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BOOK REVIEWS

Introduction to Biophotonics. By Paras N. Prasad (SUNY-Buffalo). J. Wiley & Sons, Inc.: Hoboken, NJ. 2003. xviii + 594 pp. $99.95. ISBN: 0-471-28770-9.

Single-author technical monographs, even of the "introductory" type, are becoming rare because few individuals have the breadth of knowledge and expertise to cover a field of modern science or technology adequately. In addition, monographs per se face the quandary of inherent obsolescence because of extended publication schedules, nonupdatability of the content, and the inability (as yet) to access and search contents from the Internet. Few fields are advancing faster than (bio)photonics, and thus the challenges in generating a useful overview are particularly daunting. Fortunately, Prasad has what it takes to assemble a survey of the fundamentals and applications in a manner that is undoubtedly of interest to not only "those involved in health, safety, and environmental disciplines" but also to basic scientists and engineers.

It is appropriate in such a book to introduce the material in the form of a career challenge. The fields of science and technology are highly competitive in the process of attracting the better minds and hands. By expounding the common basis of photonics-based activities from characterization of single molecules at one end to the diagnosis and therapy of disease at the other provides an attractive format for the reader.

The fundamentals of light and matter and their interactions are addressed in Chapters 2 and 4. The coverage is uneven, adequate in some areas, but suffering from the limitation of space, particularly in dealing with issues of spectroscopy. For example, with respect to multifaceted aspects of fluorescence, a student would need to consult a more comprehensive treatment, such as *Molecular Fluorescence: Principles and Applications* by Valeur, to gain a fuller understanding of the topic. In the discussion of fluorescence polarization (p 112), some discussion of the fundamental rationales for the use of certain quantities would have been helpful. It is important for the reader to understand that the parameter anisotropy is preferable to the polarization because it normalizes the difference polarization signal by the total (albeit only for isotropic distributions) emission signal. The treatment of FRET (an acronym for Förster, not fluorescence, resonance energy transfer) is woefully inadequate from both a qualitative and quantitative standpoint, and reference to the significance (and exploitability) of excited-state saturation (ground-state depletion) is missing altogether.

Unaccountably, "Basics of Biology" (Chapter 3) is sandwiched between Chapters 2 and 4. This chapter, in this reviewer's opinion, seeks to fulfill an impossible task, and one can argue that its omission would have reflected an honest recognition that a coherent introduction to biology is best achieved by perusal of standard texts that have evolved over numerous editions.

Things get better starting with Chapter 5, and the material is enhanced by good line drawings and color images. The author is clearly on familiar ground here and deals with a wide range of issues related to the properties of materials and their fabrication and detection in multiple applications.

Overall, this book reads well, although the style is at times pedestrian. The "Highlights" of the chapters, although undoubtedly well-intentioned, are sometimes irritating in that they are arbitrarily restricted to one or a few observations about a given topic. The citations are well-selected, but unfortunately are mainly pre-2000. It may have been advisable to use a combined reference list rather than chapter-by-chapter lists. In summary, *Introduction to Biophotonics* is a useful effort, a good double or a triple, if not a home run.

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Radical Reactions in Organic Synthesis. By Samir Z. Zard (Ecole Polytechnique, Palaiseau, France). Oxford University Press, Inc.: New York. 2003. xi + 256 pp. $64.50. ISBN: 0-19-850240-0.

This short book, which is an expanded version of a graduate course given by the author, is an extremely valuable contribution to the review literature on synthetic radical chemistry- the students who have taken the original course have clearly enjoyed a special privilege. Within the space of some 250 pages, the author has presented a brilliant overview of synthetic radical chemistry, has conveyed the excitement of discovery in this area, and has illustrated the immense impact of the subject on modern synthesis.

A relaxed writing style—almost conversational—is used, and the diagrams are carefully drawn and nicely set out. The text is easy to follow, and the time spent on reading it is amply rewarded by the increased understanding one acquires as well as by the pleasure of examining a large number of very impressive reactions. A particularly attractive and useful feature is that each scheme includes a brief summary that encapsulates the more detailed discussion provided in the adjacent text. The work is fully referenced, the modern literature (primarily to the 1990s but even up to 2003) is covered, and each citation also gives the title of the paper.

The book is a mine of information. It starts with a brief historical background and a short primer on chain reactions, and then moves smoothly into a much more advanced discussion of the basic principles of radical reactions that are mediated by stannanes. This second chapter, as well as the ninth (and last) chapter, includes a number of valuable experimental points. Particular attention is paid to relative rates, and in fact, a theme of the whole book is the use of approximate rate data to predict or understand the outcome of radical processes and to assist in the design of new reactions. The reliance on kinetic considerations throws a penetrating light on the chemistry that is discussed.

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The stannane chapter covers the essential topics of simple reductions, such as halide to hydrocarbon, the Barton−McCombie deoxygenation, deamination, intermolecular addition to multiple bonds, and cyclization of carbon-, nitrogen-, and oxygen-centered radicals. Each topic is illustrated by carefully chosen examples showing synthetic utility, and the appropriate stereo- and regiochemical, kinetic, and orbital considerations are explained. Radical rearrangements, including the opening and closure of rings, radical translocation, and fragmentations receive a chapter of their own. Next, the use of silicon-, germanium-, and mercury hydrides and the technique of polarity reversal are discussed. The Barton decarboxylation (Chapter 5) receives the extensive treatment that it fully deserves, and variations are described that allow formation of radicals from alcohols and the generation of nitrogen- and oxygen-centered radicals.

The sixth chapter treats atom and group transfers, such as Kharasch-type processes, the transfer of hydrogen, halogen, seleno, and telluro groups and nitriles. The ingenious transfer of xanthates and applications of other degenerate processes involving sulfones are given comprehensive treatment in this chapter, as is the formation of radicals from boranes.

Next, the persistent radical effect is explained and illustrated, and some old reactions, such as the Barton nitrite photolysis, are examined from the perspective of this concept.

Chapter 8 is the last extensive section; it is devoted to redox processes involving transition metals, organic reducing agents, and electrochemical and photochemical methods. An extremely impressive array of synthetic transformations is presented, together with a highly informative commentary on the mechanistic basis of the reactions. The discussion gives a powerful impression of the immense scope of the available transformations and of the opportunities for further discovery.

Professor Zard's book closes with a short but helpful guide on practical matters. Here he lists some of the potential pitfalls and some of the factors that can initially thwart the desired outcome of a radical reaction that is being tried for the first time, and he offers advice on removing or controlling such factors. Finally, he expresses the hope that his book will help organic chemists gain a practical and creative understanding of synthetic radical chemistry. This it will certainly do. Professor Zard's book is an outstanding treatment that is pervaded throughout by his own extensive experience and deep insight. *Radical Reactions in Organic Synthesis* deserves to be in the personal library of all chemists working in the area of complex molecule synthesis.

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