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BOOK REVIEWS

Chemical Oceanography and the Marine Carbon Cycle. By Steven R. Emerson and John I. Hedges (University of Washington). Cambridge University Press: Cambridge. 2008. xii + 454 pp. $90.00. ISBN 978-0-521-83313-4.

I was working on my review of this book, cowritten by John Hedges, while Hurricane Ike was displacing some seawater from the ocean into my house and office. In my flooded office sat the book *Isaac's Storm* by Erik Larson, which is about the storm that devastated the city of Galveston in 1900. This book, which was given to me upon my move to Galveston, contains an inscription from the self-same Hedges and the coincidence got me thinking about hurricanes, climate change, and oceanography. Regardless of whether hurricane frequency and intensity are affected by global warming, it is obvious that our ways of teaching and doing research need to become more integrated in order for our understanding of climate change to catch up to the rapid environmental changes we are observing. Putting out books to lead the way is an important and challenging task. The book under review here presents an impressive range of topics from basic background information in thermodynamics, molecular diffusion, and carbonate chemistry to the role of the marine carbon cycle in global climate variations of the past and the future. I especially liked the chapters on paleooceanography/paleoclimatology and global carbon cycle interactions, which were very informative and which I will incorporate into my undergraduate classes. I was also impressed by the frequent identification of knowledge gaps and future research needs, which should serve graduate students in the field.

The book opens with a strong introduction that includes general background information. I have never seen the coreolis force, global wind patterns, and ocean basin differences explained as well as in this book. It should serve the earth science community as a valuable blue print for future approaches to classroom teaching. However, a book of such breadth also comes with a price. Some chapters are extremely detailed, whereas others have a more general character. I felt that the chapters on stable isotopes, radioisotopes, and marine organic geochemistry could have been more detailed and missed some newer, pertinent references. Those chapters would have benefited from more "hands-on" examples and actual field data. Some of the topics that I personally missed include recent findings from analyses of marine organic matter using compound-specific stable isotope and electrospray-ionization Fourier-transform ion cyclotron resonance mass spectrometry.

I see the book as a very valuable reference for researchers and graduate students and a great supplementary text for teaching a variety of classes. From my experience with teaching chemical oceanography to undergraduate students, I think the book would be too advanced for undergraduate students without an additional, more basic text. I hope other books that integrate climate change into texts on our core oceanographic disciplines will follow.

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Radiation Induced Molecular Phenomena in Nucleic Acids: A Comprehensive Theoretical and Experimental Analysis. Challenges and Advances in Computational Chemistry and Physics, 5. Edited by Manoj Shukla and Jerzy Leszczynski (Jackson State University, MS). Series Editor: Jerzy Leszczynski. Springer Science + Business Media B.V.: springer.com. xii + 678 pp. $559. ISBN 978-1-4020-8183-5.

Chemical modification of DNA by UV and ionizing radiation initiates destructive biological outcomes such as apoptosis, genomic instability, and cancer. Despite decades of study, much remains to be discovered about the molecular events that culminate in damage. DNA is nearly nonfluorescent, and most excited states decay nonradiatively. Time-resolved laser experiments have recently shown that excited states of single bases primarily decay on the femtosecond time scale, and quantum chemical calculations have identified the nuclear motions that return an excited molecule to the electronic ground state. Synergistic contributions from experiment and theory have dramatically expanded the understanding of nonradiative decay in single nucleobases, and this work is a major theme of this book. A second theme addressed in the final four chapters is radical-initiated damage to DNA, especially by low-energy electrons. This is timely in light of the recent discovery that such electrons can induce breaks in DNA strands.

Although this volume is from a series on computational chemistry, the editors wisely solicited contributions from leading experimentalists and theoreticians that mostly succeed in creating a balanced portrait of their interdependent efforts in the book's 21 chapters. Following an introductory chapter, the next six chapters cover techniques for computing excited states. Single-reference and multireference approaches are described, including coupled-cluster and complete active space methods. In one chapter, the combination of the polarizable continuum model with time-dependent density functional theory to model excited states of solvated molecules is discussed. Unfortunately, the reader hoping to learn how these state-of-the-art electronic structure methods can be applied to nucleic acids will be disappointed. With the exception of a very brief discussion of the CD spectrum of uridine, none of the applications concern excited states in DNA. Indeed, many of the applications chosen by the authors are frustratingly off-topic, e.g., excited states of lanthanides and actinides, the electronic structure of transition metal compounds, and relativistic effects in period 6*p* diatomics. The absence of any mention of DNA in roughly a third of the book is a mistake that leaves this part of the book poorly integrated with the remainder. In addition, the frequent discus-

Unsigned book reviews are by the Book Review Editor.

sion in these chapters of excited states of diatomic molecules may leave the impression that computational chemistry is not yet up to the challenge of modeling excited states in molecules the size of the nucleobases. That would be a serious mistake, as later chapters amply illustrate the successes that have been achieved.

The reader interested primarily in what computational chemistry can do for problems concerning the electronic structure of DNA should turn directly to the next 10 chapters, which are largely devoted to experimental and theoretical understanding of excited states of single bases. Despite the title reference to nucleic acids, the book is overwhelmingly about small model systems. Several chapters review excited states in isolated base pairs from an experimental and theoretical standpoint, and one chapter briefly covers excited states in π-stacked nucleobase dimers. It is unfortunate that excitonic models and experiments on excited states in DNA oligo- and polynucleotides are not included in this volume. Overall, there is somewhat too much emphasis on single-base studies, particularly in light of recent experiments highlighting the very different photophysical pathways found in DNA polymers.

A chapter on low-temperature EPR and ENDOR spectroscopy of nucleobase single crystals reviews what has been learned about radicals produced by ionizing radiation. This is followed by three chapters that present excellent reviews of current insights and controversies into how low-energy electrons induce breaks in DNA strands. These chapters and the brief discussion of the vibrational spectroscopy of oligonucleotides in an earlier chapter are the only passages that contain discussions of single- and double-stranded DNAs.

Disappointingly, the index is little more than an alphabetical list of words or short phrases that appear in the book. Locating only exact matches for phrases frequently misses the target. For example, the index entry for "shape resonance" omits the page that first defines this term because these two words are not used contiguously at this point in the text. There are almost no cross-references, and there is little value in long lists of page citations for broad terms like "polymer", "DNA", and "lifetime". A writer mindful of what a reader would actually search for would have done a much better job than the computer software that was almost certainly used.

Although some will find it falls short of a completely comprehensive account of radiation-induced phenomena in nucleic acids, the book contains a number of excellent individual reviews that will benefit workers interested in excited states in small DNA model systems and in the mechanisms by which low-energy electrons induce strand breaks. There are excellent references to the recent and older literature throughout the book that will be valued by established and new workers in the field.

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Ion-Radical Organic Chemistry: Principles and Applications, 2nd ed. By Zory Vlad Todres (American Chemical Society, Columbus, OH). CRC Press (an imprint of Taylor & Francis Group): Boca Raton, FL. 2008. xvi + 476 pp. $189.95. ISBN 978-0-8493-9068-5.

Todres presents an informative compendium of research involving organic ion-radicals, a class of intermediates that is often overlooked in the standard training of organic chemists. The intended audience is professors, researchers, and advanced students who may encounter organic ion-radicals (or focus on them) in the course of their research in synthetic or mechanistic organic chemistry. It is an updated edition of Todres's book published by Dekker in 2003 under the title "Organic Ion Radicals", but there appear to be only limited changes to the content since its predecessor. As judged by a comparison of the tables of contents, the topical coverage in both editions is almost identical in scope and organization. A sampling of the references at the end of the chapters shows that, depending on the chapter, approximately 5−20% are new to the second edition, and the bulk of the new references seem to be intended to strengthen points that were already illustrated by the older ones. In most cases there is no special visibility accorded to novel concepts or directions that may have emerged in recent years.

The author offers broad yet deeply detailed coverage for those who wish to have a reference to the primary literature of this area. The author presents a great abundance of examples but places less emphasis on coherent themes, making the book less attractive as a pedagogical tool. Still, instructors of advanced special topics courses might find that some case studies can be drawn from it.

A strength of the book is the sprinkling of practical advice throughout; these nuggets of wisdom draw from the experience of the author to add value for readers who may not be experts in ion-radical chemistry. One example of this is the author's comparison of the operational advantages and disadvantages of specific solvents and metals for dissolving-metal reduction in Chapter 2. On the other hand, the graphics are not particularly well rendered, and there is an over-reliance on single-line text formulas rather than on modern graphics—a superficial issue, yet one that detracts from the overall readability.

This book will be a useful resource for specialists already versed in aspects of ion-radical chemistry as well for those seeking a survey of the primary literature as a foundation to begin research in the area. Therefore, I would recommend it as an addition to the monograph collections of chemical research libraries.

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Fiesers' Reagents for Organic Synthesis, Volume 24. Edited by Tse-Lok Ho (National Chiao Tung University of Taiwan). John Wiley & Sons, Inc.: Hoboken, NJ. 2008. xvi + 524 pp. $145.00. ISBN 978-0-470-22554-7.

This volume of *Fiesers' Reagents for Organic Synthesis* not only covers the literature from 2005 to 2006 but also includes a few earlier papers. The reagents are listed in alphabetical order, with each entry including a short description of the reagent's preparation and uses, its structural formula, where possible, and references. The book opens with a list of general abbreviations and a list of abbreviations for the publications cited within the text. It concludes with an author index and a subject index

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