# Book Reviews

**Silicon in Organic, Organometallic, and Polymer Chemistry**. By Michael A. Brook (McMaster University). J. Wiley and Sons: New York. 2000. xxiv + 680 pp. $125.00. ISBN 0-471-19658-4

In recent years there have been several books published that describe the various topical uses of silicon in organic synthesis. All of these books have been useful, but they did not present the broader picture of how the chemistry of the element silicon has had a major impact on many technologies. The author refers to some earlier "classical" books on silicon chemistry, particularly Eaborn's text of the 1960s, that set a very high and comprehensive standard by which to be judged. Without a doubt, Michael Brook has met this standard. This book was a pleasure to read. It is very well written in a relaxed and chatty style that conveys the obvious deep interest and delight the author brings to the subject. There are an impressive number of references to substantiate this scholarly text. One minor point that might (subjectively) make the book even better would be to place Chapter 14 (Electronic Effects of Silyl Group) earlier since it so germane to all of the book. The price is high, but not unreasonably so, and the book can quite rightly claim to be the "Eaborn" of the 2000s.

**Phillip Magnus,** *University of Texas at Austin*

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**Solid-Phase Synthesis: A Practical Guide**. Edited by Steven A. Kates (Consensus Pharmaceuticals, Inc., Medford, MA) and Fernando Albericio (University of Barcelona). Marcel Dekker: New York. 2000. xx + 826 pp. $250.00. ISBN 0-8247-0359-6.

The editors of this book have attempted to compile a comprehensive practical survey of solid-phase (insoluble-polymer supported) chemistry that covers a range of topics from small pharmacophore-like molecules to oligopeptides, saccharides, nucleotides, and pseudopeptides. This goal has been substantially achieved. For those topics covered briefly, there are recent practical approach-type texts already available, such as, those on PNA and oligonucleotide chemistry.

The book presents a historical development of solid-phase chemistry and its modern developments and uses. Each chapter is generously referenced, incorporating literature coverage up to 1999. Approximately one-half of the book deals with chemistry that is directly related to oligopeptide synthesis, whereas the remainder is devoted to other classes of oligomers, small heterocyclic molecules, methods of purification, and analysis.

The book opens by placing solid-phase chemistry in the context of postgenomics drug discovery and sets out challenges and uses for solid-phase chemistry. The 20 chapters that follow begin with a survey of the fundamentals of polymeric supports (Chapters 1 and 5) and the anchoring linkages (Chapter 2). These chapters emphasize the supports that are used for peptide and small-molecule syntheses. Together they present a comprehensive, historical to state-of-the-art treatment of this field. They also bring together a great deal of useful information that can be very tedious to glean from the primary literature. Chapters 2, 3, 4, and 6 address the strategy of peptide synthesis, α-amino protecting groups, side-chain protecting groups, and coupling methods, respectively. Concise protocols accompany these chapters and define the essentials of experimental peptide chemistry. With the synthesis of linear oligopeptides covered, the book then moves on to strategies and methods for the synthesis of cyclic peptides (Chapter 7), disulfide-containing peptides (Chapter 8), and glyco-, phospho-, and sulfonopeptides (Chapter 10). The convergent synthesis of oligopeptides and proteins is surveyed in Chapter 9.

Other classes of oligomeric molecules are discussed next. The synthesis of oligonucleotides places emphasis on relatively recent developments in RNA chemistry in Chapter 11. A chapter on oligonucleotide−peptide conjugates then follows, and in which both the postsynthetic conjugation and stepwise synthesis approaches are discussed (Chapter 12). Chapter 13, dealing with the chemistry of PNA, is brief but instructive and covers both tBoc and Fmoc synthesis strategies. The next chapter provides the reader with an overview of oligosaccharide synthesis excluding glycomimetics and the use of carbohydrates as scaffolds for library development. The last chapter that is concerned with oligomeric molecules (Chapter 16) gives a thorough account of pseudopeptides and peptide backbone mimetics. Chapter 15 limits the description of combinatorial chemistry and solid-phase synthesis to the various classes of heterocycles that have been prepared in this fashion.

The book ends with useful chapters on instrumention for performing solid-phase syntheses (Chapter 17) and methods of purification and analysis (Chapters 18 and 19) of peptides by the most common liquid chromatographic and mass spectral techniques. The final chapter introduces the reader to the concept and practice of parallel analysis by HPLC and HPLC-MS—methods that are inevitably required when dealing with combinatorial libraries of compounds.

This book should serve well chemists entering into the field and should also be a handy desk reference for those already working with solid-phase chemistry. However, at the cost of $250, it is priced out of the range of most student researchers.

**Robert H. E. Hudson,** *The University of Western Ontario*

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**Advances in Molecular Structure Research. Volume 6**. Edited by Magdolna Hargittai (Eötvös University) and István Hargittai (Budapest University of Technology). JAI Press Inc.: Stamford, CT. 2000. ix + 471 pp. $115.00. ISBN 0-7623-0657-2

This volume presents reviews of topics dealing with molecular structure, its determination, and its prediction. It continues the tenor of the series. The articles span a rather large range of topics from structural analysis to means of estimating structure to synthesis of specific structures.

Durward Cruickshank's memoir was particularly interesting as it gives an insider's view of the development of structure determination in Britain. He shows, among other things, how developments in computer science reinforced and encouraged developments in crystallography, and vice versa—a fascinating article for anyone interested in the history of science.

Several articles deal with methods of structure determination or prediction. In one, there is a discussion of the effects of dynamics on electron diffraction and an inversion method that allows one to determine rotational barriers. Lattice-energy-minimization methods as an aid in solid-state structural assignment are reviewed by Englert. Such simulation methods, which attempt to estimate the van der Waals contributions to stabilization of structure, may be useful in predicting the structures of a newly synthesized material, and this detailed introduction to its use should be interesting to those who wish to find out how it works. The ability of quantum calculations to aid in structural assignment is also demonstrated by Tossel, who predicts $^{9}$Be NMR parameters of a variety of beryllium species that may exist in solution. This article is a good example of the synergy between calculational methods and spectroscopic measurements, for without these comparisons between theory and experiment, spectral assignment would be difficult. Kleinpeter reviews the study of tautomerism in solution and in the solid state. He discusses not only various spectroscopic techniques including CP-MAS NMR spectroscopy, but also how these experimental methods may be combined with calculational methods in examining tautomerism.

Some chapters focus on description and rationalization of structures. A good example is that on hydrogen-bonding effects, but others include a chapter on stacking of nucleic acid bases and one on the structures of monosubstituted methylcyclopropanes and oxiranes.

A very interesting chapter in the book discusses the volumes of atoms and measures of them. Particularly illuminating is Figure 1, which shows the periodic trends in the volume per atom of all the elements—a great example for students of the periodicity of properties.

One chapter is a continuation of a series on the relationship of

structure to thermochemistry of certain organic compounds, and another focuses on the synthesis of silylenes.

The volume should prove useful to chemists who need references on the connection of molecular structure to a variety of measured parameters. The references in many articles include classic papers as well as papers from the late 1990s, so these are rather thorough, up-to-date reports for the most part. According to the editors' foreword, this is apparently to be the last of this series, as the publisher has decided to terminate it. The collection of such material into a single series is a meritorious effort, for which the editors are to be commended.

**Cecil Dybowski,** *University of Delaware*

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**Energy Storage Systems for Electronics. New Trends in Electrochemical Technology**. Edited by Tetsuya Osaka (Waseda University) and Madhav Datta (Intel Corporation). Gordon and Breach Science Publishers: Amsterdam. 2000. xxiv + 580 pp. $145. ISBN 90-5699-176-0

This book is a somewhat mixed bag of contributions dealing with energy storage systems for electronic devices. For example, the section on lithium secondary batteries does a satisfactory job of providing useful information for those wanting to know more about this storage system. It addresses the technology, manufacture, and market requirements for these devices, although it does not delve deeply into the science underlying them. It provides an adequate introduction to the subject that is suitable for most readers, except for those wishing to explore the elementary aspects of the system.

Conversely, the sections on the more mature energy package systems are considerably less thorough in their coverage and not apt to be that useful to anyone with some background in electrochemistry. However, it would serve some purpose for neophytes in the field.

The sections on fuel cells and capacitors are also rather brief but have a higher information content than the sections discussed immediately above. These two chapters provide both a good background and some idea of the use and possible demand for such devices. Considerable attention is given to the zinc−air system. This is a little surprising, but good basic parameters certainly make this system appealing. Overall, there is an even-handed approach which, with the references cited, can provide useful insight into its possible future.

A section on the general issues relative to the use of reversible electrochemical energy packages with electronics is particularly useful, as it provides a thorough survey of this area.

The chapters are each done by experts, and that is valuable in regard to understanding uses, exploring references, and the like. However, the clarity varies with the different authors' familiarity with the English language, so the book would have benefited by some unifying editorial work. Nevertheless, for those getting into the field and for some already in the field, this book could be of some use.

**Norman Hackerman,** *University of Texas at Austin*

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**Molecular Self-Assembly Organic Versus Inorganic Approaches**. Edited by Makoto Fujita (Nagoya University). Springer-Verlag: Berlin. 2000. viii + 254 pp. $165.00 ISBN 3-540-669488-5.

Weighing in at only 254 pages, Makoto Fujita's new book should not be mistaken for an A-to-Z encyclopedia of self-assembly. Rather, Fujita brings the reader up to date on new developments in this increasingly competitive area. He presents a survey of self-assembly synthesis with seven stand-alone chapters, each written by an international expert in the field. The thread that ties them together is the creation of well-ordered and predictable architectures brought together by exploiting complementary hydrogen-bonding or metal coordination. The book covers a wide spectrum of topics, from pure organic hydrogen-bonding, to the marriage of metals and designer ligands, and finally to pure metal clusters.

The book is written for a broad audience: some chapters are clearly aimed at the uninitiated, and others provide enough references to satisfy the appetite of those better versed in the area. There are numerous excellent chapters including the editor's own. Several will be useful resources for instructors and students of upper level courses in supramolecular chemistry. Each chapter is short, to-the-point, and informative without being overwhelming. Fujita obviously paid careful attention while editing and has managed to minimize redundancy between sections.

The first part of the book focuses on organic assemblies that exploit hydrogen bonds as their supramolecular glue. In the introductory chapter, Lehn and Krische spotlight selected examples of recognition-directed self-assembly. Hydrogen bonds are used to fabricate one-, two-, and three-dimensional architectures. Chapter 2 continues with a review by Hamilton and co-workers on the use of hydrogen-bonding to affect organogelation. This chapter is conveniently divided into sections based on the choice of heterocycle used to fabricate the molecular recognition surfaces. Zimmerman and co-authors should be especially complimented for their contribution in Chapter 3. They clearly lay out the critical factors that should be considered to maximize complex stability and emphasize many warnings to those designing self-assembling systems using hydrogen bonds as the glue of supramolecular chemistry. These lessons include the stern warning that simply increasing the number of complementary bonds will not guarantee stronger intermolecular association, but that the placement of the hydrogen bonds with respect to each other is equally critical for taking advantage of favorable secondary interactions. The importance of the need to break many intramolecular hydrogen bonds and to be able to account for the role of nonproductive tautomeric forms when designing the recognition surfaces for intermolecular interactions is also an appealing lesson described in this chapter. The discussion of organic assemblies concludes in Chapter 4 with a review of hydrogen-bonded liquid crystals by Kato.

In the second section of the book, metal coordination provides the glue to fabricate the assemblies. This inorganic section sensibly starts with a review by Saalfrank and co-workers (Chapter 5) on the rational design of supramolecular assemblies by combining the attractive features of tailored organic ligands with the versatility of metal coordination. The next chapter is the editor's own brief but informative discussion of metal-directed self-assembly using molecular paneling. The final chapter presents examples of assemblies comprised of the fewest number of different elements but perhaps the greatest repetition of the atoms. Here, Müller and co-workers review polyoxometalate clusters with special emphasis on the {Mo11} building block.

Some readers may be disappointed to find the omission of more applied systems, such as rotaxanes and catenanes, with device-like properties. These readers should be reminded of the book's focus, as it is certainly not possible to cover all aspects of a given area. The book gives an excellent overview of supramolecular chemistry that focuses primarily on the type of glue used to form the architectures (hydrogen bonds versus metal coordination). Perhaps this thematic separation should be reflected in the title instead of "organic versus inorganic approaches". With this in mind, the only obvious omission is a bridging chapter between the two major thematic sections discussing recent progress in combining the two types of interactions. A review of the work of Mingus, Lippert, and others would have fit in well.

**Neil R. Branda,** *University of Alberta*

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