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Book review

***New Trends in Enzyme Catalysis and Biomimetic Chemical Reactions*, G.I. Likhtenshtein, Kluwer Academic Publishers, Dordrecht/Boston/London, 2003, pp x+230; ISBN 1-4020-1006-0, Euro 131.00; USD 125.00; GBP 84.00**

The completion of an increasing number of genome sequences and the emergence of proteomics herald a renaissance in enzymology and related chemistry. The further integration of biology with chemistry, biophysics and mathematics must continue apace if, in this post-genomic era, we are to exploit the remarkable advances that molecular biology has made in the 50 years since Watson & Crick published their seminal paper on DNA structure. This book, by a distinguished biophysicist, clearly shows how the application of physico-chemical concepts is essential to understanding how proteins function, particularly the basis of the enormous rate-enhancements and substrate-specificity effected by enzymes. Policy makers would do well to browse this book to understand how the decline in physics, chemistry and mathematics, at least in Europe, is already compromising progress in solving the biological problems that currently concern society.

Chapter 1 comprehensively reviews the range of advanced time-resolved spectroscopic techniques for determining structure-function relationships of proteins. The section on the use of multi-dimensional and pulsed electron spin resonance applied to proteins is particularly informative and well referenced. The section on mass spectrometry is disappointing, considering the major impact this technique is having in biology in proteomics and metabolomics and the pace of instrument development.

Chapter 2 gives a good theoretical coverage of electron and proton transfer mechanisms with appropriate examples focusing on kinetic isotope effects. Current theories of the origin of rate-enhancement such as stabilisation of transition states, substrate channelling and concerted processes are eruditely discussed. The short section on free radical mechanisms is disappointing, not least because of the difficult chemistry these enzymes catalyse, the dangers to living cells that side reactions pose and the role of free radicals in cell signalling and apoptosis. However, Chapter 3 does return to this topic with up-to-date reviews of the mechanisms of P-450, methane monooxygenase, nitric oxide synthase and photosynthesis that are thought to involve free-radical intermediates.

Chapter 4 considers generic concepts and experimental approaches focusing on protein dynamics. This is an important, impressive section of the book, deriving in part from the Russian strengths in mathematics and computational analysis. The view that E-science will play a major role in biology over the next decade can be appreciated after reading this chapter.

The two final chapters give brief overviews of catalytic antibodies, bio-transformations, and the potential for redesigning enzymes by site-directed mutagenesis and domain swopping. The insights into enzyme mechanisms that chemical model systems can provide is restricted to nitrogenase, P-450, methane monooxygenase and water splitting and reflect in the main the author's and his colleagues' research interests.

I estimate that the book has over a thousand references and it will be a valuable addition to research laboratories and libraries. The content is very good but the proof reading of the text and quality of the figures is poor by modern standards.

A whole generation of scientists have been engaged in molecular biology. They have made tremendous advances but the days of the 'gene jockies' are numbered and this book is an excellent place to start for those who now wish to move on to understanding how the gene products, the proteins, actually work.

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