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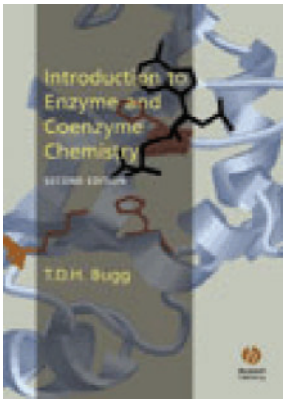
*Chris Whiteley**



Introduction to Enzyme and Coenzyme Chemistry

by T. D. H. Bugg
Blackwell Publishing
2004, 244 pp
ISBN 1-405-11452-5
Softcover, $US75

This second edition of *Introduction to Enzyme and Coenzyme Chemistry* by Tim Bugg is once again very well organized, easy to read, and has adequate drawings and figures. The arrangements of the chapters and their contents remain similar to the first edition with a notable inclusion of a chapter discussing 'Radicals in Enzyme Catalysis'.

Chapter 1 introduces the reader to coenzymes and vitamins, while chapter 2 summarizes the necessary understanding of the primary, secondary, and tertiary structures of polypeptides with specific reference to enzyme structure/function and protein biosynthesis. The fundamental rules for enzymatic catalysis are covered in chapter 3, with an extra section on protein dynamics, and chapter 4 offers the reader an overview on the methods for studying enzymatic reactions from the point of view of purification, enzyme kinetics and mechanisms, stereochemistry, and active-site catalytic groups. A small paragraph on proton tunnelling is included here. Chapters 5 through 10 deal with enzymatic reactions for hydrolases (including peptidases, esterases, lipases), transferases, dehydrogenases, oxygenases, hydratases and dehydratases, lyases, carbon–carbon bond forming reactions, and isomerases. Sadly, however, there are still no examples of decarboxylyases, which I commented on in reviewing the first edition (1997). After a brief introduction to each section, the author addresses the detailed enzymatic mechanism based upon the principles of an organic chemist, and in my opinion this is an excellent way to illustrate complicated enzymatic reactions. With each biochemical reaction the author has successfully interwoven the mechanistic role played by the relevant coenzyme. A delightful supplement to each chapter is the presentation of a case study where the enzymatic reaction under discussion is supported by well known examples. As Bugg suggests in the introduction to chapter 11 '…a series of remarkable discoveries in this area [of radical chemistry] have occurred since 1990'. Consequently this chapter is a worthwhile inclusion in the book, covering topics like vitamin B_{12} rearrangements, *S*-adenosyl methionine and sulfur insertion reactions, and 'quinoproteins' that are oxidases and dehydrogenases containing an *ortho*-quinone aromatic ring. The final chapter introduces non-enzymatic biological catalysts such as RNA, catalytic antibodies, and artificial synthetic enzymes. Each chapter is adequately covered by problems and exercises that may be used as 'self-tests' or by an instructor, along with 'further reading' and references. It is pleasing to note that since the first edition of the book new references appear for certain sections, ensuring the reader is kept up to date with the literature.

The author has managed to collate a vast amount of information and present it in an orderly, succinct manner. In the preface to the book, Bugg indicates that for this second edition he wanted to improve the figures. In the first edition only a set of colour plates was used while with the second edition a two-colour picture, drawn using the software *Rasmol* has tried to convey the views. Relevant sections of the 'views' are in red and black with the background polypeptide in shades of grey. There are 40 of these computer drawings interspersed throughout the book, supporting and enhancing the written descriptions of the enzyme mechanisms. Anyone who is familiar with Roger Sayle's (GlaxoSmithKline) *Rasmol* will know of the hot-pink colour of an α-helix and the golden yellow of a β-strand under the cartoon depictions. Including such colours may have priced the book out of the market, especially for the student pocket, but I feel they would have offered more glamour and relevance to the purpose of the book. It is, perhaps, ironic that the first edition's use of two colours for text and drawings (red and black) with red to illustrate pertinent atoms of interest is in ready abundance yet they are kept to a minimum in the second edition. Nevertheless the computer drawings are a great and welcomed asset to the book. I feel it will not be long before text books such as this one will include ancillaries such as CDs to enable students or researchers to 'view' enzyme structures and mechanisms in three-dimensions on any desk computer.

This book will please not only biological science students but those in the veterinary, medical, and organic chemistry fields as well. There is always a challenge to present and teach biochemistry to both undergraduates and postgraduates from a bio-organic perspective and Bugg has adequately portrayed this concept in his book. It is well worth considering, and can serve as an inspiration to many teachers of the subject.

**Chris Whiteley is Professor of Biochemistry at Rhodes University, South Africa. He was educated at the University of Natal (M.Sc. 1971, Ph.D. 1976) then accepted a postdoctoral fellowship at the University of Calgary. He joined Rhodes in 1979. He is the secretary of the SA Neuroscience Society and responsible for initiating biochemistry at Rhodes.*

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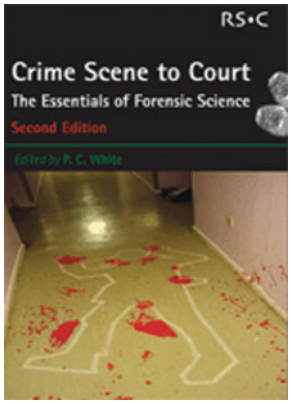
*Simon W. Lewis**



Crime Scene to Court The Essentials of Forensic Science

Edited by P. C. White
Royal Society of Chemistry
2004, 452 pp
ISBN 0-85404-656-9
Softcover, £28

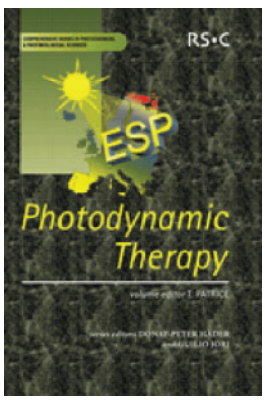
There has been a vast increase in interest in forensic science, both from the public and in education since the first (1998) edition of this book. The original purpose of the book was to give a relatively non-technical overview of forensic science for a wide range of readers including students, police, legal professionals, and the general public. This intent has been continued in this second edition, leading to a concise, well-written, single volume treatment of forensic science.

This new edition follows the pattern of the earlier edition, in which the first section gives an overview of forensic science, predominately from a UK perspective, the second concerns the crime scene, and the last the presentation of expert forensic evidence in court. In between come chapters on various forensic disciplines; new in this edition are those on 'Computer-Based Media' and 'Bloodstain Pattern Analysis'. Individually, the chapters are well written, however in common with other edited multiauthor texts there is variability in style and some repetition. This is most obvious when dealing with the knotty issue of quality assurance, which could probably have done with a separate chapter considering its importance in modern forensic science. Another topic notable by its absence is that of forensic medicine, admittedly this would be a huge subject to deal with. Considering the large mythology that has built up around this particular area however, I feel a short chapter on forensic medicine, concentrating on where it interacts and overlaps with the other forensic disciplines (for example forensic toxicology), would have been useful. The original chapters have also been revised to bring them up to date, however some of this revision is patchy. For example in chapter 4 'Marks and Impressions', mention is made of the British system of fingerprint comparison being based on the sixteen points of comparison rule, when in fact Britain changed to a non-numeric standard in 2001.

These criticisms apart, this is an excellent introductory text to forensic science. While it is concerned with UK practice the chapters are general enough to still be useful to an international readership. As the author intended, it is suitable for a wide range of interested parties, and while forensic science undergraduates may find it lacking in technical detail, it is certainly a good starting point. Highly recommended.

**Simon Lewis is associate professor of chemistry and forensic science at Deakin University, Geelong. His research interestes include chemiluminence and the application of chemical methods to forensic analysis.*

*A. David Ward and Prudence Cowled**



Photodynamic Therapy

Edited by Thierry Patrice
RSC, Cambridge
2004, 284 pp
ISBN 0-85404-306-3
Hardcover, £150

Photodynamic therapy (PDT) is a relatively new treatment for cancers and other medical conditions that is still in its developmental phase. The current interest in this new approach to the treatment of some cancers started approximately thirty years ago with the pioneering work of Tom Dougherty at the Roswell Park Memorial Cancer Institute (Buffalo, USA), but the ability of porphyrins absorbed by living systems to interact with light has been known for nearly 100 years.

This volume is the second in a series of monographs on photochemistry and photobiology commissioned by the European Society for Photobiology. It consists of 13 chapters provided by groups of authors with Thierry Patrice as the editor. The volume will be of interest to those with a research or medical interest in the treatment of cancer and other medical conditions by photoactivated drugs that act through the generation of singlet oxygen.

As is often the case with this type of publication there is some overlap of topics and some gaps in the coverage. The chapters reflect the research or medical interests of the authors rather than providing an overview of the whole topic. The first chapter outlines the history of PDT and provides an interesting account of the very early days of PDT before the 'pioneering work of Dougherty', which is dismissed in seven lines on the grounds that this history is well known. There is no overview of the various books (in the form of published

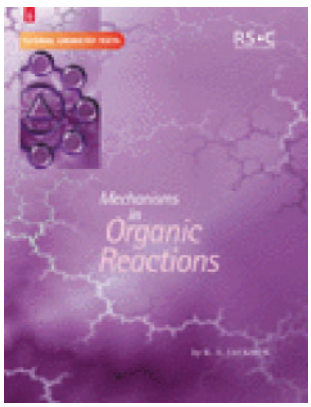
conference reports) describing initial chemical, biochemical, and medical studies with Photofrin and other porphyrins and related compounds. This chapter only lists five publications by Dougherty but 27 (out of 91) of the references are publications by the principal author. Given that Photofrin was the first drug approved for use, with PDT, for the treatment of cancers it is disappointing for chemically trained readers that so little mention is made of the chemical complexity of Photofrin and of the variation of anticancer activity of its components.

Apart from a chapter on technologies and biophysical techniques for PDT, which discusses the light sources, delivery devices, and the problems associated with light distribution, there are very few references to publications from 2001 and onwards. For this reason there is no mention of the book by Ray Bonnett on PDT that was published in 2000, nor of the 2003 review of the topic in *Scientific American*. Chemists will find Bonnett's book of more interest as he describes the chemical complexity of Photofrin in much more detail.

Overlap is particularly evident in the area of the medical use of ALA and the mechanism by which ALA is converted in living systems to protoporphyrin, which is covered in its own chapter as well as being part of two others. Although it is mentioned in several places that Photofrin has been used for the treatment of cancers such as lung cancer and bladder cancer, there is no review of its efficacy in these areas nor any mention of the difficulties that have been experienced with these early efforts with PDT for the treatment of cancer. There is an extensive review of the use of PDT for the treatment of brain tumors with a comprehensive summary of the results to date. Other medically oriented chapters cover areas involving the use of PDT for antiangiogenic therapy, for the early detection of lung cancer, and, separately, for diagnosis in dermatology using the fluorescence properties of the porphyrin molecules, clinical applications in gynecology and the use of PDT for treatment of the gastrointestinal tract. The final chapter is a balanced overview of the factors that need to be considered for the establishment and spread of PDT. All of the authors of these medically oriented chapters are positive and enthusiastic about the medical uses of PDT. As Patrice puts it at the end of the final chapter 'I am fully convinced that PDT is a major medical technology of the future, despite the difficulties that it faces!'

**David Ward is a Visiting Research Fellow (and former Head of Department) in the School of Chemistry and Physics, University of Adelaide. Prudence Cowled is a Principal Medical Scientist in the Department of Surgery, University of Adelaide. Both were extensively involved in the early period (1980–1990) of the development of PDT for the treatment of cancers using Photofrin.*

*Forrest E. Michael**



Mechanisms in Organic Reactions

by Richard A. Jackson
RSC, Cambridge
2004, 194 pp
ISBN 0-85404-642-9
Softcover, £15

Learning organic chemistry without understanding the fundamental mechanisms by which organic reactions take place is like trying to build a car without understanding how it works; it can be done, but it is far more difficult. Mechanistic organic chemistry is the basis of our ability to design and control reactivity. It is an indispensable part of any chemistry curriculum because it provides a logical framework for understanding and organizing the vast amounts of information inherent to organic chemistry.

Mechanisms in Organic Reactions is a summary of mechanistic organic chemistry intended for undergraduates. It is part of a series of short texts, each covering a single topic in chemistry. There are currently 22 books offered in the series, and each is constrained to have fewer than 200 pages. This format keeps the costs of individual books in the series fairly low and allows instructors to choose which texts are relevant for a particular course. The flexibility of this system is potentially advantageous, but may lead to confusion if the material in the various texts is not well coordinated.

This book begins with an introduction to the concept of a mechanism and guidelines for proposing potential mechanisms. Chapters 2 and 3 then discuss the major techniques for determining mechanisms (kinetics, Hammett correlations, isotope studies, etc.). Chapters 4–6 discuss the three major types of organic intermediates—anions, radicals, cations—and their reactions (carbenes receive only a brief mention). Finally, the book concludes with a discussion of concerted reactions. This organization is similar to classic texts on mechanistic organic chemistry, such as Lowry and Richardson, but condensed to fit into 200 pages.

Several strategies for enhancing the educational quality of the book are successfully employed. The summaries at the beginning and end of each chapter are useful for focussing the reader's attention on the most important concepts of each chapter. The exercises in each chapter, especially those solved in the text, provide good illustrations of how to apply these concepts.

The primary strength of this text is the author's knowledge of classical physical organic chemistry and radical chemistry. The writing is especially clear and informative in the

discussions of the Hammond postulate and Hammett correlations in Chapter 3 and the chapter on radical chemistry. Not surprisingly, these topics are also covered in more detail and at a more advanced level than the rest of the book. These sections are suitable for an advanced course on physical organic or radical chemistry.

The author struggles to establish a target audience. It is unclear whether the book is intended for beginners in organic chemistry or for a more advanced course in physical organic chemistry. It appears that an attempt has been made to do both. For instance, the book begins with a very basic discussion of Lewis structures and formal charges that is simply a review of general chemistry. The discussion of acidity in Chapter 4 is similarly basic. On the other hand, the brief discussion of stereochemistry would be difficult for a student to understand without prior introduction to the concept, and it is expected that the reader already has a good understanding of NMR spectroscopy.

The organization is problematic for a beginning organic chemistry course. By not introducing the common reactive intermediates until halfway through the book, it becomes necessary to discuss related concepts in multiple places throughout the text. The establishment of a logical procedure for how to propose reasonable mechanisms at the very beginning of the book is well thought out, but it is difficult to discuss how to assess the relative likelihood of the proposed mechanisms until some of the typical reactions of cations, radicals, and anions are discussed in Chapters 4–6. In the section on how Arrhenius parameters can be used to judge potential mechanisms, an argument based on estimated bond dissociation energies is used even though these are never formally introduced.

The text has other minor problems. The use of equation numbers as subscripts for the rate constants (e.g. $k_{2.20}$) is confusing. Several errors were distracting: the Hammond postulate was misidentified as the Hammett postulate in a figure caption, and the discussion of the epoxidation of alkenes with peracids incorrectly depicts a dihydroxylation. Despite the descriptive power of frontier molecular orbital theory in explaining organic reactivity, molecular orbitals are not introduced until the last chapter.

Unfortunately, by trying to be too many things to too many people, this book is not an ideal reference for any level. Some sections are far too advanced for beginning organic chemistry but others are too simple for an advanced course. The content of the book is strong in parts, but the organization is problematic and the text is too compressed to be a primary reference for all but the shortest of courses. Overall, this text would work best as a supplement to a more basic textbook on organic chemistry for beginning students or as one of many references for an advanced mechanisms course.

**Forrest Michael graduated in 2001 from Harvard University and completed a post-doctoral fellowship at the University of California, Berkeley. He was appointed Assistant Professor at the University of Washington in 2004. His research interests include organic methods development and mechanisms of organic and organometallic reactions.*