Additions and Corrections

1975, Volume 18

E. J. Warawa, N. J. Mueller, and Jonas A. Gylys: Quinuclidine Chemistry. 3. β-*cis*-2-(4′-Chlorobenzhydryl)-3-quinuclidinol, a New Central Nervous System Stimulant. Importance of the Benzhydryl Configuration.

Page 73. The first complete sentence in the left column should read as follows. At the highest dose tested in blood pressure studies 2β (5 mg/kg iv) and methylphenidate (4 mg/kg iv) failed to produce a significant effect (>10%) while *d*-amphetamine at 0.1 mg/kg iv caused a 30% increase.

L. J. Schaad, R. H. Werner, Lynn Dillon, Lamar Field, and C. Emory Tate: Linear Regression Analysis of Inhibitory Potency of Organic Disulfides against *Histoplasma capsulatum*.

Page 348. In Table II, the structure for group no. 34 should be $-C(O)C_2H_5$.

Page 349. In Table III, the heading for the right half should be Groups for Outer Positions X_1 and X_4[c].

G. R. Gapski, J. M. Whiteley, J. I. Rader, P. L. Cramer, G. B. Henderson, V. Neef, and F. M. Huennekens: Synthesis of a Fluorescent Derivative of Amethopterin.

Page 527. In the last line of Table I, the K_m values are reversed. The correct values for the K_m, MTX are 1.3 μ*M* (L1210) and 0.35 μ*M* (*L. casei*).

Pannalal Kole, Suprabhat Ray, Ved P. Kamboj, and Nitya Anand: Studies in Antifertility Agents. 11. Secosteroids. 5. Synthesis of 9,11-Secoestradiol.

Page 766. The melting points for compounds 11 and 12 have been interchanged. The melting point for compound 11 should be 146° and for compound 12, 195°.

Book Reviews

Advances in Pharmaceutical Sciences. Volume 4. Edited by H. S. Bean, A. H. Beckett, and J. E. Carless. Academic Press, London. 1974. 444 pp. 16 × 23.5 cm. $35.00.

The volume is made up of four different subject areas that shall be considered individually in this review. The first area is the "Rheology of Pharmaceutical and Cosmetic Semisolids" by B. W. Barry in which the basic theme is that traditional rheological studies of semisolids do not recognize the viscoelastic nature of these systems. Traditional studies assume that semisolids are merely anomolous liquids while the viscoelastic approach treats semisolids as materials having both liquid and solid properties, hence the term viscoelastic. The author develops the viscoelastic approach using soft paraffins and their formulations, ternary systems, and o/w emulsions as examples. Mathematical treatments are not stressed resulting in increased readability, simplicity, and permits space to develop the general concepts involved and the usefulness of the approach. The chapter does require some elementary knowledge of pharmaceutical rheology on the part of the reader. Traditional rheological studies (continuous shear analysis) are covered using well-chosen examples illustrating the nature of rheograms and the information derived from them. Most of the chapter deals with the viscoelastic approach and has sections on the nature of viscoelastic behavior as well as the analysis of semisolid rheology using both creep and oscillatory methods and their mathematical interconversion. The subject is very well developed including a description of instrumentation, experimental procedures, and analysis of data. It is in the analysis of data that one really begins to appreciate the advantages of the viscoelastic approach in that the physical behavior of semisolids can be viewed and possibly explained at a molecule interaction level. The author includes a protocol that he uses when examining semisolids that can be used by academic workers or by a research and development technologist who must meet a production deadline. The application of the viscoelastic approach to biological materials (sputum, blood, synovial fluids) is an exciting prospect for the future although more baseline studies must first be developed.

The second chapter, "Determination of Thermodynamics of Functional Groups in Solutions of Drug Molecules", is written by S. S. Davis, T. Higuchi, and J. H. Rytting. This chapter deals with the concepts and the application of the group contribution approach to pharmaceutical sciences with particular attention to drug activity. The chapter clearly demonstrates the potential of the concept and clearly identifies the significance of thermodynamics in pharmacy. There is a section involving a brief review of equilibrium thermodynamics including a discussion of standard states and the authors' view on the use of the "proper" standard state. Another section deals directly with the group contribution approach including a detailed historical review and the application of the group concept to activity coefficients, solubility, partition coefficients, and other thermodynamic parameters. Partition coefficients are reviewed in particular detail with a discussion and comparison of the approaches made by Hansch and his group with those of Higuchi and his associates. This section as well as others contains numerous listings of group constants. Other sections of the chapter deal with the experimental determination of thermodynamic parameters from which group constants are derived and an extensive collation of group contribution values for the functional groups: methylene, methyl (which can be quite different than the methylene), branching, double bonds, ring compounds, halogens, and various polar groupings. The last large section of the chapter deals with applications of the group contribution approach and hydrophobic interactions to the understanding and prediction of structure–activity relations, drug–receptor interactions, protein conformation, chromatographic behavior, drug metabolism, surface activity (HLB, adsorption, etc.), drug transport, ion pair systems, complexation, and ion-specific electrodes. Hydrophobic interactions are treated briefly while structure–activity relations are considered in detail. It is clear that the authors feel that it is through the application of thermodynamics that a true understanding of drug action will be reached. This is a view not apparently shared by Hansch. The chapter is long (188 pp) and utilizes about 500 references but it is worthwhile reading.

The third chapter, "Radiopharmaceuticals", by D. E. Lovett provides an overview of the use of radiopharmaceuticals. It does not deal with any subject in depth but it can represent a recommended reading for interested persons or students taking a course in radiopharmacy. The first section is introductory containing definitions, rationale for the use of radiopharmaceuticals, types of radiation, methods of production, radiation hygiene, and the relevant contents of the British Pharmacopoeia. The second section covers materials supplied by manufacturers and outlines their use

in a variety of diagnostic procedures (blood volume determination and nine others). It also includes a description of clinical scintillation counting. Radionuclide generators are discussed in another section including their description and use. The section dealing with the hospital preparation of radiopharmaceuticals is divided into two parts: the dilution of a manufacturers finished preparation and the complete preparation of an iv injection using the eluate from a radionuclide generator. This section provides formulas for liver, lung, kidney, bone, brain, and spleen scanning but the author cautions that such formulas are continually being updated. Prior to discussing formulas some comment on the use of radiolabeled albumin, kits of inactive ingredients, and the value of chelating agents was required. The use of bactericides is covered in a section that appears to be authoritatively presented and does indicate the special problems associated with preserving radiopharmaceuticals. The area of quality control is considered and it involves radionuclide purity, radioisotope purity, radioassay, as well as those control parameters that apply to any pharmaceutical (chemical purity, sterility, particulate matter in parenterals, and pyrogen testing). These latter subjects are treated from the standpoint of the differences that apply to radioactive materials. Adverse reactions to radiopharmaceuticals are covered but it is apparent that chemical toxicity is not a real problem in comparison with radiological toxicity. It is evident that there will be a continuing need for the extemporaneous preparation of radiopharmaceuticals, for new formulations, and for personnel capable of performing both of these functions.

The fourth area considered in this volume is the "Rectal Administration of Drugs" by N. Senior. The general aim of this chapter as stated by the author is to evaluate rectal administration as an alternative or auxiliary to other routes of administration and to assess the potentialities of vehicles, the influence of excipients, and the processes used in manufacture. There is a general description of a suitable suppository base as well as a specific description of the characteristics of the bases used. Since the author apparently feels that there are sufficient negative reasons precluding the use of glycerogelatin bases, they are not discussed to any further extent in the chapter. The rectal retention fluid system is discussed as well as rectal capsules. Since the chapter provides a general approach to formulation and the principles involved in the choice of a vehicle, it may be of special interest to formulators of rectally administered drugs. An apparatus is suggested to compare in vitro release from various formulations pointing out that rates and temperatures at which a suppository is extracted with water are the dominant influences on results obtained. Problems associated with suspended solids, surface imperfections, and adjuvant addition are discussed. Several facets of quality control are outlined together with recommended procedures for carrying them out, including melting ranges, physical breakdown, and strength and firmness at normal and elevated temperatures. Although the author does not try to describe all the machinery used in the manufacture and packaging of suppositories, he does illustrate the various alternatives available. A final section deals with the absorption of drugs via the rectal route. After reviewing the mechanism of absorption in the rectum and also in other sections of the G.I. tract (cf. the work of Schanker, Beckett, Ho and Higuchi, Wagner), the chapter deals with specific drug absorption via the rectum including the effect of the vehicle. A rather wide range of different pharmacological classes of drugs is covered with what appears to be a broad literature search. In this chapter the logarithmic representation of Reigelmen's equation is misleading and Beckett's equation has a typographical error.

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Progress in Analytical Chemistry. Volume 7. Methods in Radioimmunoassay, Toxicology, and Related Areas. Edited by I. L. Simmons and G. W. Ewing. Plenum Press, New York, N.Y. 1974. 183 pp. 16 × 23.5 cm. $22.50.

This volume consists of selected papers from the 1973 Eastern Analytical Symposium held in New York City. The papers were chosen from different sessions of the Symposium, but generally the topics covered are radioimmunoassay and other radioisotopic assay methods, analytical toxicology, analytical electrochemical techniques, and special techniques in atomic absorption.

The first paper deals with the historical development of the radioimmunoassay technique originating from research on insulin to some of its more modern applications in endocrinology. A descriptive summary as to how radioimmunoassay has aided researchers working on parathyroid hormone, gastrin, insulin, and ACTH is presented in the remainder of this paper. The second paper describes an enzymatic–isotopic method used to assay for biogenic amines and lists, along with references, the amines which have been determined in tissues by this method. The third paper reverts to a discussion on the structure of parathyroid hormone and its immunoheterogeneity in reference to the type of antisera used in the radioimmunoassay of this hormone. Also discussed is the importance of this immunoheterogeneity in assessing parathyroid function. The fourth paper completes the series on radioisotopic assay methods by reviewing the research performed on vitamin B_{12} and folic acid using specific, macromolecular binders other than antibodies in the radioassay.

The main theme of the next three papers is toxicology, with the first two papers dealing only with a brief history of toxicology, defining its boundaries and concepts, and the analytical expertise needed by a forensic toxicologist. The following paper discusses the roles played by differences in metabolism between fetuses, newborns, and adults in prenatal and postnatal drug or chemical toxicity. This paper reviews the toxicological investigations on cyclophosphamide to illustrate the variables involved in such toxicity studies. The final two papers cover procedures used by the FDA to determine metallic residues in food by atomic absorption and to identify and quantify either inorganic or organic residues by polarographic and other electrochemical techniques. This paper on electrochemical methods is the most difficult to follow in the book, requiring a precursory knowledge of electrochemical theory.

Some of the assay methods and techniques discussed in this book could be useful to the pharmacologist and medicinal or pharmaceutical chemist; however, in the reviewer's opinion the papers do not offer the best comprehensive introduction to these analytical methods. Therefore, this book may be of only limited usefulness to the scientist being introduced to these assay methods, although those researchers involved in the areas described in these papers may find the material and references useful to their studies. Another drawback of this book is that it is overpriced for its content and inexpensive form of printing.

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Advances in Biochemical Psychopharmacology. 8. Narcotic Antagonists. Edited by M. C. Braude, L. S. Harris, E. L. May, J. P. Smith, and J. E. Villarreal. Raven Press, New York, N.Y. 1974. xiv + 592 pp. $32.50.

This tome is a collection of invited papers presented at the First International Conference on Narcotic Antagonists held at Airlie House in Warrenton, Va., in Nov 1972. Assisted by the Committee on the Problems of Drug Dependence of the National Academy of Sciences, National Research Council, the meeting was organized and sponsored by the National Institute of Mental Health's Division of Narcotic Addiction and Drug Abuse and the White House Special Action Office for Drug Abuse Prevention. There is a touching eulogy to Dr. Nathan Browne Eddy (1890–1973) written by Drs. Everett May and Jean-Paul Smith. The purpose of the meeting was to evaluate and delineate the state of the art in chemical and preclinical pharmacological research on narcotic antagonists. This case has been clearly made for the need and potential of narcotic antagonists in the therapy of the addicted, the experimenters, and the high-risk populations in which such drugs might be used prophylactically. The remaining 47 presentations are divided into four major sections: I, Background Information (History and Structure–Activity Relationships, 2); II, Chemistry (Morphine Analogs, 2; Morphinans, 3; Benzomorphans, 5; Thebaine Derivatives, 1; New Classes of Compounds, 5); III, Pharmacology (Assay Procedures, 11; Behavioral Procedures, 6; Tolerance and Physical Dependence to Antagonist Analgetics, 3; Mechanism of Action, 3); and IV, Pharmacokinetics of Major Antagonists (Absorption, Distribution and Fate of Narcotic Antagonists, 4; Development of Long-Acting Preparations, 2). The papers provide a review of the literature through 1972 as well as considerable new data. While the earliest historical aspects of the field are repeated in several places in the book, this will serve a useful contextual purpose for those scientists delving into this area for the first time. There is little synthetic treatment of the morphine analogs for obvious reasons

but the remaining papers in the chemistry section contain thoughtfully presented synthetic schemes although there are several errors. The structures for thebaine (page 52), BC 2605 (page 57), and nalbuphine (page 58) are incorrect or incomplete. Table 3 (page 69) contains no examples of 5,6-dimethyl-3-benzazocines. While the text says that they appear there, they in fact appear in table 4. Several structures in the paper on cyclazocines and congeners are missing or unnumbered. Structure XII (page 70) is cited in the text as structure XI. Despite this, this collection of papers, including the references, represents a unique and thorough account of the state of the chemical art dealing with structures known to accord narcotic antagonism.

The section on Pharmacology is the largest section of the book. It is exceptionally well illustrated and contains few typographical errors. This section is an excellent introduction to the basic pharmacological aspects of antagonist (and agonist) research. It is specifically and generally informative and critical if bewildering in the descriptions of the complexities and the varied patterns of narcotic antagonist actions. Those already schooled in pharmacological and cognate sciences will benefit most from this section of the book. Much space is devoted to the comparison of qualitative and quantitative conclusions drawn from different tests and to the qualities of animal testing most significant in predicting activity patterns in humans. The section on pharmacokinetics is the narrowest section of the book. It is restricted to pentazocine, cyclazocine, and naloxone. Each paper has a summary at the beginning and, in most instances, a conclusion. Overviews of the Sections appear at the end of the book. They are well organized and present the salient features of pertinent segments of the collection. The Index has been thoughtfully prepared and appears to be complete. The typescript is large, clear, and uniformly legible. The figures, tables, and graphs are generally excellent. This is an important contribution and is highly recommended for institutional libraries and for medicinal chemists and biologists working in and/or interested in the field of narcotic antagonists. It is unfortunate that the price of the book may restrict ownership if not use by scientists currently engaged in this field of research and by those not currently engaged in this area of research as well as by students with an interest in the field and/or a need to learn about narcotic antagonists. Thus, some of the potential benefit derivable from the widest possible distribution of this book is lost. Use by scientists, particularly younger scientists, with potentially useful, novel approaches is not fostered, in spite of the heavy contributions of the U.S. taxpayer to the project.

While "detailed evaluation, and transcriptions of the discussions" are supposed to be available, the reviewer was only able to obtain the former. The latter is not available.

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Mediators of Inflammation. Edited by Gerald Weissmann with seven contributors. Plenum Press, New York, N.Y. 1974. xi + 205 pp. 16 × 23.5 cm. $18.50.

It has become increasingly apparent during the last decade that most, if not all, inflammatory reactions are mediated by numerous soluble substances that are released or synthesized in response to injurious stimuli. This book, ably edited by one of the leading contributors to the field, consists of timely and succinct reviews of the roles played by lysosomal hydrolases, kinins, complement, histamine and serotonin, prostaglandins, and slow-reacting substances in phlogistic phenomena. In addition, there is included a chapter describing various control mechanisms involved in the release of several of these mediators from different cell types.

Each chapter begins with a description of the chemical properties of the mediators under review and continues with a discussion of their numerous biological activities. Relatively little data are presented concerning the roles of these mediators in clinical situations. The inclusion of a section concerning the lymphokines, which have been the subject of a vast literature and are considered to be of major importance in mediating delayed hypersensitivity reactions, would have added to the value of this book.

Several errors mar the otherwise uniform excellence of the contributions. At one point, D_2O is identified incorrectly as a promoter of microtubule disassembly. The chemical formulas for histidine and tryptophan are improperly drawn, exhibiting, respectively, a divalent nitrogen and a pentavalent carbon. Incorrect structures for several prostaglandin analogs detract from what is an unusually well-balanced account of the apparently opposing functions of these ubiquitous substances as mediators and modulators of inflammation.

Medicinal chemists and others wishing to enhance their knowledge of inflammatory mechanisms will find this volume a worthy, if somewhat limited, source of information.

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Drugs in Cardiology. Volume I. Part 1. Edited by Ephraim Donoso. Stratton Intercontinental Medical Book Corp., New York, N.Y. 1975. v + 239 pp. 26 × 18 cm. $24.75.

"Drugs in Cardiology," Volume I, is a compilation of information on a select group of drugs used in the assessment and treatment of heart disease. But more than that it includes somewhat unexpectedly drugs that may be useful in the treatment of shock of any origin and, even more surprising, drugs that are used in psychotherapy that also have cardiovascular effects. Any clinician can use this book as an updated reference source on several drugs that are included as well as for obtaining some useful background information. The chapter on procainamide is excellent; the one on lidocaine which should have been discussed along with procainamide, suffers from poor quality of illustrative material. The chemical structure of lidocaine is regretfully omitted. Dilantin is comprehensively discussed in 25 pages of text in a well-organized manner. The details may be somewhat excessive for the cardiologist but should delight the pharmacologist. In contrast to this lengthy chapter is the short section (only 8 pages of text) on bretylium tosylate. Despite its brevity, however, it is well organized and presents a good review of the clinical literature, something lacking in the discussion of atropine. New agents (not yet approved for clinical use) are discussed in a 16-page chapter which dwells unduly on action potentials and too little on clinical effects. A notable omission is Aprindine, a popular antiarrhythmic drug used in Europe. No structural formulas for these drugs are presented. Only two references to Bacaner who was responsible for the revival of bretylium as an antiarrhythmic agent are cited, and there is no mention at all of Fleckenstein, who was responsible for introducing Verapamil. One may question the inclusion of drugs intended to lower blood cholesterol or triglyceride in such a text but having done so, it seems unfortunate that more specific clinical trials and side effects were not included. The chapter on nitrates and nitrites is much too brief (only 5 pages of text) for the number one drug used for the relief of angina. Recent reports concerning bioavailability of different preparations are omitted and no mention at all is made of nitroprusside, a currently popular vasodilator. β blockers are adequately discussed but the claim that "... norepinephrine is the pressor agent of choice in the treatment of shock due to myocardial infarction as well as septic shock in older individuals" may be challenged. Similarly, the statement concerning the relative effectiveness of dopamine and norepinephrine in increasing urine flow may be questioned. Finally, the chapter dealing with the effect of mood-altering drugs on the heart is excellent and such a discussion would be difficult to find in any other publication.

After reading the book, I asked myself as a cardiologist especially interested in cardiovascular drugs whether I would consider adding it to my library. The answer is a qualified yes—primarily because of the excellence of chapters dealing with procainamide, dilantin, and mood-altering drugs. However, the discussion of two very important cardiovascular drugs, digitalis and nitrites, is disappointing and the omission of some of the newer agents detracts from the usefulness of the book as an updated source of information on new cardiovascular drugs.

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Progress in Bioorganic Chemistry. Volume 3. Edited by E. T. Kaiser and F. J. Kezdi. Wiley, New York, N.Y. 1974. xi + 274 pp. 23.5 × 16 cm. $19.75.

This useful volume deals with the applications of spin labeling to conformational studies of enzymes, with the roles of subunit in-

teractions in enzyme catalysis, and with recent advances in the chemical modification of proteins.

Bioorganic chemistry, being one of the most active research areas in modern science, is progressing so rapidly that most review articles are out of date by the time the galley proofs are returned to the authors. For this reason, speed of publication is essential and it is gratifying that the present volume published in 1974 contains some references to articles that appeared that year.

The discussion by Lawrence J. Berliner of the application of spin labeling to enzyme studies is concise, timely, and provides an excellent coverage of the numerous uses of electron spin resonance spectroscopy in studying enzymes and (very briefly) in studying membrane systems. An elementary introduction to the physical background of ESR spectroscopy is provided.

Michel Lazdunski in his review of subunit interactions in enzyme catalysis concentrates on enzymes in which only half the active sites appear to react and on flip-flop type mechanisms. Such mechanisms, in which attachment of a substrate molecule to an active site induces a conformational change in which the symmetry of a dimeric structure is lost and negative cooperativity induced, are being encountered with increasing frequency. This mechanism enables some enzymes to exhibit negative cooperativity while (in contrast to allosteric enzymes) following Michaelis–Menten kinetics. The review provides a good introduction to this complicated but important problem.

The review by Robert Heinrikson and Karl Kramer discusses recent advances in the chemical modification of the amino acid side chains of proteins followed by a discussion of amino acid analysis and chemical and enzymic protein cleavage reactions with emphasis on the automatic equipment being used. The discussion of "group-specific" reagents probably should have spent more time discussing the many instances in which such reagents do not, in fact, react with the groups which they are supposed to be specific for. However, the review provides a useful introduction to this field.

The index is adequate, which is unusual for review volumes of this type. Purchase of the volume can be recommended.

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Carbohydrate Chemistry. Volume 7. By J. S. Brimacombe, Senior Reporter, R. J. Ferrier, R. D. Guthrie, N. A. Hughes, J. F. Kennedy, R. D. Marshall, and R. J. Sturgeon. The Chemical Society, Burlington House, London. 1975. xii + 611 pp. 14.5 × 22 cm. $22.00.

This report is the seventh volume in a series of "Specialist Periodical Reports" in "Carbohydrate Chemistry". The aim of these reports, as stated in volume one, is "to outline and correlate the majority of papers published in the field of carbohydrate chemistry" with emphasis upon "the chemical rather than the biochemical aspects of the subject".

The report follows the same plan as earlier volumes in this series. The book is divided into two parts, the first discussing mono-, di-, and trisaccharides and the second dealing with macromolecules containing carbohydrate units. In the first part of the report, information on various classes of carbohydrates is updated from reports published in 1972 and 1973. Discussion includes syntheses and reactions of various carbohydrates and their derivatives, amply illustrated by numerous reaction schemes, as well as physical measurements when available. In addition, specific chapters deal with physical measurement, including NMR and ir spectroscopy, mass spectrometry, polarimetry, and chromatographic methods. The application of X-ray crystallography to the structure elucidation of carbohydrates has increased in recent years and 49 references are included in the current volume. Part two of the report deals with analytical methods, both chemical and physical, used to study the carbohydrate portions of various macromolecules as well as biochemical properties and chemical syntheses and modification of oligosaccharides, polysaccharides, glycoproteins, enzymes, and glycolipids. An author index is included.

The authors have admirably achieved their stated aim of outlining and correlating information in the field of carbohydrate chemistry (almost 3000 references) and this work will be an invaluable reference for workers in the fields of carbohydrate chemistry as well as organic, medicinal, and biochemistry.

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Technique of Electroorganic Synthesis. Parts I and II. Edited by Norman L. Weinberg. (Volume V of Techniques of Chemistry Series. Arnold Weissberger, Ed.) Wiley-Interscience, New York, N.Y. 1974 (Part I) and 1975 (Part II). Part I, vii + 917 pp, 16 × 23.5 cm, $52.25. Part II, x + 1070 pp, $45.00.

Dr. Weinberg and 13 contributors have provided an extremely useful compendium of information on the technique of electroorganic synthesis. This volume in an invaluable series fulfills the aims of the preface in guiding the researcher to a wealth of literature while giving practical detail for a wide range of electrochemical syntheses. Aside from their value as a source to a very large literature the books have been carefully edited to provide an integrated approach to this rapidly emerging field. The aims of each chapter are clearly delineated and largely fulfilled.

In Part I, following an introduction to the field in which future areas of research are predicted, there is a useful chapter on experimental methods and equipment which is written for chemists who are contemplating electroorganic synthesis. A reading of this chapter will provide the practical know-how and detail necessary to set up a working synthetic system, including the cell contents (electrodes, media, reference electrodes, diaphragms), electrical equipment, cell design, and the approach to industrial scale-up. Chapter III lays the theoretical framework for describing the kinetics of electrochemical reactions and discusses the mechanistic information which can be obtained from classical polarography, oscillographic polarography, cyclic voltammetry, and ac polarography. The role of adsorption is also discussed, together with the mechanisms of some typical electroreductions. Chapter IV is a comprehensive treatment of the electrooxidation of organic compounds which contains useful experimental examples and is extremely well referenced up to 1970. This chapter is written from a very practical standpoint and is outstanding in its coverage.

The value of mechanistic information in choosing synthetic strategy is again stressed in Chapter V, which deals with the anodic oxidation of aliphatic and aromatic amines. Chapter VI is concerned with the one- and two-electron oxidation of carboxylates. It starts and ends with useful mechanistic and stereochemical detail and gives actual experimental conditions for a number of useful syntheses.

The Chapters of Part II are concerned with detailed accounts of electrochemical halogenation, electrochemical reduction, electrolysis of N-heterocycles and organometallics, and the electrosynthesis of polymers. Each chapter contains tabulated examples of many syntheses with experimental conditions, product yields, and other useful data. The volume ends with a very welcome and complete tabulation of half-wave potentials which will be valuable in synthesis design and product identification.

There can be little doubt that these volumes will serve as a practical aid and reference of lasting value in electrochemical synthesis. Each chapter is authorative, comprehensive, clearly written, and referenced. The volumes are beautifully produced, appear to contain only minor typographical errors, represent good value for money, and are heartily recommended.

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Natural and Synthetic Polymers. An Introduction. By Henry L. Bolker. Marcel Dekker, New York, N.Y. 1974. xiv + 688 pp. 16 × 24.5 cm. $29.75 (textbook $19.75).

In his preface the author states: "The present book represents an effort to overcome these barriers [between natural and synthetic polymers] by offering a unified view of polymer organic chemistry in which natural and synthetic polymers are given nearly equal emphasis. It deals with polymers as a study of interest to organic chemists . . .". This is an accurate précis of the book.

The book is organized in three parts: I, Linear Homopolymers; II, Branching and Molecular Heterogeneity; and III, Cross-linking and Cross-linked Polymers. Coverage of a large number of natural and synthetic polymers follows this system of organization. There are 12 chapters plus an appendix on molecular weight measurements. In keeping with the author's scientific interests, the first (and longest) chapter deals mainly with cellulose as a prototypical polymer and the last chapter with the chemistry of lignin. The term "heteropolymer" is used to categorize polymers containing two or more different units in the chain; I doubt that this usage will become general. Considerable biochemical information is contained in chapters dealing with natural polymers, e.g., nucleic acids and proteins, and biosynthetic pathways to several natural polymers are included. The organization of the book, based on polymer architecture, results in an artificial separation of related subjects, for example, homopolymerization and copolymerization of vinyl monomers.

The writing style varies from review-like to discursive. Information is given on the history, properties, technology, and uses of many polymers. This information is often interesting and gives the reader an idea of the commercial significance of certain materials but sometimes seems diversionary. A notable feature of the book is the large number of references—over 1400. References are eclectic, including original literature, monographs, textbooks, patents, and industrial–technical articles.

Although emphasis is on the organic chemistry and structure of polymers, physical chemical aspects are included, e.g., parameters for molecular weight distributions and the kinetics and mechanisms of polymerization and copolymerization. These are among the weaker sections of the book and several careless errors are apparent. Development of the Carothers' equation on page 153 is confusing, involving some slight of hand in the definition of $2N$. Carothers' original derivation, based on functions, is more satisfying and more generally applicable. On page 157, $x[\bar{x}_n]$ and $x_w[\bar{x}_w]$ are degrees of polymerization and not molecular weights as implied. The book is printed from typewritten manuscript and this may have contributed to a number of typographical errors. The multiplier on page 428 should be $[M_2]/(k_{21}[M_2\cdot])$ rather than $[M_2]k_{21}[M_2\cdot]$. Typographical errors in mathematical or chemical equations were noted in eq 3.32, 4.39, 4.48, 4.62, 4.66, 4.107, 9.15, 10.9, and 11.17.

The book is proposed for use as a text for graduate or undergraduate students, particularly the latter. This should be feasible, but I would prefer a different organization of the material, i.e., development of general principles of polymers and polymerization prior to detailed consideration of specific polymers. The book might better serve as a supplementary text covering natural polymers, which are largely neglected in existing texts. Finally, the book should be useful to a chemist working in the field of synthetic polymers who would like an introduction to natural polymers and vice versa.

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