Additions and Corrections

Asymmetric Induction in an Enammonium–Iminium Rearrangement. Mechanistic Insight via NMR, Deuterium Labeling, and Reaction Rate Studies. Application to the Stereoselective Synthesis of Pyrroloisoquinoline Antidepressants [*J. Am. Chem. Soc.* **1990**, *112*, 3567–3579]. KIRK L. SORGI, CYNTHIA A. MARYANOFF, DAVID F. MCCOMSEY, DAVID W. GRADEN, and BRUCE E. MARYANOFF*

Page 3577, ref 39: Structure iii should have a double bond drawn between atoms C1 and C10b.

Solid-State Voltammetry and Self-Diffusion Dynamics of a Linear Monotagged Redox Polymer: ω-Ferrocenecarboxamido-α-methoxypoly(ethylene oxide) [*J. Am. Chem. Soc.* **1990**, *112*, 3730]. M. J. PINKERTON, Y. LE MEST, H. ZHANG, M. WATANABE, and ROYCE W. MURRAY*

The mentioned (ref 16) sublimation loss of ferrocene has been discovered to be substantial, so the monomer diffusion rate was re-determined with solutions of ferrocene carboxylic acid in unlabeled Me_2PEG (Figure 5 (○, ●), available as Supplementary Material). The monomer diffusion coefficient is, at $T > T_m$ and at 25 °C, 14× and 19× larger respectively than that of ferrocene-labeled polymer, rather than 3.4× and 12× as cited (Abstract, page 3733, left col, line 18–19, right col, line 10) for the incorrect ferrocene data, and contrary to p 3733, right column, lines 8–16, $D_{FcMePEG}$ is a good measure of Fc-MePEG polymer chain self-diffusion at both T greater than and less than T_m. Other conclusions are unaffected.

Supplementary Material Available: Corrected Figure 5 showing the dependence of the apparent diffusion coefficient on temperature for ferrocenecarboxylic acid in $Me_2PEG/LiClO_4$ and bulk Fe-MePEG/$LiClO_4$ mixtures (1 page). Ordering information is given on any current masthead page.

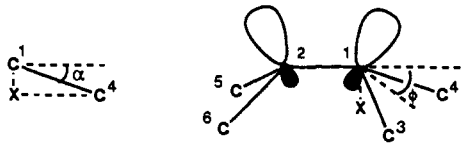
A New Method for the Stereocontrolled Synthesis of Silyl Dienol Ethers Using (Naphthalene)chromium Tricarbonyl Catalyzed Isomerization [*J. Am. Chem. Soc.* **1990**, *112*, 4906]. MIKIKO SODEOKA, HIROYOSHI YAMADA, and MASAKATSU SHIBASAKI*

Reference 2 should include the following: (f) Wan, C. S. K.; Weedon, A. C.; Wong, D. F. *J. Org. Chem.* **1986**, *51*, 3335. (g) Krägeloh, K.; Simchen, G.; Schweiker, K. *Liebigs Ann. Chem.* **1985**, 2352. (h) Tominaga, Y.; Kamio, C.; Hosomi, A. *Chem. Lett.* **1989**, 1761.

Reference (3) should read: Some silyl dienol ethers can be prepared stereospecifically. See refs 2b, 2f, 2g, and 2h.

Measure of Nonplanarity in Conjugated Organic Molecules: Which Structurally Characterized Molecule Displays the Highest Degree of Pyramidalization? [*J. Am. Chem. Soc.* **1990**, *112*, 3385]. R. C. HADDON

I have received the following diagram from Professor Greene in clarification of his paper on 9,9′,10,10′-tetrahydrodianthracene [cited as ref 2: Viavattene, R. L.; Greene, F. D.; Cheung, L. D.; Majeste, R.; Trefonas, L. M. *J. Am. Chem. Soc.* **1974**, *96*, 4342]. The angle of 19.7° quoted in this work refers to α, rather than ϕ.



Book Reviews

Methoden der organischen Chemie (Houben-Weyl), 4th Edition. Carbene (Carbenoide). Volume E19b (Parts 1 and 2). Edited by M. Regitz (Universität Kaiserslautern). G. Thieme Verlag: Stuttgart and New York. 1989. XXXVI + 1900 pp (in German). DM 2680. ISBN 3-13-219704-1.

This extraordinary two-part addition to the well-known Houben-Weyl series, *Methods of Organic Chemistry*, is a labor of love and scholarship. *Carbene* (*Carbenenoide*) has been produced by 22 authors, from 6 countries, under the general direction of M. Regitz. Yet, despite the multiplicity of contributors, the work is well-integrated. Here are 1900 pages of text, followed by 314 pages of bibliography and indices. The coverage of the carbene literature is truly encyclopedic; on every page, the reader encounters treasures of remarkable rearrangements, little-known generative reactions, or unusual products.

In a work of this magnitude, an organizing principle must be chosen first, and then maintained. In deference to the synthetic thrust of the Houben-Weyl series, the choice for *Carbene* (*Carbenoide*) is to organize the text according to the structures of the carbenes. Of necessity, this leads to a fragmentation of mechanistic discussion, but, supported by the hyperdetailed table of contents, and the extensive indices, every interest can be satisfied.

The table of contents alone takes up 22 pages, with every sub and subsub heading included, so that it is easy to locate any type of carbene and, thereunder, methods of generation and various reactions. The main text is followed by a chronologically arranged, 13-page bibliography of the carbene literature, including serials, monographs, reviews, and topical treatments. Next comes a 100-page (3 columns/page) author index that includes citations for all authors of each work. This is followed by a double-column, 200-page subject index, where carbenes, carbynes, bis-carbenes, their products, and other compounds are listed alphabetically by structural class. Cyclic carbenes and compounds are arranged in order of increasing ring complexity, with structural formulae and numbering illustrated. Finally, there is a general index to name reactions, compound classes, and trivial names.

The main text itself is felicitously produced, with lavish use of structural formulae, and literature citations at the foot of each page, repeated as often as required (a convenience that obviates page flipping, and improves concentration). Amazingly, coverage extends to 1988, and even early 1989. Part 1 begins with a 56-page introduction, meant to serve as a mechanistic overview of carbene chemistry, that includes electronic structure and substituent effects, reactivity and selectivity in intermolecular reactions, and the classes and characteristic features of various intramolecular reactions. A short (28 pages) section on carbynes follows, and then the text turns to the detailed consideration of carbenes by structural class.

Thus, a review of monocoordinated carbenes (e.g., alkylidenecarbenes) is followed by surveys of dicoordinated carbenes, beginning with methylene, and proceeding through alkyl, dialkyl, and cycloakylcarbenes. Part 1 also includes treatments of cycloalkylidenes, cycloalkenylcarbenes and cycloalkenylidenes, arylcarbenes, arylhalocarbenes, and various heteroarylcarbenes. Part 2 considers, in turn, acylcarbenes (including carboalkoxy and cyanocarbenes), silyl, germyl, stannyl and other "metallocarbenes" (but not carbene metal complexes), halo and dihalocarbenes (165 pages), oxacarbenes (with many examples, although their characteristic nucleophilicity or ambiphilicity are not explicitly treated here), sulfur-substituted carbenes, nitrogen-substituted carbenes, and, finally, phophacarbenes.

Throughout the text there are many examples of detailed experimental

procedures and a copious use of tables. In addition to the 199 numbered tables, many other tabular collections of products and yields are employed to illustrate the various reactions. With the tables and the abundant structural formulae, even the user who does not read German will be able to locate desired information and citations to the original papers.

There are two negatives that need to be briefly mentioned. The price of this two volume set is substantially in excess of $1000. Although no university chemistry library worthy of the name can afford to be without these books, individual purchases are, sadly, sure to be rare. Secondly, the arrangement of the coverage by carbene structure necessarily weakens the mechanistic themes that now offer an alternative coherent view of carbene chemistry. For example, the reader who wishes a properly developed discussion of the impact of nanosecond kinetic methods on carbene chemistry (arguably the major development of the past decade) would be best advised to consult Platz' recent volume on the kinetics and spectroscopy of carbenes and biradicals.

But these cavils pale beside the magnificent accomplishment of Professor Regitz and his colleagues. All of us, both mechanistic and synthetic chemists, are deeply in their debt.

Robert A. Moss, *Rutgers, The State University of New Jersey*

Handbook on the Physics and Chemistry of Rare Earths. Volume 12. Edited by K. A. Gschneider, Jr. (Iowa State University) and L. Eyring (Arizona State University). Elsevier: Amsterdam and New York. 1989. xi + 486 pp. $131.75. ISBN 0-444-87105-5.

This book is a continuation in the series of monographs devoted to the chemistry and physics of the rare earth elements. The intense interest in the rare earths for a diversity of applications, ranging from their use as active catalysts to recent developments in superconducting materials, makes additions to this series both timely and of interest to a wide range of scientists. The first two chapters deal with the preparation and growth of crystalline materials of both the rare earths and a variety of intermetallic compounds, with special emphasis on single crystal growth. In these chapters, both traditional approaches and more recent methods are presented in detail, including the use of molten metal fluxes. These chapters provide valuable information for those wishing to prepare crystalline materials without investing enormous time and effort learning this complex technology. The chapters are written from a largely practical perspective, enhancing the utility of the volume for the experimentalist. The following three chapters deal with the magnetic properties of rare earth containing materials, specifically the $Ln_2Fe_{14}B$-based alloys, ternary intermetallics, and spin glass materials. The first of these chapters on magnetic properties presents data and analyses for phase diagrams, crystal structures, preparatory methods, and magnetic properties of $Ln_2Fe_{14}B$-based alloys. In addition, the physical properties for these magnets made by several manufacturing processes are described in detail. The following chapter describes both the physical and magnetic properties of rare earth ternary phase materials with the general composition of LnM_2Si_2 (where M can be any of a wide variety of transition metals). The final chapter dealing with magnetic properties discusses spin glass systems such as $Eu_xSr_{1-x}S$, Gd_xAl_{1-x}, and Sc-rich and Y-rich intra-rare earth alloys. In this lengthy and detailed chapter, classification, components, requirements, and models for understanding these important materials are presented. The following two chapters of the text deal with the chemistry and physics of unusual states for the lanthanides, namely the liquid and gaseous phases. The chapter on liquid metals and alloys provides an in-depth presentation and discussion of physical, electronic, magnetic, and thermodynamic properties of these materials including applications to electronic transport properties. The next chapter deals primarily with dissociation enthalpies and enthalpies of formation for the gaseous rare earth metals. The final chapter discusses the use of lasers in the investigation of the spectroscopic properties of rare earth materials and the impact of rare earth materials as laser sources and in optical systems.

All chapters are well-written and provide insightful commentary on topics of great current interest to those involved in both fundamental and application oriented rare earth work. This volume also serves as an excellent source of compilations of pertinent data related to the various topics of rare earth chemistry and physics presented. Each chapter begins with a complete table of contents and list of abbreviations and symbols used in the chapter. The text is concluded with a thorough subject index, further facilitating the use of this volume as a ready reference source.

James T. Spencer, *Syracuse University*

High Pressure Chemical Synthesis. Edited by J. Jurczak (Institute of Organic Chemistry) and B. Baranowski (Institute of Physical Chemistry, Polish Academy of Sciences). Elsevier: Amsterdam and New York. 1989. x + 508 pp. $156.00. ISBN 0-444-88187-5.

As is the case with many edited volumes, the various contributed chapters of this volume are of uneven quality. As a consequence, this reviewer found the full read through (for the purposes of this review) tedious and distracting.

The choice of chapter topics contributed to this difficulty in lacking readily apparent coherence. The volume is less eclectic than erratic in choice of scientific substance. The chapter dealing with the synthesis of superhard materials, a well-written discourse on a sadly limited set of reactions, describes chemical behavior in a pressure domain different from, and employing techniques that bear no sensible relationship to, those utilized in gas-pressured reactions on nitride formation that follows.

These first two chapters share a goal of materials research, also that of the chapter describing synthesis of unusual metal oxides of the transition elements. The preparation of novel electrooptical materials deservedly enjoys enormous current interest. The search for an ultra-high-density read-write optical memory system drives this interest. The high-pressure domain clearly affords a wider choice of reaction parameters and beneficially broadens research possibilities.

The synthesis of metal hydrides receives important attention and is profitably studied in some detail. The discussion of the group VIII metal hydrides in this chapter could persuade many scientists engaged in the so-called "cold fusion" safari that the electrochemical techniques so popular in this hunt may obscure any effects, chemical or nuclear.

The bulk of the book is devoted to various aspects of organic synthesis, hitherto the province of industrial chemists and engineers. Several of these chapters include sections describing small-scale technologies. The removal of the mysterious will, it is to be hoped, encourage traditionalists among the organic fraternity to avail themselves of the techniques and thereby enjoy a less cluttered field of endeavor.

Perhaps the most exotic section of this volume is the chapter describing the high-pressure synthesis of materials of biological interest. In this excellent discourse the author points out the relevance to processes occurring at thermal vents in the ocean deeps. This emerging story should engage the interest of many chemists. It is certain that chemists, such as the author of this chapter, Dr. Taniguchi, will have much to contribute.

This is not a book to be read, but it makes for entertaining and informative browsing. In spite of the comments in the first paragraph, this reviewer often finds himself reaching for this volume to engage in change-of-pace reading. Frequently, an esoteric piece of information encountered in this casual way will become useful in helping to solve a current problem troubling daily scientific work.

This is an expensive book and, with the lack of coherence among the topics, it is difficult to recommend its purchase to any individual chemist. It is unfortunate that the publisher does not offer less expensive chapter pamphlets. In such case individual purchases of chapters of interest could be urged.

Grant Urry, *Tufts University*

Clinical Chemistry. Chemical Analysis. Volume 106. Edited by E. Howard Taylor (University of Arkansas). John Wiley & Sons: New York. 1989. ix + 293 pp. $75.00. ISBN 0-471-85342-9.

The editor states in the preface that the book is "written for readers with broad and diverse backgrounds within the field of chemistry", and further, that the intention is to "rapidly familiarize the reader with the essence of clinical chemistry". The collection of subjects chosen for chapters and their order of presentation will make the attainment of this goal difficult.

Given the intention, it would have been desirable to start with an introductory chapter that puts clinical chemistry in perspective with other fields of chemistry. Instead the book launches into a chapter entitled Preanalytical Variables, which, while offering some useful detail, will confuse a reader new to the area of clinical chemistry. How many chemists will recognize the reasoning behind the statement that "pseudohyponatremia may occur in specimens containing large quantities of protein or lipid". And, by the way, it is not stated in that chapter, nor will a novice deduce that "pseudohyponatremia" is method dependent—indirect and direct ion-selective potentiometry yield different results. It would have been wise to avoid the approach of cataloging detail without providing explanation. Of what use to the lay reader is a listing of days of stability of different enzymes, especially when the chapter on enzymology is a hundred pages ahead?

Chapter 2 accentuates my feelings that the editor is missing his mark. While quality control is vital, it should not occupy one of the first chapters in a book intended to generate enthusiasm for a new field. The editor seems to have taken the traditional approach toward writing a clinical chemistry text for medical technologists, and, indeed, fallen short of such textbooks presently available. Medical technologists will not buy this book, and most chemists will find chapters on preanalytical variables and quality control boring. These represent mundane activities that must be addressed, but why not begin with some of the more exciting aspects of clinical chemistry? The new reader should be drawn in and fascinated

by the breadth of analytical techniques in clinical chemistry and the relationship of analyte concentrations to clinical medicine.

While later chapters deal with analytical aspects and clinical utility, they form a hodge-podge collection that fails to represent clinical chemistry as it really exists. Glucose and carbohydrate metabolism are conspicuous by their absence, particularly since glucose is the most requested analyte in clinical chemistry. Why include coagulation at the expense of other areas? Most hematology sections perform this testing. If the idea is to show the far reaches of clinical chemistry, such expanses could have been summarized in a single chapter rather than focusing on one at the detriment of space. The chapter on nutritional assessment should also be pitched and replaced with a chapter on liver function, or lipid measurements, or cardiac isoenzymes, or drug screening, or thyroid function, or automation, or tumor markers, or ...any subject that better reflects the everyday world of clinical chemistry. The assortment of topics would seem to point to a choice of contributing authors rather than an attempt to present a cohesive overview of the field. The book might serve as a useful adjunct to existing treatises, but it fails as a stand-alone introduction to clinical chemistry.

Mark T. Watts, *Texas Tech University Regional Academic Health Center*

Adhesion and Bonding in Composites. Edited by Ryutoku Yosmiya, Kiyotake Morimoto, Akio Nakajima, Yoshito Ikada, and Toshio Suzuki. Marcel Dekker: New York and Basel. 1989. x + 357 pp. $99.75. ISBN 0-8247-8149-X.

This book can be recommended to the chemical community as a means of keeping abreast of new and important topics in adhesion and bonding in composite materials. Thus, it will interest scientists who want an overview of the theories of adhesion and insight into the commercial polymers that make up adhesives. Although there is inevitable variability in the quality and breadth of appeal of the chapters, they generally reflect, in their organization, clarity, and scholarship the high standards set by the authors.

The book contains twelve chapters, which discuss topics of varying interest to those performing research in the area of adhesion and bonding. Chapter 1 deals with an elegant discussion on the theoretical treatment of the interface in composites. Chapter 2 describes the relationship between wetting properties and adhesion, primarily of polymer matrices. Basic conditions for a good adhesion have been discussed. Chapters 3–6 are mainly devoted to descriptions of surface modifications of matrices or fillers. In Chapter 7, adhesion of plastics onto metals has been discussed in detail. Chapter 8 covers a detailed study on bonding of ceramics with metals. Chapter 9 deals with modification of the interface in fiber-reinforced metal composites, while Chapter 10 discusses the interfacial effect in carbon-fiber-reinforced composites as related to methods of carbon fiber surface treatment. In Chapters 11 and 12 we find discussions on interface analyses and interfacial strength of composite materials narrated with several examples.

The authors have cited an abundance of references, many of which are recent. However, practical aspects of adhesive formulation have not been discussed in depth, which makes the book have greater appeal to those seeking an understanding of adhesives in their applications. In summary, this reviewer believes that this book is comprehensive and that it will be a useful addition to the library of anyone working in the field or contemplating doing so.

Tejraj M. Aminabhavi, *Lamar University*

Computer-Aided Drug Design, Methods and Applications. Edited by Thomas J. Perun (Abbott Laboratories) and C. L. Propst (Affiliated Scientific, Inc.). Marcel Dekker: New York and Basel. 1989. xii + 493 pp. $99.75. ISBN 0-8247-8037-X.

Computer-Aided Drug Design is a general volume on current methods for the process of mechanistic, computer-aided drug design. The book is intended to be of use more to beginners in CADD: students and researchers not fully familiar with the field. The book is divided in two major sections: Methods and Applications.

The former consists of overviews of computer graphics, molecular mechanics and dynamics, X-ray crystallography in drug design, use of NMR in drug design, and drug design strategies based on enzyme kinetics. These chapters are well-written and informative, although the first two chapters are somewhat outdated: there are more advanced graphics systems and certainly more useful and better quantum chemical approaches than CNDO. Some pattern-recognition techniques could have been added to the Theoretical Aspects.

The Applications part is very instructive: the chapters on the design of ACE inhibitors, inhibitors of renin, inhibitors of dihydrofolate reductase, antiviral drugs, receptor-selective opioid peptides, and cyclopeptides for the inhibition of cholate uptake are truly instructive and provide good reading and understanding of some of the design strategies and processes. The authors of the chapters are well-recognized experts, and the editors did a fine job in putting everything together. It is a book recommended to students and most practicing medicinal chemists.

Nicholas Bodor, *University of Florida*

An Introduction to Rheology. Rheology Series. 3. By H. A. Barnes (Unilever Research), J. F. Hutton (Shell Research Ltd.), and K. Walters (University College of Wales). Elsevier: Amsterdam and New York. 1989. ix + 184 pp. $60.50. ISBN 0-444-87469-0.

The authors have accomplished what they describe in the title and the preface. They have written an introductory text on "the science of deformation and flow". The text is unique from other texts on this subject in that the complex mathematics is minimized in the early chapters and condensed into the last chapter. The important subsections of rheology are covered in sufficient detail to provide the reader with a good understanding of the entire subject of rheology. The text contains all of the key literature references for each aspect of rheology. Therefore, the text is an excellent place to start for the scientist or engineer interested in learning about rheology.

The text begins with a historical perspective on rheology and a description of the difference between solid and liquid behavior. The authors point out that most materials can respond like a solid or a liquid, depending upon the time scale of deformation. The second chapter covers the shear thinning behavior of most materials and provides a practical discussion on rheometers. The text proceeds with a description of viscoelasticity, normal stresses, and extensional viscosities; each of these descriptions is well presented with the important mathematical relationships. Separate chapters are written on polymer and suspension rheology. The last chapter systematically outlines the common constitutive equations and describes their use.

The text is easy to read, technically accurate, and current. Technical terms are clearly defined and consolidated into a glossary. The mathematical symbols follow the standard conventions in the literature. The text is not only good at explaining the unexpected behavior of some materials but also gives an excellent description of the physical phenomena that causes this behavior. More schematic pictures of this unexpected behavior could have been inserted into the first chapter to give the reader an overview of the following chapters, but all aspects of this behavior are well-covered in the text.

The authors have found the right balance between a mathematically complex text and a simplistic physical description of Non-Newtonian behavior. This balance makes the text an excellent reference for the scientist or engineer interested in rheology.

Douglas W. Bousfield, *University of Maine*

Atomic Layer Epitaxy. Edited by T. Suntola (Microchemistry Ltd.) and M. Simpson (University Sheffield). Chapman and Hall: New York. 1990. x + 182 pp. $115.00. ISBN 0-412-02011-4.

The explosive growth of science and technology which so clearly characterizes our present era has not been lost on the field of surface chemistry. Recent advances in the art of controlling chemical processes on surfaces have been dramatic. While demonstrations of the ability to position individual atoms precisely at desired surface lattice sites using the scanning tunneling electron microscope (STEM) have been perhaps the most dramatic, other novel techniques have opened the doors to very interesting new materials, some of which are far more accessible than those fabricated under the ultrararefied conditions required for the marvelous STEM heroics. Noteworthy among these other techniques is that which is called atomic layer epitaxy (ALE). In this process typically two different reactant species are pulsed alternately into an inert gas stream flowing across a heated substrate. Conditions are maintained appropriately for chemisorbtion of a complete monolayer of the first reactant. Excess reactant physisorbed on this monolayer is flushed away by the carrier gas before a pulse of the second reactant arrives to combine with the previously chemisorbed layer. Reaction products include an ordered solid film plus volatile byproducts that are flushed away before the arrival of the next reactant pulse. In this way ordered solid compound films can be grown layer by layer. The editors have compiled what is essentially a primer on this fascinating topic.

While the book serves as a valuable introduction to the subject and guide to the growing literature, it suffers from many of the weaknesses common to multiauthored technical books assembled with minimal coordination and editorial guidance. This is especially clear, for example, in the description of the basic ALE chemistry. It is not that the description is inadequate in detail or poorly phrased but rather that it is given so often—once by each author. The variety of narratives may offer entertainment to the reader interested in comparing individual styles, but it will likely be tiresome for those seeking merely to learn the science.

Having each author read the others contributions before preparing final drafts is an improbable way of avoiding excessive redundancy, but in this case some writers could have benefited from exposure to their co-authors' styles. For example, the book is flawed by an assumption of the authors of the early chapters that the reader will be familiar with and understand the meaning of those curious acronyms used by surface scientists; thus XRD, XPS, AES, TEM, ACTFEL, TF, SIMS, OMVPE, MOVPE, and RHEED are used without identification. Because of the potential of the ALE technique for yielding imaginative new chemistry widely divorced from the conventional microelectronic device fabrication arts, I do hope this book will be read by many chemists working outside the microelectronics area, inasmuch as it will be these individuals principally who will see the broader chemical possibilities of ALE and set out to explore them. To those potential readers my recommendation is that they not be put off by the unfamiliar jargon encountered early on in the book. The situation gets decidely better later on. In fact the third chapter stands out as an excellent bit of technical writing in which ALE is carefully compared with several other methods for controlled surface chemistry. All acronyms used therein are clearly defined as well.

The ALE technique like others has grown out of the semiconductor and microelectronics disciplines. In accordance the book emphasizes applications in these areas. The technique, however, is so versatile that it could be extended to use with elements and compounds not ordinarily considered by surface scientists. The chance to tailor make exotic layered materials with monolayer integrity using reasonably tractable equipment operating at readily managable pressures and temperatures should be intriguing to many individuals. To all of those as well as to more conventional surface scientists who wish to review the ALE art I strongly recommended this little book.

S. O. **Colgate,** *University of Florida*

Biophysical Chemistry of Membrane Functions. By A. Kotyk, K. Janáček, and J. Koryta (Czechoslovak Academy of Sciences). John Wiley & Sons: New York. 1988. xvii + 377 pp. $97.00. ISBN 0471-91657-9.

Interdisciplinary and comprehensive in scope, this book provides a concise summary of current knowledge of the physicochemical principles underlying the mechanisms of action of biological membranes. The authors state that their book deals with three functions mediated by biological membranes: (1) the transport or flow of matter, (2) the flow of energy, and (3) the flow of information. They are clearly at liberty to draw upon a variety of specialized subject matter, which they do. However, the authors focus upon the most important and central topics relevant to membrane biophysical chemistry, and for the most part they provide a useful and comprehensive guide to the subject.

As indicated by the title, the text deals with biological functions mediated by membranes and how these can be understood in terms of physical and chemical principles. Cell membranes are introduced with a fairly complete discussion of membrane-bound organelles of eukaryotes, including a number of electron micrographs. This is followed by a summary of the lipid and protein composition of membranes together with their structural and dynamic properties—pretty standard stuff, but useful. The role of membranes in the transport of matter and energy is then described, mainly from the perspectives of equilibrium and irreversible thermodynamics and kinetics, but including structural knowledge where available. Transport of ions and metabolites, osmosis, and so forth are discussed. The roles of specific channel and carrier proteins are mentioned and described, including the ADP/ATP carrier of mitochondria, the lactose transporter of bacteria, and others. Energy conversion is treated, including photosynthetic systems, electron-transfer processes, and the role of the protonmotive force and the gradient of the electrochemical potential of ions other than H^+ in driving active transport. Finally, processing of information by membranes is described in terms of known modes of signal transduction, involving phosphoinositides, Ca^{2+}, signal transducing proteins, and cyclic nucleotides. The transduction of signals due to light, heat, electrical and magnetic fields, pressure, chemical attractants and repellants, hormones and neurotransmitters, and the immune system are all mentioned and discussed. Overall the book is up to date as of the time of writing. The index is accurate and comprehensive and is sufficient for a book of this size; no author index is provided. Figures are clear and well-reproduced and include a number of electron micrographs of thin sections and freeze-etch specimens. Units and symbols are SI and appear to conform to current recommendations.

What are the relative strengths and weaknesses of this book? As I see it, the main strength lies in the juxtaposition of interdisciplinary material relevant to the study of biomembranes, including physical chemistry, biochemistry, and biology. Most of the subject matter can be found elsewhere, yet other texts tend to be superficial from the point of view of the chemist, or too specialized to serve aptly as a textbook on biomembranes. The book is extremely well organized and the material is well presented. Weaknesses can also be identified: although the text contains a great deal of information relevant to biomembranes, a synthesis is not always possible. For example, we have a section on information theory juxtaposed with reviews of hormone action and immunology, but without comprehensive integration of the material; other examples can be given. However, this can also work to an advantage; e.g. sections of the text can be read more or less independently, and each includes a concise synopsis. Detailed study from more specialized sources is always possible. Which brings me to another point—while the stated intent of the authors is to reduce the number of textual references to a minimum, one expects a review of this nature to identify key references both as a select guide to the more specialized literature and as a means of attributing important concepts and ideas. While some sections of the text (apparently written by different authors) need to identify more critically leading references, others have too many citations of a specialized nature to be useful as an entry point into the field. But if I had to identify a single weakness from the perspective of a chemist, it is that there is not as great a "molecular" emphasis as one would like. As a result the book is more "classical" in emphasis than is perhaps desirable. Knowledge of membrane lipid bilayers and lipid polymorphism is given rather short shrift, which is a serious oversight. For example, the treatment of membrane lipid order is pretty cursory and does not summarize or mention key aspects of statistical mechanical theories which relate spectroscopic parameters to bulk thermodynamic properties. Likewise the discussion of membrane lipid dynamics is mainly limited to a discussion of membrane microviscosity. The confused state of research dealing with lipid–protein interactions is largely avoided, perhaps wisely. However, other topics are included which compensate for these shortcomings, and membrane proteins are more extensively discussed, including bacterial photosynthetic reaction centers, bacteriorhodopsin, and others.

I would recommend this book to chemists and others who wish to gain an exposure to topics relevant to the study of biomembranes from a single source. Personally, I would consider it as a text for an interdisciplinary graduate course in biomembranes, supplemented with appropriate readings from the research literature. One could argue that the treatments of equilibrium and irreversible thermodynamics can be found elsewhere and that similar discussions of spectroscopy and statistical mechanics are lacking. Likewise, discussions of membrane-mediated functions can be found in specialized reviews. But it is equally true that to have such material at one's fingertips in a single text is valuable. In covering the two cultures of chemistry and biology one may displease specialists in one or both areas—such is the risk of interdisciplinary endeavors. Yet a dose of physical chemistry for the biologically inclined as well as an exposure to the most important membrane-mediated phenomena for chemists is desirable. My own view is that the book is a worthy effort and merits consideration as a graduate text as well as a spot on the bookshelves of biotechnologists, industrial chemists, and researchers in biomembranes.

Michael F. Brown, *University of Arizona*