Strained Hydrocarbons: Beyond the van't Hoff and LeBel Hypothesis. Edited by Helena Dodziuk (Polish Academy of Sciences, Warsaw, Poland). WILEY-VCH Verlag GmbH & Co. KGaA: Weinheim. 2009. xxii + 472 pp. $230. ISBN 978-3-527-31767-7.

The editor of this book wisely has not adhered too strictly to the term "strained hydrocarbons" but has included a rich sampling of many molecules that do not fit the definition very well. In addition to covering such important and familiar topics as compounds with abnormal bond lengths and angles, this book includes other topics of intense interest to many current investigators, e.g., homoaromatic systems, molecules with nonstandard topological properties such as graph-theoretically nonplanar compounds, fullerenes, carbon nanotubes, guest−host complexes, and numerous others.

Dodziuk has chosen expert authors, and the quality of the various sections is almost uniformly high. The coverage of the literature seems very thorough, and the structural formulas, illustrations, and tables are laid out clearly and carefully. There is one major flaw, which unfortunately is not unique to this book, and that is the absence of author or subject indices.

I have picked out a few specific aspects of the book for special mention because of some acquaintance I have with related material. Suzuki et al. present a stimulating section summarizing their elegant synthesis and characterization of molecules with "ultralong" bonds. These are acenaphthenes or tetrahydropyracenes in which the hydrogen atoms at the termini of an ethano unit are substituted by bulky aromatic substituents. X-ray crystal analyses show that the ethano bond has been stretched from its normal value of 1.54 to 1.79 Å. This observation prompts the question: Is there a chance that the corresponding non-Kekulé biradical may be lurking in the neighborhood, as is the case, for example, in the 5-alkylidenebicyclo[2.1.0]pentanes? There, under appropriate conditions, both the parent hydrocarbon and the non-Kekulé triplet biradical can be observed directly. The latter triplet is actually lower in energy than the covalent isomer, and the bond-dissociation energy in the parent hydrocarbon thus is negative. These results are pertinent to Zavitsas's 2004 finding of an excellent linear correlation for a variety of C−C bonds between bond lengths and bond-dissociation energies. Suzuki et al. point out that their compounds with ultralong bonds do not adhere to the Zavitsas correlation. The same is true of the 5-alkylidenebicyclo[2.1.0]pentane series. Like many other energy correlations in organic chemistry, this one is reliable only within a relatively narrow range of energies and structures. Theoretical computations in this area could be helpful.

In another section, Mlinarić-Majerski gives a scholarly review of the fascinating compounds with inverted carbon atoms, the earliest examples of which are the hydrocarbons of the small-ring propellane series. The predictive importance of high-level theoretical calculations and the subsequent extensive experimental elaboration of the field are outlined, and special attention is given to the intriguing question of whether there is or is not a central bond in [1.1.1] propellane. Particularly enlightening is the author's collection of the numerous references, which attest to broad and continuing interest in this subject. Although this problem is relevant to the section on "ultralong bonds," the authors of both sections apparently passed over the opportunity to point out the overlap. It would also have been of interest to have such a discussion include material from Williams's contribution (Chapter 8) on molecules with labile bonds. In other words, an effort to broaden the discussions would help the reader who may not be directly involved in any of these specific areas get an overview of the issues they have in common.

In view of the overall high quality of the treatment of inverted carbons, one risks an accusation of carping to mention that some of the writing is ungrammatical and in one instance fails to make a needed distinction between kinetic and thermodynamic stability. Other infelicities that impede facile comprehension of the argument may be seen in other sections as well.

I would emphasize that any organic chemist who picks up this volume and leafs through it will have difficulty putting it down again. Almost every section stimulates fresh thoughts and research ideas. With this effort, the editor and collaborating authors have earned the gratitude of this chemist and, no doubt, of many others.

Jerome A. Berson, *Yale University*

JA905486P

10.1021/ja905486p

Functional Nucleic Acids for Analytical Applications. Edited by Yingfu Li (McMaster University, Hamilton, Ontario, Canada) and Yi Lu (University of Illinois at Urbana-Champaign, USA). From the series Integrated Analytical Systems. Edited by Radislav A. Potyrailo (GE Global Research). Springer Science + Business Media, LLC: New York. 2009. viii + 396 pp. $129. ISBN 978-0-387-73710-2.

This book consists of 15 chapters contributed by experts in the field of functional nucleic acids, mostly in the area of specific analytical applications of nucleic acids, such as their use as sensors and in affinity separations. The chapters, although authored by individuals or groups of experts, are uniformly well written and include both concise abstracts and exceptionally comprehensive lists of references. The content of each chapter is presented at a level within the grasp of nonexperts, although it is not generally basic enough for novices, and the extensive lists of references readily fill in gaps in coverage.

The first chapter offers brief "introductory remarks" by the editors, Lu and Li, that justify the growing interest in functional nucleic acids and present the theme of each subsequent chapter. In the second chapter, Tremblay et al. focus on one important category of functional nucleic acids—naturally occurring ribozymes and riboswitches—and illustrate the key types of secondary structures, catalytic motifs, and functions of these elaborate RNA molecules. The following chapter by Silverman covers artificial functional nucleic acids, including aptamers, ribozymes, and deoxyribosomes identified by in vitro methods of selection. Numerous examples of aptamers that bind specific molecular targets or ribozymes/deoxyribozymes that catalyze chemical reactions are showcased. This is one of the longer

chapters in the book, and it is packed with comprehensive tables that summarize information about key binding constants and give examples of the secondary structures of the functional nucleic acids and their targets or chemical reactions. This chapter offers a superb overview of the field.

All chapters in the second section of the book follow the theme of "functional nucleic acid sensors based on different transduction principles". Chapter 4 by Chen et al. focuses on fluorescent aptamer sensors and the exploitation of fluorescence processes for sensitive biological assays, such as discovery of biomarkers and recognition of cancer cells. This chapter has a high density of schemes that are extremely helpful in illustrating the concepts of the sensing mechanisms. Chiuman and Li present approaches for integrating fluorescence-signaling modules onto nucleic acid enzymes, specifically RNA-cleaving ribozymes, for applications in biosensing and drug screening. This chapter closes with concluding remarks that offer a well-balanced perspective on future challenges and practical issues for other biological applications. In Chapter 6, Liu and Lu review the use of metallic nanoparticles and quantum dots in conjunction with functional nucleic acids as colorimetric or fluorescent sensors. It is unfortunate that a significant example in this chapter is impeded by the citation of a figure (6.1) that does not fit the caption or the text, a flaw that proves particularly distracting for nonexperts who rely on detailed schemes to follow new strategies. The theme turns to electrochemical strategies for aptamer-based sensing in the next chapter by Xiao and Plaxco. This chapter offers considerable practical insights into the viability of certain electrochemical approaches, information that is extremely useful to nonexperts and renders the chapter particularly reader-friendly. Moreover, the comparison of optical- versus electrochemical-based approaches at the end the chapter is a welcome bonus that makes it one of the best. Chapter 8 by Willner et al. is a description of advances in the development of amplified DNA biosensors facilitated by electrochemical and optical methods. An outstanding aspect of this chapter is the inclusion of a large number of informative schemes that are incredibly helpful in illustrating the concepts of the complicated detection schemes.

The third section of the book consists of seven chapters that encompass other analytical applications of functional nucleic acids, such as the use of aptamers in affinity separations. Chapter 9 by Guthrie et al. and Chapter 10 by Ravelet and Peyrin focus on capillary electrophoresis and the use of aptamers in liquid chromatographic methods, respectively. Although these are two of the shorter chapters, both close with concise conclusions that offer candid insight into unresolved hurdles and future directions. Syrett et al. in Chapter 11 offer a practical look at aptamer microarrays, including their production, processing, and data analysis. In the next chapter, Rupcich et al. present the use of solid-phase fluorimetric assays of functional nucleic acids, including applications in biosensing and proteomics. Chapter 13 by Rentmeister and Famulok is short and dedicated to the use of DNA and RNA aptamers, ribozymes, and natural nucleic acids in high throughput screening. Macdonald and Stojanovic describe the utilization of nucleic acids to create circuits for molecular computations in Chapter 14, which has numerous informative schemes illustrating the principles of the computational circuits. The book closes with a concise chapter by He et al. on the use of DNAzymes in DNA nanomachines and analysis.

Overall this book affords a comprehensive collection of clearly presented, up-to-date reviews that broadly cover the numerous applications of functional nucleic acids. Each chapter treats a separate topic with an average of 100 references per chapter that offer ample guidance for those wanting to delve deeper into the recent literature. There are some minor redundancies among the chapters, such as the repeated definition of "aptamer" and explanation of the SELEX/in vitro selection process, but this also allows each chapter to be absorbed individually on an as-needed basis. The chapters are of high quality and provide extensive insight that will be useful to newcomers entering the field of functional nucleic acids and to those interested in exploring other applications complementary to their own niches.

Jennifer S. Brodbelt, *University of Texas at Austin*

JA905562Z

10.1021/ja905562z