Book Reviews

Analytical Chemistry of Aerosols. Edited by Kvetoslav Rudolf Spurny (Schmallenberg, Germany). CRC Press: Boca Raton. 1999. xiv + 486 pp. $69.95. ISBN 1-56670-040-X.

The discovery over the past two decades of the importance of aerosols to atmospheric chemistry and climate, combined with recent advances in the chemical analysis of aerosol particles, has resulted in a renaissance in the field of aerosol chemistry. This comprehensive and in-depth description of current methods for chemical and physical characterization of aerosols will be highly valued by the growing number of scientists working in this field. The 17 chapters, written by a combination of 22 leading experts, describe analytical techniques ranging from bulk methods to those for single particles, such as particle-induced X-ray emission (PIXE) spectrometry, Raman spectroscopy, and laser-ablation time-of-flight mass spectrometry. The chapter by Christopher Noble and Kimberly Prather addresses the most exciting development in aerosol analysis in many years—that of real-time sizing and chemical characterization of ambient atmospheric particles. A final chapter by the editor on the detection and analysis of bacterial aerosols is especially intriguing; this is an area of great current interest to workers in the field of contagious disease control, including those interested in developing techniques for early detection of biological warfare agents. The chapters are written in a fairly uniform and easy-to-read style and are thoroughly referenced through about 1997.

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Advances in Amino Acid Mimetics and Peptidomimetics. Volume 2. Edited by Andrew Abell (University of Canterbury). JAI Press: Stamford, CT. 1999. xii + 308 pp. $120.50. ISBN 0-7623-0614-9.

This second of two volumes (the first appeared in 1997) consists of nine review articles compiled and skillfully edited by Prof. Abell. Six of the articles are drawn from academic laboratories: "Peptidomimetics Designed for Oral Absorption" (Giovanni M. Pauletti), "Rare Protein Turns: γ-Turn, Helix-Turn-Helix, and *cis*-Proline Mimics" (Felicia A. Etzkorn, Jeremy M. Travins, and Scott A. Hart), "Amino Acid Mimetics and Design of Peptidomimetics for Opioid and Melanocortin Receptors: General Perspectives" (Victor J. Hruby and Cheryl A. Slate), "Peptide Nucleic Acids: Potential as Antisense and Antigene Drugs" (Anne B. Eldrup and Peter E. Nielsen), "Solution and Soluble Polymer Syntheses of Azatides and Azapeptides" (Juyoung Yoon, Hyunsoo Han, and Kim D. Janda), and "Sugar Amino Acids and Carbohydrates as Scaffolds and Peptidomimetics" (Elisabeth Lohof, Fred Burkhart, Markus A. Born, Eckart Planker, and Horst Kessler). The remaining three are from contributors in the pharmaceutical industry: "Combinatorial Synthesis of Peptidomimetics" (Owen B. Wallace, Darren L. Whitehouse, and Dharmpal S. Dodd), "The Development of Novel Noncovalent Thrombin Inhibitors" (Thomas J. Tucker and Richard C. A. Isaacs), and "Design of Non-Peptide Agonists and Antagonists for Neuropeptide Receptors" (David C. Horwell, Martyn C. Pritchard, and Jenny Raphy).

Although each article is written with its own particular style and coverage, there is surprisingly little overlap in these topics. They range from essentially pure review articles ("Combinatorial...", "Rare Protein Turns..."), to articles with some review but which emphasize the authors' work ("...Thrombin Inhibitors"), to articles that primarily concentrate on the authors' work. Each could stand alone as a lecture topic in a graduate level course, and taken together, they provide a broad-ranging survey of current research in peptidomimetics. The quality of the written presentations is uniformly excellent, which must reflect not only the contributions of the editor, but also the high level of scientific analysis and accomplishments of workers in this particular field (18 interesting articles in two collections two years apart—could there soon be enough for a third volume?). The graphical presentations, including structures, schemes, and tables, are alike in style, and the articles are well-referenced, with many 1998 and a few 1999 references. There is a useful subject index of about 400 entries that locates biological and chemical names, trade names, techniques, and structural features, among other topics. One recurring inconvenience in this and related series is the disconnection between the authors' names (given in the table of contents and above each article) and their institutional affiliations (given only in an alphabetical list in the front). In these days of graphical abstracts, readers should get all the summary information in one place, or even better, each time the authors' names appear.

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Advances in Dendritic Macromolecules. Volume 4. Edited by George R. Newkome (University of South Florida). JAI Press: Greenwich, CT. 1999. x + 207 pp. $109.50. ISBN 0-7623-0347-6.

This volume, a part of a continuing series of reviews on dendrimers, is comprised of a preface, four individual chapters, and an index.

The first chapter, entitled "Organometallic Dendrimers: Synthesis, Structural Aspects and Applications in Catalysis", was written by M. A. Hearshaw, A. T. Hutton, J. R. Moss, and K. J. Naidoo (University of Cape Town, South Africa). The authors present a concise and well-written 60-page summary of the synthesis and properties of various dendrimers containing Fe, Ru, Cr, Co, Pd, Pt, Au, Ni, and Cu. A number of X-ray structures of small dendrons or wedges are presented, simulations are discussed, and studies of catalytic activities are summarized.

The second chapter, "Poly(propyleneimine) Dendrimers", was written by M. H. P. van Genderen (Technical University of Eindhoven), E. M. M. de Brabander-van den Berg (DSM Research, The Netherlands), and E. W. Meijer (Technical University of Eindhoven) and is based primarily on their work. In 45 pages, the authors summarize the synthesis, characterization, and properties of these commercially available dendrimer systems. Included are discussions of the dendritic box, superamphiphiles, and inverted unimolecular micelles. The chapter is well written and contains only a few typographical errors.

Chapter 3, "Chiral Dendrimers", by H.-F. Chow, T. K.-K. Mong, C.-W. Wan, and Z.-Y. Wang (The Chinese University of Hong Kong), is a 27-page description of the synthesis, chiroptical characterization, and recognition/catalytic properties of dendrimer systems with chiral elements. The language is somewhat awkward in places, but there are no typographical errors.

The final chapter, "Molecular Topology of Dendrimers", by M. V. Diudea and G. Katona (Babes-Bolyai University, Romania), provides a 67-page discussion of recent efforts to apply graph theory to dendrimers with the ultimate aim of providing utility in structure—property correlations and design of new systems.

Overall, this rather expensive volume will be valuable to chemists seeking to maintain currency with the very rapidly growing field of dendrimer technology. It is well referenced through 1997, and two of the chapters contain references as recent as early 1999.

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Chemometrics: Statistics and Computer Application in Analytical Chemistry. By Matthias Otto (Freiberg University of Mining and Technology). Wiley-VCH: Weinheim. 1999. $69.95. 307 pp. ISBN 3-527-29628-X.

Chemometrics can be defined as the application of mathematical and statistical techniques to chemical data for the purposes of extracting information from data and/or designing optimal experiments. Otto's text is clearly motivated by this definition of chemometrics. In nine chapters, he provides a clear description of the techniques used for either data analysis or experimental design. Each chapter has a list of learning objectives. The discussions, which are reasoned and factual, are presented with perspective-promoting understanding. The 60 worked-out examples throughout the text and the questions and

problems at the end of each chapter ensure an understanding of the use of these methods by the reader. Even the appendix is helpful, since the reader will find recommendations for software in addition to statistical tables and an introduction to linear algebra.

Chapter 1 is an introductory chapter on the concepts of analog and digital systems. In Chapter 2, Otto presents the fundamentals of descriptive statistics. Topics covered include the Gaussian distribution, tests for normality, moments of inertia, confidence intervals, propagation of error, hypothesis testing (mean and variance), outlier testing for small samples, and analysis of variance. It is truly impressive how Otto is able to condense an entire semester of basic statistics into a single chapter.

Chapter 3 focuses on signal processing and time series analysis. The Savitsky−Golay filter is treated extensively in this chapter, which is appropriate due to its widespread use in signal recovery. On the other hand, Otto's treatment of Kalman filtering is not as thorough as I would have liked. Of course, Fourier filtering is covered at great length, as are splines and autocorrelation analysis. Derivative functions as implemented by the Savitsky−Golay filter are also discussed in this chapter. Overall, I liked this chapter because it gave a good overview of signal processing.

Chapter 4 discusses optimization and experimental design. Full factorial, fractional factorial, central composite, and Box−Behnken designs were discussed as well as optimization techniques such as simplex. Chapter 5 focuses on pattern recognition. Every conceivable topic is covered. What I especially like about this chapter is its treatment of principal component analysis, which includes a thorough discussion of NIPLS and peak deconvolution via factor analysis. Unsupervised methods of pattern recognition are discussed thoroughly, whereas the treatment of supervised methods is not as extensive. For example, the discussion of K−NN should have been more thorough, and the linear learning machine could have been omitted from this chapter, since neural nets have supplanted this method. Furthermore, the author's treatment of statistical discriminant analysis is misleading since it describes the technique as a hyperplane dividing the data space into different regions. In fact, LDA and QDA are minimum distance classifiers, with distance being defined by the Mahalanobils distance. Otto's description of SIMCA is also inaccurate in view of Friedman and Frank's work.

Chapter 6 focuses on univariate and multivariate regression. Both linear and nonlinear multivariate methods are discussed, including stepwise multiple linear regression, PLS, and ACE. Regression diagnostics are presented in the chapter as a means of troubleshooting a calibration model. In my opinion, this is the best chapter in the book because of its emphasis on contemporary topics, e.g., partial least squares. What particularly stands out about this chapter is its unique blend of theory and praxis. For example, Otto discusses model diagnostics in a utilitarian manner, which promotes understanding of this otherwise obtuse topic.

Chapter 7 discusses the various formulations for representing chemical structure. Applications including library search and spectral simulations follow. Chapter 8 discusses recent techniques, which can be expected to have a dramatic impact on chemometrics, e.g., genetic algorithms. In Chapter 9, the issues of quality assurance and good laboratory practice are discussed from the standpoint of chemometrics.

Overall, I have a favorable opinion of the text and would be prepared to use it as a primary reference in a senior level undergraduate course on data analysis or a graduate level course on chemometrics.

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Transition Metal Catalysed Reactions. Edited by Shun-ichi Murahashi (Osaka University) and Stephen G. Davies (Oxford). Blackwell Science: Oxford. 1999. 497 pp. £99.50. ISBN 0-632-05126-4.

This monograph brings together some of the leading practitioners working in the broadly defined area of transition metal-catalyzed reactions. It comprises 24 chapters, with more than a third of the contributions focused on recent advances in the use of palladium catalysts in organic synthesis. Beletskaya, Genet, Grigg, De Meijere, Lu, Catellani, Reetz, Helmchen, Ito, Murahashi, and Hayashi all deal with narrowly focused aspects of the multitude of transformations promoted by what has undoubtedly become the most commonly used metal in synthetic chemistry.

Although each chapter is rather specific to each author's own area of research, the scope of the chapters taken in total is diverse. For example, Beletskaya and Cheprakov give an overview of the practical challenges associated with the use of a catalyst when it is accompanied by high-molecular-weight ligands. They discuss the advantages of phosphine-free catalysts in a variety of well-established transformations, such as Suzuki and Heck couplings. A portion of this chapter and the contribution by Genet and co-workers discuss the use of water-soluble phosphine ligands and the novel chemistry that can be performed in this "benign" solvent. Noyori also focuses on the use of environmentally friendly reaction media, notably the use of $scCO_2$. While rhodium-catalyzed reactions are the main topic of this chapter, the implications and advantages of this technology are of general importance. Reetz's contribution also concentrates on new ligands for palladium-catalyzed reactions, including the use of dendrimers. Chapters by Lu and Catellani deal with new reaction pathways rather than ligand design and reveal the multitude of processes promoted by palladium, while Helchem presents a detailed analysis of the origins of enantioselectivity in the palladium-catalyzed allylation reaction. Ito and Hayashi discuss their respective contributions to the area of asymmetric hydrosilylation and silicon−silicon σ bond activation. While the chapter by Suzuki is entitled "Catalytic Reactions in Organoboron Compounds", the main focus is also on palladium catalysts and the multitude of coupling reactions now in general use. Grigg and de Miejere concentrate on the sequential "queuing processes" of palladium catalyses and cross-coupling reactions for the synthesis of complex products from simple starting materials. Murahashi discusses the use of palladium to catalyze synthetically important oxidation reactions, the progenitor of which is the Wacker oxidation.

Among the other metals warranting significant coverage in the book are rhodium, ruthenium, and copper. For example, Doyle describes the use of Rh and Cu in cyclopropanation, C−H insertion, and ylide reactions with a particular focus on asymmetric processes. Lipshutz and Alexakis describe recent advances in organocopper chemistry, including a discussion of the novel reactivity of cyanocuprates and new ligands for enantioselective transformations. Brown and co-workers provide a detailed and insightful discussion of the mechanism of the hydroboration reaction catalyzed by rhodium and also discuss some recent synthetic advances. Kakiuchi and Murai describe the use of ruthenium for coupling between alkenes and unactivated aromatic C−H bonds. Hermann presents an overview of high-oxidation-state Ru oxides and their oxidation chemistry, while Dixneuf and Bruneau discuss the Ru-catalyzed reactions of alkynes.

The remaining chapters are an eclectic mixture of contributions including a very short chapter from Mortreux on C−C bond-forming reactions promoted by nickel. Yamamoto and Yanagisawa present a comparison of nickel or iron vs copper in allylation reactions and also provide an update on the enantioselective allylation using a chiral ligand and silver triflate.

In summary, this monograph covers a diverse range of topics in a field that is enormous. Each chapter is generally a detailed overview of the advances by the author rather than a comprehensive discussion of a topic. This book would be of use to senior organic graduate students seeking to expand their knowledge of metal-catalyzed reactions, but it lacks any introduction, so it is not for beginners. The contents covered could be incorporated into a graduate course, but another book, such as that by Hegedus (*Transition Metals in the Synthesis of Complex Organic Molecules*), would be required to introduce the basic concepts. It is an appropriate volume for scientists in industry seeking to expand the use of catalysts in preparing fine chemicals and pharmaceuticals and for academics trying to keep abreast of the array of emerging metal-catalyzed reactions.

In terms of other sources containing similar information, the series *Comprehensive Asymmetric Catalysis* covers some but not all of the contents of a few of the chapters. I am not aware of a comparable book with the detail of this one and the breadth of topics.

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