Table I. Nmr Data[a] for **2**, **3**, and a 1:2 Mixture

(t)	**2**	**3**	**2–3** (1:2)	% shift
δH_c, ppm	7.27	9.16	8.48	64
$J_{H_{ab}-H_c}$, Hz	8	5.5	6.5	60
J_{Pt-H_c}, Hz	71	20	38	65
δH_{ab}, ppm	3.89	3.28	3.49	66
$J_{Pt-H_{ab}}$, Hz	76	113	99	64
δCH_3, ppm	1.99	1.68	1.80	61
δCH_3, ppm	1.89	1.64	1.73	64
δH_e, ppm	5.64	5.32	5.41	72

[a] At 100 MHz in aqueous acetone.

Hz in **2**, the two methylene protons of **3** show an increase to 114 Hz, and the aldehyde proton a decrease to 20 Hz.

Considering the acidity of the vinyl alcohol complexes, the equivalence of H_a and H_b is not surprising, since one would expect some ionization to take place in the polar solvents used, scrambling H_a and H_b. Evidence for this rapid equilibrium is seen in the nmr mixtures of **2** and **3**, which exhibit a single spectra with averaged J and δ values. Table I gives the data for solutions of pure **2**, **3**, and an approximately 1:2 mixture of the two, which shows values (column 4) consistently two-thirds of the way between **2** and **3**.

Although the ionization involves some atomic motion besides a proton transfer, the rate of ionization is rather high, since only a slight broadening of the vinyl proton absorptions of **2** is seen even in acetone 0.05 *N* in $HClO_4$, in which the ratio of **3** to **2** must be very small. At −20° in the absence of acid, the clean doublet–triplet pattern of an acetone solution of **2** changes to a rather nondescript multiplet, whose fine structure could not be resolved due to poor solubility. At the same time, the OH resonance sharpened into two singlets of nearly equal intensity at δ 9.84, 9.94, as the rate of proton exchange slowed. The two peaks could be due either to two isomers of **2**, resulting from the two possible orientations of the vinyl alcohol, or to coupling with one of the vinyl protons. Both of these changes presumably arise from the slowing of the exchange above.

Further investigations into this dissociation of other π-vinyl alcohol complexes are in progress, and will be reported later.

Acknowledgment. We wish to thank Professor S. Murahashi and Dr. Y. Wakatsuki for providing the detailed information on their experiments. We also gratefully acknowledge the financial support from the R. A. Welch Foundation.

(6) Arakawa Forest Chemical Industries, Ltd., Osaka, Japan.

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Book Reviews*

Electron Microscopy and Plant Ultrastructure. By A. W. Robards (University of York). McGraw-Hill, London. 1971. x + 298 pp.

The fine details of the structure of plant cells as revealed by electron microscopy are presented with abundant illustrations. There are leading references, a glossary, and a good index. Biochemists concerned with cellular biology should find this book useful.

Handbook of Molecular Constants of Inorganic Compounds. By K. S. Krasnov, V. S. Timoshinin, T. G. Danilova, and S. V. Khandozhko. Israel Program for Scientific Translations, 1970. Distributed in the U. S. A. by International Scholarly Book Services, Inc., Portland, Ore. v + 275 pp. $15.00.

Except for a 36-page chapter on methods of determination and calculation, this book consists entirely of tables and the associated notes and references. Values of internuclear distances, valency angles, vibration frequencies, dissociation energies, heats of formation, and electronic ground levels are given for 1400 gaseous inorganic compounds. The literature coverage is stated to be through 1966 and partly into 1967. Accessibility is aided by a formula index.

Technology of Inorganic Compounds (Chemical Engineers' Handbook). By D. D. Mel'nik and E. B. Mel'nikov. Israel Program for Scientific Translations, 1970. Distributed in the U. S. A. by International Scholarly Book Services, Inc., Portland, Ore. iv + 248 pp. $13.00.

This book consists almost entirely of diagrams of various physical properties, such as solubility, heat capacity, vapor pressure, etc., as functions of temperature, pressure, or concentration. They are arranged in six "chapters": Nitrogen, Sulfur, Phosphorus, Halogens (and the inorganic compounds of each of these), Soda and Other Alkalis, and Salts and Some Other Inorganic Compounds. There is an appendix, a bibliography of 37 references (mostly to secondary sources), and an index.

Tables of Nuclear Quadrupole Resonance Frequencies. By I. P. Biryukov, M. G. Voronkov, and I. A. Safin. Israel Program for Scientific Translations, 1969. Distributed in the U. S. A. by International Scholarly Book Services, Inc., Portland, Ore. vi + 135 pp. $10.00.

This book is a translation of the Russian original published in 1968. It consists almost entirely of tables of nqr frequencies of compounds arranged in order of the position in the periodic table of the element being considered. Coverage is through 1966. It is a valuable compendium of information, but its usefulness is somewhat reduced by poor editorial practices. The tables are up to 47 pages long, but are printed with only the table number as a running heading, without a title; they are thus unnecessarily hard to follow. The references are given in an ambivalent alphabetical code (either Latin or Cyrillic alphabet), and since many of the letters are the same in each alphabet, one is left wondering, for example, whether reference C15 is to Cohen in *Physical Reviews* or to Semin, *et al.*, in *Zhurnal Fizicheskoi Khimii*. The summarizing of the Soviet contributions to this growing field is a helpful feature, even though it is not very recent.

Contemporary British Chemists. By W. A. Campbell and N. N. Greenwood (University of Newcastle upon Tyne). Taylor and Francis Ltd., London. 1971. 286 pp. $16.00.

In a world of harsh necessities and urgent deadlines, it is always a pleasure to stop the clock—and even turn it back a little—and indulge in some of the more leisurely pursuits of earlier times.

This book brings with it themes both ancient and modern-ancient, in that space is used with an almost total disregard to costs, the paper is excellent, and, for the most part, the photographs are

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* Unsigned book reviews are by the Book Reviews Editor.

tolerably, even if not always contemporaneously, reproduced (can anybody recognize E. J. Bowen or, less so, F. C. Tompkins?—but these are balanced by the Henry Miller-like A. R. Powell and a cherubic K. W. Sykes!). The modern aspect of the book is its across-the-board appeal for those relatively well, albeit narrowly, informed in matters chemical. It emphasizes the wide range of activities which are carried out in the name of chemistry as well as some of the less academic pursuits of the people concerned. The introductory paragraphs for each of the chemists are well written and often insightful although their effect is sometimes dulled by the "Who's Who" type of prizes won and "hoops jumped through" which inevitably follows.

One can reliably predict that this book will never appear in paperback form but surely its value lies in the fact that, in the years to come, it will stand as a snapshot of the men and women of British chemistry, together with an account of the scope of chemistry in which they were engaged at this time in history.

T. M. Dunn, *University of Michigan*

HMO Energy Characteristics. By R. Zahradnik and J. Pancir (Institute of Physical Chemistry, Czechoslovak Academy of Sciences, Prague). Plenum Press, New York, N. Y. 1970. v + 102 pp. $12.00.

This book is a compilation of Hückel molecular orbital (HMO) energy characteristics for about 750 aromatic hydrocarbons and hydrocarbon ions. The data include the number of π electrons, number of σ bonds between conjugated atoms, π-electron energy, specific delocalization energy, frontier orbital energy coefficients, and first excited state transition energies. The tables will be useful in a number of ways including studies relating to aromaticity, ionization potentials, electron affinities, polaragraphic work, electronic spectra, and charge transfer complexes.

Lemont B. Kier, *Battelle, Columbus Laboratories*

Electron Diffraction in Gases. By Michael I. Davis (University of Texas at El Paso). Marcel Dekker, Inc., New York, N. Y. 1971. x + 181 pp. $12.50.

The purpose of this book is to introduce beginning graduate students and interested scientists to the scope and limitations of gas-phase electron diffraction as a means of determining molecular structure. The chapters on the experimental setup and cautions in reducing data are well done, but rather brief. The theoretical sections provide a useful overview of current practices, and the figures are helpful, although too few in number.

Each contribution to the scattering function is treated in a separate chapter. The discussions of general approaches to dealing with the theory read well. The mathematical sections explicitly presume a good grasp of basic quantum mechanics if the reader is to follow the Legendre polynomials, complex algebra, statistical averaging, matrix algebra, Fourier transforms, and Taylor expansions used.

While numerous special cases and useful approximations are derived, there are no problems or examples given to aid the reader in understanding the equations. And while the errors possible in data reduction are described, there is no comment on the typical magnitude of uncertainty in the final results.

The philosphy and level of Davis's book are good. Only one wishes that there had been a modest amount of material added to make the book more useful.

Ralph D. Nelson, Jr., *West Virginia University*

Advances in Photochemistry. Volume 8. Edited by J. N. Pitts, Jr., G. S. Hammond, and W. A. Noyes, Jr. Wiley-Interscience, New York, N. Y. 1971. 365 pp. $22.50.

This volume is the eighth in a series of advanced treatises under the general editorship of Professors J. N. Pitts, Jr., G. S. Hammond, and W. A. Noyes, Jr. In this text, there are seven chapters by ten authors. The purpose of each chapter is to "explore the frontiers of photochemistry from the pen of experts who have strong personal points of view concerning fundamental aspects of photochemistry and spectroscopy." Almost all of the chapters meet this criterion.

The opening chapter deals with electronically excited halogen atoms (D. Husain and R. J. Donovan). Chapter 2 is concerned with the photochemistry of α-dicarbonyl compounds (B. M. Monroe). Chapter 3 (D. Bellus) discusses the photo-Fries rearrangement. B. Stevens, in the fourth chapter, describes photoassociation in aromatic systems. The photochemistry of metallocenes is surveyed by R. E. Bozak in the fifth chapter. Complications in photosensitized reactions by P. S. Engel and B. M. Monroe forms the basis of Chapter 6. In the final chapter, C. H. Nicholls and P. A. Leermakers review the photochemical and spectroscopic properties of organic molecules in absorbed or other perturbing polar environments.

It is the opinion of this reviewer that this book contains much that is valuable and praiseworthy. Certain chapters are excellent and are followed by well-annotated bibliographies. The authors have also included significant diagrams and tables. As in the previous volumes of the series, the authors have opted for critical discussion rather than completeness of coverage. The rich content of this book will make it very useful as a reference for specific information as well as a source of ideas for future work. The series continues to be an indispensable part of a chemistry library and should be required in the library of all practicing photochemists.

Albert Padwa, *State University of New York at Buffalo*

Organotin Compounds. Volume 2. Edited by Albert K. Sawyer (University of New Hampshire). Marcel Dekker, Inc., New York, N. Y. 1971. xiv + 370 pp. $30.00.

This book is the second of a three-volume treatment of organotin chemistry designed to provide a much-needed comprehensive, current coverage of this highly active area of research. As in the first volume, the treatment is divided into chapters each dealing with a particular element or group of related elements bonded to organotin species. Each chapter is written by one or more international authors recognized for their expertise in the field. This volume deals with compounds containing tin–oxygen, tin–sulfur, tin–selenium, tin–tellurium, tin–nitrogen, tin–phosphorus, tin–arsenic, tin–antimony, and tin–bismuth bonds.

The chapter on tin–oxygen compounds by R. Okawara and M. Ohara treats compounds with carboxyl groups and with inorganic oxyanions bonded to tin as well as organotin complexes with oxygen-containing ligands. Other tin–oxygen bonded compounds were treated in Volume 1. Besides providing an excellent description of preparative methods, structure, bonding, and physical properties of these compounds, a bibliography of 135 references is given.

The second chapter by H. Schumann, I. Schumann-Ruidisch, and M. Schmidt deals with compounds involving Sn–S, Sn–Se, and Sn–Te bonds. This chapter, containing 210 pages, is the longest in the volume, but more than 75% of the chapter is a table giving the known compounds, some of their properties, and literature references. The text presents a good discussion of the preparation, properties and structures of the various classes of Sn–S compounds.

The third chapter by K. Jones and M. F. Lappert gives a review of compounds with Sn–N bonds. The text presents preparations and reactions of the compounds as well as some of their physical properties and structures. A table of known compounds, their preparation, and some of their properties is also included. A rather unique and useful feature of the table is a column heading for physical properties and measurements which includes references to the various spectroscopic techniques and other physical measurements applied to these compounds.

The final chapter by H. Schumann, I. Schumann-Ruidisch, and M. Schmidt covers organotin compounds with bonds to the other group Va elements. This chapter is quite similar in format and presentation to the second chapter but is considerably shorter because of the much smaller number of known compounds in this category.

The literature surveys extend into 1970 except for that in the Sn–O chapter which only covers the period prior to 1968. As with the first volume, this volume provides a comprehensive up-to-date review of organotin chemistry in the selected areas.

E. O. Schlemper, *University of Missouri*

Dipole Moments in Organic Chemistry. By V. I. Minkin, O. A. Osipov, and Yu. A. Zhdanov (University of Rostov). Translated from Russian by B. J. Hazzard. Plenum Press, New York and London. 1970. xi + 288 pp. $19.50.

This book is intended by the authors to serve as a comprehensive treatment of the dipole moment technique and its application to structural problems in organic chemistry. The term "dipole moment technique" was not familiar to this reviewer before reading this book, and perhaps a definition of it in the context of the book is in order. The dipole moment technique refers to the use of experimental dipole moments of molecules in comparison with theoretical moments obtained from appropriate physical and theoretical models to deduce information about the structure of the molecules. The information sought can relate, for example, to geometrical isomerism, positional isomerism, conformational isomerism, electron distribution, hydrogen bonding, *et al.* A simple concrete example is the use of a dipole moment measurement to distinguish a *cis*- from a *trans*-1,2-dihaloethylene.

The first two chapters concern the basic principles of dielectrics and methods of experimental determination of dipole moments. It is perhaps unavoidable that such chapters be included in volumes like the present one for the sake of completeness; however, this reviewer is invariably disappointed by such efforts since all seem to say everything yet say nothing at the same time. There simply is not space to do a complete job, yet authors seem to feel compelled to give at least some mention to every idea of any importance. The result is a disjointed and logically unmotivated stream of equations with words interspersed for the purpose of defining terms. It is no accident that entire books have been written on the topics treated in each of these chapters. These two chapters by themselves are not an adequate introduction to dielectric theory and dipole methodology for the uninitiated. Fortunately, the present authors have given a generous list of references to the original literature and, surprisingly also, most of these are to works written in English.

The meat of the book is in the remaining four chapters. In these, calculational methods are outlined and then applied to a large (really huge!) number of specific examples. The results are discussed critically and, again, numerous references to the original literature as well as extensive tables of data are supplied for the benefit of the serious reader. The teacher who would like to incorporate lectures on the dipole moment method into his course in physical organic chemistry will find ample material here. Many of the discussed examples could be turned into homework problems with little effort.

Especially interesting and useful is the treatment of the vectorial additive method for calculating total moments from group and bond moments, not because it is conceptually difficult, but because the reader is led carefully through actual calculations in which the vector addition and trigonometric manipulations are illustrated. This is appreciated by your reviewer who cannot rotate a vector in the x,y plane in less than five pages.

In summary, the book largely achieves its goal, but it is for the serious practitioner only, not for the casual reader. It definitely belongs in the library of any research institution.

John W. Raymonda, *University of Arizona*

Recent Topics in Mass Spectrometry. Edited by R. I. Reed (University of Glasgow, Scotland). Gordon and Breach, Science Publishers, Inc., New York, N. Y. 1971. ix + 357 pp. $29.50.

This book is the third in a series edited by R. I. Reed, which contains the proceedings of the NATO Study Institutes on Mass Spectrometry. The present work reports on the 1969 Institute at Lisbon, Portugal. As in the past, a broad selection of topics is covered. Approximately 25% of the book is of general interest and contains articles on multiply charged ions, energetics, metastables, rearrangement reactions, gc–mass spectrometry, and the application of set theory to interpretation of mass spectra. A review on multiply charged ions is sorely needed, but the present article is rather limited and concentrates on four previously published papers. The chapter on energetics is also quite short and superficially reviews some of the usual material. Subjects either unmentioned or covered in a cursory manner include characterization of ion structure, "kinetic shift," and instrumental and mathematical methods for obtaining monoenergetic electrons. The article on metastable ions reviews the standard material and presents mathematical derivations. Little note is made of metastable studies on instruments other than sector types, and the important application of metastable studies for ion structure studies is glossed over in less than one page. The presentation on rearrangement reactions provides a test for the hypothesis that these reactions possess low-frequency factors and activation energies by comparing results obtained by field ionization and low-energy electron impact.

For the physical chemist, there are two articles which occupy another 25% of the book. A chapter on recent studies of metastable ions is concerned with anomalous effects, and quantum-mechanical arguments are presented in an attempt to explain the observations. A second chapter reviews the important areas of photoionization and photoelectron spectroscopy. A rather limited discussion of the ESCA method occupies seven pages.

The exhaustive coverage of the mass spectra and energetics of ferrocenes and related complexes should be of interest to chemists working in the area of organometallics.

The largest portion of the book is devoted to nuclear and industrial-analytical applications. Under the latter category are two articles, one on applications in a wide variety of chemical industries and the other devoted to the use of high resolution mass spectrometry for analysis of highly complex mixtures such as airborne particulate matter and weathered road tars.

In contrast to the former volumes in this series, the only reviews of instrumental advances are found in the section on nuclear applications and in a chapter on combined gas chromatography and mass spectrometry.

Perhaps the book is not intended to be comprehensive, but certain important topics are not considered. Among these are ion–molecule reactions and chemical ionization, computer applications, mechanistic organic mass spectroscopy and the quasi equilibrium theory, mass spectra of natural products, and spark-source mass spectroscopy. Because of these omissions, the rather superficial treatment given certain topics, and the exorbitant price, the book cannot be recommended.

Michael L. Gross, *University of Nebraska-Lincoln*

Far-Infrared Spectroscopy. By K. D. Moller (Fairleigh-Dickenson University) and W. G. Rothschild (Ford Motor Company). John Wiley & Sons, Inc., New York, N.Y. 1971. xix + 797 pp. $29.50.

This book fills the need for a well-balanced text in far-infrared spectroscopy. The contents are focused primarily on the needs of the advanced student and researcher.

The general scope of this book is covered in three major areas: far-infrared instrumentation, chemical physics, and solid-state physics. The area of instrumentation is thoroughly covered with special emphasis on grating spectrometers, Fabry–Perot interferometers, and Fourier transform spectroscopy.

The second section discusses the bands generated in the far-infrared region. This section is devoted to studying stretching, bending, skeletal, torsional, and rotational vibrations of molecules. These sections will find widespread use for spectroscopists interested in chemical applications and molecular structure. The chemist or physicist who has been working in the infrared region will find this information presented in a style and format which bridges these two areas in an orderly fasion. The authors present this material, with numerous illustrations, molecular band assignment tables, and far-infrared spectra, thoroughly documented with excellent references, in a manner that is clear and concise.

The authors have designated six specialized areas of far-infrared research to be covered by investigators in the following fields: impurity induced lattice absorptions, dielectric properties, magnetic phenomena, semiconductors, superconductivity, and rapid scan Fourier spectroscopy. The text concludes with a 1512-entry bibliography. This last section lends itself to use by the research-oriented investigator interested in specific applications of the far-infrared technique.

Basil Zanedis (*Chemistry Branch, MERDC, Department of the Army*)

Molecular Thermodynamics. By J. H. Knox (University of Edinburgh). John Wiley & Sons, Inc., New York, N. Y. 1971. xii + 246 pp. $11.95.

From the title on, this book presents a fresh view of statistical mechanics. The care used in organizing and writing the book is soon apparent. The material presented is sufficient for a one-term course for undergraduates who have completed a general undergraduate physical chemistry course or for an introductory course on the graduate level.

Even though the book has a section on definitions, some symbols that may be unfamiliar to chemists are used without definition (J, C, and K, for example). This, however, is only a mild detraction from what is otherwise a clear and readable book. Following the definitions is a brief overview of molecular thermodynamics followed by equally brief summaries of quantum mechanics, classical mechanics, and classical thermodynamics. Following this background material, the actual development of molecular thermodynamics occurs in Chapters 4 and 5. The last two-thirds of the book is concerned with partition functions and their applications. Topics covered are molecular partition functions, monatomic crystals, ideal gases, the Maxwell–Boltzmann distribution, chemical equilibrium, and the absolute rate equation.

The author is careful to continually emphasize the important ideas. He states in several forms the fundamental assumption (other than those of classical thermodynamics and classical and quantum mechanics) underlying molecular thermodynamics: "... that all complexions of a given total energy are equally likely." He clearly indicates the importance of statistical mechanics in bridging the gap between atomic and bulk properties. Examples comparing calculated and measured thermodynamic parameters are widely used and problems (with answers) are provided to illustrate each point.

This book does what it sets out to do: to provide an introduction to statistical mechanics "which will be suitable for second- and third-year undergraduates of chemistry who have taken a course in classical thermodynamics, and who may be assumed to be familiar with differential and integral calculus."

Gordon J. Ewing, *New Mexico State University*

Annual Survey of Photochemistry. Volume 3. Survey of 1969 Literature. By N. J. TURRO, G. S. HAMMOND, J. F. ENDICOTT, J. C. DALTON, T. KELLY, J. E. LEONARD, D. R. MORTON, and D. M. POND. Wiley-Interscience, New York, N. Y. 1971. x + 382 pp. $19.95.

The third volume of this now annual publication is similar in outline to the previous two issues. The bulk of this volume is devoted to a general survey of developments in the field during the year 1969. The coverage is comprehensive and over 1000 references are cited. As in the previous volumes of the series, the authors have opted for completeness of coverage rather than critical discussion. The organization of the first section is good and the discursive presentation is well done considering the demands of conciseness. The second section on photophysical processes of organic compounds is excellent, and workers in the field will appreciate the extensive tabulation of data (over 1000 references) which appears in this section. Topics covered include the formation of electronically excited states, their properties, and their decay back to ground state. The volume closes with a short section dealing with emission spectroscopy and photochemistry of coordination complexes.

Comparison of this volume with the Chemical Society series "Photochemistry" is inevitable, since the literature coverage overlaps. Both series handle the subject matter in a similar fashion and present the facts in a concentrated, albeit reasonably lucid, manner. Although there is a definite need for periodic appraisal of broad aspects of photochemistry, it is difficult to be completely convinced of the need for this new series in light of the excellent references already available. In terms of price and detail, The Chemical Society report appears to be of better value.

Albert Padwa, *State University of New York at Buffalo*

Analytical Emission Spectroscopy. Volume 1. Part 1. Edited by E. L. GROVE (Freeman Laboratories, Inc.). Marcel Dekker, Inc., New York, N. Y. 1971. xv + 401 pp. $26.50.

Spectrochemical Methods of Analysis. Volume 9 of Advances in Analytical Chemistry and Instrumentation. Edited by J. D. WINEFORDNER (University of Florida). John Wiley and Sons, Inc., New York, N. Y. 1971. xiii + 530 pp. $23.00.

For many years the field of analytical emission spectroscopy has been poorly represented by published text books. Although many excellent books have been published in the past, most of these discuss only a small part of emission spectroscopy or are now out of date. Dr. Grove is editing "Analytical Emission Spectroscopy" in three parts, and the first part has just been published. According to his plan, everything you ever wanted to know about analytical emission spectroscopy will be included, from history to statistical treatment of data. The first book starts from historical development and thoroughly covers the use of the technique from the beginnings to the present. I believe the discussion of the origin of atomic spectra in the second chapter is adequate for students in atomic spectroscopy. The prism system is discussed in great detail in the third chapter. Even though the large prism system is no longer popular in modern spectroscopy, there are still quite a number of prism instruments in use. Thus this chapter fits in place nicely. The fourth chapter might be the most complete discussion ever written of gratings and grating instruments for analytical spectroscopists. The final chapter of Part 1 is "Spectroradiometric Principles," which discusses the efficiency of spectroscopic system in delivering radiant power to detecting devices.

The "Spectrochemical Methods of Analysis," edited by Dr. Winefordner, should be welcomed by students and people actively engaged in analytical chemistry. The book consists of two parts, Flame Spectrometric Methods and Molecular Spectrochemical Methods, and an appendix, the Signal-to-Noise Ratio in Spectrochemical Methods. Both parts start with an introductory chapter of theoretical consideration of excitation and deexcitation processes followed by chapters on particular fields. The flame methods chapters are on flame emission, absorption, and fluorescence spectrometry. The molecular methods part has chapters in absorptimetry, fluorescence spectrometry, and phosphorescence spectrometry. The appendix is a detailed discussion of the signal-to-noise ratio for which an understanding and standardized practice is extremely important in spectrochemical analysis. This book is well organized and written with emphasis in quantitative analysis and is essentially up-to-date through 1969. Of course, many developments have occurred in atomic absorption spectrometry since that time. But it should please people to see the tremendous growth of the atomic absorption. The book is intended to help modern spectroscopists who cannot read all of the literature or books (nobody can). It will help a spectroscopist to obtain a fair amount of understanding or select the proper tool for his job.

Each chapter of both books is written by an authority in his field and covers the particular area in a general but relatively comprehensive way. The books are suitable for advanced undergraduate and graduate students and also will serve as excellent references in a scientists book shelf. In summary, "Analytical Emission Spectroscopy," Volume 1, Part 1, has proved to be an excellent text book as well as a reference. I hope Parts 2 and 3 will have a complete treatment of this field. "Spectrochemical Methods of Analysis" is certainly an interesting source of review articles on an important and fast growing field. I think we need more books of this type to give neophytes a thorough understanding of the field without resorting to the jungle of the original literature.

M. S. Wang, *Monsanto Company*

Fluorescence Spectroscopy. An Introduction for Biology and Medicine. By AMADEO J. PESCE (Illinois Institute of Technology), CARL-GUSTAF ROSÉN (University of Stockholm), and TERRY L. PASBY (University of Illinois). Marcel Dekker, Inc., New York, N. Y. 1971. xiii + 247 pp. $16.50.

This book does a fine job of guiding the reader through the fundamental facts of fluorescence spectroscopy. Comparison of this book with recent books concerned with fluorescence analysis indicates the complementarity of this book with the analytical books. The rapid growth of fluorescence methods in recent years has been stimulated by the availability and continuing improvement of simple and sophisticated instrumentation and the publication of informative books of the kind reviewed here.

Topics that have been covered include background and physical principles, fluorescence of absorbed radiation, relation between absorption and fluorescence, solvent and pH effects, fluorescence quenching, polarized fluorescence, energy transfer, quantitative aspects of fluorescence measurements, and use of fluorescence in binding studies involving proteins and nucleic acids.

A mathematical background is given for much of the material. Many equations and some derivations are interspersed in the book with examples of practical applications.

The text contains much illustrative material which is presented in a clear and concise form. The subject index does not do justice to the many facts presented in this little book. For example, data are given for Rhodamine B on pages 155, 162, and 179, but the Subject Index does not include this compound.

This book is recommended as a worthwhile addition to the library of all versatile analysts and is especially recommended to organic, physical, and biological chemists wishing to obtain a first-step background knowledge of fluorescence spectroscopy.

Eugene Sawicki, *National Environmental Research Center, EPA*