for anyone who is interested in applying single-molecule techniques to their own research.

The book is divided into three sections according to the techniques that are used for single-molecule detection. These techniques differ in sampling conditions and the means of delivering excitation energy, but all of them share the need to isolate single molecules for detection. One approach is to isolate individual molecules spectroscopically in low-temperature solids because matrix perturbations cause each molecule to have a slightly different absorption frequency. A more broadly useful approach is to isolate molecules on a surface or in dilute solution; that is, individual molecules are spatially separated from each other in the area or volume probed by a laser beam.

The first section deals with single impurity molecules embedded in low-temperature solids. Moerner describes the fundamental principles and experimental methods in high-resolution single-molecule spectroscopy, and Basche and co-workers discuss single-molecule excitation profiles, wavelength-resolved spectroscopy, and quantum optical studies. Wild and co-workers present fluorescence microscopy, polarization, and lifetime measurements. A fascinating finding is that the absorption line of a single molecule often undergoes frequency jumps called "spectral walking". This behavior is discussed experimentally by Brown and Orrit and analyzed theoretically by Skinner. This section concludes with the use of magnetic resonance to detect single molecular spins.

The second section covers the use of near-field scanning optical microscopy (NSOM) for single-molecule studies at room temperature. Trautman and Ambrose first discuss the fundamental principles of NSOM and then describe its applications to single-molecule imaging and spectroscopy. The main advantages of near-field microscopy are its improved spatial resolution and the ability to correlate spectroscopic information with topographic data. If the primary goal is to study single molecules and subdiffraction spatial resolution is not essential, far-field confocal and evanescent-wave methods may be better choices. Far-field optical excitation in the confocal or evanescent-wave mode is much simpler and noninvasive, and has unlimited laser throughputs.

The third section discusses single-molecule detection in the liquid phase. A number of schemes are described including hydrodynamic sheath flow, microdroplets, confocal microscopy, total internal reflection, and electrophoresis capillaries. A single molecule in solution is generally detected as a photon burst as the molecule moves across a tightly focused laser beam by either liquid flow or diffusion. These studies present an opportunity for sensitive chemical analysis without standards and are important to ultrasmall and ultrasensitive chemical instrumentation.

With the caveat that the most exciting and important insights are likely to be unforeseen, single-molecule detection and spectroscopy has already yielded new information that is not available from population-averaged measurements. In particular, discrete spectral jumps or intermittent photon emission has been observed for single dye molecules, single fluorescent protein molecules, and single conjugated polymer molecules. Still, the future of single-molecule detection appears to lie in its application to solve important problems such as DNA sequencing, biomolecular dynamics, ultrasensitive diagnostics, and optical information storage.

Shuming Nie, *Indiana University at Bloomington*

JA975696J

S0002-7863(97)05696-5

Organic Reactions in Aqueous Media. By Chao-Jun Li (Tulane University) and Tak-Hang Chan (McGill University). John Wiley and Sons: New York. 1997. xi + 199 pp. $59.95. ISBN 0-471-16395-3.

The monograph *Organic Reactions in Aqueous Media* by Chao-Jun Li and Tak-Hang Chan is a wonderful resource for a broad audience. This text should be useful to not only those currently practicing the art of organic synthesis in aqueous media but all organic and organometallic chemists interested in learning about the possibilities of reactions in this unusual (for the organic chemist) environment. There are a number of features which make this a very attractive and useful volume. First, the coverage is extensive. The topics covered include pericyclic reactions, nucleophilic additions and substitutions, metal-mediated reactions, transition metal catalyzed reactions, and oxidations and reductions. There is also a separate section giving an overview of current industrial applications of aqueous organic chemistry. Hydrolysis reactions are not covered, but the authors adequately explain this exclusion in the preface. Second, each reaction is fully illustrated with very clear structural drawings. Where different stereochemistries or regiochemistries are possible in the products, full details of product distribution are typically provided. Finally, the references are fairly up to date for a book published in 1997; references from 1995 and 1996 are common. While the references may not be exhaustive, the text provides a good coverage of each topic. The only drawback to the text is that there are a number of places throughout where the grammar seems awkward and stilted. This is not a serious problem since these occasions are quite rare and do not really mar the overall effectiveness of the text. Overall, with a reasonable price for a scientific monograph, this volume is a must for researchers working in aqeuous media and highly recommended for all who are involved with organic synthesis in its broadest sense.

Joseph S. Merola, *Virginia Tech*

JA975656F

S0002-7863(97)05656-4

Environmental Toxicology and Chemistry. By Donald G. Crosby (University of California, Davis). Oxford University Press: Oxford and New York. 1998. 336 pp. $59.95. ISBN 0-19-511713-1.

A knowledge of the chemistry of toxicants, including the biochemical and chemical transformations, is invaluable for a better understanding of their toxic effects. Hence, it is unfortunate that most books should treat environmental toxicology and environmental chemistry as two different subjects. This is probably because of the extensive nature of each subject and the requisite background in several specialized areas. It is in this context that Dr. Crosby's ambitious attempt at bringing together both these subjects in one book has to be appreciated.

The result is a work of 16 chapters which cover a wide range of topics. After introduction of the preliminaries in the first chapter, environmental chemicals and their chemodynamics, transport, and abiotic transformations are discussed in the next four. This is followed by a discussion, in Chapters 6−10, of toxicological subjects including Biotransformations, Intoxication, Quantitative Toxicology, Intoxication Mechanisms, and Exposure and Risk. In the next five chapters (11−15) examples of specific environmental chemicals (Inorganic Toxicants, Biotoxins, Industrial Chemicals, Refractory Pollutants, and Reactive Pollutants) and their toxicological effects are presented while Chapter 16 is devoted to prediction of the environmental fate and effects of toxicants. Representative examples of toxicants (both organic and inorganic in nature), their effects, their occurrence and distribution in nature or production on an industrial scale, regulatory controls by specified agencies, and a great deal of other useful information have been given in a large number of tables in the relevant sections. Literature is cited from as far back as the 1950s and as recently as 1997. At the end of each chapter an illuminating discussion of a special topic is included.

The greatest merit of this work is its readability, which is a result of the lucid, unpretentious style of writing. This feature is especially important if the book is to be used for an introductory course at the undergraduate level.

Although a simplified style is generally laudable, it can sometimes lead to inaccuracies. This drawback is evident in this book in several places, especially in discussions of some aspects of chemistry. For example, the following statements appear in Chapter 16: "Every physical or chemical system contains energy, generally expressed as heat (H)." "Free energy makes things happen." "The equilibrium and rate constants for any reaction are directly and linearly related to ...$\Delta G°$." Energy is not stored in a system as heat. Heat becomes equal to enthalpy transferred at constant pressure. Besides H is the symbol for enthalpy, not for heat. Free energy merely indicates the *possibility* that some process can take place but a kinetic barrier can preclude its happening. The equilibrium constant is related to $\Delta G°$ between products and reactants. According to the transition state theory, the rate constant is related to the Gibbs free energy change between the activated complex and reactants, but this is not $\Delta G°$. In eq 5.27 (p 81), which relates log K to $\Delta E°$, the factor 2.303 should be in the denominator, not the numerator. Water is referred to as "hydrogen

oxide" (p 84); its correct term is "dihydrogen oxide". As with most other books on cognate subjects, Detection and Measurement (Chapter 2) have been discussed superficially with a cursory mention of TLC, GLC, LC, and immunoassays and two brief paragraphs on analyte detection. Since some toxicants are routinely analyzed by GC−MS, it is surprising that mass spectrometry should be completely omitted in a list of chromatographic detectors (Table 2.2) that is titled Some Modern Analytical Detectors. Moreover, not a single technique for analysis of inorganic toxicants (e.g., atomic absorption spectrometry) is even mentioned. The difficulty of accurately measuring low concentrations has been highlighted, but the possible improvements have not even been mentioned.

In contrast, topics on toxicology constitute the stronger aspect of the book although molecular mechanisms of toxicity could have been dealt with in greater detail to avoid any confusion. For example, although binding to sulfhydryl groups may be a dominant mechanism, the toxicity of arsenic is species-dependent and may involve other mechanisms as well.

Overall, the clarity of exposition and the range of topics covered would commend this book to undergraduates as an appropriate text for an introductory course on environmental toxicology and/or environmental chemistry. Corrections to the indicated misstatements would undoubtedly enhance the utility of the next edition.

Nelson Scott, *California State Polytechnic University*

JA985626S

S0002-7863(98)05626-1

Principles of Molecular Biology, Volume 5: Molecular and Cellular Genetics. Edited by E. Edward Bittar and Neville Bittar (University of Wisconsin). JAI Press: Greenwich, CT. 1996. xiv + 412 pp. $128.50. ISBN 1-55938-809-9.

The authors of this book have attempted to fill in an important piece of a puzzle which, regrettably, keeps changing at breath-taking speed. Because the knowledge in the field of molecular genetics is literally exploding, the authors had a difficult task of critically discussing important subjects which are in rapid flux. The volume fulfills an essential need. Specifically, it presents in a review-like format the 1995-96 state-of-the-art of the subject based on information available *at that time*. Most of the chapters are written concisely and informatively.

The topics of nucleosome structure and DNA replication are handled with clarity and enthusiasm. The chapter on DNA methylation, an important subject for most aspects of nucleic acid function, is poorly written and organized in an uninteresting fashion. The chapters on histone acetylation, synthesis and activity of transcription factors, and alternative DNA splicing are well written and presented with skill. The protein−DNA interaction subject is presented in a somewhat heavy-handed manner with exuberant description of spacial modalities but with little consideration of relevant consequences.

The potential use of antisense nucleic acid fragments for inhibition of gene expression is skillfully explored. The essential aspects of specificity, efficiency, delivery, and toxicity are well addressed. The use of antisense reagents in clinical medicine shows interesting promise in the fight against viruses and cancer.

The possible mechanism and pathways for signal transduction from external cell-membrane receptors to intranuclear DNA are presented with insight. The emphasis is mainly on the dynamic aspects of the process such as distribution and equilibria of architectural proteins and protein kinase activities. Other important aspects of transduction such as changes in cell morphology and availability of cytoloplasm-produced metabolites are acknowledged but not considered. The subject of DNA damage and repair is succinctly exposed and linked to some known hereditary human disorders in which a repair function does not conform to the normal cellular response to DNA damage.

The chapters on PCR, molecular cloning, and use of DNA probes deal mostly with standard techniques in experimental molecular genetics.

Overall, I enjoyed reading Volume 5. It covers quite satisfactorily most of the important subjects in the field of molecular and cellular genetics. Graduate students in biochemistry, molecular biology, and genetics may find the book edited by the Bittars useful and informative. The introductions of each chapter review concisely some important basic principles in the field. Unfortunately, by 1998, Volume 5 of *Principles of Medical Biology* is out of date. While this may limit its value for researchers, the book can be quite useful for trainees, graduate students, and educators.

Nicolae Filipescu, *George Washington University*

JA975579O

S0002-7863(97)05579-0

Plasma Source Mass Spectrometry: Developments and Applications. Edited by Grenville Holland (University of Durham) and Scott D. Tanner (PE-Sciex). American Chemical Society: Washington, DC. 1997. x + 329 pp. $136.00. ISBN 0-85404-727-1.

This book represents the proceedings of the 5th International Conference on Plasma Souce Mass Spectrometry, which was held in September 1996 at the University of Durham, U.K. There are 31 papers on ICP mass spectrometry and 1 on glow discharge emission spectrometry. The ICP-MS papers span a wide range of interests, with fundamental papers on (a) the effects of droplets and particles on the ICP, (b) space charge effects on ion optics, (c) the use of a hexapole collision cell for removing polyatomic ions, (d) a magnetic sector MS that is capable of higher spectral resolution and sensitivity than the usual quadrupole analyzer, and (e) the use of solvent removal and multicomponent analysis to deal with spectral interferences.

Applications of ICP-MS is the main theme of this conference, and some of the topics emphasized include flow injection for matrix removal and preconcentration, speciation, the analysis of biological materials such as urine, plants, and food, trace element measurements in steel, landfills, drinking water, and Antarctic waters, radionuclides in concrete, etc.

All the papers are quite current. Some are of very high impact, such as the initial description of the desolvated microconcentric nebulizer. Except for a few overview papers, each article is an original work, not a rehash of material published elsewhere. The application papers span most of the scientific uses of ICP-MS and provide a good picture of the types of problems addressed by this technique. The papers are edited to a fairly uniform format. There are very few errors, the most serious one being the statement on p 52 that a shielded plasma cannot be operated under normal "hot" conditions. A good index is provided.

This book is very valuable for the ICP-MS practitioner who wants a survey of the main new developments under a single cover. It belongs in the library of every research group or institution that is active in ICP-MS. It is not a textbook but would serve as a valuable resource for any course in analytical atomic spectrometry, in a mass spectrometry course that includes inorganic analysis, or in an instrumental analysis course. I commend the editors for a job very well done.

R. S. Houk, *Iowa State University*

JA975652A

S0002-7863(97)05652-7

Catalytic Reductive Carbonylation of Organic Nitro Compounds. By Sergio Cenini and Fabio Ragaini (Università degli Studi di Milano). Kluwer Academic: Dordrecht. 1997. xii + 340 pp. $169.00. ISBN 0-7923-4307-7.

This monograph is the 20th volume in the series Catalysis by Metal Complexes edited by Renato Ugo and Brian R. James. These generally involve comprehensive reviews of a narrowly defined topic within the field of catalysis. Such is the case with the current book. Catalytic carbonylations of nitro groups, especially for the production of isocyanates and carbamates, are of special interest as a replacement for existing phosgene-based technology. The great interest in this area originated in industrial laboratories, and a large portion of the literature is located in patents. To their credit, the authors have included a review of the patent literature, and this summary alone greatly enhances the value of this volume. Many of the catalytic systems are homogeneous and are based on soluble complexes of palladium and ruthenium. Throughout the book, the authors nicely complement the survey of