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BOOK REVIEWS

**The Maillard Reaction**. By S. E. Fayle (Crop and Food Research, Christchurch, New Zealand) and J. A. Gerrard (University of Canterbury, Christchurch, New Zealand). Royal Society of Chemistry: Cambridge, U.K. 2002. xiv + 120 pp. $89.95. ISBN: 0-85404-581-3.

The goal of the authors of this book was to provide a "one-stop shop" for scientists who frequently deal with the Maillard reaction; thus, it is geared toward both new and experienced researchers in the food industry. The first two chapters introduce the Maillard reaction and its consequences in food, whereas the remaining chapters concentrate on the various techniques for analyzing the reaction. Such methodologies as gas chromatography, liquid chromatography, mass spectrometry, electrophoresis, and capillary electrophoresis are explored, and new, emerging techniques are briefly reviewed. A subject index concludes the volume.

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**Structure and Dynamics of Polymer and Colloidal Systems**. Edited by Redouane Borsali (LCPO-CNRS-ENSCPB-Bordeaux University I) and Robert Pecora (Stanford University). Kluwer Academic Publishers: Dordrecht. 2002. viii + 478 pp. $60.00. ISBN: 1-4020-0501-6.

This book, based on the proceedings of the NATO Advanced Study Institute on the title subject held in September 1999, provides reviews of the research at the forefront of the polymer and colloid fields, with emphasis on the close connection between them. A sampling of the various chapters includes "Interactions in Colloidal Particle Systems", "Structure of Dendrimers in Solution as Probed by Scattering Experiments", and "Stability of Soft Colloids. Relation to Interfacial and Thin film Dynamics". References are generally current to 2000, although there are a few references to work published in 2001. An index is provided.

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**Ultraviolet Spectroscopy and UV Lasers. Practical Spectroscopy Series. Volume 30**. Edited by Prabhakar Misra (Howard University) and Mark A. Dubinskii (Magnon, Inc., Reisterstown, MD). Marcel Dekker: New York, Basel. 2002. xvi + 570 pp. $195.00. ISBN: 0-8247-0668-4.

This volume contains 14 chapters on a broad range of topics dealing mostly with experimental and technological aspects of ultraviolet and vacuum ultraviolet spectroscopy and photochemistry. The chapters are organized into the following four major categories: Ultraviolet Spectroscopy in Chemical Physics, Combustion, Plasma Science, and Photolithograpy (6 chapters); Spectroscopy Associated with the Search for New Ultraviolet and Vacuum Ultraviolet Solid-State Materials for Laser Technology (3 chapters); Solid-State Tunable Lasers for Ultraviolet Applications (3 chapters); and Ultraviolet Spectroscopy in Atmospheric Science and Astronomy (2 chapters). The backgrounds of the various authors are predominantly in physics and engineering, which is reflected in the range of applications discussed. There are chapters on high-resolution spectroscopy of diatomic molecules and ions (NO, $CO^+$, and $N_2^+$), the vacuum UV photochemistry of small molecules ($H_2O$, OCS, $CH_3Cl$, etc.), and UV fluorescence spectroscopy, as well as excellent chapters on laser optogalvanic spectroscopy, tunable solid-state UV lasers, and atmospheric ultraviolet spectroscopy. The dominant emphasis of the book, however, is on the detailed description of the experimental and technological aspects of such phenomena as nonlinear processes. In general, the book does not emphasize the latest applications, but focuses rather on the experimental aspects. The reference lists do not include many recent (2000+) publications as a result. An exception is the chapter by Lipson and Shi on fluorescence and time-of-flight mass detection, which includes an extensive table with references to studies on small molecules and ions.

Not all chapters are of high quality. A short chapter on the generation of coherent ultraviolet and vacuum ultraviolet radiation by nonlinear processes in intense laser fields by Oldenburg and Eden is replete with references from the 80s, but contains only a few more recent references, mostly to the authors' own work. No reference is made to the X-ray lasers being developed at JILLA in Boulder. The last chapter by Carruthers on UV spectroscopy in astronomy devotes considerable space to very basic experimental tools, which may be quite useful for advanced undergraduate students. However, detailed descriptions of how discrete dynode, continuous dynode, and multichannel plate detectors work seems a bit out of place. A minor criticism of the book as a whole is the considerable nonuniformity in referencing, which perhaps reflects the editors' lack of direction. Some chapter references contain titles and others do not. Some have numbered references, while others have alphabetical lists of references.

Overall, this book should be quite useful to the chemical community. It addresses a number of topics in sufficient detail to provide an excellent overview of UV spectroscopy from a point of view not normally covered in chemistry curricula. It is very much a "hands-on" book in which the theoretical background serves to highlight the main focus of the book, which is to serve as a practical guide to the field of UV photochemistry.

**Tomas Baer,** *University of North Carolina*

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Unsigned book reviews are by the Book Review Editor.

**Self-Assembling Peptide Systems in Biology, Medicine and Engineering**. Edited by Amalia Aggeli, Neville Boden (University of Leeds, U.K.), and Shuguang Zhang (Massachusetts Institute of Technology). Kluwer Acedemic Publishers: Dordrecht, Boston, London. 2001. xii + 364 pp. $100.00. ISBN 0-7923-7090-2.

Molecular self-assembly is an area of growing interest and importance in both fundamental and applied areas of chemistry. The ability to control the nature and size of multisubunit aggregates through careful design of the individual components offers great potential in the identification of new chemistry within nanoscale assemblies. Central to the discipline is the idea that these new properties of the aggregated species are not present in the individual subunits. As a result, novel and complex self-assembled aggregates are finding application or being identified in such diverse areas as molecular electronics, sensor design, catalyst assembly, and medicine.

This book offers an outstanding and detailed survey of the self-assembling properties of peptides as they are found in a wide range of synthetic and natural systems. The monograph is the result of a workshop held on the subject in 1999 and reflects the principal lectures presented. The authors have done a good job in providing a series of comprehensive reviews into different aspects of peptide aggregation. The only disadvantages of the monographs are the inconsistent styles used by different authors and the absence of any literature after 1999.

The early chapters deal with peptide-based materials and the wide range of shapes and structures that can be achieved through modification of sequence and conformation. In Chapter 1, Aggeli et al. survey both the theory of formation and variety of structure of tapes, ribbons, fibrils, and fibers that are formed at different peptide concentrations. They further explore the effect of sequence variation on interstrand affinities. In the following chapter, Atkins focuses on one particular type of aggregate, ribbon lamellar structures formed from folded peptides, that is prevalent in silks. In Chapter 3, Blondelle et al. extend the application of designed peptide aggregates with the identification of functional catalysts for decarboxylation reactions. Other combinatorial strategies are discussed later in the book by Hecht et al. (Chapter 10) in the search for novel sequences that form amyloid structures.

The presence of amyloid aggregates in certain human diseases has focused the attention of many on the structure, origin, and mimicry of these important assemblies. This is reflected in this monograph with chapters from Dobson et al. (Chapter 5) on the role and mechanism of amyloid formation in disease, from Gajdusek (Chapter 8) on amyloid nucleation, from Iconomidou (Chapter 12) on amyloid-like fibrils in silk moth proteins, and from Kapurniotu (Chapter 13) on the lethal properties of the islet amyloid polypeptide. The bulk of the other chapters focus on the wide variety of peptide aggregate structures and properties that are found in nature or can be imparted by design. These range from helical peptides that form channels in membranes (Chapter 7) to the assembly of fibers in adenoviruses (Chapter 16) and from the design of peptides that form spheroidal disulfide-linked trimers (Chapter 18) to helical aggregates that function as multiple antigens (Chapter 19). The monograph is rounded out by a series of chapters that discuss the underlying factors that influence the structure and formation of peptide aggregates. These include a consideration of the thermodynamics of protein−protein interactions from Cooper (Chapter 4), the molecular recognition of peptides and proteins within membranes from Shai (Chapter 20), and the temperature-dependent mechanisms of self-assembly from Urry et al. (Chapter 23). Finally, detailed discussions of several applications of peptide aggregates in drug delivery (Chapter 11), probing protein secretion (Chapter 15), DNA binding (Chapter 21), and biomedical engineering (Chapter 24) are included.

Overall, this excellent and extensive monograph provides a panoramic snapshot of the wide area of peptide aggregation as it stood at the end of the past decade. Despite its diverse origins, the book provides good coverage of the many different strategies for probing the structure, elucidating the mechanism, and extending the applications of peptide aggregate formation. As a result, the monograph provides valuable insights into self-assembly for one particular, naturally inspired, class of molecular subunits. These will provide important guidelines for those seeking to develop nonbiological analogues that assemble into new aggregates with the same degree of control and variety.

**Andrew D. Hamilton,** *Yale University*

JA0153722

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**Modern Organocopper Chemistry**. Edited by Norbert Krause (University of Dortmund). Wiley VCH: Weinheim. 2002. xiv + 378 pp. $125.00. ISBN 3-527-29773-1.

The organocopper seed planted by Gilman in the 1930s was nurtured in the 1960s by House and Whitesides at M. I. T. and by Corey and Posner at Harvard. With help from fundamental research publications, comprehensive reviews, and a book in the 1970s and early 1980s, that organocopper seed grew into a widely admired and broadly useful plant.

During the past 20 years, cuttings from that plant have been established worldwide, and this book describes the diverse offshoots that have been so creatively and so successfully grown from the original seed.

The current international character of organocopper research activity is well-illustrated by the country of origin of the authors of the 10 chapters in this book: six from Europe, two from Japan, and two from the United States. These chapters, written by many of today's leading organocopper researchers, are focused mainly on organocopper reactions and briefly on organocopper reagent formation and on organocopper structure/mechanism of action, with one chapter on natural product synthesis using organocopper reagents. Coverage of organocopper reactions includes 1,2- and 1,4-reductions, addition and substitution reactions of extended multiple bond systems, and stereocontrolled addition and substitution reactions. The review of organocopper reagent formation includes heterocuprates and also functionalized cuprates derived via transmetalation from the corresponding functionalized organozinc reagents. Thus, the scope of the book appropriately reflects the broad current interest and research activity in modern organocopper chemistry. The chapters provide overviews and generalizations but not experimental details, and references are generally up-to-date, including some in 2000 and 2001.

This book, with nicely drawn reaction schemes, provides an authoritative, accurate, and timely picture of the importance and the robust state of modern organocopper chemistry. The book's pricing at $125 for 378 pages of text seems reasonable.

**Gary H. Posner,** *Johns Hopkins University*

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**Radicals in Organic Synthesis. Volume 1. Basic Principles; Volume 2. Applications**. Edited by Philippe Renaud (Université De Fribourg) and Mukund P. Sibi (North Dakota State University). Wiley-VCH: Weinheim and New York. 2001. xxvi + 518 pp (Vol. 1) and xxiv + 594 pp (Vol. 2). $360.00. ISBN 3-527-30160-7.

This book is one of the latest in a series of monographs published by Wiley-VCH in which an important area is covered by experts who provide highly topical updates on various aspects of the field. The value of such a book depends on the ability of the authors to provide sufficient background before delving into more advanced themes. Thus, the quality of individual chapters can vary widely, depending on the pedagogical interests of the authors and their willingness to provide an all-inclusive summary rather than an account of their own research in the area. In such publications, the role of the editors becomes very critical. With the choice of the right topics and authors capable of presenting the material in a clear, concise, and comprehensive fashion, such a monograph can be an invaluable source for both a beginning investigator and the seasoned expert.

In this first comprehensive book covering radicals in organic synthesis, Renaud and Sibi have done a superb job of assembling a team of authors who are at the forefront of research in various aspects of free radical chemistry. The stated goal of providing the state-of-the-art in radical chemistry at the beginning of the 21st century has clearly been met. Most articles are self-contained, comprehensive, and very well written. Numerous cross references to other sections of the book give instant access to related information, and this adds immensely to the readability of the articles. The chemical equations, for the most part, are complete with the reaction conditions shown above the arrows for ready visualization. The perspective drawings showing intermediates and model transition states are wonderfully clear and visually pleasing. With some unavoidable overlap of related topics between the two volumes, the division of titles, Basic Principles (Volume 1) and Applications (Volume 2), seems somewhat artificial. There are also some redundancies in the chemistry discussed. Nonetheless, Volume 1 contains an immense number of useful thermodynamic and kinetic parameters that are useful for anyone planning to employ radical chemistry in synthesis. Plenty of examples of how careful consideration of physical organic principles has led to the discovery of successful radical processes are given throughout the book, and this should stimulate further work. Volume 2 is arguably the single most useful source of information on the application of radical chemistry in natural product synthesis. The examples found here are a rich source of information concerning functional group compatibility of various types of radical reactions and stereochemical outcomes in complex ring-forming situations. In areas familiar to this reviewer, no major references have been ignored or omitted up to early 2000. Other relevant reviews and monographs have been cited to make the coverage more complete.

These books are remarkably free of typographical and factual errors, even though one might quibble about idiomatic consistency in some of the writings. In no place is technical accuracy or clarity compromised. These books are mostly written and edited by synthetic chemists for synthetic chemists; thus inevitably, some sections (for example, on polymer-forming reactions) are relatively less developed. Even here, the editors have made sure that the more modern aspects of the topics, like living atom-transfer polymerization have received proper attention. In short, there is very little reason to complain about these volumes.

So what is missing? A few topics, such as phenolic coupling, Meerwein arylation, $S_{RN}1$ chemistry, and electron-transfer catalysis (e.g., of Diels−Alder reactions by $R_3N^{\bullet+}$) get only scant attention, if at all. Because of the segmented nature of the presentations, occasionally a historical perspective on some of the topics is lost. Thus, seminal contributions by pioneers such as Walling, Julia, and Bunnett get only cursory attention. Although there are plenty of illustrative examples of cyclization reactions, especially hex-5-enyl radical cyclizations, a comprehensive treatment of the basic conformational aspects (like the wonderful sections on stereochemistry of the intermolecular additions, Volume 1, Chapter 4) is missing except in a chapter that deals with computational methods. Citations of Ph.D. theses as references should have been avoided, since they are not readily available. Both volumes have excellent indexes, although this reviewer thinks that a single index covering both volumes would have been more useful. More judicious choice of indexing terms would also have improved the book as a reference source. Terms such as cyclization, Lewis acid, and radical are likely to be too broad to be of use. To the editors' credit, however, there are also subsections under some of these terms.

In summary, I believe that these two volumes will serve as a valuable resource for synthetic chemists for years to come. Even with the hefty price, I recommend these books to anyone who has a serious interest in organic free-radical chemistry.

**T. V. RajanBabu,** *The Ohio State University*

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**Topics in Current Chemisty. Volume 218. Host−Guest Chemistry: Mimetic Approaches to Study Carbohydrate Recognition**. Edited by Soledad Penadés (Instituto de Investigaciones Quimicas, CSIC). Springer-Verlag: Berlin, Heidelberg, and New York. 2002. xi + 241 pp. $159.00. ISBN 3-540-42096-7.

It is well-accepted that cell surface glycosylation mediates a variety of biological processes. Yet, unraveling and defining the forces at work, namely, carbohydrate-protein and carbohydrate-carbohydrate interactions, remains a monumental challenge. The understanding of the mechanism of carbohydrate recognition on the molecular level requires an understanding of both the precise intermolecular forces involved and how these forces define both affinity and selectivity within the overall

recognition process. This volume successfully reviews recent advances in this broad arena and does a particularly nice job of merging the advances in polyvalent chemical model systems (glycopolymers, dendrimers, and self-assembled monolayers) with the application of new analytical techniques (biosensors, surface plasmon resonance, and atomic force microscopy) toward a better understanding of carbohydrate affinity and selectivity. Given the dynamic and wide-ranging influence of glyconjugates and significant analytical challenges faced by researchers in the field, this book is timely.

The book is divided into seven chapters that cumulatively offer a compilation of over 800 references, the bulk of which date post-1995. Although not explicitly stated by the editor, it is assumed that readers already possess a fundamental working knowledge of the field. Thus, this volume is not the best choice for newcomers looking for a general overview, but rather, it is aimed at practitioners looking for an up-to-date summary of recent progress in the field. Two chapters are specifically dedicated to the design, construction, and utility of multivalent model systems. Two additional chapters focus upon some specialized applications of multivalent models: (i) to provide evidence in support of carbohydrate−carbohydrate interactions as a mechanism for cellular adhesion/communication, and (ii) to unravel the specific role of water in carbohydrate organization. The book also contains two chapters that are focused on analytical techniques directed toward understanding carbohydrate−ligand interactions. The first of these details the application of surface plasmon resonance detection for investigating carbohydrate−ligand interactions, whereas the second highlights the use of atomic force microscopy for measurements of intermolecular forces, some of which are single-molecule interactions. In addition, a chapter illustrating the potential of artificial receptors as a means of creating carbohydrate chemosensors is included.

In summary, this book presents a timely overview of recent developments in mimetic and analytical approaches aimed at better understanding carbohydrate recognition. The presentation is of high quality and the references are up-to-date. Generalists looking for a good introduction to the title field would be better served to consider alternative books that cover basic concepts prior to reading this volume; however, this book is well-suited for specialists in the area, and such individuals will find this volume a useful addition to their collection.

**Jon S. Thorson,** *University of Wisconsin*

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**Extraction of Metals from Soils and Waters**. By D. Max Roundhill (Texas Tech University). Kluwer Academic/Plenum Publishers: New York. 2001. xvi + 375 pp. $110.00. ISBN 0-0306-46722-4.

The book represents a good reference for those looking for basic information on the title theme. By design, emphasis is placed on complexation strategies, but there are also chapters dedicated to select groups of metal alkalis (with emphasis on Cs), coinage metals, heavy metals, lanthanides, and actinides. The book begins with a useful description of the classification of heavy metals and precious metals as well as an introduction that outlines current strategies for remediation. This section provides a brief review of common methods of treatment, with a focus on strategies involving solvent extraction and recognition of metal ions.

Subsequent chapters cover a range of remediation techniques, including phase-transfer extractions, adsorption, chelation, and even electrokinetic extractions. Each chapter thoroughly covers the development and evolution of the methods and follows up with a review of current applications. About one-half dozen chapters focus on specific metals or groups of metals, as promised in the preface. The discussion includes information on their background, toxicity, and occurrence, as well as current remediation techniques. Extensive coverage is given to a wide variety of methods commonly employed for each metal. Numerous diagrams, figures, and tables are included to supplement the discussion.

In general, this book is highly informative and covers a wide range of topics relevant to metal extraction. It does an excellent job highlighting issues appropriate to both soil and water matrixes, including a chapter on phytoremediation and bioremediation. It also covers current environmental problems and provides information on what to consider when choosing a remediation technique, yet frequently points out the limitations of various methods.

Each chapter is relatively well referenced, with 70−120 references being typical. The well-balanced collection of citations provides an excellent mix of background information, current applications, and developments, and the two-level index and parallel format of many chapters facilitate locating information. Overall, this book serves as an excellent reference for novices in the field looking for information on the current state of technology used for metals remediation.

**Lisa L. Malachowski and James A. Holcombe*,** *University of Texas at Austin*

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**Combinatorial Strategies in Biology and Chemistry**. By Annette Beck-Sickinger and Peter Weber (University of Leipzig, Germany). J. Wiley & Sons: Chichester. 2002. xiv + 180 pp. $35.00. 0-471-49727-4.

The introduction of combinatorial concepts can be likened to a new molecular highway system, a stretch of which opened in the 1980s in the form of peptide libraries, followed by rapid expansion to include numerous other "destinations" in subsequent years. Here, reaching a "destination" refers to arrival, with unprecedented speed, at new scientific insights or the identification of desirable new compounds. Some of these destinations, such as interesting new peptide sequences, have proven much easier to reach than others. Nevertheless, the introduction of combinatorial strategies has undeniably changed the way we think about how long it takes to travel from place to place in the molecular sciences.

*Combinatorial Strategies in Biology and Chemistry* is important, because it summarizes the vital concepts of combinatorial strategies, encompassing everything from small-molecule chemistry to molecular biology. It is precisely this link between combinatorial approaches within diverse areas that provides the

reader with a larger understanding of how combinatorial ideas have been developed and then incorporated into the very infrastructure of molecular science and discovery.

This book is not comprehensive enough for the combinatorial specialist. Rather, its concise, broad coverage is targeted at a reader new to the concepts of combinatorial strategies. It will be perfect for scientists seeking to catch up with current trends or as a formal textbook for students seeking to bridge the increasingly large divide between their basic scientific education and current practices. Consequently, the authors make the effort to explain fundamental principles first, followed by specific examples that introduce increasing complexity. The result is a text that is readable enough for use in advanced undergraduate courses, but thorough enough to supplement a graduate level course as well. Best of all, the book is not focused solely on molecules and synthetic methods, but systematically introduces the new synthesis and spectroscopic hardware, techniques, and other technology that have raised the "speed limit" for travel along the combinatorial highway.

The book begins with a brief overview of important achievements and then introduces essential definitions, which are illustrated with both chemical and molecular biological examples. The second chapter traces the history of peptide combinatorial libraries, starting with an overview of solid-phase chemistry and followed by technological advances and a description of the resulting first peptide library experiments. The third chapter covers important nonpeptide libraries, beginning with oligomeric structures conceptually analogous to peptides and leading to a description of the initial carbohydrate and low-molecular-weight libraries synthesized on solid phase. The chapter ends with a discussion of various libraries that have been synthesized in solution or using soluble carrier systems rather than on solid supports. Chapter 4 covers the essential topics of synthesis involving compound mixtures as well as spectroscopic methods used to identify the structures of molecules designated as "hits" in a functional library screen. The next chapter introduces parallel synthesis as well as the use of technology, focusing on several diverse automation platforms. Chapter 6 switches gears and describes important applications of combinatorial strategies in molecular biology, ranging from phage display of peptide libraries to the directed evolution of nucleic acid and protein catalysts. The text ends with a chapter on the important topic of how chemical libraries or arrays can be analyzed for purity and yield prior to function-based screening.

One could quibble with the authors' preoccupation with the history of peptide libraries and the paucity of industrial examples of non-peptide libraries. In fact, more case histories of industrial combinatorial programs of small molecules would have significantly increased the connectivity between concepts and "real life." Nevertheless, as a textbook that will provide the student or nonexpert scientist with a general road map for the ever-expanding combinatorial highway system of molecular science, this book has achieved its stated goal.

**Brent Iverson,** *University of Texas at Austin*

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