

and photochemical alkylation.¹⁰ The conjugate acid of purine ribonucleoside, with a pK_a value of 2.05,¹¹ is also protonated at N-1.¹² Equation 1 yields an equilibrium constant of 1.1×10^{-7} for hydration of purine ribonucleoside to form 1,6-dihydro-6-hydroxypurine ribonucleoside. In general, substitution at carbon strongly disfavors water addition to C=N groups (see ref 1), so that the equilibrium constant for 1,6-hydration of adenosine is presumably some orders of magnitude lower still. Recent work indicates that the equilibrium constant for activation, in the uncatalyzed hydrolytic deamination of adenosine which may proceed by water addition at the 1,6-position, is approximately 10^{-13} .¹³ Accordingly, the instability of the water adduct of adenosine may approach that of the transition state for its deamination.

A similar approach can be taken to other heterocyclic systems. For example, 1-methylnicotinamide appears to add hydroxide ion reversibly to form a pseudobase with an absorption maximum at 325 nm, in a reaction with an equilibrium constant in the neighborhood of $0.25 M^{-1}$ or less.¹⁴⁻¹⁶ The pK_a value of the

conjugate acid of nicotinamide is 2.1,¹⁷ so that the equilibrium constant for covalent addition of water to nicotinamide can be estimated as 3×10^{-13} or less.¹⁸ In principle, this method can also be used to determine equilibria of addition of nucleophiles other than water. The chief requirements are that methylation can be carried out at the position at which proton addition would occur and that anion addition to the resulting quaternary amine yields a product of sufficient stability to allow determination of the equilibrium constant for its formation.

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(18) This is a composite equilibrium constant that includes adducts formed at all possible sites of water addition (1-2, 1-4, and 1-6). Guilbert and Johnson¹⁶ suggest that hydroxide addition occurs mainly at C-2. If that is the case, equilibrium constants for addition at other sites must be less favorable.

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Book Reviews*

Nuclear Magnetic Resonance: A Specialist Periodical Report. Volume 14. Edited by G. A. Webb (University of Surrey). The Royal Society of Chemistry: London. 1985. 1 + 383 pp. \$127.00. (Available from the ACS, Washington.) ISBN 0-85186-372-8.

This annual volume surveys the NMR literature for the period from June 1983 to May 1984. In the process, it documents the impressive scope and vitality of current NMR research. The volume contains 4633 references, including a list of 441 books and review papers pertaining to NMR that were published during the review period.

The book contains twelve chapters: Theoretical and Physical Aspects of Nuclear Shielding (Cynthia J. Jameson), Applications of Nuclear Shielding (G. E. Hawkes), Theoretical Aspects of Spin-Spin Couplings (A. Laaksonen), Applications of Spin-Spin Couplings (D. F. Ewing), Nuclear Spin Relaxation in Liquids and Gases (H. Wiengartner), Solid State NMR (P. S. Belton, S. F. Tanner, and K. M. Wright), Multiple Resonance (H. C. E. Farlane and W. McFarlane), Natural Macromolecules (D. B. Davies), Synthetic Macromolecules (A. V. Cunliffe), NMR of Living Systems (P. G. Morris), NMR of Paramagnetic Species (K. G. Orrell), and NMR of Liquid Crystals and Micellar Solutions (O. Soderman).

This volume is highly recommended for anyone who is trying to keep up with the NMR literature, and the series as a whole is an excellent place to begin a literature search for NMR data.

Douglas C. McCain, *University of Southern Mississippi*

Handbook of Stochastic Methods for Physics, Chemistry and The Natural Sciences. 2nd Edition. By C. W. Gardiner (University of Waikato, New Zealand). Springer-Verlag: New York. 1985. xix + 442 pp. \$34.50. ISBN 3-540-15607-0.

An understanding of stochastic processes and the mathematical methods for their quantitation can provide substantial insight into many physical phenomena. This is a book of considerable value in that it provides the physical scientist with relatively easy access to that understanding. The author's intent is to provide, in relatively simple and appealing terms, an accurate and fairly comprehensive treatment of subject matter discussed in many other similarly titled books at either a superficial or impractically detailed level. The author has succeeded in this regard; the book is, indeed, comprehensive, accurate, yet mercifully non-rigorous. Practical examples and demonstrations rather than formal proofs provide the target audience with an intuitive understanding of some rather difficult material. Nevertheless, those with a more advanced

tinuity of the discussion as well as the somewhat unusual approach the author has taken.

The book's ten chapters may be grouped into three "parts". Part I (1. Introduction; 2. Probability Concepts and Definitions; 3. Markov Processes) provides a clear introduction to the primary material which follows. The reader is assumed to have a good working knowledge of advanced calculus and partial differential equations. Part II (4. Ito Calculus and Stochastic Differential Equations; 5. The Fokker-Planck Equation; 6. Approximation Methods for Diffusion Processes) forms the "primary core" of the book. Rather than basing his discussion upon the Fokker-Planck equation, the author has chosen to discuss stochastic processes in terms of the associated stochastic differential equations. His unique presentation of the essential elements of Ito calculus facilitates this approach which, in turn, facilitates the demonstration of approximation methods (small noise perturbational expansion and adiabatic elimination) which should appeal to the pragmatically minded. Part III (7. Master Equations and Jump Processes; 8. Spatially Distributed Systems; 9. Bistability, Metastability, and Escape Problems; 10. Quantum Mechanical Markov Processes) provides illuminating demonstrations and applications of the foregoing material.

This second edition includes some reference to recent progress in the field but differs from the first edition primarily in providing a more correct definition of the Stratonovich stochastic integral and a somewhat better discussion of predetermined boundary conditions of the Fokker-Planck equation. Unlike the first edition, the second is available only in soft-cover, presumably to offset the cost of the superlative typesetting.

This book would be an excellent resource for any serious student of stochastic processes.

Robert S. Pearlman, *The University of Texas at Austin*

Books on Mathematics and Physics

The Elements of Graphing Data. By William S. Cleveland (AT&T Bell Laboratories). Wadsworth Advanced Books and Software: Monterey, CA. 1985. xii + 323 pp. Cloth: \$27.95. ISBN 0-534-03729-1. Paper: \$18.95. ISBN 0-534-03730-5.

A goal of this book is "to raise the effectiveness of graphical data analysis and presentation in scientific and engineering journals." Both traditional and new methods are described, with many intriguing illustrations, and it does indeed look as though attention to the book's content would improve the communication of scientific data.

Statistical Analysis of Measurement Errors. By John L. Jaech (Exxon Nuclear Company). John Wiley & Sons: New York. 1985. xxvi + 293 pp. \$29.95. ISBN 0471-82731-2.

The author uses maximum likelihood for experimental situations in

*Unsigned book reviews are by the Book Review Editor.

which several features are measured by several methods to develop a model for statistical inference.

Amorphous Silicon Solar Cells. By K. Takahashi and M. Konagai (Tokyo Institute of Technology). John Wiley & Sons: New York. 1986. xii + 225 pp. \$68.00. ISBN 0471-83838-1.

This book is divided into two parts, one of which is the title subject and the other is *The Fundamentals of Solar Power*. It deals with the replacement of conventional microcrystalline silicon cells with amorphous silicon, an endeavor that has now moved from fundamental research to practical applications.

Molecular Electronics: Beyond the Silicon Chip. Second Edition; Revised. By M. Todd Jarvis. Technical Insights, Inc.: Madison, GA. 1985. v + 148 pp. \$390.00. ISBN 0-914993-21-6.

This revision of an original work published in 1983 describes recent developments in transcending the limits of silicon technology for the production of devices with higher speeds and computational densities. The new approaches are concerned with conducting polymers, charge-transfer salts, and other synthetic materials, or with biopolymers, such as proteins. An anticipated advantage is that elements might be spaced closer by a factor of 40.

Applied Classical Electrodynamics. Volume II. Nonlinear Optics. By F. A. Hopf and G. I. Stegeman. John Wiley & Sons: New York. 1986. x + 182 pp. \$27.50. ISBN 0471-82787-8.

This is a teaching text for the Optical Sciences Center of the University of Arizona. The main viewpoint is toward material science and laser applications.

The Breadth and Depth of Continuum Mechanics. Edited by C. M. Dafermos, D. D. Joseph, and F. M. Leslie. Springer-Verlag: Berlin and New York. 1986. xii + 778 pp. \$63.00. ISBN 0-387-16219-4.

This softbound Festschrift contains a collection of papers dedicated to J. L. Erickson on his 60th birthday, reprinted from *Archive for Rational Mechanics and Analysis*.

Amorphous Semiconductors. Second Edition. Edited by M. H. Brodsky. Springer-Verlag: Berlin and New York. 1985. xviii + 347 pp. \$29.00. ISBN 0-387-16008-6.

This edition emphasizes silicon as the "prototypal" semiconductor and consists of 11 contributed chapters, which includes one on Recent Advances, new since the first edition.

Books on Applied Topics

Rohm and Haas: History of a Chemical Company. By Sheldon Hochheiser. University of Pennsylvania Press: Philadelphia. 1986. xiv + 231 pp. \$19.95. ISBN 0-8122-7940-9.

The history of the first 75 years of a major chemical firm is the essence of this volume, which traces the Rohm and Haas Company from its beginnings as a supplier to the leather and textile trades to its modern diversification. As such, it is a case study of the evolution of industrial chemistry in the USA. Useful appendices include a glossary of Rohm and Haas trademarks.

Modern Chemical Technology and Emission Control. By M. B. Hocking. Springer-Verlag: Berlin and New York. 1985. xvi + 460 pp. \$38.50. ISBN 0-387-13466-2.

The author "considers the interface between chemistry and chemical engineering, using examples of some important process industries". The

book is "aimed primarily towards science and engineering students". Emission control and process information are given integrated treatment.

Process Mineralogy of Ceramic Materials. Edited by Wolfgang Baumgart, A. C. Dunham, and G. Christian Amstutz. Elsevier Science Publishing: New York and Amsterdam. 1984. xiv + 229 pp. \$27.50. ISBN 0-444-00963-9.

Directed "at all those active in the application of, and in research on, ceramic materials in manufacture and use", this book consists of 11 chapters, each on a class of ceramics (silicates, hard materials, refractories, carbon, etc.), and one on exploration for and concentration of ceramic raw materials. One of the chapters, *Synthetic Fibres*, embraces various inorganic types, from carbon to zirconia. There is much information on chemical structure, physical properties, technology, etc., throughout the work.

Rubber Processing and Production Organization. By Philip K. Freakley. Plenum Press: New York. 1985. xvi + 455 pp. \$59.50. ISBN 0-306-41745-6.

The topic of this book is broadly conceived and embraces "the full spectrum of activities which lead to successful and profitable product manufacture". The book is meant for practitioners in the field and includes topics ranging from screw extrusion to company philosophy.

Elementary Principles of Chemical Processes. 2nd Edition. By Richard M. Felder and Ronald W. Rousseau. John Wiley & Sons: New York. 1986. xx + 668 pp. \$43.95. ISBN 0-471-87324-1.

Stoichiometry and the formulation of material and energy balances remain the core of this successful textbook. New problems, three new case studies, and a chapter on computer-aided balances are the principal new features of this edition.

Industrial Hygiene Aspects of Plant Operations: Volume 3. Engineering Considerations in Equipment Selection, Layout, and Building Design. Edited by Lester V. Cralley and Lewis J. Cralley. MacMillan Publishing Co.: New York. 1985. xiv + 785 pp. \$65.00. ISBN 0-02-949370-6.

After several chapters on general subjects, such as ventilation, noise control, etc., various industrial areas are taken up one by one. These include such examples as aluminum smelting, asbestos manufacture, hydrochloric acid, isocyanates, paper, etc.

Hazardous Waste Management. By Gaynor W. Dawson and Basil W. Mercer. John Wiley & Sons: New York. 1986. xii + 532 pp. \$65.00. ISBN 0-471-82268-X.

This is a reference work designed to guide the chemist to solutions to problems of waste disposal. It has chapters on incineration, ocean dumping and underground injection, landfill disposal, transportation, abandoned sites, regulation, etc. A group of 12 appendices provide a lot of useful information for quick reference.

Structural Adhesives: Chemistry and Technology. Edited by S. R. Hartshorn. Plenum Press: New York. 1986. xviii + 505 pp. ISBN 0-306-42121-6.

The several chemical classes of structural adhesives (bonding agents of high strength, capable of transferring stress) are systematically described with respect to their chemistry, structure-property relationships, and application. Separate chapters review durability, testing and design, and industrial applications. Appendices give definitions of terms relating to adhesives, conversion factors, and ASTM standards. There is a large amount of fundamental chemistry included, and it appears in general to be sound and up to modern standards of sophistication.