BOOK REVIEWS

Actualités de Phytochimie Fondamentale. By CHARLES MENTZER, Professeur au Museum National d'Histoire Naturelle, and OLGA FATIANOFF, Ingénieur Agronome. Masson et Cie., Editeurs, 120 Boulevard Saint-Germain, Paris VI, France. 1964. 266 pp. 16.5 × 21.5 cm. Price, 85 F.

Structural unities, deduced by molecular dissection, have been of great service in the chemical investigation of natural plant products. Professor Mentzer and Miss Fatianoff have presented in this small volume a brief discussion of what has come to be designated "biogenetic theory" in relation to the occurrence of these unities within certain classes of plant constituents. Their treatment is neither detailed nor sophisticated. Instead, it takes the form of a general introduction to the subject with numerous elementary examples. Emphasis is placed upon the identification of structural elements which plausibly may be thought to arise from acetate (C_2), an isoprenoid (C_5), and shikimic acid, respectively. A useful feature in this regard is the discussion of a number of compounds of relatively rare occurrence and obscure documentation. Most unhappily, since the term "biogenesis" implies some degree of association with "biosynthesis," the authors have made little effort to bring their discussion into a contemporary perspective with regard to the latter term.

The unique and valuable part of the book is a catalog with bibliography covering 141 pages. The catalog provides in tabular form the names, structures, empirical formulas, botanical origins, some physical constants, and reference citations for 425 natural plant products. Included among these are some cyclitols, nonprotein amino acids, some thiocyanates, ethylenic and acetylenic acids, and many cyclic and polycyclic compounds including terpenoids, genins, and polyphenols. Chemists and biochemists interested in plant products belonging to these classes will find this book well worth the price. Unhappily, the alkaloids, most of the fungal antibiotics, polycondensed molecules (proteins, polysaccharides, etc.), porphyrins, and many other classes of plant constituents are omitted.

One cannot avoid comparing this book with the "Merck Index." The latter is not confined to plant products, but it does treat many of them. On the other hand, it presents much more useful information about individual compounds and it does so in less space, relatively speaking. The reviewer would welcome a volume combining the better points of both the "Merck Index" and the Mentzer–Fatianoff book. More extensive coverage of plant constituents and more complete information regarding botanical sources than are provided by Professor Mentzer combined with the detail and format of the Merck volume would make a first-rate and exceedingly valuable handbook. It is to be hoped that the Mentzer–Fatianoff publication represents but a first step in this direction.

The book is printed on good paper, the type impression is clear, and the jacket is heavy paper. It is stated that the plan permits the addition of fascicles from time to time in the interest of updating the catalog and bibliography.

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The Analytical Chemistry of Thorium. By D. I. RYABCHIKOV and E. K. GOL'BRAIKH. Pergamon Press, The Macmillan Co., 60 Fifth Ave., New York 11, N. Y. 1964. 316 pp. 14.5 × 23 cm. Price, $14.00.

The present monograph is the inaugural volume of a 50-volume series on the analytical chemistry of the elements being published under the auspices of the V. I. Vernadskii Institute of Geochemistry and Analytical Chemistry of the Academy of Sciences of the U. S. S. R. As such, it may well establish a pattern for subsequent volumes. If it does, the quality and utility of the series will be assured, for "The Analytical Chemistry of Thorium" is an excellent book—comprehensive, well-organized, well-written, well-documented, clearly translated, and carefully edited by Drs. R. Belcher and L. Gordon.

The textual material covers, in order, the occurrence of the element and its properties, methods for determining thorium, methods of separating it from associated elements, the determination of thorium in natural and industrial materials, and the determination of impurities in metallic thorium. Each topic is handled in considerable detail, with inclusion of specific procedural directions wherever possible and of adequate literature citations. The limitations of each procedure are clearly delineated. Detailed referencing in the text continues only through 1955, but a supplementary bibliography through at least part of 1962 has been appended.

The general format and printing have been very well handled. Few errors, and none of them serious, have been detected.

This volume is recommended to the analyst who deals with any phase of the analytical chemistry of thorium, to the teacher who concerns himself with the heavy elements as such or with analytical problems in general, and to the student who values a condensation of information within a given area of chemistry.

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Mass Spectrometry. Edited by CHARLES A. MCDOWELL, Department of Chemistry, The University of British Columbia, Vancouver, B. C., Canada. McGraw-Hill Book Company, Inc., 330 West 42 St., New York, N. Y. 10036. 1963. x + 639 pp. 16 × 23.5 cm. Price, $20.00.

Mass spectrometry has developed rapidly following the impetus it received during the war. In common with other modern instrumental techniques, this development has produced specialists in one of three main areas. First, there are the experts in the physics of the instrument itself. They design and build new or improved types of instruments, determine how closely the performance agrees with theoretical predictions, and then immediately begin the next one, rarely stopping on the way to measure anything. At the other extreme are the chemists who exploit the analytical properties of the technique, and who generally use commercial instruments without modification. In between there are the chemical physicists and physical chemists who use the technique for obtaining information about molecular properties and processes. Although they also use the instrument primarily as a tool, their particular applications often require them to be involved in its design and construction.

While a number of books on mass spectrometry have been published recently, they have perforce been written by experts in one or other of the above categories and have consequently been somewhat lacking in the others. This book has attempted to circumvent these difficulties by presenting an anthology of twelve chapters, each written by different specialists. This attempt has been largely successful.

The first half of the book is concerned primarily with instrumental design and associated problems. The last half discusses some of the more important applications. The book starts with a succinct description of the different types of mass spectrometers available today, including the newer nonmagnetic instruments. The next short chapter entitled "Mass Spectrometry in Research" is somewhat misplaced, since most of the material is covered again in the last half of the book. This is followed by a chapter on the various means of forming ions in mass spectrometer sources. The author shows remarkable restraint in avoiding undue reference to his company's products. The next chapter on "Ion Optics" is perhaps misnamed. The author gives an extremely detailed treatment of the ion focusing characteristics of magnetic fields but barely mentions electrostatic lenses. This is probably because theory is incapable of accounting for the effects of the many perturbations which occur in mass spectrometer ion sources, and empirical methods are generally used in their design. However, since electrostatic lenses are required in all types, including nonmagnetic mass spectrometers, some of the more practical aspects of their design and operation would have been appreciated.

The chapter on high resolution instruments is expertly written, but it again is so detailed that much of it will be of interest only to the advanced instrument designer. On the other hand, the chapters on electronic circuitry and vacuum techniques contain

much material of interest to all but the analyst who never intends to modify a commercial instrument. For him the chapter on analysis will hold the greatest interest. Not only does it review all the important analytical techniques, but also gives sufficient information about the different commercial instruments to help him select one best suited for his requirements.

Two very comprehensive and authoritative reviews on isotope and free-radical mass spectrometry are presented by the heads of the outstanding groups in these areas. Both are highly readable. The final two chapters are concerned with research applications in chemical physics. One describes the measurement and interpretation of appearance potential measurements using electron and photon impact sources, as well as discussing other primary ionization processes. The other is a very well-written, if somewhat too brief a treatment of the increasingly important field of ion–molecule reactions. One would have liked to see included in this chapter a discussion of the equally important, related processes, such as charge transfer, atom–ion interchange, etc.

The book is relatively free of mistakes and typographical errors with one notable exception. The Editor's own chapter is replete with both, the most serious of which is a misstatement of Stevenson's rule. Presumably he was too busy editing the other chapters to be concerned with his own. The other chapters do, however, present us with some rather horrendous additions to the technical vocabulary such as *refilamented*, *monochromatize*, and *deboltzmannization*. But the prize must surely be awarded for *nonendoergeticness*.

In his introduction, the Editor admits that the advantages gained by the use of many authors may be offset by a lack of uniformity in style and outlook. Confession does not, however, bring automatic absolution. This nonuniformity, coupled with a considerable amount of redundancy, and some serious omissions are the main faults of the book despite the excellence of many of the individual contributions. Thus, for example, photoionization is described in several chapters, and we really do get to know that J. J. Thomson, Aston, and Dempster had something to do with early mass spectrometers. Some notable omissions are: the use of mass spectrometers in (1) plasma research, (2) upper atmosphere composition studies, (3) crossed beams and other important atom physics research such as those being conducted at University College and the University of Pittsburgh.

In spite of these short-comings, it is undoubtedly the most authoritative and comprehensive single volume on mass spectrometry and will find its place on the bookshelf of anyone involved with any aspect of this complex field.

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Macromolecular Synthesis. A Periodic Publication of Methods for the Preparation of Macromolecules. Volume I. Edited by C. G. OVERBERGER. John Wiley and Sons, Inc., 605 Third Ave., New York 16, N. Y. 1963. ix + 81 pp. 15 × 23.5 cm. Price, $4.75.

"Macromolecular Syntheses" is a projected series of publications on detailed laboratory methods for the preparation of polymers. The title recalls the extremely useful series, "Organic Syntheses," and, indeed, the format of the new work is that of the latter. Each preparation consists of Procedure, Notes, Methods of Preparation, and References; the category of Characterization has been added in some, but not all, of the examples. In those where the latter does not appear, however, some of the expected information generally does. For example, a solution viscosity number, molecular weight–viscosity equation, polymer melt temperature, cystalline melting point, glass temperature, density, X-ray diffraction spacings, fiber repeat distance, infrared absorptions, elemental analyses, and mechanical properties (in one instance) appear, although coverage is quite varied, even for equally well-known polymers. In the preparation of crystalline polystyrene, for example, the only characterization given is for "m.p."; no indication of molecular weight is given, and the only notice taken of the crystalline nature of the product appears in the title heading. On the other hand, syndio- and isotactic poly(isopropyl acrylates) are prepared and characterized in considerable detail as to viscosity–molecular weight relationships, infrared maxima, and X-ray diffraction *d*-spacings, along with other helpful information on, and references to, properties. While the latter polymers represent exceptionally well-characterized examples, the average polymer in the book, to its credit, is better characterized than the first mentioned.

Directions for the preparation of nineteen polymers are given. For some of them, more than one polymerization scheme is given, *e.g.*, free-radical bulk and cationic solution methods for atactic polystyrene. In addition to the polymers already noted, the contents include: bisphenol-A polycarbonate, poly(hexamethylenesebacamide) by interfacial polycondensation, poly(ethylene terephthalate), poly(methyl methacrylate) suspension polymer, poly(acrylic anhydride), ethylene–maleic anhydride copolymer, poly(propylene maleate phthalate), polydisulfide of 1,9-nonanedithiol by catalytic air oxidation, crystalline poly(vinyl chloride) prepared in an aldehyde medium, stereoregular poly(vinyl trifluoroacetate) and poly(vinyl alcohol), poly(*n*-hexyl 1-nylon), poly(2,5-dimethyl-2,4-hexadiene), poly(1,4-butylene hexamethylene carbamate), poly[ethylene methylene bis(4-phenyl carbamate)], and poly(2,6-dimethyl-1,4-phenylene ether). In keeping with the "Organic Syntheses" style, each preparation has been checked in another laboratory from that of the submitters. The extent of detail provided for execution of each polymerization appears very satisfactory.

It is difficult to fault what will be a multivolume series for the examples selected for appearance in the first volume. In fact, selections in this volume are representative of a sufficient number of polymer types and polymerization reactions to make it quite a valuable source in itself. It is intended that polymers of all types will be included in future volumes, including those of biochemical interest.

The objectives of the editorial board are to provide trustworthy examples for organic laboratory courses and specific assistance for industrial laboratories without polymer experience in a given area. This series should be as successful in serving neophyte and experienced organic polymer chemists as the "Organic Syntheses" series is for organic chemists in general. Many of the latter will use the new polymer series and feel entirely at home in doing so. In this respect, "Macromolecular Syntheses" is another successful and significant effort to put organic polymer chemistry in its correct perspective as a logical segment of synthetic organic chemistry. Volume I of the new series can be highly recommended to anyone working in the organic polymer field or wishing to try his hand there. In all probability, "Mac Syn" will become a standard reference to as many chemists and students as has "Org Syn" over the years.

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Foundations of Thermodynamics. By PETER FONG, Professor of Physics, Utica College, Syracuse University. Oxford University Press, 417 Fifth Ave., New York 16, N. Y. 1963. x + 94 pp. 14.5 × 22 cm. Price, $2.50.

The purpose of this book is to present the author's original development of the logical structure of equilibrium thermodynamics. The book begins with a very short chapter on the zeroth law of thermodynamics, followed by a hasty discussion of the first law. The treatment of these two laws is conventional. The *raison d'etre* for the book is the third chapter, which deals with the second law and represents approximately half of the book. The book ends with short chapters on applications and on the microscopic interpretation of the zeroth, first, and second laws.

In the third chapter the author rejects both the Clausius–Kelvin and the Carathéodory approaches to the second law and instead introduces his own development. He first considers a quantity ϕ, called the *potential of spontaneous transition*, which is a function of the thermodynamic variables (*e.g.*, pressures and volumes) for a composite system made up of two (or more) equilibrium systems with different temperatures, pressures, and compositions. This potential ϕ always increases as the composite system attains equilibrium, *i.e.*, as the substituent systems become uniform in temperature, pressure, and composition by means of heat exchange, volume change, and diffusion across boundaries. The author then determines how ϕ changes in various experimental situations and ultimately shows that ϕ possesses all the properties that are associated with the entropy in the conventional formulation of the second law.

Although this approach to the second law is carefully thought