Book Reviews*

An Introduction to Coal Technology. By N. BERKOWITZ (Alberta Research Council and University of Alberta). Academic Press, New York. 1979. xiii + 345 pp. $32.50.

This is a more comprehensive book than its title suggests, and has a strong orientation toward fundamental understanding. It provides a well-balanced mix of historical background, basic principles, and technological applications and problems. The first seven chapters constitute a section titled "Origins, Formation, and Properties of Coal", in which is found basic information on geology, petrography, classification, physical properties, and chemical composition and behavior. The second section (eight chapters), "Upgrading, Handling, and Processing of Coal", includes chapters on gasification, liquefaction, carbonization, and solvent extraction.

All of this material is presented in a scholarly fashion, with substantial but selected bibliographies. The many special terms used in connection with coal are lucidly defined. The various processes for conversion of coal to gases, liquids, tars, etc., are described from the standpoints of reactions and mechanism as well as composition of the product, and the similarities and differences among the processes are set out clearly. Indeed, it is this sort of integrated presentation that makes this such a satisfying book, compared to books made up of contributed chapters. It is an excellent introduction to coal chemistry, and also a useful reference work. If a library could afford but one book on coal, this should be it.

Photometric Determination of Traces of Metals. Fourth Edition of Part I of Colorimetric Determination of Traces of Metals. By E. B. SANDELL and H. ONISHI. John Wiley & Sons, Inc. New York. 1978. ix + 1085 pp. $45.95.

The previous edition of this work appeared in 1959, since which time the new papers touching on the subject number in the thousands. The authors have not tried to bury the reader with all the information in them, but have selected what seemed most interesting and important to them, and have provided bibliographies of leading references—roughly a hundred per chapter.

The largest part of the book (233 pp) is the chapter on organic photometric reagents. The last quarter of the book is devoted to various methods for analytical separation: precipitation, chromatography, extraction, volatilization. Figures, tables, formulas, and equations abound. The index is appropriately substantial. The authors state that they have not decided whether to revise Part II of the work, which deals with individual metals.

Rodds' Chemistry of Carbon Compounds. Second Edition. Volumes IIIH and IVK. Edited by S. COFFEY. Elsevier Scientific Publishing Co., New York and Amsterdam. 1979. Vol. IIIG: xviii + 659 pp. $122.25 ($109.00 by subscription). Vol. IVK: xxii + 552 pp. $126.75 ($112.25 by subscription).

This series should already by very familiar, both from wide use of the original edition, and the several reviews that have appeared in this Journal as successive volumes have come out. Volume IIIH is devoted to "polycarbocyclic aromatic compounds with more than thirteen atoms in the fused-ring system", and Vol. IVK is devoted to "six-membered heterocycles with two or more hetero-elements, one or more being from the groups II, III, IV, V or VII, and heterocycles with seven or more ring atoms".

Volume IIIH actually contains but three chapters, but when one notes that one of them covers anthracenes and phenanthrenes, another covers acenaphthenes, fluorenes, fluoranthenes, etc., and the third covers all types of aromatic structures with four or more fused rings, it is easy to understand why they require so much space. In addition, half of this volume is taken up by a cumulative index to Volumes IIHA-IIIH, a feature that will make access to material much more efficient.

Volume IVK contains nine chapters, which are written by one of two authors: R. S. Edmundson and J. M. F. Gagan. They must have had to work very hard indeed to deal so adequately with the varied subjects. Several of the chapters are concerned with "unusual" heteroatoms, such as boron, germanium, tin, arsenic, aluminum, etc. This gives scope for some fascinatingly exotic combinations, such as azaluminines and thiasilins. Seven-membered rings, such as oxepins, azepines, phosphepins, azasilepins, etc., take up several chapters, and rings of eight or more atoms are treated in the last two chapters. A thorough index concludes the volume, which should be of special interest to pharmaceutical chemists, polymer chemists, and those concerned with unusual structures and the theory of bonding. It is a pity that the editor and contributors continue to omit the date up to which the literature was surveyed, a simple piece of information to give, but one of much value to the user.

Hypothalamic Peptide Hormones and Pituitary Regulations. Edited by JOHN C. PORTER (University of Texas). Plenum Press, New York and London. 1977. viii + 366 pp. $32.50.

This book contains the proceedings of a workshop conference held at the National Institutes of Health, Bethesda, in November 1976, the third of three symposia on neuroendocrinology. It consists of 16 chapters in which participants review basic research on the biochemistry, physiology, and pharmacology of the hypothalamic peptide hormones and their influence on the release of anterior pituitary hormones. The peptides discussed in depth include those responsible for the release of gonadotropins (LH-RH) and thyroid stimulating hormone (TRH) and the growth hormone release inhibiting hormone (somatostatin), and there are reviews of current progress in research into corticotropin releasing factor (CRF) and the factors affecting secretion of prolactin and melanocyte stimulating hormone.

The early chapters deal with the origin (R. Guillemin), distribution in the brain, biosynthesis, and the transport of active peptides. Plentiful experimental details on the subcellular fractionation of TRH and LH-RH from hypothalamic homogenates are presented by J. C. Porter's group, while the fine review by S. Ochs on the axoplasmic transport in peripheral nerves contains clear illustrations and ample references.

The synthesis of peptides with increased potencies and long actions and of those which are antagonists of the natural peptides is important to the physiologist and clinician looking for improved experimental and therapeutic agents. There are two substantial contributions from Schally's and Vale's laboratories on structure/activity relationships and on the biological activity of analogs. The roles of LH-RH, TRH, and somatostatin in the human are described in three chapters. Yen and his colleagues review their evidence for the existence of two pools of pituitary gonadotropin, one immediately releasable and the other requiring prolonged stimulation by LH-RH and relate these to the pattern of release throughout the menstrual cycle. TRH, and its role in the release of prolactin in addition to TSH, is discussed by Frantz, while Gerich reviews the complicated actions of somatostatin with special reference to its regulation of carbohydrate homeostasis.

The book is well produced and the illustrations are of high quality. Discussions of the individual papers are not included but the conference as a whole is summarized admirably by Gorski in a concluding chapter. This is a useful book on the current state of knowledge in this rapidly expanding area.

Wilfrid R. Butt, *Birmingham & Midland Hospital for Women Birmingham, England*

Rutherford and Physics at the Turn of the Century. Edited by M. BUNGE and W. R. SHEA (Department of History and Philosophy of Science, McGill University, Montreal). Neale Watson Academic Publications, Inc., New York. 1979. v + 192 pp. $20.00.

This fascinating book contains the following nine essays: (1) The State of Physics at the Turn of the Century, *Erwin N. Hiebert,* Harvard; (2) The Origins of Big Science: Rutherford at McGill, *Lawrence Badash;* (3) Physics at McGill in Rutherford's Time, *John L. Heilbron,* Berkeley; (4) Some Episodes of the Alpha-Particle Story, 1903-1977, *Norman Feather,* F.R.S., University of Edinburgh; (5) Rutherford in the McGill Physics Laboratory, *Thaddeus J. Trenn,* University of Regensburg; (6) The Reality Beneath: The World View of Rutherford, *Stanley L. Jaki,* Seton Hall; (7) 1900: The Cavendish Physicists and the Spirit of the Ages, *Neil Cameron,* McGill; (8) Scientific Revolutionaries of 1905: Einstein, Rutherford, Chamberlin, Wilson, Stevens, Binet, Freud, *Stephen G. Brush,* University of Maryland; (9) Astrophysics of the Turn of the Century, *Guglielmo Righini,* University of France.

* Unsigned book reviews are by the Book Review Editor.

These essays describe Rutherford at work and provide illuminating insights into his character and his enormous contribution to a period of unprecedented advancement of knowledge.

Erwin Hiebert writes, in the first essay:

> And so I wonder what it must have been like to be a scientist at the time, and to be convinced that what was then happening in physics would dominate the whole of physics more than all that had gone before.

I am such a person. My birth year address to the American Chemical Society, "From Then to Now", referred to that era. In the summer of 1906 I arrived in Berlin to prepare myself to be the first teacher of physical chemistry in the University of Pennsylvania. I was fully convinced that what was happening in physics and chemistry was more exciting than the "Chemical Philosophy" of a book by Harvard Professor Josiah Cooke put into my hands by the principal of my high school.

I was received cordially into the company of young German scientists, one of whom was Otto Hahn, who had recently returned from the laboratory of Rutherford in McGill University. I did research with Geheimrat Professor Dr. Walter Nernst; I was invited to dine several times in the home of the famous Professor J. H. van't Hoff. He told me about making the paper models of tetrahedral carbon atoms that were on exhibit in the Deutsches Museum. In the course of the year I came in contact with many of the notable persons dealt with in this book.

It tells about the efforts to understand puzzling phenomena; how, for example, Rutherford, in 1904, saw that progress depended upon determining the nature of the α, β, and γ emanations from radioactive substances.

The most notable physical scientists of the day were those who could ask the right questions and plan experiments that could yield pertinent answers. Gilbert Lewis had been in Germany. He caught the spirit of this new physical science and introduced it into the College of Chemistry in Berkeley in 1912. I joined it in 1913. Graduate instruction was carried on not by retelling book knowledge in lectures but by research and seminars where nascent knowledge was actively discussed. To teach in that way takes imagination by a person who has interesting questions in his own mind.

I recommend this book as informative and stimulating reading.

Joel Hildebrand, *University of California, Berkeley*

Toxicity of Heavy Metals in the Environment. Part 2. Edited by F. W. OEHME (Kansas State University). Marcel Dekker, Inc., New York. 1979. x + 450 pp. $45.00.

This book is a continuation of Part 1, a discussion of heavy metals in the environment. As with the first volume, the various chapters give a good review but not an in-depth look at the effects of heavy metals.

Chapter 23, the first chapter in the book, deals with fluorides. While one must stretch his concept of heavy metals a good bit to include fluorine in this group, the chapter adequately deals with fluoride toxicity in animals. As expected there is a special emphasis on the effects of fluoride on teeth and bones.

Chapter 24 is a short chapter dealing with beryllium and boron. Except as concerned with rocket motors, there does not seem to be an extensive environmental problem with either of these metals.

Chapter 25 is a useful reference to the metals that are generally less toxic. This includes all of the metals except mercury, cadmium, and lead. This chapter will be very useful for the person who is looking for a quick review. Levels in diet, body burden, and toxic effects are valuable points in this chapter.

Chapter 26 deals with teratogenicity of metals. While it is important to understand the mechanisms of teratogenic agents, the natural occurrence of all heavy metals in the environment surely means that there are safe as well as unsafe levels of exposure. The authors are fully aware of this and address it adequately in the discussion section.

Chapter 27 deals with the interaction of heavy metals with one another. This is an important concept and is handled well in this chapter.

Chapter 28, dealing with regulatory aspects of trace metals, is useful for understanding the U.S. Government approach. In addition to explaining government regulations, the chapter is a valuable source of the range of concentrations of trace metals in animal tissue.

No discussion of toxicology is complete without an understanding of the dose response effect. Very low levels of chemicals are generally without effect. Very high levels are always toxic. In between is an area where animal and plant life can safely exist. In the case of metals, many are beneficial, with moderate levels necessary for life. Chapter 29 discusses these beneficial effects of trace elements.

After 29 chapters of overview and review it is surprising to read Chapter 30 and find the detail with which the author addresses quantitative analysis for trace metals. The subject is treated well, covering flame emission, atomic absorption, atomic fluorescence, neutron activation, X-ray fluorescence, and spark-source mass spectrometry.

The final chapter deals with the use of chelating agent BAL to treat heavy-metal poisoning. While this is of historical interest, the medical community generally looks with disfavor today on the use of chelating agents except in life-threatening situations.

Gary Ter Haar, *Ethyl Corporation*

Nuclear Magnetic Resonance. Volume 6 (Specialist Periodical Reports). R. J. ABRAHAM, Senior Reporter. The Chemical Society, London. 1977. 269 pp. $42.00.

This volume contains ten annual and biennial reports providing well-referenced literature surveys of some of the more active areas of NMR spectroscopy. Reviews are concise (typically 20–30 pp in length) and generally thorough, although no attempt is made to provide background theory. Almost as useful as the articles themselves is a compilation of 118 books, chapters, "books of partial relevance", and review articles published during 1976–77. An index of authors, but not of compounds or subjects, is provided.

Topics chosen for review begin with two long annual chapters on Nuclear Spin–Spin Coupling and Experimental Techniques, but do not include the usual report on chemical shifts. Other topics include Multiple Resonance, Nuclear Spin Relaxation in Fluids, NMR of Paramagnetic Molecules, Synthetic Macromolecules, NMR of Natural Macromolecules, The Solid State, Liquid Crystals and Micellar Solutions, and Solvent Effects.

In a volume of this general excellence and scope, it is unfortunate that only one chapter of modest length, "N.m.r. of Natural Macromolecules", is specifically directed toward biological applications. Even this chapter represents a departure from the strongly physical bias of previous volumes, in which biological macromolecules and synthetic polymers have been reviewed as a single topic. Porphyrins, heme proteins, cytochromes, and other enzymes with paramagnetic active sites are covered with some overlap in a separate chapter on "NMR of Paramagnetic Molecules". The highly active field of model membrane systems and lipid vesicles receives substantial attention in a chapter on "Liquid Crystals and Micellar Solutions". Happily, the author of this chapter interprets his topic rather broadly and includes, for example, studies of the mechanism of ion and water transport across biological membranes as well as studies at the cellular level. However, reviews of biological applications of NMR, which by any measure are explosive and of central interest to many NMR spectroscopists, do not fit naturally into the current, highly physicochemical organization of topics. Unification of this material in separate chapters would be desirable.

Robert R. Sharp, *University of Michigan*

Polymerization Processes. High Polymers. Volume 29. Edited by C. E. SCHILDNECHT (Gettysburg College) and IRVING SKEIST (Skeist Laboratories). John Wiley & Sons, Inc., New York. 1977. ix + 768 pp. $40.00

The objective of the editors was to bring together under one cover both an update of established areas of polymerization technology and a survey of new developments in polymerization. The result is a very useful reference volume which together with its predecessor, "Polymer Processes, High Polymers", Volume 5, covers the field well.

One relatively minor criticism of the book is in the organization and scope. One can take two approaches in a survey of process technology: focus on processes illustrating use by reference to specific materials; or focus on materials describing the processes used to make them. There is no consistent approach in this volume. Addition polymerization is treated by the first approach; condensation polymerization by the second. A chapter on general principles of condensation polymerization is lacking.

There are 19 chapters in the book, each written by experts in the particular area. As is often the case, the individual authors take widely differing approaches. For example, the chapter on Emulsion Polymerization gives a detailed account of theory, but devotes only 5 pages (out of 50) to "practical" considerations. In contrast, the chapter on Suspension Polymerization is mainly descriptive.

New areas, such as oxidative coupling polymerization, are covered

very well. Older areas such as epoxy resins have been updated extensively. The latter, in fact, is a very concise but thorough account of the area of technology rather than being limited to the subject of polymerization. This is true of most of the chapters.

Ritchie A. Wessling, *The Dow Chemical Company*

Nucleic Acid Structure. By W. GUSCHLBAUER. Springer-Verlag, New York. 1976. 146 pp. $7.60.

This book is a concise introduction to nucleic acid structure and the methods used to study the structure; it summarizes the field up to 1975. It can show a beginner where to start reading to learn in depth about many topics in the physical chemistry of nucleic acids. For a worker in the field it can serve as a reminder and an index of what has been done. Essentially the book is a long review article. It tells what has been done, but not how.

The longest and most detailed chapter is on Model Systems for Nucleic Acids (Chapter 6). This is the author's own research interest; it provides a good description of physical studies on synthetic polynucleotides and oligonucleotides.

As in all books there are a number of imprecise or misleading statements; also as usual some reported results are no longer valid. However, it was particularly disturbing to find on page 23 that the first time the structures of DNA and RNA are presented, they are mislabeled. The polyribonucleotide is labeled DNA; the polydeoxyribonucleotide is labeled RNA, and thymine and uracil are interchanged.

I. Tinoco, Jr., *University of California, Berkeley*

Evaluation and Optimization of Laboratory Methods and Analytical Procedures. Techniques and Instrumentation in Analytical Chemistry. Volume 1. By D. L. MASSART and L. KAUFMAN (Vrije Universiteit Brussels) and A. JUJKSTRA (Rijksuniversiteit Utrecht). Elsevier, Amsterdam–New York. 1978. xvi + 596 pp. $57.75.

Volume 1 provides an excellent starting point and perspective for the series on techniques and instrumentation in analytical chemistry. This volume is a formal treatment of the practicalities experimental scientists consider in selecting and improving experimental methods. The subtitle aptly describes the contents as "A Survey of Statistical and Mathematical Techniques". The authors are successful in presenting a development of experimental methods analysis that is broad in scope and quite comprehensible to a general scientific audience.

The five sections comprising the volume can be summarized as: (1) statistical comparisons of methods, (2) optimization of controllable parameters for the method of choice, (3) the combining of methods and procedures to maximize information output, (4) sampling theory, and (5) a systems analysis approach to the optimization of analytical laboratories and experiments. Background in elementary statistics and information theory is presented in the early chapters, and numerous references are cited throughout the volume for increased depth. An especially strong point is the extensive use of chemical examples for illustration of mathematical concepts. The generous amount of discussion makes the volume very readable and provides continuity among the sections. The subject matter covered in this volume is useful to both the experimental researcher and the practicing analytical chemist.

M. J. Wirth, *University of Wisconsin—Madison*

Current Topics in Materials Science. Volume 2. Crystal Growth and Materials. ECCG-1 Zurich. Edited by E. KALDIS (Laboratorium für Festkörperphysik der ETH, Zurich) and H. J. SCHEEL (IBM Forschungslaboratorium, Rueschlikon, Switzerland). North-Holland Publishing Co. Amsterdam and New York. 1977. xvi + 918 pp. $122.50/D.Fl. 300.0.

This volume contains a large number of the invited review papers presented at the First European Conference on Crystal Growth, ECCG-1, and the associated Materials Symposium from September 12 to 18, 1976, at the ETH, Zurich, Switzerland. The book reflects the excellent planning and foresight of the Conference organizers who managed to bring together such a large number of wide-ranging, high-quality review articles in one conference. Crystal growth is a highly developed, multidisciplinary subject, and this is nowhere more apparent than in this book which is probably one of the best available to the advanced student of the subject.

The first part of the book is devoted to twelve papers on *fundamental studies of crystal growth/growth from the vapour phase;* this is followed by nine contributions on *growth and perfection of crystals and layers from the liquid phase;* Part III of the book deals with *recent progress in materials research and applications.* In all three parts the book aims to cover recent developments, and in the main it is successful although, inevitably, some of the authors devote a lot of space to old ground in introducing their subjects.

In Part I there are outstanding papers on the nucleation of crystals including theoretical, computer-simulation, and experimental studies. At first sight the subject of vapor-phase growth appears to be rather neglected, but the main developments in this subject are covered in articles on molecular beam epitaxy, the practical application of the temperature-oscillation method, and growth mechanisms in CVD of GaAs.

Part II of the book has successfully compounded the vast subject of melt growth and characterization into nine articles—again with no serious omissions.

Many of the new and exciting developments in materials research and applications are contained in Part III. The reader can discover the potential applications of metallic glasses, organic metals, and superionic conductors—all relatively "new materials". The important topic of silicon solar cells spans two articles, and there is also an interesting review on the results of the crystal growth experiments in Skylab and the ASTP-Apollo-Soyuz Test Project.

It is difficult to single out individual articles in a book of this quality, but the average crystal grower's breadth of knowledge will be greatly increased by studying: A.A. Chernov and D.E. Temkin on Capture of Inclusions in Crystal Growth; H.R. Oswald and J.R. Günter on Topotactic Preparation of Crystalline Solids; B.K. Vainshtein on Structure and Growth of Protein Crystals; D.T.J. Hurle on Hydrodynamics in Crystal Growth. In particular, the final article by R.A. Laudise on Trends in Materials Science is highly recommended since this concisely outlines the responsibilities of all material scientists in helping to solve current world problems of energy, pollution, materials resources, and communications.

K. G. Barraclough, *RSRE Malvern, United Kingdom*

Progress in Flavour Research. Edited by D. G. LAND (Food Research Institute) and H. E. NURSTEN (University of Reading). Applied Science Publishers, London. 1979. xvi + 371 pp. $46.00.

This work contains papers presented in 1978 at the University of East Anglia, as part of the second in a series of tentatively triennial flavor research symposia. The proceedings of the first symposium, held in Zeist, have been reviewed by this writer (*J. Am. Chem. Soc.,* **99,** 2834 (1977)). A few comparisons are in order. Organized similarly to its predecessor, this work deals with "four major areas—sensory aspects, analytical and instrumental techniques, formation of flavor substances, and aspects relating to consumer quality". There is some overlap of participants between the two symposia. However, the newer work is an improvement in several ways. The numbers of participants (75 vs. 56) and papers (30 vs. 20) have been increased, and the scope of presentation and documentation has been expanded in most cases. Several of the papers are essentially review articles, and the emphasis is on research done since 1975. The newer publication is more carefully produced, in hard cover, in a larger typeface, and includes a subject index. If the quality of this series is maintained or continues to improve, it should become a valuable reference for flavor chemists and could serve as supplementary material for courses in food chemistry.

About two-thirds of the material concerns the chemistry of flavors or analytical methods of general technical interest. The principal subject areas covered are: sensory evaluation of aromas; new methods of instrumental analysis (GC–TLC, GC–MS, CIMS, and related techniques); formation of volatiles in fruits and vegetables, by microorganisms and during processing; aroma components of strawberries, dairy products, and thermally degraded thiamine; stability of black pepper; metallic taint caused by lipid oxidation; a review of the current state of flavor research.

Keith T. Buck, *Fries & Fries, Inc.*

Kinetics of Ion-Molecule Reactions. Edited by P. AUSLOOS. Plenum Press, New York. 1978. viii + 508. $49.50.

For many years, it was a prevalent assumption that gas-phase ion–molecule reactions all went at collision rate. This volume, the Proceedings of a NATO Advanced Study Institute at Le Baule, France, in 1978, is evidence that the kinetics of such reactions are at least as rich in structural and energy dependence as solution-phase chemistry is. The chapters can be loosely grouped around the topics of theory, energy dependence, structural dependence, applications,

and new instrumentation. The first includes discussions of calculated potential energy surfaces and an extensive comparison of the various methods of estimating collision frequencies. Energy effects on collision complexes, charge transfer, and reactions in molecular beams and drift tube apparatus are presented. Several chapters discuss rates, equilibria, and mechanism for organic reactions corresponding to "well-known" solution-phase examples, for both positive and negative ions. There is perhaps the most cogent and extensive presentation of the "intermolecular entropy" theory of Lias and Ausloos, along with an important warning concerning different standard states for cation thermochemistry in the two major compilations, JANAF and "Energetics of Gaseous Ions". The role of ion–molecule reactions in such phenomena as nucleation, flames, interstellar and atmospheric chemistry, and lasers is reviewed. Several chapters discuss the decay and reactivity of electronically excited ions. A panel discussion presents brief descriptions of several new instrumental developments.

This volume is a necessary addition to the library of any researcher in ion–molecule reactions. The chapters in general are well written. The part on organic mechanisms in the gas phase has considerable pertinence to the solution phase, and is both understandable and of importance to mechanistic organic chemists. It is hoped they will not be put off by the preceding theoretical and physical chapters. It should be noted that the last chapter carries the name of the panel leader on the heading of each page, but omits the name of the person who actually prepared the chapter, B.S. Freiser. Finally, considering the cost of the book, it does not seem too much to ask for printed text, rather than the reproduced typescript used.

John E. Bartmess, *Indiana University—Bloomington*

Atomic Spectra and Radiative Transitions. By I. I. SOBEL'MAN (P.N. Lebedev Physical Institute). Springer-Verlag, Berlin–Heidelberg–New York. 1979. 302 pp. $35.00.

As the author states in his prologue, this book is very similar to Parts I and II of this earlier book, "Introduction to the Theory of Atomic Spectra" (English edition: Pergamon Press, Oxford, 1972). The motivation for that book was to modernize the classic text, "The Theory of Atomic Spectra" by E.U. Condon and G.H. Shortley (Cambridge University Press, 1935). This new book also admirably accomplishes that goal. I found several of the sections, particularly those dealing with angular momentum and the systematics of multielectron atoms, easier to read and to use than the corresponding sections of Condon and Shortley. Although not designed as a textbook, it would serve well as a graduate-level introduction to atomic spectroscopy.

There are, however, shortcomings. Most notable is the short bibliography of 32 references, only five of which were published during the last decade. Since many topics are dealt with in a cursory manner (for example, atoms in external electric or magnetic fields), the lack of current references is troublesome. Similarly, several topics of current interest (such as multichannel quantum defect theory and dielectronic recombination) are not mentioned, although they have a direct bearing on other topics discussed extensively. Excitation and broadening processes are deferred for treatment in Volume 7 of this Springer Series in Chemical Physics.

William E. Cooke, *University of Southern California*

X-Ray Spectroscopy. An Introduction. By B. K. AGARWAL (University of Allahabad). Springer-Verlag, Berlin–Heidelberg–New York. 1979. xiii + 418 pp. $40.70.

Professor Agarwal, himself a respected and productive researcher, has written a very detailed and complete introduction to X-ray spectroscopy. Most aspects of modern X-ray spectroscopy are treated, including: photoelectron (XPS and SXPS) and Auger electron production, X-ray scattering and absorption (including EXAFS), and characteristic X-ray emission. There are also sections describing specific details of production and detection techniques. Perhaps the best indicator of the book's completeness is its extensive bibliography of over 600 references.

Even with its high density of information, I found the book easily readable. It begins with a classical description of X-ray production and then introduces only simple quantum mechanical treatments as they are necessary (although references direct one to more detailed treatments). This general procedure is used throughout, providing a rather physical interpretation to the more complicated issues. Much of the jargon is presented in a clear, concise manner so that the book also serves as a fine reference text. This book would serve well as a graduate-level textbook.

William E. Cooke, *University of Southern California*

75 Years of Chromatography—A Historical Dialogue. (Journal of Chromatography Library. Volume 17). Edited by L. S. ETTRE (Perkin-Elmer Corp.) and A. ZLATKIS (University of Houston). Elsevier Scientific Publishing Co., New York. 1979. xiv + 502 pp. $49.75.

A few years ago, Dean Acheson wrote a portion of his autobiography and entitled it, "Present at the Creation—My Years in the State Department". This book on the history of chromatography could well be entitled or subtitled, "Present at the Creation—Chromatography". It is a collection of 59 essays by the scientists who have been most active in the development of all of the various aspects of chromatography over the last fifty years or so. Each is preceeded by a short biography written by the editors and a picture of the scientist. The essays themselves are first-person accounts of the investigators' encounters and experiences in chromatography. A final chapter is devoted to those chromatographic greats "who are no longer with us". The book was assembled and published in celebration of the 75th anniversary of the invention of chromatography by Michail Tswett. Tswett's initial paper entitled "On a New Category of Adsorption Phenomena and Their Application to Biochemical Analysis" was presented on March 21, 1903, at a meeting of the Biological Section of the Warsaw Society of Natural Sciences.

Modern chemistry, as we all practice it, is made possible by the availability of two techniques: chromatography as a separation method and spectroscopy as a method for the characterization of molecules. Chromatography, as a concept and as a technique, has probably kindled more imagination and fascinated more scientists than any idea in this century. This fascination and enthusiasm shine through all of the accounts given in this rather unique book. The contributors range from A.J.P. Martin in Paper, Partition, and Gas Chromatography to J.G. Kirchner and E. Stahl in Thin Layer Chromatography to H.H. Strain and L.R. Snyder in Adsorption and Column Chromatography, and so on. Some accounts are better written than others; some are broad; some are narrow; but all are enthusiastic and fascinating. In the last chapter, Dr. Ettre has included essays on Tswett himself, Palmer, Zechmeister, Tiselius, Pollard, Keulemans, and Dal Nogare.

The book has little technical content and, of course, was not published for this purpose. It is reminiscent of the short memoir by Guy Alexander entitled, "Chromatography, An Adventure in Graduate School" (American Chemical Society, Washington, D.C., 1977) in which a similar enthusiasm was captured. If one wishes to gain some insight into how scientists think and how concepts are developed between people of many nations, the book is worth reading, both as such and as a historical account of a fascinating era in science.

James M. Bobbitt, *University of Connecticut*

Physical Chemistry. By GORDON M. BARROW. McGraw-Hill Book Co., New York. 1979. xvi + 832 pp. $23.00.

The Fourth Edition of this undergraduate textbook of physical chemistry contains some important modifications to the previous editions. Most of the new material deals with introductory quantum mechanics, including a chapter on group theory, symmetry, and character tables. There are in all four chapters dealing with elementary quantum theory. This is apparently intended to give the text some coherence and to relate the various sections. For example, fermions and bosons are introduced during a discussion of the second law of thermodynamics. It is somewhat incongruous that the first-principles determination of molecular structure is not mentioned at all. The description of the SCF computation method is very brief and is incorrectly implied to be appropriate only for atoms. There is, however, a section giving some good qualitative descriptions of molecular orbitals.

All of the topics traditionally found in a physical chemistry text are adequately covered, although in a rather unusual sequence: quantum theory and statistical mechanics precede thermodynamics. Unfortunately, no section is devoted to solid-state concepts such as the band model. There are good discussions of catalysis and photochemistry. The total number of topics is not particularly large compared to that covered in other physical chemistry texts, although there is a useful bibliography at the end of each chapter. The problem sets with each section are comprehensive but many require a tedious analysis of tabular data.

This textbook contains good descriptive material and hence should prove particularly useful on this score. Some instructors, however, may not wish to follow the sequence of topics as given in the text.

Carl S. Ewig, *Vanderbilt University*

Topics in Current Chemistry: Inorganic Biochemistry II. Springer-Verlag, New York and Heidelberg. 1977. 204 pp. $38.50.

This volume consists of three lengthy review articles: "Interactions Between Metal Ions and Living Organisms in Sea Water" by Kenneth Kustin and Guy C. McLeod, "Inorganic Metabolic Gas Exchange in Biochemistry" by Gernot Renger, and "Complex Formation on Monovalent Cations with Biofunctional Ligands" by Wolfgang Burgermeister and Ruthild Winkler-Oswatitsch.

The first of these is an extremely interesting and important discussion of the general area of metal ions in marine biochemistry. The article begins with a global view of metal ions in sea waters: their origin, transport, and their chemical status in the seas. The authors give an adequate background of ligand-exchange mechanisms, then present information dealing with the effect of metal ions on various marine organisms. The article ends with a detailed discussion of the dynamics of vanadium uptake by tunicates.

The second paper combines a discussion of the ecological importance of the gases CO_2, O_2, N_2, and H_2 with many details of the chemical manipulation by living systems. While the apparent objective of this chapter is to convey an overall view of the role of these gases in nature, this Reviewer felt that selected biochemical topics were discussed in too great detail while the global aspects were too sketchy to convey a proper sense of the ecological importance of these gases.

The third chapter is a comprehensive, yet very readable, discussion of the chemistry and biochemistry of ionophoric substances. There are four basic sections: thermodynamic selectivity, kinetics and mechanisms of complex formation, mechanisms of carrier mediated ion transport through lipid bilayers, and the structures of ionophoric ligands. A large amount of thermodynamic and kinetic data is tabulated and the structures of many ionophores are discussed in terms of their mechanism of action. In general, this is a well-written and useful review article.

The high cost ($38.50) will probably preclude purchase by individual scientists except those having an immediate interest in the three topics covered by the book. However, the volume will make an important contribution to most technical libraries.

James A. Fee, *The University of Michigan*

Modern Methods for Trace Element Analysis. By M. PINTA (Office de la Recherche Scientifique et Technique d'Outre-Mer). Ann Arbor Science Publishers, Ann Arbor, Mich. 1978. xi + 492 pp. $29.50.

This book is intended as a convenient desk reference to all of the major methods for trace elemental analysis. The stated objective of the author is to allow the reader to choose the method most suited to any particular analytical problem. Considering the ambitious nature of this goal and the numerous complications attendant to it, one can understand why Dr. Pinta has not been completely successful.

The first difficulty associated with such a venture is choosing the proper techniques to cover. The author has made excellent choices. Approximately 50% of the book is devoted to emission spectroscopy and atomic absorption spectrometry (AAS), adequately reflecting the preeminence of the methods in modern trace analysis. Other topics include fluorometry, atomic fluorescence, X-ray fluorescence, and activation analysis. The neglect of electrical methods is defended on the basis of the numerous matrix effects inherent in these techniques. One could further argue that such techniques are species specific, not element specific. In any event, the methods chosen certainly include all the most commonly employed methods of analysis.

The next problem is to cover the topics consistently, with due consideration to their relative importance. The author's success is less complete in this regard. The coverage of emission spectroscopy is adequate, with one glaring exception. Dr. Pinta devotes only three pages to a discussion of the inductively coupled plasma, which easily ranks with electrothermal AAS as one of the two most important developments in elemental analysis in the last decade. The coverage of AAS is spotty with inadequate coverage of volatilization techniques such as hydride generation, and complete neglect of the coupling of chromatography with AAS. Meanwhile, much space is devoted to a fundamental discussion of electrothermal atomization mechanisms. This discussion is of questionable value to the analyst, especially since it neglects several important considerations and presents a deceptively simple representation of these complex processes. The coverage in the remainder of the book is quite good.

These problems are undoubtedly caused by the author's inability to overcome a more fundamental difficulty. Of the 1000 references cited in the book, only about 200 are as recent as 1974. This hysteresis is inherent in writing technical texts, but it is probably more severe than necessary in this particular case. In any event, the lack of a more recent survey of the literature explains several of the book's shortcomings.

If we ignore these and several other irksome problems, the book does have some good points. The annotated tabulations of applications to real samples presented for each technique are particularly valuable. They appear to be comprehensive, within the time limitations already noted. They certainly provide the analyst with a good survey of the general approaches used in real analyses. The chapter on atomic fluorescence is one of the best concise treatments of this method available.

In general, Dr. Pinta's book represents a good effort to meet its objectives, but it falls considerably short. I would recommend it for most analytical libraries, but probably not for personal acquisition.

Edward M. Heithmar, *University of New Orleans*

Chemical Compounds in the Atmosphere. By T. E. GRAEDEL (Bell Laboratories, Murray Hill, N.J.). Academic Press, New York. 1978. xii + 440 pp. $29.50.

The primary objective of this book is the presentation of a unified compendium of substances, ranging from highly reactive free radicals to stable freons, found in the atmosphere as vapors, aerosols, and particulate matter. Some 1600 species are tabulated according to emission sources, reported detection (accompanied in many cases by ranges of ambient concentrations), and reported (gas phase 25 °C) specific rate constants with the reactive substances in the atmosphere. These latter are listed in Table 1.1 on page 7, along with typical average concentrations, so that one may readily integrate this information with the rate constants in order to determine a dominant loss mechanism, e.g., via OH or O_3, for a given substance. Typically, two references are provided for each item of information on the emission and detection of substances, and readers must seek the original sources in order to evaluate procedures and inherent accuracies. The book consists of ten chapters, eight of which are categorized according to substance type (Chapter 2, Inorganic Compounds; Chapter 3, Hydrocarbons; Chapter 4, Carbonyl Compounds; Chapter 5, Oxygenated Organic Compounds; Chapter 6, Nitrogen-Containing Organic Compounds; Chapter 7, Sulfur-Containing Organic Compounds; Chapter 8, Organic Halogenated Compounds; Chapter 9, Organometallics). Chapter 1 is an introduction and Chapter 10 involves correlation of some of the data presented in earlier chapters. Literature references (approximately 870 in number) include numerous 1977 entries. Some innovative means of cross-referencing compounds and literature citations have been employed, although these reviewers encountered some difficulties in interpreting some of the superscripts and symbols and feel that a simplified tabulated explanation of referencing is desirable.

This monograph admirably fulfills the ambitious task undertaken by the author. Although most of the pages are filled with tables of data, consistent with the author's approach which is "taxonomic rather than pedagogical", the book is very readable. As a unified data compendium, its major purpose will be as a sourcebook for practitioners in the field. The book's appendices are especially useful, citing, for example, a given emission source, and referencing all related atmospheric substances.

It is inevitable that a book that spans analytical chemistry and chemical physics, discusses all classes of substances found in the environment, and cites as many references as this should contain a few errors. For example, the structures of quaterphenyl and benzo[*c*]-tetraphene in Table 3.5 (p 117) are misdrawn. On page 129, ambient levels of polynuclear aromatic hydrocarbons are incorrectly reported at several hundred ng/m^3, when the original literature source reports several hundred ng/1000 m^3.

These are relatively minor flaws in an otherwise excellent book. The thoughtful coverage of a vast and diverse group of chemical constituents associated with a plethora of sources and distributions, based on literature spanning analytical chemistry, kinetics, chemical physics, geophysics, and environmental science, makes this monograph a valuable contribution to the scientific community. This book implicitly illustrates the need for much more work, both in analyzing and understanding the chemistry of the atmosphere. These reviewers highly recommend this book to researchers, teachers, and institutional libraries.

Arthur Greenberg, Joseph W. Bozzelli
New Jersey Institute of Technology