Table II. $(1/T_1)_{dd\text{-}intra}$, $(1/T_1)_D$ of Deuterons Measured in the Perdeuterated Analog of the Given Liquid and f_r Calculated from eq 1, 2, and 5 at 25°C

Liquid	$(1/T_1)_D$, sec^{-1}	$(1/T_1)_{dd\text{-}intra}$, sec^{-1}	$1/f_r$ eq 1	$1/f_r$ eq 2
CH_2I_2	1.93	0.119	14.9	14.7
CH_2Br_2	0.74	0.052	10.8	11.9
CH_2Cl_2	0.312[a]	0.019[a]	11.4	11.8
C_6H_6	0.714[b]	0.009[c]	11.2	14.9
$C_6H_3D_3$	0.714[b]	0.00079[d]	11.2	14.6
C_6H_5Br	1.905[c]	0.027[d]	8.1	7.6
CH_3CN	0.154[f]	0.020[e]	15.3	12.8

[a] See ref 13. [b] See ref 2. [c] See ref 5 and 6. [d] See ref 6. [e] See ref 3. [f] See ref 4.

2, and 5 are shown in Table II. It can be seen from Table II that the values of f_r are of the order of $1/12$ for nearly all the liquids. It may be mentioned that Gierer and Wirtz[1] assume spherical rotation in their microviscosity model and acetonitrile[3,4] has nonspherical rotation because it rotates about ten times faster about the methyl group symmetry axis than it does about an axis perpendicular to the symmetry axis. However, taking into account the errors involved in the deuteron quadrupole coupling constant, and in reading the figures for T_1, it is quite reasonable to assume that $f_r \sim 1/12$ instead of the commonly accepted value of $f_r = 1/6$. Furthermore, the value of $f_r = 1/12$ gives a better agreement between the experimental values of $(1/T_1)_{dd\text{-}intra}$ and the values calculated using the BPP theory modified to include the rotational microviscosity factor.

It can be seen from Table II that the values of f_r obtained from the deuteron T_1 data agree with the values obtained from $(1/T_1)_{dd\text{-}intra}$ values. This would indicate that the assumption $(\tau_c)_q = (\tau_c)_{dd\text{-}intra}$ is justified.

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*Book Reviews**

Les Grandes Réactions de la Synthèse Organique. By J. MATHIEU, R. PANICO, and J. WEILL-RAYNAL (Ecole Nationale Superieure des Techniques Avancées). Hermann, Paris xv. 1975. 356 pp. 76.00 F (about $19.00).

This large paperback book is meant to serve as a review and quick reference for the well-established synthetic reactions that are the backbone of organic chemistry. They are arranged in five groups: Condensations; Dimerizations; Insertions; Cleavages; and Rearrangements. Each section has a short introduction which includes some comment on mechanism, and organized presentation of each reaction in brief form, often less than one page. Some representative examples are given in equation form, with a reference (many are to "Organic Syntheses", but most are to recent journal articles). Both classical reactions and those of recent introduction are included. References to review articles or chapters, or to other leading references, are also given. Some of these are unfortunately rather outdated, but this fact does not seriously detract.

Because so much of the information is in the form of equations and references, only a minimal knowledge of French is needed. There is both a subject index and an index of synthons. The book appears to be useful enough to warrant personal purchase by graduate students and professional organic chemists.

Geochemistry of Water. Edited by Y. KITANO (Nagoya University). Dowden, Hutchinson & Ross Inc., Stroudsburg, Pa. 1975; distributed by Halsted Press, John Wiley & Sons, New York. xv + 455 pp. $27.00.

This is another in the series "Benchmark Papers in Geology", the philosophy behind which is to collect and sift for key papers in a basic area, and to make them more easily available in a single volume. It is surprising to note that the editor has selected no paper earlier than 1953 for this volume, which is concerned with the chemical and isotopic composition of sea water, rain and river water, and deep subsurface (connate) waters. The subject of medicinal spring waters is essentially ignored, and neither Oscar Baudisch nor balneology is to be found in the important papers, many of which may be unfamiliar to chemists although of much significance to them. The papers themselves, reproduced from the original journals, are amplified with comments by the editor.

* Unsigned book reviews are by the Book Review Editor.

Synthesis of Life. Edited by CHARLES C. PRICE (University of Pennsylvania). Dowden, Hutchinson & Ross, Inc., Stroudsburg, Pa. 1974. xiii + 391 pp. $22.00.

This somewhat misleadingly titled book is a volume in the series "Benchmark Papers in Organic Chemistry". It is a collection of key papers reprinted by photoreproduction from the original journals: one of them is in German; the rest are in English. The selections are deployed in three groups: The Natural Synthesis of Biomonomers, concerned with chemical evolution and primordial generation of organic compounds; Synthesis of Biopolymers, concerned with natural and total laboratory synthesis of peptides, proteins, and nucleic acids; and Self-Organizing Systems of Biopolymers, concerned with ribosomes, enzymes, optical activity, and proliferation. As in previous volumes of the series, thoughtful, critical, and stimulating comments (actually, short essays) by the editor are included with each group of papers. The whole subject is one that should strike at least some chord of interest with any chemist.

Symmetry Principles in Solid State and Molecular Physics. By MELVIN LAX (City University of New York). John Wiley & Sons, Inc., New York, N.Y. 1974. xi + 499 pp. $19.50.

Melvin Lax is eminently qualified to author a book dealing with symmetry in solid state physics, having done extensive theoretical work in this field. In this book he has brought together most of the

applications of group theory to solid state physics. The book is intended to be a text book for students studying solid state physics. There are abundant problems at the end of each chapter, and the text is liberally sprinkled with examples. However, the book should not be pursued with the thought of self-instruction unless the student is well versed in linear algebra, tensor theory, as well as classical and quantum mechanics. Previous exposure to abstract group theory would also be helpful. There is no question that the reader, with an appropriate background, will find upon completion of this book that he is completely up to date as regards the application of group theory to solid state physics. He will also find that he has at his disposal very powerful theoretical tools with which to attack solid state problems.

Chapter 1 is for the most part abstract group theory, but several examples are discussed in order to help the student over the rough spots. Chapter 2 is a continuation of abstract group theory as it applies to point groups. There are numerous theorems and corollaries with very few examples in this chapter. Supposedly, Chapter 3 illustrates the group theory of the previous chapters as applied to physical examples. In reality, more group theoretical concepts are introduced including outer and inner products of groups and projection-operator techniques. The first three chapters present the fundamentals of group theory.

Applications of point group theory are given in Chapters 4 and 5. Chapter 4 is devoted to determining the nonvanishing and independent elements of matter tensors. The discussion of molecular vibrations in Chapter 5, in the opinion of this reviewer, is not as good as in the standard text on the subject by Wilson, Decius, and Cross.

The extension of group theory to space groups and applications of space group theory are to be found in Chapters 6-12. Chapter 6 covers the fundamentals of crystal symmetry, defines terms, and introduces the concept of the Brillouin zone. Chapter 7 features a very good discussion of electronic energy bands. The theory of space groups is presented in Chapter 8. A beginning student would have difficulty with this chapter. In the opinion of this reviewer, this chapter could be improved by pointing out the terminology used by different authors for the same concept. For example, the multiplier representations are variously referred to by other authors as ray, projective, weighted, or loaded representations. There is no problem here for the experienced professional, but such a multiplicity of terms is quite confusing to the novice. This reviewer, for one, was not familiar with the term "Dirac character" and could not find this term mentioned in several standard group-theory books. Applications of space group theory are given in Chapter 9. Chapters 10 and 11 are two of the most important chapters in the book in that they show how time reversal and crystal symmetry influence the dynamics of the crystal vibrations. While studying these chapters, the reader will probably find it necessary to consult the original literature. In this respect the book contains a very good bibliography, although it is not meant to be exhaustive. A very nice feature of the book is Chapter 12, where the concepts of the previous chapters, especially Chapters 5, 6, and 11, are utilized in a discussion of the dynamics of the diamond lattice.

In Chapter 13 the application of group theory to the electronic structure of molecules is outlined. The symmetry orbitals are derived for tetrahedral bonding, and such topics as resonance, broken symmetry, and the Jahn-Teller effect are succinctly discussed.

There are eight appendicies which the reader will find useful. Included are character tables, points of high symmetry in the Brillouin zones of the Bravais lattices, and multiplier representations.

Some pertinent topics such as site group-unit cell group analysis and second-order phase transitions have been omitted from the book. Overall, this reviewer was favorably impressed by the book and recommends it to those chemists and physicists who are engaged in solid state research.

R. E. Wilde, *Texas Tech University*

Experiments in Polymer Science. By EDWARD A. COLLINS (B. F. Goodrich Chemical Co.), JAN BAREŠ (Xerox Corporation), and FRED W. BILLMEYER, JR. (Rensselaer Polytechnic Institute). Wiley-Interscience, New York, N.Y. 1973. ix + 530 pp. $16.95.

This book contains more than the title implies since two of the three main parts contain background information for the experiments described in Part III. Parts I and II describe experimental techniques and equipment necessary for polymer synthesis and characterization. In addition, some of the theoretical background for these topics are also included. The authors state that "Textbook of Polymer Science", 2nd Edition, 1971, by F. W. Billmeyer, is to be used as a supplement and there are many references to specific portions of that book. Each chapter in Parts I and II has an extensive bibliography which should prove useful to the reader.

Part III describes 32 experiments on synthesis, molecular weight measurement, and property determinations. Most experiments are described in sufficient detail for the reader to satisfactorily complete the experiment without other references.

Each experiment description contains a section on safety considerations which is very commendable since many of the reagents and experiments are hazardous.

Information on standard polymer samples, properties of polymers, monomers and solvents, and a discussion of errors and statistical treatment of data are included in four appendices.

The book is well suited for use by advanced undergraduates or graduate students as a laboratory manual. The industrial scientist or engineer would find it useful when first entering the field.

The experiments depend heavily on commercial instruments which may not be available unless the laboratory is exceptionally well equipped. Several of the instruments specified require trained operators for accurate results, and students may have difficulty in learning to operate them in the short time period alloted for laboratory courses. In addition, some of the instruments are a bit delicate and students can harm these easily.

Some simple experiments like creep and stress relaxation are not included. It seems these would be useful to demonstrate the viscoelastic nature of polymers, and creep, in particular, does not require elaborate equipment. The time for each experiment must be examined closely since many of them require extensive preparatory steps.

This book should prove to be very useful to the education of polymer scientists and engineers. Billmeyer, in "Textbook of Polymer Science", stated that education in polymer science has not kept pace with the industrial gains. This book should help us in the universities to narrow the gap.

Carl E. Locke, *University of Oklahoma*

The Entanglement Concept in Polymer Rheology. (Volume 16, Advances in Polymer Science). By W. W. GRAESSLEY (Northwestern University). Springer-Verlag, Berlin. 1974. 179 pp. $27.90.

This monograph represents an excellent, up-to-date survey of what is currently one of the most actively investigated areas of polymer rheology. Its subject is the role of chain entanglements in the flow and elastic behavior of polymeric materials, a topic obviously of both fundamental and practical importance. The author himself has made substantial contributions in this area, and the book he has written is authoritative, exhaustive, and quite timely.

The book is divided into twelve sections entitled: Introduction, Chain Configuration in Amorphous Polymer Systems, Material Properties of Viscoelastic Liquids, Molecular Models in Polymer Rheology, Experimental Results on Linear Viscoelastic Behavior, Molecular Entanglement Theories of Linear Viscoelastic Behavior, Entanglement in Cross-linked Systems, Non-linear Viscoelastic Properties, Conclusions, Acknowledgments, Nomenclature, and References. There are no indices.

Although the book is expensive for its size, it will be required reading for anyone interested in the rheology of polymers or polymer solutions.

J. E. Mark, *University of Michigan*

Structure of Water and Aqueous Solutions. Edited by W. A. P. LUCK. Verlag Chemie, Weinheim/Bergstr. 1974. xxx + 590 pp. DM 94.00.

The editor of this book states that a need exists for a good, short review of current water research. He further states that this collection of papers should be of interest to experts, to nonspecialists needing a modern view of water structure, and to students viewing the approach to a single problem using all modern techniques.

This book is the Proceedings of an international symposium held at Marburg in 1973 and consists of 31 reports of the main lectures generally presented by the original workers. The book is produced by photooffset of the typescript which is on the whole readable although some of the illustrations, e.g., spectra and plots of correlations, are too small to be used easily. The papers are classified

under the general chapter headings of Introductory Survey, Theory (this includes thermodynamics and structural models), Infrared Methods, Raman Methods, Scattering Methods, Dielectric Methods, NMR Methods, Ultrasonic Methods, and Sea Water Desalination. A short chapter is appended with the titles and references of short communications at the conference. This also has a few abstracts. In addition there is a useful subject index for the whole volume.

The editor recognizes the existence of the comprehensive treatise "Water" edited by Felix Franks with which a comparison is useful. A large overlap exists between the authors of both. For instance, in "Water", Volume 3, Chapter 1 is by H. L. Friedman and C. V. Krishnan on "The Thermodynamics of Ion Hydration." In the reviewed volume, Chapter 11, Part 5 is an article by H. L. Friedman, C. V. Krishnan, and L. P. Hwang, "Solute-Solute Interaction and the Excess Properties of Aqueous Solutions". The presentation in the latter is by necessity brief and without much background material. Similar comparisons can be made for other articles. The chapter bibliographies contain references to 1973. With these limitations, the book may be useful or interesting to specialists, less valuable for nonspecialists, and probably all but unreadable by students unless unusually well read in the field.

Kenneth A. Rubinson, *University Chemistry Laboratory, Cambridge, England*

Polymer Characterization by Thermal Methods of Analysis. Edited by JEN CHIU (E. I. du Pont de Nemours & Co.). Marcel Dekker, Inc., New York, N.Y. 1974. 254 pp. $25.50.

This book is a collection of the papers presented at the Symposium on Polymer Characterization by Thermal Methods of Analysis which was held during a joint meeting of the Polymer Chemistry and Rubber Chemistry Divisions of the American Chemical Society in Detroit, May 1-4, 1973. The book is divided into three parts based upon experimental techniques. The first group of papers is mainly concerned with differential thermal analysis (DTA) and differential scanning calorimetry (DSC). The second selection of papers consists of work based upon utilization of thermogravimetry or thermogravimetry coupled with gas chromatography and mass spectrometry. The third group of papers deals with numerous other thermal techniques such as thermal mechanical, thermooptical analysis, thermoacoustical analysis, and thermal evolution analysis combined with pyrolysis mass chromatography. Materials studied by these various thermal analytical tools range from additives to plastics, fibers, elastomers, and thermosetting resins.

The application of thermal analysis to the characterization of a variety of polymer systems seems to be an endless process, and I believe that this collection of papers is indicative of the current research efforts in this field and should be a useful reference for those interested in polymer characterization by modern instrumental methods.

H. E. Bair, *Bell Telephone Laboratories*

Laboratory Practice of Organic Chemistry. Fifth Edition. By THOMAS L. JACOBS (University of California, Los Angeles), WILLIAM E. TRUCE (Purdue University), and G. ROSS ROBERTSON (Late of the University of California, Los Angeles). Macmillan Publishing Co., Inc., New York, N.Y. 1974. x + 463 pp. $10.95.

The fifth edition of this standard laboratory text for an introductory organic chemistry course constitutes an up-dating rather than an extensive revision of the fourth edition (1962). The most significant addition to the text is the inclusion of a chapter dealing with infrared and nuclear magnetic resonance spectroscopy.

A feature of this book is the extensive, but not highly formal, discussion and treatment in Part I of the fundamental physical principles underlying the laboratory procedures. It is interesting to note that the illustrations show both standard-taper apparatus and apparatus utilizing cork for connections. Helpful references are given at the end of each chapter. The section on theory and general techniques should prove valuable to the students who do additional work in organic chemistry after the completion of the introductory course.

Directions for 41 sets of laboratory experiments are given in Part II and provide an instructor with considerable choice. The experimental emphasis is on laboratory manipulations, transformations, and synthesis. Chromatographic techniques are treated separately and are not generally utilized in the preparative experiments. Most experiments are followed by a few questions relevant to the reaction or procedure involved. Missing from the text are physical organic experiments concerning reaction kinetics or equilibrium. The text does not have a list of chemicals and quantities for each experiment, nor is an estimate of the time necessary for each experiment given, but it appears that most are suitable for a normal three-hour laboratory period.

In the section on qualitative organic analysis, the identification of an unknown is based on the classical method for determining physical properties, functional group analysis, and the preparation of derivatives as proof of identity.

A section on special experiments contains 184 experiments drawn from the literature and the *Journal of Chemical Education.* These supplemental experiments provide the student with the opportunity to gain experience with a special technique, a multistep synthesis, or in an area of special interest or emphasis.

This laboratory manual has a great many desirable features and should be considered by those instructors teaching a more traditional organic laboratory course.

R. G. Bass, *Virginia Commonwealth University*

Computers in Chemical Research and Education. Edited by D. HADZI. Elsevier Scientific Publishing Co., Amsterdam. 1973. 3 Volumes: 314, 477 and 281 pp. $56.00.

This three-volume set constitutes the Proceedings of the International Conference on Computers in Chemical Research and Education, held in Ljubljana/Zagreb, July 12-17, 1973. The papers were grouped into six major subdivisions: (1) Computer control of experiments, and data acquisition and refinement; (2) Handling of chemical information; (3) Analysis and simulation of spectra, structure determination from complex data; (4) Theoretical chemistry and phase structures; (5) Computer designed synthesis; and (6) Chemical education.

The editor points out in his introduction that his primary consideration in publishing these volumes was to get them out fast. For this reason, it is not unexpected to find substantial variations in the quality of the published papers. Of the 57 papers, some are good reviews of specific areas, but many are only mediocre. In areas where this reviewer is familiar with other publications by the same authors, it should be pointed out that a substantial portion of the material presented here has been published elsewhere, often in considerably more detail. The general content of the papers is informative from an overview standpoint, but the reader would spend his time and money better by reading the more detailed and extensive papers published by these same authors in readily available journals.

James S. Mattson, *University of Miami*

The Chemistry of Imperfect Crystals. Second Edition. Volume 1. Preparation, Purification, Crystal Growth and Phase Theory. By F. A. KRÖGER (University of Southern California). North-Holland Publishing Co., Amsterdam; American Elsevier Publishing Co., New York, N.Y. 1974. xii + 313 pp. $25.50.

The second edition of Kröger's well-known treatise on imperfections in inorganic, nonmetallic crystals has been expanded in size to three volumes. The first volume (which will be reviewed here) and the third volume (which deals with applications) are somewhat abbreviated in length. The main body of material dealing with the imperfection chemistry of solids is contained in Volume 2.

The presentation in Volume 1 does not differ markedly from that of the first edition and, with the exception of a small addition on thin film growth, the text is relatively unchanged. The coverage of preparation, purification, crystal growth, and phase theory in Volume 1 serves as a proper introduction to the extensively revised and improved contents of Volume 2. However, the subject treatment is far too confined to permit Volume 1 to stand by itself. Of the purification processes, only normal freezing and zone melting are treated in any detail. The graphical representation of phase theory continues as an essential technique for understanding the complex equilibria present during crystal growth of the important III-V and II-VI compounds. However, visualizing the three-dimensional P-T-c relations would be vastly simplified for the reader by including a few of the P-c and T-c sections contained in Ricci's "Phase Rule and Heterogeneous Equilibrium" (D. Van Nos-

trand Co., Inc., 1951). The thermodynamic treatment of the phase relations between liquids and vapors offers but a brief foretaste of the elegant expositions for solids presented in Volume 2.

The extensive compilation of substances and methods used to grow single crystals has been updated to the end of 1972 by the addition of some 900 references. A similar table on the thin film growth of electrically and optically important materials has been included. These completely referenced tabulations can serve as a valuable guide to appropriate techniques for the novice crystal-grower or as a rapid point of departure for the more experienced materials scientist.

Sherman Susman, *Argonne National Laboratory*

Problems for General Chemistry and Qualitative Analysis. Third Edition. By C. J. NYMAN and G. B. KING (both at Washington State University). John Wiley & Sons, Inc., New York, N.Y. 1975. x + 347 pp. $5.50 (paperback).

It is to be regretted that no general chemistry text known to this reviewer contains problems of sufficient number and variety to service the freshman science major of only average background and ability. Thus many instructors require the additional use of a problem supplement. The text under review represents the second major revision in ten years of one of the half-dozen most popular problem supplements for the general chemistry course. Explanations are brief and practical and the problems vary in difficulty from drill to moderate. The factor label method is used extensively in the worked out solutions. Most major areas of freshman problem coverage are included and a chapter on chemical bonds has been added during revision. The appendices contain a review of basic mathematics (including experimental numbers and logarithms), the usual data tables, and answers to *all* the ca. 800 numerical problems.

The plan of the text could be termed conventional in that the programmed learning approach is not explicitly used. The text should be of interest both to educators and to those who have some reason to review general chemistry.

Edward K. Mellon, *Florida State University*

Scientific Analysis on the Pocket Calculator. By J. M. SMITH (Software Research Corp.). John Wiley & Sons, Inc., New York, N.Y. 1975. xii + 380 pp. $12.95.

This book should appeal to the average scientist who has purchased an electronic pocket or desk calculator during the last couple of years and uses it for numerical tasks no more complicated than making check book balances. The text develops methods tailored to the calculator which allow sophisticated numerical analysis to be performed. Pocket calculator language is first described using as three examples a typical simple four-function calculator, an engineering calculator with an expanded function and memory set, and a programmable calculator (the Hewlett-Packard HP-65 being the first pocket model to come on the market). The text then presents methods for approximating logarithms and trigonometric functions with simple calculators, followed by sections on elementary and advanced numerical analysis, and finally a section on simple programming. The stress is on the use of pocket calculators for numerical evaluation of such functions as Legendre's polynomials and Bessel functions.

The author feels that working scientists should exploit the numerical analysis capabilities of calculators in training themselves in allied fields. It is certain that most calculators are under-utilized at present. This book presents intriguing possibilities for expansion in their usage.

Edward K. Mellon, *Florida State University*

Systematic Materials Analysis. Volumes II and III. By J. H. RICHARDSON and R. V. PETERSON (The Aerospace Corporation). Academic Press, New York, N.Y. 1974. Vol. II: xix + 263 pp. $23.00. Vol. III: xix + 385 pp. $29.00.

These two volumes represent the second and third in a series of four volumes designed to "provide a much needed central source of information on the latest techniques available to material analysts." At a time, and it seems as though we are always at such a time, when the body of knowledge in analytical techniques is growing by leaps and bounds, there is a great need for a series of books which collect and present this information in an orderly fashion.

The editors have acquired the assistance of various workers, experienced in the instrumental methods covered, to discuss briefly the theory behind the method, the type of information one can obtain from the method and the corresponding application and data interpretation involved. The analytical techniques discussed ranged from such common techniques as nuclear magnetic resonance spectrometry, refractometry, visible and ultraviolet spectrophotometry, emission spectrometry, flame photometry, and gas chromatography to less common techniques such as neutron activation, scanning electron microscopy, and Mössbauer spectrometry. Emission spectrometry, for example, is covered in 59 pages. The approach used in this chapter is typical of most chapters in the series. The author begins with a brief introduction of the typical reasons for using this technique followed by a second brief section on the theory involved and a third brief section on instrumentation which included such points as excitation sources and recording techniques.

The final, rather lengthy section, on application and data interpretation discussed sample size, sample matrix, detection limits, sample forms, excitation sources, analysis time, accuracy, and precision. In a very few pages the author has included a wealth of information. Given a sample to analyze, an analyst could go to this chapter and in a few minutes have some concept of the sample size, the excitation source, analysis lines of interest, interferences, and detection limits.

Each volume is well written and small in size, making it easy to handle while sitting at one's desk. The figures and tables are clearly used when appropriate. An extensive list of references is given at the end of each chapter, to assist readers seeking additional information.

One must study the goals of a book of this type and evaluate whether or not the writers have accomplished them. The volumes reviewed have indeed accomplished the goal stated in the previous paragraph. The only limiting factor is the cost; a set of four volumes would cost in excess of $100. I believe that any organization involved in a variety of testing techniques would be wise to purchase these volumes as a quick reference source.

These volumes will not, nor were they intended to, serve as a complete course in specific analytical techniques. They will, however, offer a fine source of information for anyone seeking a quick review of theory and techniques or an accumulation of specific facts. I intend to purchase Volume I and look forward to the printing of Volume IV. I recommend them highly.

Donald R. Wilkinson, *Delaware State College*

An Introduction to Separation Science. By B. L. KARGER, L. R. SNYDER and C. HORVATH. John Wiley & Sons, New York, N.Y. 1973. xix + 586 pp. $19.50.

The title of the book understates the scope of the contents. The first of three sections includes five chapters presenting, in detail, the fundamental aspects of separation and one chapter on the practical considerations involved in selecting a particular separation method to solve a particular analytical problem. The following two sections present no less than eighteen specific methods of separation, divided into equilibrium methods and rate processes. The authors have included chapters on gas-liquid, liquid-liquid, and liquid-solid adsorption chromatography and sections on membrane techniques, molecular sieves, ultracentrifugation, gas-solid adsorption, gel chromatography, and mass spectrometry. Chapters have been contributed by other authors on the following subjects as well: distillation, solvent extraction, crystallization, ion exchange, exclusion, barrier processes, and electrophoresis. Each chapter presents the theory of the particular method in light of the previous chapters on fundamentals. In addition to the references, most chapters contain a selected bibliography and a list of symbols used in discussing the method. Whenever possible, IUPAC nomenclature has been used, and an extensive master symbol list is included at the front of the book.

The authors indicate that the book is intended for use as a text in an advanced undergraduate or graduate level course in separation science. For this purpose, the book is by far the best currently available. The only drawback to its use in this capacity is that only three chapters (liquid-liquid, ion exchange, and liquid-solid adsorption) contain sections on applications. Separation methods are, by their nature, applied, and a more complete set of examples of their use could have been presented to illustrate the utility of each

method. The authors do include a final chapter which presents four problems which require the use of more than one of the methods previously presented, however.

Richard Delumyea, *University of Michigan*

Emulsions and Emulsion Technology (in two parts). **Part I.** Edited by K. J. LISSANT (Petrolite Corp.). Marcel Dekker, Inc., New York, N.Y. 1974. xii + 400 pp. $39.50.

The book consists of eight chapters, the first three of which deal with the theoretical aspects of emulsions and the rest cover technological applications which utilize or are based on emulsions. The theoretical introduction in the first three chapters deals mainly with the geometry of packing, discussion of phase ratios, techniques of emulsification, including selection of emulsifiers, and micro emulsions.

The remaining five chapters deal with selected technological applications of emulsions and include agricultural emulsions, food emulsions, medicinal emulsions, emulsion paints, and asphalt emulsions. Each chapter, including the first three, has a collection of references to the pertinent literature. There is no index in Part I, but a reference is made to cumulative indices in Part II.

Each chapter, except for the first two, was written by a different author and, as might be expected, this multiple authorship does not provide for the continuity of the book. On the other hand, perhaps any sort of continuity, even with one author, would be difficult or impossible to achieve with such disparate topics as, for example, food emulsions and asphalt emulsions, and perhaps the book would best be regarded as a collection of essays on industrially important emulsions.

Each chapter is edited with reasonable care (although there are a number of errors, for example, Erick for Eirich), and the book is easy and interesting to read. Its best use would be for readers who are totally unacquainted with these subjects and desired an introduction to any or all of these areas of technology. In the opinion of this reviewer, however, the chapters would be completely inadequate for the reader who works in one of these fields and who would like to review the latest research and applications or to be inspired by an idea for his own work.

R. Dowbenko, *PPG Industries*

Recent Developments in the Chemistry of Natural Carbon Compounds. Volume V. Recent Flavonoid Research. Edited by R. BOGNÁR, V. BRUCKNER, and CS. SZANTAY. Akademiai Kiado, Budapest. 1973. 183 pp. $8.50.

This volume is broken down into seven sections, the first four of which are taken from the chemical lectures held at the Third Hungarian Bioflavonoid Symposium (May 1970, Debrecen, Hungary). The chemist may find the first two chapters of some interest, as possible biogenetic relationships between neoflavones, aurones, peltogynols, and the main group of flavonoids are discussed. This is followed by a review of the synthesis of citrus flavonoid glycosides. The third and fourth chapters review the physiological action of flavonoid compounds. The flavonoids responsible for the antihepatotoxic nature of *Silybum Marianum Gaertn* (milk thistle) are discussed in Chapter 3, after which the effects of a flavonoid mixture, isolated from *Agrimonia Eupatoria*, on the cardiovascular and vegetative nervous systems are summarized. The final chapters will find greatest audience among chemists concerned with synthesis or interconversions of flavonoid compounds. In Chapter 5, R. Bognar (Dubrecen) summarizes the extensive flavonoid research of his group from 1950 to 1971. He presents a very readable discussion of various heteroatom-substituted flavonoids in which much pertinent uv and NMR spectral data are included. L. Farkas (Budapest) then summarizes the work of his research group from 1957 to 1971 in Chapter 6. This review concerns some new reactions, e.g., transacylation, as well as their application to the synthesis of several natural flavonoid glycosides. The final chapter then discusses reactions of flavonoids with hydrazines.

The book is very well referenced and contains a subject index.

In summary, I think the editors have done a creditable job of compiling the chemical research in the flavonoid area, especially since 1950. Accordingly, this volume should prove to be a valuable supplement to the more comprehensive work edited by T. Geissman entitled "The Chemistry of Flavonoid Compounds," which covers the literature up to 1960.

Grant E. DuBois, DYNAPOL

Immobilized Enzymes in Food and Microbial Processes. Edited by A. C. OLSON (Western Regional Research Lab., U.S. Department of Agriculture) and C. L. COONEY (Massachusetts Institute of Technology). Plenum Press, New York and London. 1974. x + 268 pp. $18.50.

This book comprises the proceedings of a symposium on this subject held at the 166th National Meeting of the American Chemical Society, Chicago, Ill., 1973. Thirteen papers were presented at the symposium, contributed by 29 scientists from various chemical, biological, and engineering disciplines.

The book reports on the current trends in the rapidly expanding field of enzyme engineering, especially the latest theoretical and practical advances in research on immobilized enzymes in food. The first three chapters concentrate on immobilized enzymes in milk systems, their preparation, support systems, and application in starch degradation processes, which were presented in detailed manner. The book also surveyed various methods of immobilizing the enzymes, such as (1) the use of controlled-pore titania; (2) collagen; (3) imido-ester-containing polymers; and (4) phenol-formaldehyde resins and glutaraldehyde. The last two chapters offer a good comparison of the proposed methods for the in vitro synthesis of edible carbohydrates, as well as a review of the effects of diffusional limitations on Lineweaver-Burke plots for immobilized enzymes.

Some of the chapters are preceded by a very brief general outline of the paper; however, the discussions that followed the presentations of these papers are not included. In addition, the individual chapters contain sufficient detail in their subjects that make the book invaluable as a quick reference in the field. For scientists active in this area of research, this book and also two recent books ("Insolubilized Enzymes", edited by M. Salmona, C. Saronio, and S. Garattini, 1974; "Immobilized Biochemicals and Affinity Chromatography", edited by R. B. Dunlap, 1974) are a good addition to a library at the present time.

Ahmed H. El Masry, *University of Michigan*

Mössbauer Effect Data Index, Covering the 1966–68 Literature. By J. G. STEVENS, V. E. STEVENS, A. H. MUIR, H. M. COOGAN, and R. W. GRANT (University of North Carolina, Ashville, and Rockwell International, Thousand Oaks, Calif.). IFI/Plenum Data Co., New York, N.Y. 1974. x + 522 pp. $49.50.

Mössbauer Effect Data Index, Covering the 1973 Literature. By J. G. STEVENS and V. E. STEVENS (University of North Carolina, Ashville). IFI/Plenum Data Co., New York, N.Y. 1974. x + 495 pp. $49.50.

With the publication of the above two volumes of the "Mössbauer Effect Data Index" (MEDI), persons interested in this technique now have a complete list of publications employing Mössbauer spectroscopy from the initial discovery of the Mössbauer effect to the end of 1973 and a partial list for early 1974. For those practitioners who must remain abreast of the generation of Mössbauer spectroscopy data on at least a monthly basis, the MEDI editors also provide a monthly reference and data listing service for a nominal fee. Indeed, as U. Gonser states in the foreword to the 1973 MEDI, few methodologies are fortunate enough to have a data and reference source as complete and timely as the MEDI.

Considerable effort is made, however, to produce these high quality reference and data compilations. The editors are not located at an institution that maintains extensive archival collections of journals, and extensive use is made of the facilities of the Oak Ridge National Laboratory more than 75 miles away in producing the MEDI; then too, both editors attend the various Mössbauer conferences and though J. G. Stevens attends these meetings as a practicing Mössbauer spectroscopist, considerable work is done for the MEDI, such as discussing new developments, monitoring the thrusts that various laboratories are making, and simply meeting people and encouraging them to submit reprints and preprints to the MEDI Center and soliciting their ideas on improving the MEDI.

The publication of the 1966–68 MEDI is particularly noteworthy as it fills a gap in the reference and data compilation when there were significant developments in the applications of the Mössbauer effect due to the entry into the fields of problem-oriented investigators with non-nuclear physics backgrounds, occasioned by the increasing ease of building state-of-the-art spectrometers

and of the introduction of reliable commercial spectrometers.

Despite the fact that the 1966-68 MEDI was published in 1974, it follows the basic format of the 1958-65 MEDI of Muir, Ando, and Coogan and lacks the extensive tabular and tutorial material introduced by John and Virginia Stevens with the 1969 MEDI. Inasmuch as some of the editors of the 1958-65 MEDI are coeditors of this volume, this format seems appropriate. However, the Isotope Pages are based on the latest information. The listing of the references is convenient and complete. The various isotopes are listed alphabetically (one does not need a periodic chart to use the Index), and all of the references for a given isotope are listed immediately following the Isotope Page. The title and paginations of the articles are also given. A topical listing of the complete references and an author index are also given. For the widely studied isotopes ^{119}Sn and ^{57}Fe, an index of the references according to the type of experiment and/or type of material is also given and is quite useful.

The 1973 MEDI follows the pattern of the earlier volumes edited by the Stevenses and includes again extensive tabular and tutorial materials as well as the authoritative reviews first introduced in the 1970 MEDI. The reviews by Roberts, Barton and Greenwood, and deWaard on ^{197}Au, ^{151}Eu, and ^{129}I, respectively, are comprehensive, lucid and precise with a wealth of numbers to support the discussions. One cannot help but wonder, though, what the influence of such review articles can have on the continued publication of the "Mössbauer Effect Methodology" series. The Addendum List which contains articles missed in previous volumes is continued in this volume and goes a long way in increasing the reliability of the MEDI. The advertisements by the small number of equipment manufacturers are tastefully done and surprisingly, do not appear at all out of place. Errors are surprisingly low and the few that do occur are readily found by the avid users of these compilations and reported to the editors. One interesting item in the 1973 MEDI is two graphs of the number of papers versus year. It is noteworthy that the rate of growth of the number of nonconference publications has dropped from 25% per year for the 1958-65 period to 5% for the 1968-74 period. The importance of conference papers has also increased in recent years, accounting for 25% of all papers published in 1972. Such monitoring of publication trends is a useful feature for any index since it can alert the individual investigators to trends that in the long run may be detrimental to a field.

The use of the term "Index" in the title of these compilations is to some extent unfortunate since the MEDI's are more than indices and include, in most instances, information on the actual contents of the articles referenced, making it unnecessary for the reader to go to the original article.

The complete set of MEDI's is recommended for the collections of chemistry, physics, earth sciences, and engineering libraries with active graduate research programs. Mössbauer spectroscopists will, of course, add these two new volumes to their previously acquired five volumes.

B. J. Evans, *University of Michigan*

Gmelin Handbuch der Anorganischen Chemie. 8. Auflage. Seltenerdelemente. Teil C2. Sc, Y, La und Lanthanide. Verbindungen. Edited by Gmelin-Institute for Inorganic Chemistry of the Max Planck Society for the Advancement of Science. Springer-Verlag, Berlin. 1974. vi, xv + 299 pp. $196.

This volume of the 8th edition of the "Gmelin Handbook of Inorganic Chemistry" is the second volume which discusses compounds of the System-Number 39 elements, i.e., Sc, Y, La, and the fourteen lanthanides. The following classes of compounds of these elements are treated in this work: hydroxides, oxide hydroxides, peroxo compounds, alkali oxometalates and hydroxometalates, nitrides, imides, amides, azides, nitrites, and nitrates. The coverage within each area defined in the table of contents is comprehensive and includes methods of preparation, structural characteristics, physical properties including thermal, magnetic, optical, electrical, and mechanical data where appropriate, and chemical reactions. Individual sections are well organized. Each contains an overview of the subject, a presentation of data comparing the seventeen metals to be discussed, and subsequent individual descriptions of the compounds of each specific metal. The general sections, however, do not contain enough references to earlier review articles and to information on closely related topics. For example, double nitrate salts with alkali metal and ammonium cations are covered, but one must look elsewhere for information on double nitrate salts with Mg, Mn, Fe, and Co, and no leading references are cited. Nevertheless, this volume provides useful collections of data which are not always readily available in other review sources. The method of organization, the convenient placement of references throughout the text, and the duplicate table of contents and marginal paragraph headings in English make this an easily usable, valuable reference book for chemists regardless of their knowledge of the German language.

William J. Evans, *University of Chicago*

Metabolic Interconversion of Enzymes. Edited by O. WIELAND (Institut für Diabetesforschung, München), E. HELMREICH (Universität Würzburg), and H. HOLZER (Universität Freiburg). Springer-Verlag, New York, N.Y. 1972. xi + 448 pp. $23.80.

The proceedings of the Second International Symposium on Interconvertible Enzymes (October 1971) are presented here, reproduced from the contributors' manuscripts, with illustrations and discussions. All of the papers are in English. The papers are all accounts of original research, in most cases lacking experimental detail. There is an index of contributors but no subject index. It is of some convenience to have the reports of this symposium gathered together under one cover; however, most of the results are now redundant with more complete and timely journal publications.

T. M. Farley, *Utah State University*

Handbook of Moisture Determination and Control, Principles, Techniques, Applications. Volume 1. By A. PANDE (Shriram Institute for Industrial Research). Marcel Dekker, Inc., New York, N.Y. 1974. xi + 266. $28.50.

This volume is the first in a four-part monograph on moisture determination and control. The author states in his preface that the primary purpose of this volume is to provide a basic source book providing access to the widely scattered publications in the literature on this subject. He is only partially successful. There are a total of 425 references cited in the book, and this indeed gives one an entrée to the literature. However, of these, slightly less than 11% are later than 1969 and only 25% later than 1959. This means that three-quarters of the references are more than 15 years old!

This age is reflected in the text. Descriptions of instruments and methods are quite detailed, but they represent the technology of the early 1960's for the most part. One example occurs in Chapter 2 where thermogravimetric methods for moisture determination are discussed. The author cites the early Aminco Thermo-grav as a new instrument, giving as a reference an *Analytical Chemistry Review* citation for 1960. That work was obviously done in the '50's.

The heavy emphasis on older work sometimes leads to actual errors. In Chapter III, for instance, Pande discusses gas chromatographic methods and states that indirect measurement of moisture through reaction with calcium carbide is preferable because direct measurement of moisture leads to broad and unsymmetrical peaks which make quantitative analysis difficult. This is a fair statement of the state of the art of 10 years ago, but the development of porous polymer columns in the last several years has made direct measurement of moisture by gas chromatography quite feasible.

Because of the time required to write, edit, and publish technical books, one allows for a one- to two-year lag in technology in such books. However, when this lag stretches to five years or even ten years in some cases in this book, it must be considered as a serious deficiency. There is no doubt that Pande has assembled an impressive source book for moisture measurements to 10 years ago, and some of the unpublished work of his and of his colleagues presented here would undoubtedly be difficult to obtain in another form. In addition, Pande provides a readable introduction to the basics of various moisture measurement techniques. Nevertheless, this book can be recommended without qualification only to those interested in a brief survey of traditional moisture measurements or those interested in the historical development of such methods.

Thomas J. Gedemer, *McGraw-Edison Power Systems Division*

The Osmotic Pressure of Biological Macromolecules. By M. P. TOMBS (Unilever Research Laboratories) and A. R. PEACOCKE (Clare College, Cambridge). Clarendon Press, Oxford. 1974. vii + 143 pp. $22.50.

This is the fifth title in a series called "Monographs on Physical

Biochemistry", which promises to be an excellent series judging from the two examples this reviewer has seen up to this time. The present volume will be an indispensable aid to those interested in osmotic pressure measurements on biological polyelectrolytes, especially proteins. The four chapters in this book, on thermodynamics of macromolecular solutions, theory of osmotic pressure, osmometers and osmotic pressure measurements, and applications of osmotic pressure measurements to protein solutions are uniformly excellent both in content and in exposition. In one of these chapters, there are some well-chosen examples of data handling and data reduction which will be especially useful for those planning their own osmotic pressure measurements. This volume is so outstanding within the limits set by the authors that this reviewer wishes that the scope had been somewhat broader, especially in view of the book's title. Biological macromolecules, after all, are not all proteins. They are not all polyelectrolytes (a particularly cogent example is natural rubber, *cis*-1,4-isoprene), and even the polyelectrolytes are not necessarily as monodisperse as proteins or as rigid as most globular and fibrous proteins. Because of these considerations, some discussions of activities and virial coefficients of randomly coiled macromolecules and of polydisperse systems would have been appropriate. In spite of these limitations, I would give this book my highest recommendation; the chapters on thermodynamics, especially, are useful in a wider context. These chapters should be required reading for those considering any thermodynamic measurements on biological polyelectrolytes, light scattering and sedimentation equilibrium as well as osmotic pressure.

Sonja Krause, *Rensselaer Polytechnic Institute*

Foams. By JACOB J. BIKERMAN. Springer-Verlag, New York, N.Y. 1973. vii + 337 pp. $23.80.

This monograph provides a highly readable account of the development of foam technology from both a fundamental and practical point of view. Bikerman has provided a coherent overview in an area which had been marked by much disjointed and conflicting information. Treatment is given primarily to aqueous foams, and extension of the principle to other types is not considered.

The book begins with chapters on the formation and stabilization of foams and continues with discussions of their properties and applications. Frequent references to experimental data and techniques serve both to make theoretical arguments more convincing and to provide a useful laboratory manual to those involved in foam research. The sections on the measurement of foaminess show this to be an area much in need of refinement. The author's critical and sometimes caustic comments will serve to forewarn anyone contemplating such measurements of their difficulty. Another section on foam fractionation establishes this as a valuable separation technique in many systems. One area of commercial importance which is substantially neglected is the elimination of undesirable foam. Since this seems to be as frequent a problem as foam stabilization a chapter could have been devoted to this subject.

In general, this book can be read on two levels, either selectively by a student new to the subject or extensively by an established researcher interested in a thorough and authoritative review.

Ronald W. Kreis, *Uniroyal, Incorporated*

Statistical Thermodynamics. Volume II. By A. MÜNSTER (University of Frankfurt/Main). Springer-Verlag, Berlin, and Academic Press, Reading, Mass. 1974. viii + 841 pp. $75.00.

The two-volume treatise "Statistical Thermodynamics", written in English, is the result of much revision and expansion of the author's earlier book, published in German in 1956. The first volume (which appeared in 1969 and is currently priced at $60) covered General Foundations and the Theory of Gases. The second volume, under review here, consists of The Theory of Crystals and The Theory of Liquids. These two volumes are a work of extraordinary scholarship and clearly represent a milestone in the pedagogy of statistical mechanics.

The part on crystals consists of chapters on Ideal Crystals, Vapor Pressure Equilibrium and the Nernst Heat Theorem, and Cooperative Phenomena (Superlattice Transformations, The Ising Model, Critical Phenomena, Solid Solutions, Magnetic Systems, and Rotational Transitions). Approximately 300 pages are devoted to these topics. The chapters on liquids are entitled Pure Liquids, Solutions of Non-Electrolytes, and Solutions of Strong Electrolytes, and make up most of the rest of the book. There are also a number of Appendices, an Index of Symbols, and Author and Sub-Indices.

The treatment of these topics is rigorous, comprehensive, and authoritative. The book is clearly written and hardly seems to have been translated from another language. It has been produced in a very attractive format, as is usual for these two publishers.

Both volumes are expensive, but not excessively so, considering the labor involved in such an undertaking. One can wholeheartedly recommend these two books to all serious students of statistical thermodynamics.

J. E. Mark, *University of Michigan*

The Raman Effect. Volume 2. Applications. Edited by ANTHONY ANDERSON (University of Waterloo). Marcel Dekker, Inc., New York, N.Y. 1973. vi + 629 pp. $45.00.

Advances in Raman Spectroscopy. Volume 1. Edited by J. P. MATHIEU (Faculte des Sciences, Paris). Heyden and Son, Ltd., London. 1973. xii + 639 pp. $44.00.

These volumes represent two different approaches to surveying recent progress in Raman spectroscopy. The Anderson volume consists of five long reviews on selected topics. The Mathieu book is the preceedings of a 1972 conference. The 82 chapters cover almost the entire range of Raman spectroscopy in snippets of five to ten pages. In a few instances only abstracts are presented.

Anderson's contributors discuss inorganic molecules (R. S. Tobias), the electronic Raman effect (J. A. Koningstein and O. S. Mortensen), high resolution, mostly rotational, spectra of gases (A. Weber), molecular crystals (R. Savoie), and ionic, covalent, and metallic crystals (G. R. Wilkinson). The reviews are authoritative and generally comprehensive. Readers of this journal may be disappointed, however, to find no discussion in this work of any applications to biochemistry or organic chemistry.

"The Raman Effect", Volume 2, is an important contribution to the literature of Raman spectroscopy. Although it is limited in its scope primarily to physical chemical applications, it should be read by all serious students of this field. Regrettably, the book is priced out of the reach of individual chemists.

Mathieu's volume is divided into eight sections: Nonlinear phenomena (six contributions), New techniques (eight contributions), Phase transitions (15 contributions), Flame spectra (two contributions), Macromolecules and biological molecules (five contributions), Resonance Raman effect (13 contributions), Band profiles (17 contributions), and Molecular structures (16 contributions). These are a mixture of original research reports and short reviews of various topics. The reviews are generally too brief to allow good development of their subjects or even an adequate introduction to the literature. The original researches vary in quality, but most could certainly have been published in one of the journals where Raman spectroscopy is normally found. The original contributions are significant enough that they are being cited in the Raman literature. Unfortunately, that means your librarian should probably order a copy of this book, even at its inflated price.

Michael D. Morris, *University of Michigan*

Tritium and Its Compounds. Second Edition. By E. A. EVANS. Halsted Press (John Wiley & Sons), New York, N.Y. 1974. 822 pp. $55.00.

This is the updated and expanded version of Dr. Evans' 1966 edition. The book consists of six chapters. Chapter 1 describes the physical properties and production of tritium. Chapter 2 describes the uses of tritium with four subsections: uses in physics, in nonbiological chemistry, in biological research, and in clinical medicine. Chapter 3 contains precautions in tritium handling. Chapter 4 discusses the preparation of tritium-labeled compounds under the four main divisions of isotope exchange reactions, direct chemical synthesis, biochemical methods, and recoil labeling. Chapter 5, measurement and analysis of tritium compounds, is divided into measurement (instruments, scintillants, standards, sample containers, etc.), autoradiography, analysis (chemical), and the specificity of tritium labeling. The final chapter discusses properties peculiar to tritium compounds. These include isotope effects, decomposition by self-irradiation, and the stability of tritium atoms in molecules.

The author states that the book is not intended to be a practical manual, and that the original papers should be consulted for exper-

imental details. However the "problems and pitfalls" of many procedures are pointed out. Another strength of the book is its extensive bibliography for each chapter. Over 160 pages of the book contain bibliography! Included are manufacturer's and government technical reports and other references which may be difficult to find in the usual chemical indexes.

The book contains an extensive compound index as well as a separate subject index which is rather poor. For example, the author mentions in the preface that one of the new developments highlighted is the "development of triton magnetic resonance spectrometry." This is listed only under the full "Triton magnetic resonance spectrometry" and not under "magnetic" or "resonance" or "spectrometry".

The book is organized in clear outline form, and it would be useful to have the entire outline in either the table of contents or in parts at the beginning of each chapter. Finding a specific subject (as opposed to a compound) is somewhat difficult. The writing style is lucid and easy to read, and many well-organized and useful tables are included. A tyro in the field would probably do well to begin with Dr. Evans' book, and, while the price will probably not allow it in most private collections, groups and institutions working in the field should certainly consider its purchase.

Kenneth A. Rubinson, *University Chemistry Laboratory Cambridge, England*

Critical Evaluation of Chemical and Physical Structural Information. Proceedings of a Conference. Edited by D. R. LIDE, JR., and M. A. PAUL. National Academy of Sciences, Washington, D.C. 1974. xii + 628 pp. $26.25.

This excellent book contains the proceedings of a conference held at Dartmouth College in 1973, sponsored by the National Research Council and the National Science Foundation. The contributors are comprised of specialists from a number of widely differing areas interested in structural chemistry ranging from mathematicians, involved in the development of theories of analysis of experimental data, and theorists, concerned with the agreement between theory and experiment and the general overall reliability of theoretical predictions, to more conventional structural expertises such as diffraction (X-ray, electron, neutron, protein), spectroscopy, (microwave, infrared, optical), resonance methods (ESR, NMR, NQR), and electric and magnetic polarizability studies. As can be inferred from the foregoing, the word structure is used in a general sense to include: (1) geometrical arrangement (interatomic distances and angles), (2) forces between atoms (stretching, bending-force constants, rotational barriers), and (3) electronic charge distribution (chemical shifts, coupling constants, electron density distributions).

One reason for the conference was the growing concern for communication among specialties since it is becoming increasingly more difficult to intelligently compare the results obtained from one specialty with those of another. Large-scale computers have compounded the problem in the sense that they have removed the investigator further from direct contact with experimental data and the advantages of more interactive judgments and interpretations; on the other hand, they have permitted more elaborate and sophisticated treatments of not only the primary data and its errors but also the models upon which the analysis is based. A few interesting generalizations seemed to have emerged from the conference: (1) in most fields, statistical treatment of data is not completely satisfactory, (2) the method of least squares is not necessarily the best way for large data sets, (3) new methods of analysis are in the process of being developed, (4) atomic vibrations (especially anharmonic) are still a problem, and, satisfyingly, (5) the judgment of the experimenter is still considered fairly important.

The nine chapters of the book each contain three to four contributors; at the end of each chapter, the discussions following the presentations are reported. As mentioned already, the book is most excellent and should be owned by all serious practitioners of structural chemistry. It is not for the novice.

Alexander Tulinsky, *Michigan State University*

Essays in Biochemistry. Volume 10. Edited by P. N. CAMPBELL (University of Leeds) and F. DICKENS (Findon Valley, Worthing). Academic Press, New York, N.Y. 1974. xi + 156 pp. $7.00.

This latest edition of the series includes reviews of four topics. The first, "Regulatory Mechanism of Muscle Contraction with Special Reference to the Ca-troponin-Tropomyosin System", by S. Ebashi reviews the known or postulated roles of Ca^{2+} and troponin in muscle function, then discusses a possible mechanism for their regulation of myosin and actin, especially in relation to ATP. Regulation, used here to include a more complex process than usually considered, is also discussed relative to other proteins in the system and in terms of ultrastructure. The second chapter, "The Structure and Metabolism of Starch", by D. J. Manners, makes the point that in vivo starch metabolism is still an active research area, requiring the best efforts of researchers from many disciplines. Current knowledge of the enzymic synthesis and degradation of the components of the starch granule is reviewed, along with an overview of starch metabolism in selected organisms. In the third chapter, D. Givol discusses research in "Affinity Labeling and Topology of the Antibody Combining Site", especially approaches for analyzing the architecture of the antibody combining site in analogy to the active sites of enzymes. The critical points made via these fascinating studies are that enzymes and antibodies are basically different in the origins of their structure, and that the mechanism generating the hypervariable segments of antibodies selects in favor of their existence. The fourth chapter, "Activation and Inactivation of Chemical Carcinogens and Mutagens in the Mammal", by P. N. Magee, provides a thorough review of the known chemistry of enzymic detoxication, as well as activation of precarcinogens. After considering how these premutagens and the activating and inactivating enzymes are distributed in tissues, modes of metabolism of various classes of compounds are discussed. Defense mechanisms employed by other systems of the organism (liver function, DNA repair, immune response) are reviewed, along with factors known to influence the interaction of carcinogens with cellular targets.

With the author and subject index provided, this volume should be a useful addition to any biochemist's bookshelf.

Frederick C. Wedler, *Rensselaer Polytechnic Institute*

Progress in Polymer Science, Japan. Volume 7. Edited by T. OTSU (Osaka City University) and M. TAKAYANAGI (Kyushu University). Halsted Press, Kodansha Ltd., Tokyo, and John Wiley & Sons, New York, N.Y. 1974. x + 380 pp. $29.95.

Volume 7 in this excellent series consists of six chapters, three on polymer synthesis and three chiefly concerned with structure and properties. They are in the form of reviews primarily of the authors' own research areas. In the section on synthesis, H. Kamogawa of Yamanashi University describes certain aspects of the synthesis and properties of photoactive polymers, including photochromic, fluorescent, and semiconductive polymers, polymeric ultraviolet absorbers, and photoredox polymer catalysts. M. Kinoshita and K. Yamauchi of Osaka City University, with M. Imoto of Kansai University, review work on the synthesis of polymers containing nucleic acid bases and their derivatives by various reactions, such as vinyl polymerization, polyaddition, polycondensation, as well as reactions. M. Oiwa and A. Matsumoto of Kansai University discuss the behavior of diallyl dicarboxylate monomers in polymerization, placing special emphasis on a detailed kinetic treatment of the gelation and cyclization which may occur.

In the section on polymer properties, Y. Chatani of Osaka University gives a review of structural features of solid-state polymerization, covering many types of reactions such as addition polymerization, polycondensation, ring-opening, and canal polymerization, based mainly on his own crystallographic studies. T. Takemura of Kyushu University summarizes his extensive work in determining the behavior of crystalline polymers under high pressure. T. Shimanouchi of the University of Tokyo, Y. Koyama of Kwansei Gakuin University, and K. Itoh of the University of Gunma describe in the final chapter various studies on polypeptide chains and protein molecules undertaken in their respective laboratories, giving emphasis to the clarification of molecular conformation in solution and in the solid state.

All manuscripts were submitted between June 1973 and January 1974. References are up-to-date, some having been entered after the manuscripts were sent in! The English is excellent. The topics are interesting and timely. The book is highly recommended.

Robert M. Fitch, *University of Connecticut*