

areas are pertinent to chemistry. Chemists who are preparing books for publication, especially textbooks, could gain much from this book. It is, however, a cultural contribution as well as a practical one, and it shows how esthetics and communication are intertwined.

Quantics: Rudiments of Quantum Physics. By J.-M. Lévy-Leblond (Université de Nice) and F. Balibar (Université de Paris). English translation by S. T. Ali. Elsevier/North Holland: Amsterdam. 1990. xix + 539 pp. \$109.75 (hardbound); \$44.95 (paperback). ISBN 0-444-87424-0 (hardbound); 0-444-88120-4 (paperback).

This is the first of three volumes comprising a comprehensive introduction to quantum physics. The term "quantics" is suggested as a replacement for "quantum mechanics", to take its place alongside "thermodynamics", "electronics", "acoustics", even "physics". (French students apparently refer to their "examen quantique".) This is not a bad idea, although probably about 60 years too late. Analogously, the quantum successor to the classical object called a wave or a particle is designated as a "quanton". This first volume covers the fundamental ideas of quantum physics with no reference whatever to the Schrödinger equation. It depends rather on experimental results, dimensional analysis, and heuristic arguments. It is still possible, without the usual mathematical machinery, to develop such topics as angular momentum, uncertainty relations, scattering, diffraction, transition amplitudes, fermions and bosons. The quantum treatment of potential steps, wells, barriers, and "battlements" is done as completely as in any conventional quantum-mechanics text, since the pieces of the wave function are all of free-particle type and the Schrödinger equation is thus incidental. The authors evince a deep understanding of quantum phenomena and even the well initiated reader is sure to profit from many interesting tidbits of insight. Some 170 problems supplement the text, many based on recent publications. This would probably not be an appropriate introductory quantum mechanics text for American undergraduates since it requires a fairly advanced level of mathematics and nonquantum physics, including relativity. But, for those with some knowledge of quantum mechanics, this is entertaining and profitable reading.

S. M. Blinder, *University of Michigan*

Reviews of Environmental Contamination and Toxicology. Volumes 118 and 119. Edited by George W. Ware. Springer-Verlag: New York. 1991. Volume 118: viii + 158 pp. \$49.00. ISBN 0-387-97447-4. Volume 119: viii + 150 pp. \$49.00. ISBN 0-387-97444-X.

Volume 118 contains two reviews: Toxaphene: Chemistry, Biochemistry, Toxicity, and Environmental Fate (M. A. Salch), and Pesticide Residues in Food Crop Analyzed by the California Department of Food and Agriculture in 1989 (D. Okumura et al.). The latter contains extensive tables. Volume 119 also consists of two reviews: Acute Toxicology of Components of Vegetation Smoke (F. N. Dost), and Small Mammals as Monitors of Environmental Contaminants (S. S. Talmage and B. T. Walton). The former review is concerned with smoke from wood and brush, burned in the wild or for residential agricultural purposes. The latter review notes the importance of studies of small mammals, because they "integrate contaminant exposure spatially, temporally, and across media". The emphasis is on heavy elements and radioelements, and much information is included in tables.

Each volume is well indexed.

Dye Laser Principles With Applications. Edited by F. J. Duarte (Eastman Kodak Company) and Lloyd W. Hillman (The University of Alabama in Huntsville). Academic Press, Inc.: San Diego. 1990. xi + 456 pp. \$64.50. ISBN 0-12-222700-X.

The book contains contributions from eight experts in the area of dye lasers/laser dyes. Basic principles of coherence and propagation are covered in the first two chapters by F. J. Duarte and L. W. Hillman and lead into the topics of the next four chapters: Femtosecond Dye Lasers by J.-C. Diels; Narrow Linewidth Pulsed Dye Laser Oscillators by F. J. Duarte; Continuous Wave Dye Lasers by L. Hollberg; and Technology of Pulsed Dye Lasers by F. J. Duarte. In a chapter on Photochemistry of Laser Dyes G. Jones II discusses molecular structure and photophysics of dyes. The book concludes with three chapters on industrial applications by D. Klick, isotope separation by M. A. Akerman, and medical applications by L. Goldman. The excellent selections of informative examples of industrial and medical applications will appeal to readers in many areas. The short chapter (six pages) on isotope separation is primarily a grouping of references from 1978-1989. An adequate comprehensive index (six pages) is included.

Throughout the book a liberal offering of literature citations (with a total number over 1100) is found. Instructive problem sets are given at the ends of six of the ten chapters. An Appendix (16 pages) catalogues about 50 laser dyes available from Eastman Kodak Company. Each dye is characterized by molecular weight, absorption, fluorescence, laser

activity, solvents, and structural formula. This Appendix as an advertisement is inappropriate and as a service to the reader is inadequate since it covers laser activity (with some gaps) over a restricted area from about 400 to 920 nm. More than twice that number of essential dyes is currently available from Kodak's competitors, e.g., Exciton, Sigma, Aldrich, Lambda Physik, and others, to provide continuous dye laser activity over the range from about 300 to 1300 nm.

The authors have met their intended goal to provide (1) a text for senior and graduate students and (2) monographs on aspects of dye lasers and laser dyes for the wide variety of workers active in research and in industrial applications. In striving to achieve these broad aims, the book inadequately serves one group of readers with little or limited knowledge on the chemistry of dyes and another group unfamiliar with many of the engineering and technological applications of dye lasers.

On balance, the accomplishments outweigh the shortcomings. I strongly recommend the book to its intended audience of students and active research workers.

Joseph H. Boyer, *The University of New Orleans*

Modern Aspects of Electrochemistry. Volume 21. Edited by R. E. White, J. O'M. Bockris, and B. E. Conway. Plenum: New York and London. 1990. xiii + 321 pp. \$69.50. ISBN 0-306-43313-3.

This volume is the most recent in a series of collected monographs relating to aspects of electrochemistry. It follows the tradition of the series in that the material is quite broad in scope. The articles are universally well-written and illustrated. A topical index for this volume and both an author and a title index for the series are included. Most of the material is pitched primarily at the specialist, although some articles are appropriate for a general readership. Bibliographic citations are, with a few exceptions, current through about 1988. This volume is certainly required material for a well-stocked chemistry library and is sure to be consulted by electrochemists and by others interested in a solid introduction to electrochemical aspects of the subjects outlined below.

The volume contains six chapters. Chapter 1 on applications of scanning tunneling microscopy in electrochemistry (by R. Sonnenfeld, J. Schneir, and P. Hansma) is particularly timely; it provides a good general overview of this rapidly growing subdiscipline, appropriate for both specialists and generalists. Chapter 2 on the nickel oxide electrode (by J. McBreen) focuses on applications in batteries and includes material on the properties and reactivity of the various nickel oxides and on battery fabrication. Chapter 3 on in situ radiolabeling methods (by A. Wieckowski) is a comprehensive review covering instrumental and calculational methods and on applications to ion adsorption and surface reaction chemistry. Chapter 4 on the electrochemistry of metallic glasses (by P. C. Searson, P. V. Nagarkar, and R. M. Latanision) focuses on the behavior of glassy transition metals (primarily Fe, Ni, Co, Cr, and Cu) and their alloys (primarily with B, P, and Zr). Anodic dissolution, hydrogen evolution, and passivation are discussed. Chapter 5 on electrochemical reactivity on single crystal metal electrodes (by R. Adžić) reviews this important subject with an emphasis on proton and oxygen reduction and on formic acid, methanol, and carbon monoxide oxidation chemistry. Finally, Chapter 6 on DC relaxation techniques (by Z. Nagy) reviews electrochemical methods for probing fast reactions. Theory, data evaluation, and applicability limits are reviewed and compared for experiments involving perturbation of electrochemical current, charge, or potential.

Stephen E. Creager, *Indiana University*

Energy Density Functional Theory of Many-Electron Systems. By Eugene S. Kryaschko (Institute of Theoretical Physics, Kiev, USSR) and Eduardo V. Ludeña (Venezuelan Institute for Theoretical Physics, Caracas, Venezuela). Kluwer Academic Publishers: Dordrecht, Boston, and London. 1990. xiii + 850 pp. \$235.00. ISBN 0-7923-0641-4.

Although the title promises a treatise on density functional theory (DFT), the scope of this book extends from DFT itself to properties of density matrices, binding and electrostatic forces, the topological theory of atoms in molecules, and atomic charges and population analysis. Taking into account the explosive growth of quantum chemistry in the recent decade, appearance of such a comprehensive monograph on the electron density is welcome news.

The book is divided into nine chapters. The text begins with a historical overview of DFT and leads the reader through detailed preliminaries covering the topics of quantum-mechanical states, density matrices, and the variational principle. The third chapter deals with properties of the one-electron density and their relevance to the description of molecular structure. The Hartree-Fock method and electron correlation are discussed in Chapter 4. After more than 300 pages of text, the reader is well armed with all the necessary knowledge to begin investigating the intricacies of density functional theory.

After Chapter 5 which is centered around the Thomas-Fermi theory,

the foundations of DFT are described in great detail and with mathematical rigor. This is continued in Chapter 7 which introduces a rigorous variational formulation of DFT. The self-consistent-field concept in DFT is dealt with in Chapter 8. The book is concluded with a synopsis and the description of future trends, followed by an extensive (more than 130 pages!) and up-to-date bibliography.

The book is very comprehensive. Virtually all topics, including those quite distantly related to DFT, are covered. Most of the theorems are proven. The text is well-organized and the material is well-presented. Although the omnipresent mathematics may make the reading difficult to graduate students, the book is a gold mine of facts, theorems, and literature references to any scientist interested not only in DFT itself but also in quantum chemistry, solid-state, or many-body physics. The reader has a chance to check his understanding of DFT with problems scattered throughout the text, although (unfortunately!) the solutions to these problems are not given in the book.

The book has two minor weaknesses. Not enough emphasis is put on differentiating the concepts that rely solely on the wave function or the electron density (such as Bader's atomic charges) from those defined within arbitrary basis sets (such as Mulliken population analysis, the natural localized molecular orbitals, and the related concepts). Also, there are several annoying, but quite benign, typographic errors, although those are not unexpected in a book prepared from a "camera-ready" manuscript.

The book is an exhaustive monograph on the electron density and its properties. It can serve a multitude of purposes: from a quick reference to a source of inspiration to anybody working in the field of DFT. I recommend it as a "must-read" to anybody interested in modern theoretical chemistry.

Jerzy Cioslowski, *Florida State University*

Inorganic Syntheses. Volume 27. Edited by Alvin P. Ginsberg. John Wiley and Sons: New York. 1990. xxv + 433 pp. \$59.95. ISBN 0-471-5097-0.

This volume maintains the style and high standards of its predecessors. It contains some 200 independently checked syntheses, grouped into nine chapters. The care and thoroughness of the checking process is well-documented by numerous footnotes reporting minor variations or other pertinent observations. As usual, experimental hazards are carefully described.

A large proportion of the syntheses represent important and currently active areas of research. Particularly notable is the third and longest chapter, which contains 45 syntheses of early transition metal polyoxo-anions ranging from simple species like $\text{Mo}_2\text{O}_7^{2-}$ to giant anions like $[\text{P}_8\text{W}_{48}\text{O}_{184}]^{40-}$. In addition to documenting a large number of difficult syntheses, this section provides a good overview of a fascinating area. Other chapters include the following: Transition Metal Polyhydride Complexes (20 syntheses, including several dihydrogen complexes); Transition Metal Chalcogenide Complexes (19 syntheses); Lanthanide and Actinide Complexes (24 syntheses); Transition Metal Cluster Complexes (25 syntheses); Phosphorous Complexes and Compounds (22 syntheses); Transition Metal Complexes of Biological Interest (15 syntheses, mostly of lacunar cobalt(II) and iron(II) dioxygen carriers), Miscellaneous Transition Metal Complexes (19 syntheses), and Ligands and Other Main Group Compounds (10 syntheses).

It should be noted that the *Inorganic Syntheses* series celebrated its 50th anniversary in 1989. Browsing through previous volumes is a fine way to gain appreciation for the explosive development of modern inorganic chemistry as well as for the wisdom and foresight of the founders of *Inorganic Syntheses*. Future generations of inorganic chemists will be fortunate if the series continues for another half century.

Robert J. Doedens, *University of California, Irvine*

Serendipity: Accidental Discoveries in Science. By Royston M. Roberts (University of Texas). John Wiley and Sons: New York. 1989. xviii + 270 pp. \$19.95. ISBN 0-471-50658-3 (hardback); 0-471-60203-5 (paperback).

Traditional science education presents knowledge as a tidily built edifice, with each consequentialy brick set neatly and inevitably into place on the preceding supporting data. In recent years the role of accident and insight in scientific work has received more attention from various published accounts in books and periodicals. Royston Roberts has carried

that process one step further by combining accounts of many of the known serendipitous discoveries into a single volume.

Dr. Roberts covers a wide field, including in 36 chapters examples from physics, organic and inorganic chemistry, radiochemistry, microbiology, archeology, astronomy, medicine, and pharmaceuticals, as well as some examples not easily categorized such as the discovery of Velcro. He has included examples of discovery of a desired result by an unexpected means, which he refers to as *pseudoserendipity*, along with those encompassed by the usual definition of serendipity as an accidental discovery of something not looked for. The account of Russell Marker's isolation of progesterones from Mexican yams, although fascinating, strikes me as not a true example of accidental discovery in either sense, at least not from Robert's description. Its inclusion illustrates the author's tendency to add interesting material related but not essential to the topic at hand. Roberts is an able story teller, and he presents his material in a popular style, including flashy chapter headings such as "Archimedes--The First Streaker". He has largely succeeded in writing for a nonscientific audience; one exception is the section on the discovery of the structure of DNA, which would require at least an introductory chemistry course as background for full appreciation. Photographs, cartoons, explanatory diagrams, and chemical structures help to maintain a visual tie to the examples. A thorough table of contents, bibliography, and index provide excellent access to the current information as well as the author's sources.

Although many of the examples Dr. Roberts relates are familiar ones, the impact of the combined stories is beyond that of any one alone. Several themes emerge from the stories. One is that the importance of a scientific discovery is related to its usefulness in contributing to a product or procedure, as well as to its unexpectedness. Another theme is the importance of the discoverer's understanding the unexpected result and acting upon it. For example, Roy Plunkett could have reached for a fresh supply of tetrafluoroethylene instead of slicing open an uncooperative cylinder to discover Teflon. These common threads give some unity to what is essentially a collection.

The book will be especially valued by science teachers, who will use its many examples to illustrate and enliven lectures. I would further recommend it for all practicing bench scientists, who will look at unexpected results in a new light, perhaps to their own benefit as well as that of science and society in general.

Marvin S. Hoekstra, *Parke-Davis Pharmaceutical Research*

Dictionary of Organometallic Compounds. Fifth supplement. Executive Editor, J. E. McIntyre; Assistant Editor, F. M. Daniel. Chapman and Hall: London and New York. 1989. Two volumes: XVI + 502 pages and x + 508 pages. \$895.00. ISBN 0-412-28180-5.

The Dictionary of Organometallic Compounds in three volumes published in 1984 describes, in a very attractive way, the structures and chemical and physical properties of more than 40 000 compounds. It's continually updated each year by a Supplement. This Fifth Supplement (1989), like the previous four, includes recent information and literature references about compounds listed in the Main Work as well as data of new compounds (3000 entries). For these reasons, this dictionary is certainly the most comprehensive compilation available of organometallic compounds. As in the previous volumes, the compounds are classified alphabetically by the metal they contain and then by increasing number of carbon atoms. The structure of each compound listed is depicted very clearly allowing one to use this dictionary very efficiently. It is accompanied by an index volume which includes a name index, a molecular formula index, as well as a CAS registry number index. These indexes are cumulative allowing access to entries in the Main Work and in all Supplements. This Fifth Supplement is as useful and as well written as the previous volumes. It is an indispensable tool for the research chemist in organic, organometallic, and inorganic chemistry.

Paul Knochel, *The University of Michigan*

Sixteenth Symposium on Nucleic Acids Chemistry. Edited by Hiroshi Takaku (Chiba Institute of Technology, Japan). Oxford University Press: Oxford, New York, Tokyo. 1990. vii + 142 pp. \$65.00 (paperback). ISBN 0-19-963127-1.

This little book is based on a symposium held in Narashino, Japan, October 5-7, 1989. It contains 70 two-page summaries, in typescript, of the papers presented at the symposium. There is an index of authors, but not of subjects.