Book Review

Microwaves in Organic Synthesis, Completely Revised and Enlarged 2nd ed., Volumes 1–2 Edited by André Loupy (Université Paris-Sud, France). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2006. 1033 pp. $375.00. ISBN 3-527-31452-0.

James J. Kiddle

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BOOK REVIEWS

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The ever-expanding field of microwave heating in organic synthesis has continued to attract the interest of chemists from many diverse areas. The increasing interest is evidenced by the expansion of the new edition of this monograph from one to two volumes that now include chapters on ionic liquids, carbohydrate chemistry, multicomponent reactions, solid-phase peptide synthesis, and polymer chemistry, to name a few. The second edition still remains a well-written monograph that can serve as an excellent reference both for chemists already engaged in research on microwave heating in organic synthesis and for newcomers to the field. This monograph of 22 chapters continues to offer the reader a background in microwave theory as well as a discussion of the available instrumentation and the experimental uses of the technique, with each chapter offering a detailed review of the pertinent literature.

The chapters on theory have been slightly reorganized with the major revision being a separation of the overview of the development and design of microwave reactors into its own expanded chapter covering not only laboratory-scale syntheses but also industrial equipment and its evolving utility in commercial scale uses of microwave heating. In addition, this chapter also provides an excellent overview of hyphenated techniques, e.g., microwave photoconversions, microwave-ultrasound reactions, and microwaves with pressure setup, in combination with microwave units. This edition still contains a well-written chapter on kinetic, thermal, and nonthermal effects, but many of the detailed examples from the first edition have been removed from this chapter and now are included in chapters that focus on specific reaction types using microwave reactors. Finally, a new chapter that addresses how conditions of microwave-promoted reactions can influence chemo-, regio-, and enantioselectivities has been added.

The remaining 17 chapters of the monograph provide overviews of the major areas where microwave synthesis is being applied to a wide range of research interests in organic chemistry. Chapters from the first edition that focused on specific reaction types have been expanded in this edition to include new literature references. These chapters continue to provide a clear and concise description of the development and optimization of microwave synthesis in each area. Some of the topics previously covered, such as ionic liquids and carbohydrates, have seen so much growth that each warrants its own chapter in this edition. Other chapters, such as that on multicomponent reactions, are completely new to this edition and cover areas that have seen rapid development since the publication of the first edition.

In summary, this monograph is well written and provides clear explanations for newcomers on the use of microwaves in organic synthesis as well as contemporary details and theory for the experienced user of this technique in the organic laboratory.

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Analytical Chemistry: Theoretical and Metrological Fundamentals. By K. Danzer (Jena, Germany). Springer: Berlin, Heidelberg, New York. 2007. xxxii + 316 pp. $99.00. ISBN 978-3-540-35988-3.

The author of this book begins by addressing the question of what is analytical chemistry. Although a simple question, it is one that will elicit many different responses depending on who is answering. Danzer addresses it from a data-mining and information-gathering perspective and explores the details of how to extract information from experimental data. In the first chapter, he discusses the definition of analytical chemistry and tries to establish the relationship of the discipline to other areas of chemistry and science. Although analysis has played a central role throughout the history of chemistry, the place of analytical chemistry as a separate and distinct discipline has not been uniquely defined. This is probably because of the evolving role of this specialization and the changing abilities of measurement techniques throughout history. Danzer acknowledges this fact and then tries to establish the unique aspects of analytical chemistry that argue for its characterization as a distinct discipline.

This book is unique in that it is solely focused on the analytical process, i.e., the information-generating aspect of analytical chemistry, which is established in Chapter 2. The detail with which he presents the metrological aspects—those that deal with measurement—of the field is extensive, and the presentation is general so that it can be applied to any measurement technique. This discussion also establishes the argument that the metrological aspects of analysis are central to the discipline, as opposed to the more common focus on measurement techniques, and are crucial to any discussion of analytical chemistry. This establishes the theme for the remainder of the book. One particularly interesting section of Chapter 2, which illustrates Danzer's approach, is the discussion of homogeneous and heterogeneous samples. Much like the definition of analytical chemistry presented in Chapter 1, what constitutes a homogeneous or a heterogeneous sample is a simple concept with which most are comfortable. As Danzer points out, however, a homogeneous or a heterogeneous sample is really dependent on the point of view and the capabilities of the measurement system. This discussion establishes the importance of the evaluation of data when making analytical determinations. It also illustrates how the details of the measurement techniques can change over time but the data analysis and interpretation methods stay the same. This early discussion, I believe, sets

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the tone of the book in which aspects of the analytical process that most people are familiar and comfortable with are looked at in detail and from a new perspective where the focus is on the process of extracting information from measurements.

Figure 2.1 provides a flow diagram of the analytical process. The presentation of the remainder of the book follows this flow chart, with each subsequent chapter providing theoretical and mathematical details of the different steps of the process. The emphasis is on the fundamental statistical and mathematical methods of extracting information from measurement data, not the measurement technique, and the author explores concepts that are both familiar (mean, median, standard deviation, etc.) and less familiar (principal component analysis, neural networks, cluster analysis, etc.). The discussion is presented in a logical fashion; however, when Danzer discusses less familiar, more advanced topics, the details of the mathematics often make it difficult to follow for the nonexpert.

The first half of the book focuses on topics that are familiar to most. The discussion is detailed, especially with regard to the mathematical formulation for treating data. Chapter 4 has a particularly good discussion of the statistical treatment of data and the role of the null hypothesis when evaluating data. This discussion clearly delineates the thought process that should occur when evaluating data by common statistical methods. In Chapter 5, Danzer discusses optimizing the analytical process. Here, particularly with regard to systems with factors of multiple influences, the discussion and, especially, the mathematics become complex. Chapter 6 begins with a discussion of familiar topics, linear relationships with one dependent and one independent variable, and progresses to nonlinear calibrations and multivariant calibrations. The progression to more complex systems is logical and lends a sense of familiarity to the more difficult systems. I found this discussion, especially that of the complex mathematics, more understandable than the topics discussed in Chapters 7, 8, and 9: "Analytical Performance Characteristics"; "Presentation, Interpretation and Validation of Analytical Results"; and "Assessment of Analytical Information", respectively.

Overall, this is an interesting book examining analytical chemistry from the perspective of measurement and data mining/presentation. The structure follows the steps of the analytical process, providing a logical flow; however, the book bogs down in the mathematical details, especially with the advanced topics. This approach is unique among books focused on analytical chemistry, and the book would be a valuable addition to any chemist's collection. I do have a few minor criticisms, however. Danzer is not a native speaker of English, and this is evident in the odd choices of words and sentence structures found periodically throughout the book. There are also several instances where the copy editor's formatting mark-ups made it through to the final printed version. Also, I believe that discussing fewer topics more completely would have provided more clarity to the more advanced topics of the book. The addition of examples would also help guide the reader through some of the mathematical details of the advanced topics.

This is a book that could be used in a graduate course in analytical chemistry or simply as a reference for any practicing chemist charged with interpreting experimental data. Although complex, Danzer's book has extensive referencing to both the historical and current literature for those who would like to examine topics further.

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The Chemistry of Anilines, Parts 1−2. From the Patai Series: The Chemistry of Functional Groups Volume and Series. Edited by Zvi Rappoport (The Hebrew University, Jerusalem). John Wiley & Sons, Ltd.: Chichester. 2007. 1180 pp. $945.00. ISBN 978-0-470-87171-3.

The 17 chapters in this set cover all aspects of the chemistry of anilines, from the history of this functional group to the "theory, structure, thermochemistry, photophysics and photochemistry and electrochemistry of anilines." Other chapters cover the mass spectrometry and gas-phase chemistry of anilines as well as their NMR spectra. There are also chapters on rearrangements, the hydrogen-bonding capabilities of anilines, and anilines as nucleophiles, among others. Like others in the series, this is a hefty, comprehensive set of up-to-date volumes on a specialized topic: literature references are current to 2005. An author and a subject index complete the set.

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Atomistic Approaches in Modern Biology: From Quantum Chemistry to Molecular Simulations. Topics in Current Chemistry, Volume 268. Edited by Markus Reiher (ETH Zürich). Springer: Berlin, Heidelberg, New York. 2007. xii + 362 pp. $329.00. ISBN 978-3-540-38082-5.

This book is focused on computational molecular modeling and its applications in biology and is particularly worthwhile in two respects. First, the reader will enjoy broad yet detailed coverage of modern theoretical approaches to the structures, electronic properties, and dynamical behavior of peptides, metalloenzymes, bioinorganic systems, proteins, and nucleic acids. Also included are excellent methods-oriented chapters focused on QM/MM methods, Car−Parrinello molecular dynamics, and classical dynamics of biomolecules near transition states. Second, the writing and editing are of uniformly high quality. Each chapter is a valuable and timely point of entry to the literature of the subfield of computational chemistry that is being covered. Some chapters focus on the authors' own contributions, whereas others are broader and more inclusive in scope, but all are extremely well-written and the authors do a great job of placing their own work in a larger context—something often not achieved in review texts.

For the most part, this is a book written by theorists for theorists (and their students). However, many of the topics are quite accessible to a broad audience of physical, bioinorganic, and biophysical chemists. Every chapter is an interesting read, and there are new things to learn throughout, no matter what

one's area of specialty might be. The references are up-to-date with nearly every chapter including references through 2006. In the chapter on QM/MM by Senn and Theil, over 750 references are cited as part of an included summary of QM/MM research through 2006. Overall, this volume constitutes an outstanding contribution to the *Topics in Current Chemistry* series.

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Current Fluoroorganic Chemistry: New Synthetic Directions, Technologies, Materials, and Biological Applications. Edited by Vadim A. Soloshonok (The University of Oklahoma), Koichi Mikami (Tokyo Institute of Technology), Takashi Yamazaki (Tokyo University of Agriculture and Technology), John T. Welch (State University of New York at Albany), and John F. Honek (The University of Waterloo). American Chemical Society: Washington, DC (distributed by Oxford University Press). 2007. xiv + 520 pp. $189.50. ISBN 0-8412-7403-7.

This volume was derived from three symposia held on organofluorine chemistry in the fall and winter of 2005. The first two, *New Frontiers of Fluoroorganic Chemistry* and *Fluorous Chemistry*, were held at the 230th National ACS Meeting in Washington, D.C. in late August/early September 2005. The third, *Fluorine-Containing Amino Acids: Preparation and Application to Biological Systems*, was part of the International Chemical Congress of Pacific Basin Societies held in Honolulu, HI in December 2005. There are 31 chapters, which are organized into three different parts: New Synthetic Directions; New Technologies and Materials; and New Biological Applications. An author index and a subject index complete the book.

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