topics covered in this chapter might easily constitute a text alone, an extensive list of review articles is provided at the end of the chapter for further reading.

The separation of chapters 3–5 based on three reaction types is logical, and is clearly connected to considerations detailed in Chapter 2. The authors have resisted the temptation to review, choosing instead to cite case studies which collectively demonstrate the scope of reactions studied to date. Elaboration is left to the reader with recent reviews cited at the end of each chapter.

The final chapter is chronologically a continuation of Chapter 1, and outlines industrial biocatalytic processes in use today for the production of amino acids, steroids, vitamins, antibiotics, and fine chemicals. The authors also have included recent developments which tend to lie outside the traditional fermentation arena, such as the production of acrylamide, chiral intermediates such as (*S*)-2-chloropropionic acid, biopolymers (e.g. polyesters), and complex polysaccharides. A promising new direction in the field, the application of enzymes outside normal operating ranges of temperature, pH, and aqueous reaction media is addressed briefly. The chapter finishes with a description of the Genentech process for ascorbic acid, a unique example of how metabolic and genetic engineering tools are combined to prepare a biocatalyst.

This book would lend itself well both as an introductory textbook and as a teaching resource. Bibliographies at the end of each chapter allow expansion of particular topics. It is particularly satisfying to see a balanced treatment of both whole cell biocatalysis (biotransformation) and enzyme catalyzed synthesis based on commercially available enzymes in a single text. Too often, earlier texts and reviews have treated these research areas separately to target a particular audience. The authors have also been careful to note the potential for cleaner chemical processes, but have not oversold the 'green' aspects of biocatalysis. Some editing errors in chemical structures can be found in Chapters 3–5, but are limited to a missing bond or methylene group and do not hinder understanding of the reactions. Overall, *Introduction to Biocatalysis Using Enzymes and Micro-organisms* fills an important instructional need, providing a balanced overview of a complex field.

Paul Swanson

Protein–Solvent Interactions; Edited by Roger B. Gregory; Marcel Dekker, New York, USA, 1994; xix + 570 pp. $185.00. ISBN 0-89603-301-5.

The aim of this book could not be stated more clearly than in the editor's preface: 'Our understanding of protein–solvent interactions has ... over the last 15 years ... been marked by a number of interesting and important discoveries. The contributions in this volume present some of these advances in our understanding of structural, thermodynamic and dynamic aspects of protein–solvent interactions. It is not intended to be a comprehensive survey, but the chosen topics will give some sense of the real progress achieved and the outstanding questions that must be addressed.'

The editor's modest disclaimer is belied by the scope of the chapter titles; the book is a broad and much-needed survey of biophysical aspects of the interplay between proteins and their solvent. On the structural side, a chapter deals systematically with bound water molecules that have been located by X-ray crystallography of proteins, summarising the relevant principles that emerge from the 500 known protein crystal structures. Two chapters treat the hydration of proteins at low water:protein ratios; this topic will seem obscure to many biochemists, but in fact it gives important information about water tightly associated with the polypeptide and its side-chains, and it is therefore relevant for proteins in solution, where a tightly-bound water layer is still present on the protein's surface. Rather more specialised chapters include the study of solvent–protein-interaction by scattering of Mössbauer radiation (it is a pity that the type-setter's otherwise apparently inexhaustible stock of symbols did not include the *Umlaut*); a case study in ligand-binding kinetics (the myoglobin–CO reaction investigated by flash photolysis); and a review of the physical principles governing precipitation-based separation of proteins. Of perhaps more general interest are a chapter on the effects of solvent viscosity upon protein dynamics, which places protein dynamics in the context of modern kinetic theory; one on the influence of solvent upon protein stability and association, which attempts to demarcate the 'missing information' still needed for a statistical-mechanical description of these phenomena; a review of thermodynamic mechanisms responsible for the well-known but little-understood enthalpy/entropy compensation effect; and a review of the interaction between proteins and water containing co-solvents. Predictably, all the proteins discussed are globular, and almost all the solvent systems are aqueous: the book purports to be a state-of-the-art review, and such is the state of the art. The chapter on proteins in non-aqueous environments is by far the book's shortest.

Inevitably, a weakness of thermodynamic treatments of proteins in solution is the use of the standard state of infinite dilution, which is highly unphysiological. A chapter on thermodynamic non-ideality and protein solvation presents a well-argued case for the equivalence of classical and statistical–mechanical treatments of these topics; it is emphasized that the statistical–mechanical view is the more productive. This chapter revises some earlier misconceptions in both the classical and the statistical–mechanical treatments and may become a milestone contribution to a general re-assessment of non-ideal solutions of macromolecules.

141 of the book's 547 pages are devoted to a long chapter with the eye-catching title 'The New Paradigm for Protein Research'. This chapter, comprising > 25% of the book's length and therefore costing the purchaser some fifty bucks, argues that the way ahead for protein research is the 'knot-matrix' principle proposed by Gregory and Lumry in 1985. The discourse includes a sweeping review of physical aspects of protein structure, and the author of the chapter (Lumry) has understandably been allotted by the editor of the book (Gregory) the space to expound his views in depth. Whether these views are right, the reader and history will judge; there is certainly a case to be answered. However, the paradigm shift has yet to make a deep impression, as the index entries under 'knot' lead only to allusions by these two contributors. This chapter is occasionally marred by rhetoric ('... many older ideas [i.e. secondary structure of proteins] can now be seen to be naïve'; 'confusing biology with chemistry'), but it is a vigorously written and highly readable manifesto, and would still be recommended reading if its only virtue were the impressive breadth of protein physico-chemistry on which it draws.

This is not a book for the generalist; it presupposes fluency in thermodynamics, kinetics and spectroscopy, and the reader may occasionally inkle that Hilbert's dictum 'physics has become too difficult for physicists' is beginning to embrace biochemistry. However, the contributions, diverse as they are, are uniformly well written (this may the result of careful editorial work), and the collection will be of value to anyone with an active interest in the physical chemistry of proteins.

Paul Woolley