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BOOK REVIEWS

Molecular Theory of Solutions. By Arieh Ben-Naim (The Hebrew University, Jerusalem, Israel). Oxford University Press: Oxford, New York. 2006. xviii + 380 pp. $64.50. ISBN: 0-19-929970-6.

Ben-Naim has written a clear, lucid, and pedagogical exposition of a molecular theory of solutions. It bears the hallmarks of an author who has thought deeply, published extensively, and has very decided views on the subject. It is a beautiful read.

The book begins with an introductory chapter on basic statistical mechanical ensemble theory and its relationship to thermodynamics, followed by a discussion of deviations from ideal gas behavior at the level of the second virial coefficient. This sets the stage for Chapter 2, which introduces the topic of molecular distribution functions and potentials of mean force in multicomponent systems of the canonical and grand canonical ensembles. The connection between the distribution functions and thermodynamics is established in the next chapter, where the ubiquitous Kirkwood−Buff (K−B) integrals are introduced in anticipation of a detailed discussion of the K−B theory of solutions in Chapter 4. This theory relates the thermodynamic properties of a system to molecular pair correlation functions, g_{ij}, of the species in solution through the set of K−B integrals, $G_{ij} = \int(g_{ij} - 1)4\pi r^2\, dr$.

These integrals $\{G_{ij}\}$ lie at the heart of the K−B theory proposed nearly 56 years ago (*J. Chem. Phys.* **1951**, *19*, 774). Accurate correlation functions are needed to make it functional, but at the time the theory was formulated, the study of correlation functions in mixtures was at a primitive stage. It is not surprising that early applications were confined to simple systems and to qualitative explanations of solvation, e.g., the negative entropies and heats of solvation of inert gases in water. An equivalent set of relations between the thermodynamic functions and integrals of the direct correlation function was developed by O'Connell in 1971 and by Mansoori and coworkers in 1981. Applications of the K−B theory to simple mixtures were stimulated by concurrent developments in integral equation and perturbation theory approximations for the correlation functions of simple fluids. Progress was slow because the calculations were difficult and computationally intensive. Studies of more complex mixtures and solutions were also hindered by the lack of information about the intermolecular potentials.

What has made this exact but dormant K−B theory popular in recent years is the inversion of K−B theory in which a set of thermodynamic properties—typically the compressibility, κ_T, partial molar volumes, $\bar{V}_i$, etc.—is used to calculate the set of K−B integrals $\{G_{ij}\}$. This inversion and its pitfalls are clearly explained in Chapter 4. The K−B integrals can be used to study the *local* composition and properties of solutions in contrast to the *global* properties exemplified by the excess thermodynamic functions. This aspect was exploited by Ben Naim, Mateoli, and Lepori (1995), Ruckenstein and co-workers (2001−06), Marcus (2002), and many others. Recent promising applications are the development of improved force fields that reproduce the experimentally determined K−B integrals and studies of cosolvent effects on the conformations of peptides in solution, pioneered by Paul Smith and his group. Ideal solutions and deviations from ideal and ideally dilute behavior as well as stability conditions in solutions are discussed in Chapters 5 and 6, the latter contains a brief description of the McMillan−Mayer theory.

The theory of solvation, the second topic covered at length in this book, is discussed in Chapter 7. Here a new measure of solvation is presented which, as is colorfully recounted in the Preface, met with vigorous opposition due to a misunderstanding about whether a new standard state was proposed or dismay at the author's chutzpah in proposing a different view that eschews hypothetical standard states that are traditionally part of the well-established field of solution chemistry. The solvation of a molecule in its own solvent, for example, water in water or benzene in benzene, in addition to the more conventional water in benzene or vice versa is discussed. Stepwise solvation, group contributions and internal rotation effects on solvation, and the solubility and solvation of globular proteins are also explained. The last chapter (8) returns to the K−B integrals and concepts of solvation thermodynamics applied to preferential solvation in three- and two-component systems over the entire range of compositions. The monograph ends with a slew of 16 appendices that include information about some of the technical aspects of the subject, e.g., functional differentiation and scaled particle theory.

The book is written at the graduate level and is self-contained. There are no problems in the book which may limit its adoption as a text for a course. It is a farily comprehensive although personal view of the molecular theory of solutions that is likely to remain the definitive source of information on the K−B theory and its inversion, local, and cosolvent effects. Electrolyte solutions and polymers are not discussed in any detail. To someone already familiar with the K−B theory and traditional solution thermodynamics, the last three chapters on solvation thermodynamics and preferential solvation may be the most interesting. There are some footnotes and references to correspondence that could have been omitted. I recommend the book for its clarity, content and fresh insight into the molecular theory of solutions.

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Chiral Separation Techniques: A Practical Approach, Completely Revised and Updated 3rd ed. Edited by Ganapathy Subramanian (Canterbury, U.K.). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim. 2007. xxii + 618 pp. $200. ISBN 978-3-527-31509-3.

This is the third book edited by Subramanian that details advances in the area of chiral separations with emphasis on

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practical applications. Review of the series can provide a perspective on where the field has been and where it may be going. The topics in the book have changed as the field has matured. For instance, only the first edition, published in 1994, contains an introductory chapter offering a brief overview of chirality and its relevance to the pharmaceutical, agrichemical, and environmental as well as food/beverage industries. Also, chapters devoted to chiral pharmaceutical regulatory issues, present in the previous editions while the regulatory environment was still evolving, are absent here. The second edition, published in 2001, provided discussion of a greater mix of tools for chiral separations, including a chapter on CHIRBASE, an extensive database of chiral separations, and an overview of combinatorial approaches. In addition, a wider array of separation platforms, e.g., membranes, simulated moving bed, super- and subcritical chromatography, electrophoresis, was presented in the second edition.

The third edition is much longer than either of the previous editions. Separation platforms, e.g., capillary electrophoresis and capillary electrochromatography, counter-current chromatography, not covered in the earlier editions are introduced, and other supporting technology, such as enantioselective electrochemical biosensors, on-line chiroptical and mass spectrometric detection, are discussed. In some cases, the titles of the chapters, e.g., Chapters 2 and 3 and Chapters 6 and 7, suggest that there may be some overlap in content. However, the content in each of the pairs is actually complementary rather than redundant. For instance, Chapter 2 provides a fairly exhaustive review of polysaccharide-based chiral separations beginning with a thorough discussion of the column technology and what is known about their chiral recognition, and ending with a review of their application in liquid and supercritical fluid chromatography as well as capillary electrochromatography. Chapter 3 is focused on the analytical and preparative liquid chromatographic applications of the polysaccharide phases. Chapters 6 and 7 cover simulated moving bed chromatography with the first chapter more focused on the theoretical models while the second chapter details case studies.

All in all, the book presents a nice mix of background and practical information. As advertised, the book is “completely revised and updated”. There is certainly enough new material in it to justify its acquisition even if the earlier editions are already in-house.

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N-Heterocyclic Carbenes in Transition Metal Catalysis. Topics in Organometallic Chemistry 21. Edited by Frank Glorius (Philipps-Universität Marburg, Germany). Springer: Berlin, Heidelberg, New York. 2007. xii + 232 pp. $199.00. ISBN 978-3-540-36929-5.

This book is a review of *N*-heterocyclic carbene ligands (NHCs), their preparation, and use in transition metal catalysis. It is divided into seven chapters, each of which is written by an expert on that particular topic, which is reflected in the thoroughness of coverage. This book should serve as an excellent starting point for those wishing to enter the field, as well as a superb reference book for those already there.

The first chapter, written by Glorius, provides not only an outline of the book but also a concise, well-referenced introduction for readers unfamiliar with NHCs. A brief history of these interesting carbenes is given, in which Glorius highlights the discovery of these unique ligands and discusses their distinction from the analogous reactive non-heteroatom-substituted carbenes. A discussion of the fundamental structural properties of NHCs is followed by a summary of the advantages of these ligands in terms of their stability, electronics, and sterics, and then a brief discussion of the different classes within this ligand set—mostly ring sizes, but also bi- and multidentate ligands. Overall, this is an excellent starting point for all newcomers, including new graduate students. Most importantly, this chapter serves as an all-encompassing introduction for the rest of the book, so that the authors of succeeding chapters need not repeat the basics.

The remaining chapters include discussions of oxidation chemistry, Pd-catalyzed reactions, synthetic routes to NHCs, chiral NHCs as stereodirecting ligands, reactions not involving palladium or ruthenium, and ruthenium-catalyzed olefin metathesis. Although the order in which these chapters are presented is questionable—perhaps the chapter on “other metals” could have appeared last or, at least, after the chapters on palladium and ruthenium—they are all extremely well written and provide a sufficient number of figures, up-to-date references, and excellent summaries of the work done in each particular field.

The main developments in catalysis that have been made with NHCs are generally not new transformations but rather are improvements of already well-known reactions by allowing activation of difficult substrates, use of milder conditions, or broadening of scope. This is the focus of these chapters, which highlight these achievements in favor of simply listing the many reactions that transition metal complexes of NHCs are capable of effecting. The chapters covering oxidation reactions, palladium-catalyzed reactions, and olefin metathesis are each organized very well and extensively referenced, making them easy-to-read, relevant introductions to these topics. In some cases, comparisons of NHC-based catalysts to catalysts bearing other ligands would have been helpful to understand the true impact of these ligands on the field of catalysis. However, this is a relatively accurate reflection of the primary literature where comparisons of catalytic activity between NHCs and other ligand classes are not always performed. The chapters on the synthesis of NHCs, reactions with metals other than Pd and Ru, and the chapter on enantioselective catalysis with NHCs not only were interesting and well written, but also provided welcome perspectives on the opportunities for expansion that are still present in this rapidly growing field.

This is the first volume in the *Topics in Organometallic Chemistry* series on this subject. Given the amount of research involving NHCs in catalysis and the expanding uses of transition metal complexes of NHCs, one can only expect more books on this topic to follow. This volume is an excellent starting point.

Any references missing in it are simply the result of a rapidly evolving, prolific research area in modern chemistry.

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Hydrogen-Transfer Reactions, Volumes 1−4. Edited by James T. Hynes (University of Colorado, Boulder and École Normale Supérieure, Paris), Judith P. Klinman (University of California, Berkeley), Hans-Heinrich Limbach (Freie Universität Berlin), Richard L. Schowen (University of Kansas). Wiley-VCH Verlag GmbH & Co. KGaA: Weinheim, Germany. 2007. 1603 pp. $650.00. ISBN 978-3-527-30777-7.

Hydrogen is the smallest atom and perhaps the simplest element. One might thereby expect hydrogen transfer to be the simplest of all chemical reactions. However, it is not simple because its dynamics are not classical but instead require a quantum-mechanical treatment that takes tunneling into account. Moreover, the motions of the hydrogen are complicated by coupling to the motions of other nuclei. Also, hydrogen transfer often occurs via hydrogen-bonded intermediates and transition states; thus, it is necessary to understand hydrogen bonds, which are weak and have important implications for structure, especially in biomolecules.

Hydrogen-Transfer Reactions is a compilation of many articles written by a well-chosen group of eminent authors. The reviews are truly comprehensive and do not cover only the authors' own results. There are many graphs, tables, and molecular structures for clarification and specificity. This four-volume set is an immense work that is daunting to review. Because I cannot claim expertise in all areas, I have focused on some of my favorite topics. Regretfully I must neglect some topics and authors, whose forgiveness I beg.

In general, the emphasis is primarily on the theory of hydrogen-transfer reactions and the experimental observations and conclusions of the authors, with gratifyingly little detail of experimental techniques, which can be quite specialized. The presentations develop many interconnections among topics, but there are no cross-references from one chapter to another. This is a worthy companion to *Isotope Effects in Chemistry and Biology*, edited by Kohen and Limbach, CRC Press, 2006.

The set begins with a foreword by Zewail and includes prefaces to the individual volumes by various editors. Nearly all the chapters open with a very helpful introductory page or two that defines the scope of the topic. Volumes 1 and 2 cover physical and chemical aspects of hydrogen-transfer reactions, beginning with several articles on coherent proton tunneling in a small number of paradigmatic species, e.g., malondialdehyde, tropolone, carboxylic acid dimers, bihalide ions, and $H_5O_2^+$, studied primarily by high-resolution infrared spectroscopy. A discussion of proton transfer from alkane radical cations to alkanes in solid matrices is more relevant for the information provided regarding product structures than for the proton-transfer process. I especially appreciated a long chapter by Limbach on single and multiple proton transfers in a wide variety of species in condensed media, with attention to potential-energy surfaces, isotope effects, and the role of tunneling, along with a companion chapter by Waluk on tautomerization in porphycenes, and another by Vener on strong hydrogen bonds in crystals, studied by infrared spectroscopy, inelastic neutron scattering, and computation. A chapter by Smedarchina et al. develops the theory of multiple proton transfers, including the possibility of tunneling. It should be noted that proton refers only to ^{1}H, whereas the proper term, independent of isotope, is hydron, but these volumes, and I too, employ the synecdoche.

Fast proton transfer from excited states of naphthols in cyclodextrins and in protic and aprotic solvents is described in several chapters, especially the ones by Pines and Pines on methods for measuring excited-state acidities, by Tolbert and Solntsev on the question of what makes a superacid, and by Nibbering and Pines on the influence of diffusion on the reaction dynamics. Kiefer and Hynes also give a theoretical interpretation of the energetics of the proton-transfer process and the implications for kinetic isotope effects. The theory of proton-coupled electron transfers, with equations and interpretation of experimental examples, is presented by Hammes-Schiffer, whereas Hodgkiss et al. discuss hydrogen-atom transfer, chiefly from aromatic radical cations to transition metal complexes, in terms of proton-coupled electron transfers. A different theoretical approach to a wide variety of hydrogen transfers, using variational transition-state theory, is provided by Truhlar and Garrett, and in another chapter, Ingold presents experimental examples of radical reactions where hydrogen atoms tunnel, including evidence from isotope effects on EPR line broadening in ROCHR′ radicals. In other articles, Williams develops the relationship between rate constants and equilibrium constants for proton transfer, and Koch provides kinetic data for proton transfers from carbon acids to alkoxide anions, to compare with the thermodynamic data. The unusual features of hydrogen and dihydrogen exchange in η^2-H_2 complexes of metals, studied primarily by NMR, are discussed in two separate chapters by Kubas and by Buntkowsky and Limbach. Proton transfers in fuel cells, in solids (zeolites, ice, metals), and on surfaces, which are of more interest for applications, are also discussed in several other chapters.

Volumes 3 and 4 may be of wider interest, because they focus on the biological aspects of hydrogen transfers. An insightful chapter by Amyes and Richard covers proton transfers to and from carbon in model reactions, with particular attention to the relation between rates and equilibria as well as the role of catalysis. Considerations of intramolecular general acid/base catalysis are further elaborated by Kirby. Articles by Schöneich on hydrogen atom transfers in model radicals and by Schowen on hydride transfers then extend the topic beyond proton transfers. The latter also considers the proximity effect and the general topic of the use of model reactions for understanding enzymatic catalysis. In another article, Baltzer discusses progress in designing polypeptides to catalyze such reactions as decarboxylation, transamination, and hydrolysis of carboxylic esters, whose mechanisms involve hydrogen transfer. Although considerable attention is paid to ester hydrolyses throughout these two volumes, I would judge that insufficient attention is paid to phosphate ester hydrolysis and mechanisms involving nucleic acids.

Gerlt explores the role of hydrogen bonding in stabilizing high-energy enolate intermediates in enzyme-catalyzed reactions and concludes that there is no special stabilization associated with "low-barrier" or "short, strong" hydrogen bonds between donors of matched basicity, but that the hydrogen-bond strength is enhanced by the aprotic environment of the enzyme active site, although he ignores my evidence against his earlier theory. Spies and Toney review mechanisms of epimerases and racemases, which occur via multiple proton transfers. Braun-Sand et al. describe some conclusions obtained from computer simulations of proton transfers in proteins. Schwartz develops the theory of promoting vibrations that facilitate hydrogen transfer and their influence on kinetic isotope effects, chiefly in dehydrogenases. Knapp et al. provide an excellent development of the topic of kinetic isotope effects and of the role of quantum-mechanical tunneling, along with several illustrative examples of hydride and hydrogen-atom transfers. Chapters by Huskey, by Kohen, and by Basran et al. show how primary and secondary isotope effects when comparing protium, deuterium, and tritium, including the temperature dependence, can reveal tunneling.

In a chapter by Lee et al., methods for measuring hydrogen exchange in proteins and the application to studies of protein conformations and dynamics are described. Further articles cover dehydrogenases, dihydrofolate reductase, hydrolases, and enzymes that use thiamin diphosphate or coenzyme B_{12} as a cofactor. An article by Gutman and Nachliel addresses proton transfer at the protein/water interface, which is important for generating a pH gradient in mitochondria and chloroplasts, but the examples are of proton dynamics at the surface of proteins.

There is no author index, only a subject index, which is too concise and without sufficient subheadings, forcing the reader to consult many pages in order to find the one covering the specific aspect of the topic of interest. The references are reasonably up-to-date, but there are few after 2003.

In summary, this is a comprehensive, reasonably up-to-date reference on the theory and applications of hydrogen-transfer reactions, written by a host of highly respected experts in the field. We owe a debt of gratitude to the editors and authors for producing these volumes addressing this important topic. Individual purchases may be precluded by the cost, but these four volumes ought to be in the library of every institution at the forefront of scientific research.

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HPLC for Pharmaceutical Scientists. Edited by Yuri Kazakevich (Seton Hall University, South Orange, NJ) and Rosario LoBrutto (Novartis Pharmaceuticals, East Hanover, NJ). John Wiley & Sons, Inc.: Hoboken, NJ. 2007. xxvi + 1104 pp. $175.00. ISBN 0-471-68162-8.

This is a very useful, very large, and practical text on the applications and utility of HPLC in the pharmaceutical and biotechnology industries. Its editors have many years of experience with HPLC, with Kazakevich teaching it at the academic level and LoBrutto applying it in industry. Together, they bring their expertise in the area to cover the fundamentals, theory, and applications of HPLC for pharmaceutical scientists.

There are 25 contributors and 22 chapters, which are broken down into three parts, the first of which covers the fundamentals and theory of HPLC and then the different modes most commonly practiced in the pharmaceutical industry, e.g., normal phase, reversed phase, size exclusion, etc. A chapter on LC/MS, perhaps the most important use of HPLC at the analytical level, and its application to small molecules follows. There are also chapters on method development, method validation, and computer/software-assisted HPLC and knowledge management, which make this text different from others on HPLC where such topics are not usually covered.

Part II is devoted to specific uses of HPLC in the pharmaceutical industry, such as the roles of HPLC in drug discovery, preformulation, process development, developing formulations, and technical transfer and manufacturing. The role of LC/MS in pharmacokinetics and drug metabolism is also covered.

Finally, hyphenated techniques and specialized HPLC separations are covered in Part III. This last section includes discussion of the following topics: development of fast HPLC methods, temperature as a variable in pharmaceutical applications, LC/MS analysis of proteins and peptides in drug discovery, an overview of LC/NMR and pharmaceutical applications, preparative HPLC for pharmaceuticals, and, finally, chiral separations.

I was personally somewhat disappointed that the book did not devote more space and attention to the HPLC of larger molecules and applications involving biotech products. There is some discussion of HPLC of proteins and peptides but almost nothing on nucleic acids or carbohydrates and antibodies, although these are important areas in the practice of HPLC for biotechnology researchers. My main criticism of the overall text is that 90% of the material is devoted to small-molecule pharmaceuticals at a time when the biotech industry is booming throughout the world. Perhaps the next edition could introduce a third editor from this sector with experience, expertise, and familiarity with HPLC for biotech products.

The chapters are written by a potpourri of authors, whose writing styles and command of English vary. Although the editors are to be commended for selecting acknowledged experts in the areas covered, the book could have been improved by more thorough oversight of language and style. Still, the chapters flow very nicely from one to the next, and together they make a very cohesive and comprehensive volume, one that is well-rounded and pleasing overall. The total is indeed more than the sum of its parts.

The book is too long to digest in a few sittings and is not a simple text for any first course in instrumental analysis or analytical separations. Rather it would be most useful for practitioners of HPLC in the pharmaceutical/biotech industries or perhaps for those being trained for employment in such industries, such as part of an upper-level or graduate course in analytical separations.

In conclusion, I found the book extremely useful and quite extensive in its coverage of the subject matter. The authors are clearly knowledgeable, and they have written excellent overviews of each subject area, with very extensive, up-to-date literature coverage and citations. I highly recommend the book to those involved in or expecting to become involved with HPLC for the pharmaceutical and/or biotech industries.

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Flavins: Photochemistry and Photobiology. Comprehensive Series in Photochemical and Photobiological Sciences. Edited by Eduardo Silva and Ana M. Edwards (P. Universidad Catolica de Chile, Santiago). Royal Society of Chemistry: Cambridge. 2006. x + 328 pp. $329.00. ISBN 0-85404-331-4.

This volume contains 12 chapters that deal in a comprehensive fashion with a wide range of topics related to the photochemistry and photobiology of flavins. An introduction to the biochemical and photochemical properties of flavins is provided in the first two chapters. The photochemistry of flavins in industrial and medical applications is presented in Chapters 3−5. The biological toxicity of flavins induced by light is covered in Chapters 6 and 7, and the biological relevance of flavin-containing enzymes and proteins in DNA repair and light-sensing processes in bacteria, plants, algae, and fungi is illustrated in the last five chapters. Coverage of the literature is up-to-date and focuses on the many exciting advances that the field has witnessed mostly in the past decade.

The general properties of flavins are summarized in the first chapter by Edwards, with ample use of material from previous review articles published on flavins and flavoproteins. Although the lack of novel material may be a disappointment to someone who is adept in the field, this chapter provides an excellent and concise summary of the general properties and classification of flavoproteins, thus serving as a good introduction to the photochemistry and photobiology of flavins for those scientists who are interested in gaining basic knowledge in this area of research. In Chapter 2, Ahmad and Vaid focus on the spectral and photophysical properties of flavins and present the latest developments on photoreduction and photoaddition reactions of flavins. A comprehensive summary of the most recent literature on flavin-sensitized photoreactions completes this chapter. Encinas and Previtali discuss in Chapter 3 the application of the interaction of the excited states of flavins with amines in vinyl polymerization. The recent advances on the kinetic and mechanistic behaviors of riboflavin-promoted photooxygenation reactions of sympathomimetic and ophthalmic drugs are presented by Garcia et al. in Chapter 4, and a commercial application of the antiviral and antibacterial properties of photoactivated riboflavin to transfusion medicine and blood safety is illustrated by Goodrich et al. in Chapter 5. Although, in principle, the topic of the latter chapter is of significant interest, it is presented more like an advertisement for a biotechnological process than as a purely scientific endeavor, leaving the reader perplexed as to whether the chapter fits well with the rest of the book. Nonetheless, the medical relevance of the process that is described is of interest. The toxic effects of riboflavin as a photochemical sensitizer on DNA, lipids, amino acids, and proteins, as well as the cell toxicity and apoptotic behavior on tumor cells of photoactivated riboflavin, are nicely illustrated in Chapter 6 by Edwards. Chapter 7 by Silva and Quina presents a new study on the photoinduced processes in the eye lens. A comprehensive review of the current available knowledge on blue light-initiated DNA repair by photolyases is presented by Kay et al. in Chapter 8. This chapter extensively covers the spectral properties and structures, as well as substrate binding and mechanistic properties of the different classes of photolyases, with particular attention to the most recent advances using biophysical and biochemical tools. The next chapter by Briggs on the flavin-containing photoreceptors in plants, i.e., cryptochromes, phototropins, and members of the ZTL/ADO family, thoroughly and effectively covers the enormous progress in our understanding of the biochemistry and photochemistry of these proteins that has accumulated in the past decade. The chapter concludes with a review of LOV domain-containing proteins in bacteria and fungi, a topic that is fully expanded in the following chapter by Losi. Here, she nicely presents a detailed analysis of prokaryotic LOV and BLUFF proteins and domains and their photochemical reactions and provides an exhaustive review of bacterial LOV protein families. She concludes the chapter with a comprehensive summary of the light-triggered responses observed in bacteria, their possible links to flavin-containing photosensors, and the use of prokaryotic flavin-containing photosensing proteins for addressing important questions pertaining to the evolutionary aspects of both prokaryotic and eukaryotic photoreceptors. In Chapter 11, Iseki et al. present a nice account of a novel FAD-containing photoactivated adenylyl cyclase recently identified in the unicellular flagellate *Euglena gracilis*. The final chapter by Kennis and Alexandre is a detailed review of the mechanisms of light activation in flavin-containing photoreceptors, with particular focus given to the recent advances on the three-dimensional structures, as well as the steady-state and pre-steady-state spectroscopy and photocycles of LOV and BLUFF domains. An extensive subject index completes the volume.

In conclusion, this book is an extremely useful resource that summarizes current knowledge of the photochemistry and photobiology of flavins and flavin-containing proteins. It should be an essential part of the collection of any comprehensive chemistry or biology library and would certainly serve as an essential and updated reference for scientists interested in this topic. The timely coverage of the recent literature, as well as the several unanswered questions that are presented throughout the volume, should inspire many researchers to further explore the exciting field of flavin photochemistry and photobiology.

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