Book Reviews

Subunits in Biological Systems (Biological Macromolecules Series). Volume 6. Part B. Edited by G. D. FASMAN and S. N. TIMASHEFF. Marcel Dekker, Inc., New York, N. Y. 1973. ix + 373 pp. $27.50.

This volume contains five reviews.

1. "The Structure of Nucleoprotein Systems" (J. Pardon and B. Richards) discusses histones, protamines, and nonhistone chromosomal proteins, emphasizing histones and their interaction with DNA.

2. "Principles of Ribosome Structure" (A. S. Spirin) is an impressive organization of the massive literature on ribosomal structure and function according to three dominant motifs: the differences between major and minor ribosomal subparticles, the multiplicity of ribosomal proteins and resulting asymmetry of the entire ribosome, and the different classes of conformational determinants responsible for the compact folding of the one ribonucleoprotein strand in each subparticle.

3. "Bacterial Cell Walls" (D. J. Tipper) outlines with remarkable clarity the problems involved in defining a structure which, although much larger and more complex than the ribosome, actually may contain repetitive elements of structure. The major emphasis is on peptidoglycan structure, synthesis, and digestion.

4. "Viral RNAs" (J. Witz and Cl. Strazielle) focuses on the conformation of single-stranded viral RNAs and the relationship between RNA and protein in the intact virion.

5. "Probing Subunit Systems by Transport Techniques: Problems and Pitfalls" (J. R. Cann, J. L. Bethune, and G. Kegeles) reviews the effects of macromolecular aggregation and of binding of small ligands (*e.g.*, buffer ion) on sedimentation, electrophoretic migration, and gel filtration. Attention is paid not only to the potential of such interactions for generating the artifactual appearance of macromolecular heterogeneity, but also to the use of transport processes to determine binding stoichiometry, affinity, and site heterogeneity.

However unrelated the topics of these articles may seem (actually, three are closely aligned in their concern about protein–nucleic acid interactions), three common features render them valuable additions to the biochemical literature. All five reviews are interpretive rather than encyclopedic in nature, outlining the authors' perceptions of the principal issues in their respective domains. All five emphasize the importance of sound methodology and sober inference in probing microscopic detail with largely macroscopic tools. All five (to varying degrees) attempt to relate structure to biological function. They must be seen as progress reports in highly active research fields rather than as definitive statements; after initial submission in 1971, all were updated by rewrite or addendum to include relevant literature through 1972.

In ten years, this book may be completely obsolete, but in the interim it should help students and professionals find easy access to five large bodies of research literature. With an eye toward the value of these articles to undergraduates, the reviewer was distressed by two possible sources of confusion. The term "configuration" is used constantly in the first article and occasionally in the fourth in contexts in which "conformation" would appear more appropriate. Indeed, a unifying theme in the first, second, and fourth reviews is the progress that has been made in inferring the conformations of nucleic acids and nucleoprotein assemblies. The second source of discontent is the heavy use in the fifth review of figures from the original literature without sufficient explanation to render them easily intelligible to a novice seeking entry into the field. However, this lapse in style is balanced in large part by the authors' felicitous emphasis on qualitative conclusions and experimental interpretation in a field easily rendered indigestible by the formalism of nonequilibrium thermodynamics.

Will Bloch, *Reed College*

Topics in Current Chemistry. Volume 41. New Concepts 1. Edited by F. BOSCHKE. Springer-Verlag, Berlin, Heidelberg, New York. 1973. 150 pp. $19.70.

This volume continues the high standards found in this popular series. It has four chapters: Sulfuranes in Organic Reactions and Synthesis (Trost), Electron Correlation and Electron Pair Theories (Kutzelnigg), Orbital Symmetry Rules for Inorganic Reactions (Pearson), and Discovery of Organic Synthetic Routes (Gelernter, *et al.*). The chapters are well written and are referenced through 1972. The level of presentation make the book useful as a supplementary reference in graduate school courses or as refresher reading for more advanced chemists. The diversity of topics makes one wonder whether a grouping of topics with a common theme might not be more advisable for future volumes of the series.

The sulfurane article is an excellent review of the status of tri- and tetravalent sulfur compounds in organic synthesis. No mention is made, regrettably, of the recent theoretical treatments of tetravalent sulfur bonding and rearrangement modes by Musher and others. These studies should ultimately be of value in the understanding of the mechanistic pathways of the reactions of sulfuranes, as was the case in phosphorane chemistry.

The second article describes the development of the concept of electron correlation energies with emphasis on mathematical treatments. It will be of interest to quantum chemists.

The Pearson article is thought-provoking and presents simple rules for predicting the "allowedness" of numerous reactions involving inorganic reagents. Symmetry arguments are used and many specific examples are given. The article will be of interest to organic and inorganic chemists. Some biological examples should have been given.

The last article describes the authors' system for computer-generated syntheses of complex organic molecules. A drawback of the system, as recognized by the authors, is the lack of stereochemical input. Although references to other systems (Corey, Wipke) are given, there is no comparison of the relative merits or drawbacks of these systems which might guide the novice into which is best for his particular needs.

Irving J. Borowitz, *Belfer Graduate School of Science Yeshiva University*

Solid State Chemistry and Physics: An Introduction. Volumes 1 and 2. Edited by P. F. WELLER (State University College, Fredonia, N. Y.). Marcel Dekker, New York, N. Y. Vol. 1: 1973. xi + 500 pp. $26.00. Vol. 2: 1974. xi + 434 pp. $25.75.

Weller has attempted to weave the contributions of 14 separate authors into a coherent introductory text on solid-state chemistry and physics and, for the most part, he has succeeded. Choice of this format was probably influenced by the fact that solid-state science itself is composed of contributions from diverse areas of the physical sciences. Therefore, the nature of the subject matter to some extent masks the unevenness in presentation which so often results in texts with a large number of authors.

The two volume set is grouped into four major subdivisions and is intended to serve students in both the physical and life sciences who have the background provided by a typical physical chemistry sequence. The first section consists of a three-chapter introduction to solid-state principles, including an overview of physical properties, crystal structure, and bonding models. The introductory chapters are well written and emphasize the important role played by imperfections. This is followed by a seven-chapter section on physical properties which comprises over half the text. Topics treated include electrical, magnetic and optical properties, magnetic resonance, point defects, diffusion, and surface chemistry. The chapters dealing with electrical and optical properties and diffusion are especially good. The chapter on magnetic resonance, however, contains no bibliography, reference books, or journal references. In addition, though it provides a basic introduction to the subject, there is no mention of the important line-narrowing and rotating-frame nmr techniques developed over the past 10 years expressly for the study of solids. The third part is a two-chapter section on purification and crystal growth which is appropriately oriented toward practical applications. The final two chapters deal with polymeric materials and semiconduction in organic and biological systems. Material similar to that presented in this last section is seldom found in an introductory text and provides the serious student an opportunity to extend and apply concepts developed to describe processes in crystalline solids.

Although the book treats a wide range of topics of both current and lasting interest in solid-state science, it suffers from several limitations which may hamper its use as a text in a formal course. For example, there are no problems or exercises in the book, and some unevenness, due in part to the separate styles of the contributors, remains. In addition, a subject index is not included at the end of

the first volume, severely restricting its use alone as a text or reference book. Potentially this could be a serious limitation, as the material in the first volume is almost sufficient to fill a typical one-semester undergraduate course in solid-state science. The instructor who is tempted to require both volumes for this introductory course should be prepared to quell a minor student revolt or, at the least, anticipate a possible decline in student interest in the field. If the above difficulties can be surmounted, however, this set will provide a comprehensive and generally well-presented introduction to solid-state chemistry and physics.

Lowell J. Burnett, *San Diego State University*

Magnetism and Transition Metal Complexes. By F. E. MABBS and D. J. MACHIN (University of Manchester). Wiley/Halsted, New York, N. Y. 1973. xviii + 206 pp. $11.00.

The purpose of this book is to give a detailed account of the methods of calculation of the magnetic properties of transition metal complexes. The book was based on lecture courses given to final-year undergraduates and first-year graduate students at the University of Manchester. It is aimed to the reader who has a reasonably good grasp of quantum mechanics and some understanding of transition metal chemistry.

The first three chapters present the basic definitions of magnetic behavior as well as a review of crystal field theory and perturbation theory applied to spin–orbit coupling and magnetic field perturbation. In the next two chapters the magnetic properties of cubic and axially distorted complexes are calculated in detail for one *d* configuration. Less detailed calculations are presented for other configurations, but the results of the calculations are discussed. In Chapter Six a small number of examples are discussed, and the strengths and weaknesses of the treatment are emphasized. The final chapter is devoted to a discussion of the magnetism of polynuclear species in which antiferromagnetic ordering occurs over small numbers of centers. Detailed calculations by the "Dipolar Coupling" approach are given and the results applied to a number of studies from the literature. At the end of each chapter there are a few references, but these have been chosen to illustrate particular points and are not at all comprehensive. About half of these references are more than ten years old. This limits the usefulness of the book to investigators in the area. Nevertheless the book is a good reference for workers who need to be introduced to this subject.

Kim Cohn, *California State College, Bakersfield*

A Chemical Background for the Paramedical Sciences. Second Edition. By GERALD F. GRILLOT (Syracuse University). Harper & Row Publishers, New York, N. Y. 1974. 591 pp. $10.95.

In many of the paramedical sciences, practical knowledge of the fundamentals of chemistry is important. However, the traditional sequence of one year of inorganic chemistry, one year of organic chemistry, and one year of biochemistry and medicinal chemistry includes a great deal of information that is inappropriate to the needs of the paramedical professions. This textbook has been prepared to meet the specific needs of the paramedical professions for practical chemical knowledge.

The text is divided into 34 chapters, which can be grouped under four headings: inorganic chemistry, organic chemistry, biochemistry, and medicinal chemistry. Fourteen chapters are included in the first group, including: Introduction to the Study of Chemistry, Some Fundamental Concepts of Chemistry; Atomic Structure, Compound Formation and Valence; Oxygen and Combustion; Chemical Arithmetic, Gas Laws and the Kinetic-Molecular Theory of Gases; Hydrogen and Its Oxides; Water and Hydrogen Peroxide; Solutions and Methods of Expressing Concentrations in Solutions; Chemical Equilibrium; Ionization: Acids, Bases and Salts, and Nomenclature of Inorganic Compounds; Hydrogen Ion Concentration, pH and Buffer Solutions; Some Important Nonmetals and Their Compounds; Oxidation-Reduction Reactions; Colloidal Substances; and Radioactivity and Its Biological Applications. Seven chapters are included under the second heading, including: An Introduction to Organic Chemistry; Aliphatic Hydrocarbons; Alcohols, Ethers, Alkyl Halides and Poly Halides; Aliphatic Aldehydes and Ketones; Organic Acids and Esters; Some Simple Nitrogen-Containing Organic Compounds; and Cyclic Organic Compounds. The last two chapters also include material in the area of biochemistry. Seven chapters are devoted to biochemistry, including: Lipids, Fats, Oils and Soaps; Carbohydrates; Proteins; Enzymes; Metabolism of Carbohydrates, Fats and Proteins and Energy Metabolism; Photosynthesis and Biosynthesis of the Carbohydrates; and The Structure and Biological Role of the Nucleic Acids. The last group, medicinal chemistry, includes six chapters as follows: The Chemistry of Digestion; The Urine in Health and Disease; The Chemistry of Blood and Respiration; Inorganic Metabolism; Vitamins; and Hormones. The volume includes three appendices: Mathematical Operations, The Calculation of the pH of a Buffer, and Metric-English and Other Conversion Factors. The text also includes a list of reference books and films, and a useful subject index.

The author has written a textbook which surveys the subjects of inorganic chemistry, organic chemistry, biochemistry, and medicinal chemistry. In order to cover all of these subjects in 591 pages, a great deal of information is necessarily omitted or highly condensed, and occasionally this makes the text difficult reading. A highly valuable feature of the book is the study questions included at the end of each chapter. The answers to most of these are found in the rear of the text.

Although some may argue about the inclusion or deletion of material, the text is in general quite satisfactory. The first edition of this book was published ten years ago, and this edition has been greatly revised and updated to reflect the expansion of knowledge in the past ten years.

Schools preparing students for entrance into paramedical professions should definitely consider this textbook for possible course use.

Donald F. Logsdon, Jr., *USAF Academy (DFLS)*

Air Filtration. By C. N. DAVIES (University of Essex). Academic Press, London and New York. 1973. x + 171 pp. £4.00.

The title of this book is a little misleading in that the contents do not cover the whole field of air filtration. Rather, it represents an excellent advanced text and reference work on the theory of small particle removal from air streams by fiber and membrane filters. In view of the increasing concern about the contribution of small particles to air pollution, the appearance of this book is both timely and appropriate.

Unlike the majority of advanced theoretical texts, this one is written with a keen sense of history. The result is a highly readable monograph which not only reviews the theory of air filtration as it now stands, but also provides the reader with a clear perspective on the developments which have led to our present understanding. Indeed, in addition to being a highly valuable theoretical text for the specialist, "Air Filtration" makes enjoyable and instructive reading for a more general audience.

The contents of the main chapters include early theories of filtration, resistance of filters, modern concepts of filtration, electrical forces in filters, membrane filters, rotary impaction filters, pore theory, clogging of filters, and adhesion of particles. The coverage of these areas is entirely up-to-date (*e.g.*, the inclusion of rotary impaction filtration), and it is encouraging to find a chapter devoted to the much neglected theory of clogging of filters. Little space is devoted, however, to state-of-the-art applications of air filters—a topic which, although outside the intended scope of the book, would have added to its value as an advanced text.

The diagrams and tables have been well chosen and presented and add a great deal to the written description. The index is comprehensive and enables easy access to the text, and the references are up-to-date at the time of writing. Overall, "Air Filtration" provides an excellent description and critical review of the theory of particle collection from air by fibrous and related filters. Its author is a leading authority in the field. This book is highly recommended to all those interested either in collection of airborne particles or in their removal from an air stream.

David F. S. Natusch, *University of Illinois*

Form and Function of Phospholipids (BBA Library, Volume 3, Second Edition). Edited by G. B. ANSELL (University of Birmingham), J. N. HAWTHORNE (University of Nottingen), and R. M. C. DAWSON (Agricultural Research Council). Elsevier Scientific Publishing Co., Amsterdam. 1973. xiv + 494 pp. $45.00.

The explosion of interest in membrane research over the past decade has attracted workers from many diverse backgrounds and stimulated a number of experimental approaches to understanding biological membrane structure and function at a molecular level. Such an understanding has as a prerequisite a thorough understanding of the chemistry and metabolism of phospholipids, a major component of membranes. Thus phospholipid research has greatly expanded over the last ten years. "Form and Function of Phospholipids," a revised and enlarged edition of "Phospholipids," edited by Ansell and Hawthorne in 1964, is an impressive attempt to provide a comprehensive coverage of the current areas of research involving phospholipids. As would be expected in a single volume treatment

of such a broad topic, much of the book consists of concise summary descriptions of the conclusions of various workers. Several references to more detailed review articles make the book a useful key to the phospholipid literature. The book provides a view of the major thrust of productive work in several phospholipid areas as well as defining questions which have defied presently available research tools.

The 16 chapters, which appear to be arranged somewhat arbitrarily, are authored by an impressive list of well-known workers and recognized experts in their areas. Seven new chapter titles, not included in the 1964 edition, attest to the expansion of phospholipid research since that time. With the exception of the Historical Introduction (Chapter 1), which is essentially unchanged from the earlier edition, the chapters which are not new in title have been completely rewritten and reorganized to accommodate new material.

Structure, preparation, and analysis of phospholipids, previously covered in three chapters, have been reduced to Chapters 2 and 3. The remainder of the book concerns itself with either the metabolism or physical properties of phospholipids. Metabolism is extensively covered in chapters on animals, subcellular organelles, photosynthetic plants, microorganisms, the hepato-portal system, the nervous system, and transport processes. Phosphonolipids are treated in a separate chapter. Physical properties of phospholipids are discussed in chapters entitled Specificity of Enzymes Involved in the Metabolism of Phospholipids, Physical Chemistry of Phospholipids, Phospholipids as Model Membranes, and Phospholipids in Biological Membranes and the Study of Phospholipid Protein Interactions. The last chapter of the book is a collection of tables of phospholipid composition of mammalian tissues.

The chapter on specificity of phospholipid enzymes, written by R. M. C. Dawson, is excellent and should be read by anyone working with enzymes which require phospholipids as substrates or activators. The question of physiological specificity of enzymes for interaction with various phospholipid substrates is discussed in light of the variety of physical factors which can affect such interactions.

Overall, this book gives a lucid picture of the state of knowledge of the occurrence and metabolism of phospholipids, as well as describing experimental progress toward defining their physical characteristics relating to their role in membrane structure and function.

Richard D. Mavis, *Northwestern University*

Advances in Magnetic Resonance. Volume 6. Edited by J. S. WAUGH. Academic Press, New York, N. Y. 1973. 310 pp. $27.50.

I feel that "Advances in Magnetic Resonance" has been an excellent series of annual reviews on topics of current interest. This is amply supported by the fact that many of the articles have become classics as reviews in magnetic resonance and are quoted numerous times in the literature as authoritative and comprehensive sources. The present volume, Number 6 in the series, maintains the high standard established by its predecessors, and I consider it a valuable asset for chemists and physicists who are seriously interested in magnetic resonance. The editor has again done a commendable job of appealing to experts in the field. The topics covered are of current interest, and at present no other updated reviews are available.

The volume contains five articles. The first is on Gas Phase Magnetic Resonance of Electronically Excited Molecules, by Donald H. Levy. As the editor remarks in the preface, this is a masterpiece of Clebsch-Gordanry. The material described draws on the many contributions of the author and provides good descriptions of theory, the application of molecular beams, level crossing, optical microwave and optical-r.f. double resonance, a short discussion of nonlinear optical methods, etc. Since this is a relatively new subject, the examples of recent applications to O_2, NF, SO, SeO, N_2, CO, H_2, OH, NO, Na_2, CS, CN, BaO, CS_2, SO_2, and I_2 in selected states are more or less comprehensive. The second chapter describes NMR Studies in Liquids at High Pressure, by Jiri Jonas. Again, this is a timely review by an expert, with a comprehensive summary of recent results. It is particularly rich in details of specialized probes and other equipment for high-pressure nmr from the author's own laboratory and should prove invaluable to anyone contemplating research in this area. The third article describes NMR of Organic Free Radicals, by Robert Kreilick. I found this very readable and useful. The description of results on nmr measurements of electron-nuclear coupling should prove particularly useful to chemists employing nmr and esr in studies of reactions with radical intermediates.

The fourth paper is on Crystal Symmetry in Magnetic Resonance, by John A. Weil, Tomas Buch, and James E. Clapp. This is an encyclopedic review and is a masterful and definitive coverage of an important topic. Although the effects of crystal structure and symmetry on tensor properties have been described in various places, they have not been presented as such a self-contained, coherent, and accessible subject. Here you will find a systematic, detailed tabulation of the effects of all classes of point group symmetry on second rank tensor interactions. This is not the type of article I would select for light evening reading, but it should serve as a valuable reference for research in esr, nmr, and nqr in solids. The final article is on Second and Fourth Moments in NQR Spectroscopy for Spins With I = 1, by S. Vega. This fully solves several difficult cases which have not been treated extensively before, including the presence of magnetic fields, asymmetry of the electric field gradient tensor, coupling to unlike spins, and all combinations thereof. Extensive tabulations of exact results are presented, and the author performs a useful service by correcting some previous errors in the literature.

All in all, a useful volume. An article in one of the future volumes by the editor himself on any of his many contributions to magnetic resonance would be enormously welcome.

What a pity that Felix Bloch's name is misspelled on page 1.

Alex Pines, *University of California—Berkeley*

Infrared Spectra of Labelled Compounds. By S. PINCHAS (The Weizmann Institute of Science, Israel) with I. LAULICHT (Bar-Ilan University, Israel). Academic Press, London and New York. 1971. xii + 371 pp. $19.00.

Isotopic substitutions are widely employed in all areas of modern chemistry ranging from theoretical through mechanistic organic to biochemistry. Hence in the past two–three decades an increasing number of isotopically labelled compounds have been prepared. The present monograph deals in great detail with the infrared spectra of such compounds. The contents may be divided into four broad areas. The first three chapters comprise a brief introduction, a summary of the theory of infrared absorption in general, and a theoretical discussion of the effect of isotopic substitution on ir frequencies.

The second area (Chapter 4) deals with deuterated and tritiated compounds. Perhaps the single most widely used isotope is deuterium, and hence the largest number of labelled compounds (estimated to be well over 3000 by the authors) contain this isotope. Since deuterium substitution also results in the largest relative change in mass (outside of tritium substitution), its effects are most pronounced upon the vibrational modes and hence absorption frequencies of molecules. The discussion is subdivided according to the type of molecules into inorganic and organic compounds, with the latter further classified according to functional groups.

The third area (Chapters 5, 6, 7, and 8) covers the effects in the infrared of C-13, N-15, O-18, and miscellaneous (^{6}Li, ^{10}B, ^{34}S, ^{35}Cl), isotopic substitution, respectively. Isotopic substitutions in various classes of compounds and structural features are examined in some detail.

The final section deals with the effects of isotopic substitution upon the intensity and width of absorption bands (Chapter 9), spectra of labelled molecules in the condensed phases (Chapter 10), absorption in matrices (Chapter 11), and analytical applications (Chapter 12), particularly the analysis of deuterated compounds.

In summary, this is a well-written and exhaustive monograph on the infrared spectra of a great number of various isotopically labelled compounds. Literature coverage is complete through 1968 and early 1969 and very extensive, with over 1500 references to the original literature. It should prove to be a valuable reference source for any one working with and interested in the infrared absorption of isotopically substituted molecules.

Peter J. Stang, *The University of Utah*

How Modern Medicines Are Discovered. Edited by FRANK H. CLARKE (Ciba-Geigy Corp.). Futura Publishing Co., Inc., Mount Kisco, N. Y. 1973. ix + 177 pp. $10.00.

This book contains eight contributed chapters on various aspects of new drug discovery and development. The authors are all actively engaged in medicinal research and are well qualified to discuss their chosen topics. The reader obtains a broad overview of how drugs are developed with specific examples from the areas of antibiotics, analgesics, sulfa drugs, antihistamines, tranquilizers, antidepressants, and hormones. The various topics are developed from a historical viewpoint in an exciting manner that makes one feel he was there as it was happening. It is a very readable, enjoyable, enlightening book for anyone in the health professions.

Donald L. Trepanier, *The Dow Chemical Company*