution effects, dissociation, concentration, *p*H and fluorescence. A presentation which is most welcome in view of the mounting tide of spectrophotometric data is a discussion on identification by curves and catalog systems of filing. To the applied research worker in chemistry and biochemistry this may be the most useful section, providing the nomenclature innovation and data presentation methods can be comprehended.

8. "Spectrophotometers: Infrared Region" (by L. J. Brady). The discussion in this chapter is a brief general résumé of the nomenclature, theory, instrumentation and data presentation of infrared data, much as the previous chapters have considered the field of visible and ultraviolet regions. Operational suggestions are made on choice of cells, solvents, measurement conditions, and application to qualitative and quantitative procedure.

9. As in the case of the preceding chapter, the last chapter on "Measurement and Specification of Color" (by D. B. Judd) presents a separate survey of this important field with a critical comparison of methods of color notation and description by name and symbols as well as graphical assignments in different systems.

The compilation as a whole, in spite of its radical divergence from accepted terminology and presentation methods, is highly recommended as a reference work as well as a stimulus to research thought.

NATIONAL BUREAU OF STANDARDS
WASHINGTON 25, D. C. WALLACE R. BRODE

BOOKS RECEIVED

October 10, 1950–November 10, 1950

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