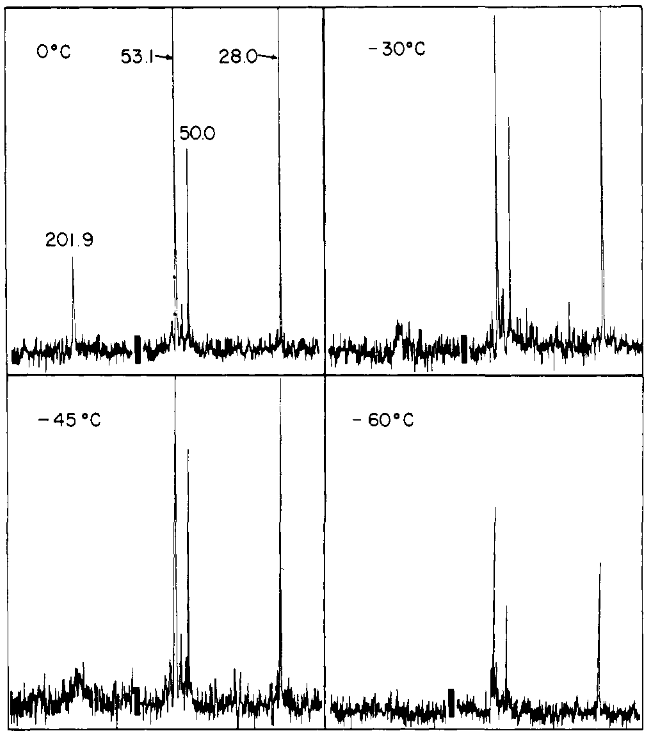
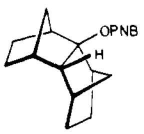
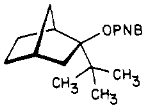


Figure 2. Selected ^{13}C NMR spectra (22.6 MHz) of **3** in $FSO_3H-SO_2ClF-CD_2Cl_2$ solution recorded at the various indicated temperatures.



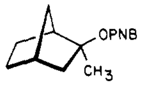
1c

k_{rel}(25°C) 26,000



9

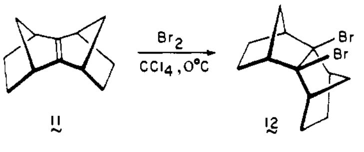
21,000



10

1

A major thrust of norbornyl cation research has involved examination of exo:endo rate ratios. In the present instance, such considerations lose their significance because of the major steric alterations which would accompany the changeover to endo stereochemistry. In this connection, it would seem appropriate to call attention to the fact that the double bond in **11** is preferentially attacked from the exo direction. However, placement of an exo substituent at C_2 necessitates that the same stereochemistry be adopted at C_3 because of strain. The bromination of **11** to produce cis dibromide **12**[17] exclusively without skeletal rearrangement exemplifies this rationale.[18]



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(4) Utilization of lithium in ethylenediamine for the latter system caused overreduction of the benzene ring as expected. Reduction of the eopxide with diisobutylaluminum hydride in ether at room temperature led to **2a** in 62% yield.
(5) Analytical and spectral data for all new compounds were fully compatible with the given assignments.
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(18) This research was financially supported by a grant from the National Science Foundation (CHE-7900333).

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Book Reviews

Radicals. By D. C. Nonhebel (University of Strathclyde), J. M. Tedder (University of St. Andrews), and J. C. Walton (University of St. Andrews). Cambridge University Press, Cambridge, England. 1979. xvi + 200 pp. $32.50 hardcover; $11.95 paperback.

This book is intended primarily for undergraduate and beginning graduate students. It provides an extensive introduction into the study of free-radical chemistry and detection, but is aimed at a level such that it can be easily read after an introductory course in organic chemistry. It accomplishes these goals admirably, and provides a useful reference survey for the researcher as well. The subject of radical chemistry plays an ubiquitous role in industrial and polymer chemistry, synthesis, and even biochemical processes. The present text provides a valuable introduction to the awareness of free-radical chemistry and the importance of free radicals in these fields. The treatment is mainly oriented toward examples in organic synthesis, although there are numerous sections on the physical detection of radicals, inorganic metal complex radical species, and radical reactions in biochemistry. The text is well written, extensively documented, and clearly outlined with well-chosen subheadings. Extensive tables catch the immediate attention of the reader, providing intriguing comparisons, such as the relative selectivities of radical reactions at various sites on substituted hydrocarbons. The text thoroughly covers traditional subjects such as chain initiation, propagation and termination, and explosive reactions, in terms of the *chemistry*. It is not a text for detailed kinetic treatment of these phenomena. This book gives an excellent appreciation for the overwhelming importance of radicals in chemical synthesis and industrial processes.

Stephen R. Leone, *Joint Institute for Laboratory Astrophysics*

Physical Organic Chemistry through Solved Problems. By Joseph B. Lambert (Northwestern University). Holden-Day, Inc., San Francisco. 1978. xii + 265 pp. $11.95.

Joseph Lambert has given us a remarkably useful collection of representative, challenging, and instructive problems which have been gleaned from the current literature and several physical organic chemistry texts. Most noteworthy are his clearly thought-out, well-documented, and lucid answers which compose the lion's share of his effort. A plethora of topics is covered which include such topics as conformational analysis, isotope effects, equilibria, kinetics, catalysis, and orbital symmetry. My only criticism of this volume, which I highly recommend for advanced undergraduate or first-year graduate courses in physical organic chemistry, is that more problems concerned with PMO theory were not included and that the section on organic thermochemistry did not include any problems employing the Benson-Schleyer group increment approach.

David B. Ledlie, *Bates College*

Guide to Basic Information Sources in Chemistry. By ARTHUR ANTONY (Sciences-Engineering Library, University of California, Santa Barbara). Halsted Press, John Wiley & Sons, New York. 1979. vii + 219 pp. $14.95.

How to Find Chemical Information: A Guide for Practicing Chemists, Teachers, and Students. By ROBERT E. MAIZELL (Olic Corp.). Wiley-Interscience, New York. 1979. xxiii + 261 pp. $17.95.

Chemical information retrieval is not a task which one does easily without being informed of or instructed in the width and breadth of sources available. These two books aim at informing chemists, students, and librarians about how to find chemical information. Each approaches the problem differently and is aimed at separate audiences.

"Guide to Basic Information Sources in Chemistry" by Antony aims at being an annotated bibliography of chemical information reference tools primarily in the English language. Each chapter deals with a type of reference material (guides to the chemical literature, guides to techniques, safety manuals, . . .). Within each chapter Antony broadly describes the type of material and then enumerates the relevant sources. For each source a very brief description of the source and what is contained in it are given. In cases where sources are more important larger annotations are given, and in the case of *Chemical Abstracts* a whole chapter is devoted to just this tool. Descriptions of sources are often brief, many only four to five lines long. The process of chemical information retrieval is only lightly covered. While succeeding quite well at being an annotated bibliography, this is not a book which one who had never used chemical reference sources before would turn to first.

Robert Maizell in "How to Find Chemical Information" presents us with a well-written practical book on chemical information retrieval. In the first five chapters Maizell very pragmatically describes how one goes about doing chemical research in the library. The last ten chapters are devoted to the sources, what they are, and how to use them. One weakness of this book is its brevity of description (*Beilstein* has only 2 pages of text devoted to it) and paucity of sources. The latter is understandable (if not forgivable) when one considers the volume of sources which one would need to describe if completeness were aimed at.

Each of these books has its pluses and minuses. Antony's "Guide" has many more sources briefly described, and as its last chapter has case studies in working out chemical information retrieval problems. His chapter on nomenclature is welcome. Antony has sacrificed a degree of how-to-do-itness, and never really enters into a discussion of how to use a chemistry library. Maizell tends to be pragmatic and less formal: this is what works; look here for a good description of how to use this source. Maizell describes computerized retrieval of information much better than does Antony. Maizell has included an excellent chapter on the literature of patents, how to find, where to locate. "How to" also has an appendix which updates information from the text (none of this material is footnoted in the text).

"How to Find Chemical Information" is highly recommended for anyone in chemistry looking for a very readable book on chemical information retrieval. "Guide to Basic Information Sources in Chemistry" is not a beginner's book. This book is recommended for readers already familiar which chemical information sources who occasionally are at a loss as to where to look for information. I would recommend both of these books for chemistry libraries.

Stephen C. Lucchetti, *University of Michigan*

Electrical Properties of Polymers. By A. R. BLYTHE. Cambridge University Press, New York. 1979. x + 191 pp. $42.50.

This book, part of the Cambridge Solid State Science Series, is intended to provide "an introduction to the theory, experimental observation and use of electrical properties of polymeric materials." It clearly does this. The organization is very logical, beginning with a brief survey on the structure of polymers, continuing with a survey of molecular dielectric theory (including a short summary on its application to polymers) and a discussion of dielectric relaxation (in particular, how it applies to polymers). Other chapters discuss the measurement of dielectric properties, conduction in polymers, dielectric breakdown, and static charges. The only section which appears "out of order" is that on the measurement of resistivity in the chapter on conduction in polymers. The book cites 128 references both within chapters and as suggestions for further reading at the end of each chapter. Approximately one-third each of these is from the 1960s and 1970s. References of historical interest are also cited. Unfortunately, the usefulness of this book in private libraries or as a text will be limited by its rather high price. However, it is a well-done book.

Adriane G. Ludwick, *Tuskegee Institute*

Introduction to Macromolecular Chemistry. Second Edition. By H. BATZER and F. LOHSE. Translated from German by W. GOOD. John Wiley & Sons, New York. 1979. xiv + 297 pp. $34.50.

This book provides a very concise overview. The style is that of persons with depth in the area who are able to express their expertise clearly in summary form. In some sections, the translation is wordy and/or unclear (e.g., most of the brief introduction and a few scattered passages in the remainder of the text). Whether the unclear portions would hinder the use of this book as a text would depend on the level of the students. Certainly they would not hinder "the practitioner and technologist occupied in a specific field of macromolecular chemistry" from obtaining "a general review" (quotes from the cover jacket). There are also a few editorial mistakes (e.g., Table 31 is incorrectly cited on p 132; part (d) on p 50 appears incomplete; and there are a few scattered typographical-type errors).

The three major divisions of the book are: (a) synthesis and isolation of macromolecular compounds; (b) characterization and isolation of macromolecular compounds; and (c) physical properties and technical processing of macromolecular substances. In the first section, the description of monomer syntheses from raw materials adds a useful highlight. The second section is a very clear overview and shows the relationships among the various techniques. The third section includes a good discussion not only of synthetic but also natural polymers. No references are cited in the book, although a brief bibliography is given. Indeed, much of the work cited is that of the authors. This approach was intentional, but it would make it difficult for a beginning level student to use this book for independent study.

Adriane G. Ludwick, *Tuskegee Institute*

Quantitative Mass Spectrometry in Life Sciences. II. Edited by A. P. DE LEENHEER (R.U.G.), R. R. RONCUCCI (Continental Pharma), and C. VAN PETEGHEM (State University of Ghent). Elsevier Scientific Publishing Co., Amsterdam. 1978. v + 501 pp. $53.25.

The proceedings of the Second International Symposium held at the State Univerity of Ghent in 1978 are reported. The volume contains reports from five plenary lectures and 41 contributed papers. The subjects of the plenary lectures include isotope dilution-mass spectrometry of steroid hormones (L. Siekmann), biogenic amine metabolism studies by mass spectrometry (S. P. Markey et al.), gas chromatography-chemical ionization mass spectrometry for quantitative analysis of abused drugs in physiological fluids (R. L. Foltz), quantitative field ionization and field desorption mass spectrometry in life sciences (H.-R. Schulten and W. D. Lehmann), and criteria for selection of internal standards and error analysis in quantitative mass spectrometry (B. J. Millard). The contributed papers are divided into four areas [quantitation of endogenous substances (11 papers), quantitation of drugs and drug metabolites (15 papers), quantitation of exogenous substances (9 papers), and topics of general interest relating to quantitative mass spectrometry (6 papers)].

In the plenary papers, Siekmann reports on the use of ^{14}C-labeled steroids as internal standards for isotope-dilution mass spectrometry. Markey et al. discuss the use of electron capture negative ion chemical ionization for quantitation of melatonin at the parts per trillion level in human plasma. The paper by Foltz reports on the use of newer techniques in drug and metabolite analysis to achieve higher sensitivity and facilitate simultaneous analysis. These include the use of high performance liquid chromatography, glass capillary gas chromatography, and negative chemical ionization. An up-to-date review of the applications of field ionization/desorption is the subject of the paper by Schulten and Lehmann. New results are presented on quantitative FD of quaternary ammonium ions (e.g., choline and acetylcholine in brain tissue) and Li (in human plasma). The final plenary paper by Millard gives a thorough discussion of sources of error in the quantitative determination of compounds in plasma by GCMS. The advantages of the use of homologues over stable isotope labeled analogues is discussed.

The papers of general interest include topics in selected ion and metastable peak monitoring, mass fragmentography, and applications to clinical endocrinology. The papers on quantitation of endogenous substances cover applications to vitamin D_3, steroids, and metabolites, lipids, phenylpyruvic acid, and arterial and intracerebral gases. The section devoted to quantitation of drugs and drug metabolites includes papers on bioavailability of drug mixtures in man, and measurements of biological fluid levels of drugs and drug metabolites that cover an extensive spectrum of physiological activity. The methods presented give excellent examples of the new applications of diverse techniques to drug analysis in fluids that include stable isotope dilution, selected ion monitoring, mass fragmentography, glass capillary GC, kinetic isotope effect, and direct probe high resolution mass spectrometry.

The final section on quantitation of exogenous substances includes studies on organic pollutants in the atmosphere and marine animals, impurities in commercial samples of polycyclic aromatic hydrocarbons, and pesticides.

This volume gives an up-to-date coverage of the range of research activities being carried out in the applications of modern chromatographic-mass spectrometric methods to the analysis of trace components in complex biological matrices and gives a good account of the principles being established for reliable quantitative measurements.

R. D. Macfarlane, *Texas A&M University*

Les Polymeres Organiques, By C. AUBINEAU (Ugine-Kuhlmann Ltd.) and R. AUDEBERT (C.N.R.S.). Presse Universitaire de France, Paris. 1974. 232 pp. $20.00.

Polymer science is a vast subject which starts with pure and simple organic chemistry and ends in mechanics of materials. In between, thermodynamics, rheology, and reaction engineering come in for more than passing attention. Since many "chemistry majors" in North American universities are lucky if they find the time and the offering of a decent half-course on the subject, the availability of a paperback which covers all of the above in 232 pages is unusual.

The survey is brief, but comprehensive: the first 88 pages deal with synthesis including ionic, transition metal and metal oxides, catalytic polymerization, as well as the classic free radical and condensation systems. The next 44 pages cover dilute solution properties: thermodynamics, molecular weights, polymolecularity, etc. This material is typical of what is found in Flory's classic monograph, "Principles of Polymer Chemistry". There is a logical presentation of the material and the brevity is supplemented by imaginative illustrations and good summary tables. One such table is entitled, "Comparison of Methods for Molecular Weight Determination", and one gets the impression that the authors, who happen to be engineers, have listened to too many graduate students as they list the "inconveniences" associated with each method.

The last hundred pages attempt to cover the solid-state properties of polymers. This is the area of greatest importance to material scientists and the one where there is greatest progress and controversy at this time. In this area, the book remains very classical and does not get into important recent developments involving phase separation phenomena in thermal elastomers or liquid crystalline behavior of rigid chains. Statistical treatment of polymer chains is sadly lacking throughout the book and the Flory-Huggins expression for the entropy of mixing is given with barely a mention that it comes from statistical thermodynamics.

This elementary survey is one of the few such books available as a paperback and probably the only one in French. It can serve a useful function in an introductory course, but it is not of lasting value as a reference text. At the very least, paperbacks such as this should be inexpensive, but this one is not, at least in North America.

R. H. Marchessault, *University of Montreal*

Electroanalytical Chemistry. Volume 11. Edited by ALLEN J. BARD (University of Texas). Marcel Dekker, New York. 1979. xi + 370 pp. $45.00.

Volume 11 continues the tradition of this fine series in comprehensively reviewing recent advances in electroanalytical methods. Three out of the book's four chapters deal with the applications of various electrochemical techniques for the determination of physiologically important substances. A section on in vivo analysis describes voltammetric and potentiometric procedures for measuring several electroactive species, including neurotransmitters, oxygen, and potassium, directly in living subjects. Detailed illustrations focussing on the design and fabrication of the microelectrodes employed as well as brief theoretical considerations relevant to each technique are supplied. Separate sections on polarographic analysis in pharmacology and polarography of antimicrobial substances survey the wide range of biologically active drugs, metabolites, and vitamins, measurable by conventional dc, pulse, and differential pulse methods. Organized according to the class of compound analyzed, these sections also provide summary tables and thorough bibliographies which substantially add to the presentation.

The initial chapter of this text rigorously reviews the theory and principles of charge-transfer processes at semiconductor surfaces. While complete in its treatment of the subject, the section seems misplaced within this volume's subsequent bioanalytical emphasis. Nonetheless, this book should serve as a valuable reference of selected electroanalytical methods for researchers in several disciplines.

Mark E. Meyerhoff, *University of Michigan*

Topics in Current Physics. Volume 11. Raman Spectroscopy of Gases and Liquids. Edited by A. WEBER (Fordham University). Springer-Verlag, Berlin. 1979. vi + 318 pp. $29.50.

This volume, one of several recent review collections devoted to Raman spectroscopy, is addressed primarily to physical chemists. The emphasis is on high-resolution gas-phase work. Authoritative discussions of vibration-rotation spectra (S. Broderson) and pure rotational spectra (A. Weber) are, of necessity, limited to small gas-phase molecules. The contribution on absolute scattering cross-sections (H. W. Schrotter and H. W. Klockner) provides good coverage of the gas phase, including an extensive tabulation of results, but is sketchier on liquid-phase measurements. Similarly R. P. Srivastava and H. R. Zaidi emphasize gas-phase line shapes and provide limited coverage of the liquid phase in their review. Readers of this journal may find the review on resonance Raman spectroscopy a very useful introduction to that topic. D. L. Rousseau, J. M. Friedman, and P. F. Williams clearly show the difference between the Franck-Condon and Herzberg-Teller scattering mechanisms. The use of halogen molecules to illustrate the former and metal porphyrins to illustrate the latter allows clear discussion of the phenomenon unburdened by descriptions of exotic systems. The review is an excellent starting point for those unfamiliar with resonance theory. There is little discussion of experimental details or of the numerous applications which have appeared in recent years. The concluding chapter on coherent anti-Stokes Raman spectroscopy (J. W. Nibler and G. V. Knighten) surveys both the theory and results of this new branch of Raman spectroscopy. The review is well written and clearly explains the unfamiliar jargon on CARS. CARS is the "hottest" topic of those included in the book, and experiment has advanced significantly since the review was written. All of the reviews are current through 1977 or early 1978. An appendix of 1978 literature citations for all of the chapters is a useful attempt to make the book more timely.

Michael D. Morris, *University of Michigan*

Ziegler-Natta Catalysts and Polymerization. By JOHN BOOR, JR. (Shell Development Co.), Academic Press, New York. 1979. xvii + 670 pp. $65.00.

This remarkably written book by the well-known investigator of Ziegler-Natta catalysts, edited posthumously, is divided into 23 chapters, each of which covers a definite area and deals with different aspects of this fascinating field of chemistry.

The first chapter, which gives a general idea of the Z-N catalysts, can be regarded as an introduction to the matter which can be used separately by the nonpretentious reader for getting acquainted with the field. Chapter 2 gives an outline of the pioneering works of Ziegler and Natta groups as well as of some other investigators. Chapter 3, where the definition of Z-N catalysts is given, deals with the basic concepts of tacticity. It is to be regretted that more complicated structures, such as ditatic, are not discussed. In this complex chapter are also described methods for characterization of the polymers obtained, the laboratory devices for polymerization, and the polymerization conditions. At the end the description of commercial polymers is given. In the following two chapters in a very concise way are represented the chemical nature and the physical state of the catalysts for olefin and conjugated diene polymerization. Chapter 6 deals with the initial physical state of the catalyst and its importance in the stereochemical control, efficiency, and morphology of the polymers formed. The soluble, colloidal, and heterogeneous catalysts including supported catalysts are also discussed. In Chapter 7 the physical state of the polymer during polymerization is discussed in the solution, slurry and vapor-phase processes. Chapter 8 deals with an important point—the growth of the polymer particle. This part is well illustrated by schemes and genuine microphotographs. Some selected cases of modification of the traditional Z-N catalysts by third components are reviewed in Chapter 9. The next chapter describes some reactions at the transition metal-carbon bond active centers, caused by different substances which are mainly chain-transfer agents. In Chapter 11, the activity of different transition metal salts is followed in different oxidation states. Chapter 12 deals with catalysts that consist of transition metal salt alone or in combination with a second component: the Phillips and the Standard Oil of Indiana catalysts, π-allyl complexes, etc., which, of course, could not be regarded as typical Z-N catalysts. The next chapters (13, 14) are devoted to the mechanistic problems of the initiation and the propagation reactions in the polymerization of olefins and dienes. Chapters 15-17 deal with the stereochemical control of the propagation reaction in different cases, including stereoselectivity and stereoelectivity of isotactic propagation. Chapter 18, devoted to kinetics, discussed different proposed models and schemes. In Chapter 19 are reviewed the cases when Z-N catalysts were used in the polymerization of different monomer groups. In Chapters 20 and 21 are considered different cases of copolymerization of random, block, and alternating type, while Chapter 22 deals with other possible uses of Z-N catalysts such as radical and cationic polymerization, metathesis, oligomerization, isomerization, etc. The book is supplied with the inevitable "Final comments and outlook". At the end, supplementary bibliography is given, which covers the years 1972-1978.

The book is by no means an encyclopedia or reference book on Z-N catalysts and polymerization. In all cases only selected examples are discussed which are enough for a good understanding of the matter. The numerous schemes, figures (145) and tables (145) also contribute to this. No doubt, this excellent book will be useful for the polymer scientist, chemist, and engineer and to everybody who would like to get in touch with this marvelous field of contemporary chemistry.

Ivan M. Panayotov, *Bulgarian Academy of Sciences*

Structural Theory of Organic Chemistry (Topics in Current Chemistry. Volume 70). By N. D. EPIOTIS, W. R. CHERRY, S. SHAIK, R. L. YATES, and F. BERNARDI. Springer-Verlag, Berlin-Heidelberg-New York. 1977. viii + 250 pp. $41.40.

The structural aspects of organic chemistry that are approached by this monograph are primarily nonbonded attraction and conjugative interactions. Additionally, brief discussions of geminal effects and bond ionicity are presented. A short theory chapter is followed by a collage of the authors' published and unpublished exercises in perturbed molecular orbital (PMO) theory.

The theory section outlines the basic PMO equations relied upon in this volume and, using some tables, acquaints the reader with orbital energies, magnitudes of overlap integrals, and the behavior of orbital interactions. Conformational and torsional isomerism are the dominant topics of both the nonbonded and conjugative interaction sections. Stabilizing interactions are considered preferentially, with destabilizing terms invoked only when other approaches fail. In places the choice of a particular orbital interaction explanation could have been more persuasively documented. Throughout, calculational examples are drawn from a mixture of CNDO and ab initio computations. While there are other works on perturbed molecular orbital theory that provide more pedagogical dissertations on the subject, this volume does serve to provoke discussions among practitioners in the field.

H. Bernhard Schlegel, *Merck, Sharp and Dohme*

Annual Review of Materials Science. Volume 8. Edited by R. A. HUGGINS (Stanford University), R. H. BUBE (Stanford University), and R. W. ROBERTS (General Electric Co.). Annual Reviews, Inc., Palo Alto, Calif. 1978. x + 524 pp. $?

This volume presents 13 critical evaluations of recent developments in materials science. An essay by Harvey Brooks on "Resources and the Quality of Life in 2000" introduces the volume. Also included is "Data Sources for Materials Scientists and Engineers" by J. H. Westbrook and J. D. Desai, which organizes by material and property over 340 data centers, handbooks, nonnumeric references, and computer-readable data bases.

C. A. Evans, Jr., and R. J. Blattner discuss experimental methods for surface and thin-film chemical analysis. Werner Weppner and R. A. Huggins review the use of electrochemical techniques for the study of ionic and electronic transport properties and chemical reactions of solids.

Alan Lawley reviews methods of preparation of metal powders. G. B. Stringfellow reviews vapor phase epitaxial growth of III/IV semiconductors.

Tsuyoshi Masumoto and Koji Hashimoto discuss the corrosion characteristics of amorphous metals. D. M. R. Taplin and A. L. W. Collins review high-temperature fatigue of metals. K. A. Andrianov, A. A. Zhdanov, and V. Yu. Levin consider the physical properties and structure of organosilicon ladder polymers. R. A. Oriani discusses hydrogen embrittlement in steels. C. D. Grahm, Jr., and T. Egami review magnetic properties of amorphous alloys. A. T. English and C. M. Melliar-Smith review reliability and failure mechanisms of electronic materials.

A. Meuth, H. Nagel and R. S. Perkins review the magnetic properties of rare earth-transition metal compounds. L. A. Harris and R. H. Wilson review the photoelectrolysis of water by semiconductor electrode materials. E. M. Conwell and R. D. Burnham discuss materials for integrated optics.

John M. Powers, *University of Michigan*

Acid Proteases: Structure, Function, and Biology. Advances in Experimental Medicine and Biology. Volume 95. Edited by JORDAN TANG (Oklahoma Medical Research Foundation). Plenum Press, New York. 1977. ix + 355 pp. $35.00.

Acid proteases are expected to hydrolyze proteins at low pH. Pepsin, the first enzyme named, is *the* most familiar acid protease. Studies with pepsin have revealed: (1) catalysis is inhibited by the antibiotic pepstatin; (2) diazoacetylnorleucine methyl ester or 1,2-epoxy-3-(*p*-nitrophenoxy)propane, active-site-directed reagents that form covalent derivatives with the β-carboxyls of unique aspartyl residues, inactivate the enzyme. These catalytic features of pepsin have now been recognized in enzymes that hydrolyze proteins maximally even at neutral pH. This and the completion of the amino acid sequence of pepsinogen/pepsin prompted the first symposium on "acid proteases". This volume is a collection of the main lectures delivered at that conference.

Thirteen chapters deal with pepsins. The first essay compares the primary structures of pepsins and chymosins. In the next four papers, X-ray crystallographic data suggest that porcine pepsin, the acid proteases of *Rhizopus chinensis* and of *Endothia parasitica*, and penicillopepsin have similar three-dimensional shapes and that the active site residues are indeed located in the catalytic cleft. One of two papers on the mechanism of activation of pepsinogen considers the order and number of cleavages of pepsinogen necessary to generate pepsin. The other paper interprets kinetic evidence in terms of an intramolecular mechanism for the conversion of pepsinogen to pepsin. (A part of this mechanism has subsequently been challenged.) Four papers consider enzyme specificity and propose catalytic mechanism(s) for pepsin action. As yet, though, no unified and completely acceptable mechanism of catalysis by pepsin has evolved. One of two papers on inhibitors of pepsin proposes a mechanism for the interaction between pepsin and pepstatin. The other demonstrates that one of the peptides from the activation of pepsinogen (residues 1 → 16) becomes a more effective inhibitor (of the milk clotting activity of pepsin) when lysyl residues are converted to homoarginyl residues by guanidination.

The last seven chapters describe "acid proteases" other than pepsin. Two essays on renin describe its purification and the evidence for proenzyme form(s) that are converted to renin by limited proteolysis. Proteinase A, an acid protease, and an accompanying protein inhibitor present in yeast are described. Three chapters are directed at studies on cathepsin D in liver, rodent lymphoid tissue, and bovine uterus. An "acid protease" and an inactive proenzyme in human seminal plasma are described in the concluding chapter. These last seven chapters demonstrate that "acid proteases" fulfill roles in hormone regulation, growth, development, and reproduction. They suggest that "acid proteases" may function unrecognized in many biological systems. This volume accurately reflects the status of investigation of "acid proteases". It articulates questions still unanswered. It is a handy reference for the expert and an invaluable source of information for the interested novice.

Robert J. Peanasky, *The University of South Dakota*