

livestock are discussed, because the introduction of rearranged immunoglobulin genes into livestock is a major area of research. All in all, however, the explanation of knockout and replacement technology is quite valuable for the newcomer.

The production of transgenic livestock is an exciting area, and it is handled very well in the next chapter. The current status of this field is well described, and the management of some of these larger species, even if a bit more detailed than necessary, makes entertaining reading. Obviously, the enormous cost of producing these animals is a major problem. The perfection of other methods of gene transfer, and/or of embryonic stem cell technology, would contribute significantly to the further advancement of this field, though microinjection clearly works well.

The final chapter, on 'minor transgenic systems' was perhaps included for the sake of completeness. These systems are quite disparate, and relatively little work has yet been done in many of them.

Nonetheless this information is useful because it satisfies potential curiosity and provides a reference base in the event one or more of these areas develops substantially.

Overall, this book covers a very large area of science surprisingly well. For an individual with extensive knowledge of one transgenic field but little understanding of others, it makes enjoyable reading. It also would serve as nice introductory reading for the graduate student or advanced undergraduate. Where possible the book is comprehensive, but where this is not possible, the book does not lapse into prosaic, detailed discussions of specific experiments that would inevitably lead to an imbalanced presentation. That a readable, informative book could be distilled from the mass of information available in this field is a credit to the authors and editor.

Jan. W. Gordon

**Patch-Clamp Applications and Protocols**, edited by A.A. Boulton, G.B. Baker and W. Walz, 1995. Humana Press Inc. Totowa, NJ, USA, 1995. viii + 316 pp. \$89.50. ISBN 0-89603-311-2.

Written by leading experts from around the world, this book comprehensively reviews the latest on the patch-clamp technique. Contributors offer practical advice on how to overcome the problems encountered in performing and analyzing patch-clamp experiments. Most of the different chapters provide all the information needed to set up and carry out any of the procedures without having to use other resource books.

This book can be divided into three sections. The first section summarizes some basic concepts on the fabrication and properties of patch pipets, cell-free ion channel recordings and on whole-cell patch-clamp recordings. The chapter on 'Patch-Clamp Electrode Technology' reviews, in great detail, the methods used to obtain low-noise whole-cell or single channel recordings. A particular emphasis is given to the choice of the glass used in electrode fabrication. The chapter on 'Cell-free Ion-Channel Recording' gives an excellent description of the methods and problems encountered in performing inside-out membrane patches (like problems of channel rundown and problems of diffusion to the ion channel in the patch); it also provides a list of tips and hints for performing a successful experiment.

The second section contains more specialized applications of the patch-clamp technique. There are three chapters that illustrate the use of different methods of controlling the composition and concentration of the solutions inside and outside the patch-pipet. The chapter on the perforated patch-clamp technique gives a brief but informative review on the different protocols (ATP, nystatin, amphotericin) used to

permeabilize the membrane patch. Hamill and McBride describe a novel variant of the patch-clamp technique: the pressure clamp method. This method allows the application of precise and rapid suction or pressure steps to membrane patches and whole cells and has been recently used to study mechano-gated ion channels. The chapter on the 'Loose Patch-Clamp technique' gives a useful overview on the technique, showing its unique features over other methods and pointing out possible sources of errors and artifacts. There is also a chapter devoted to the use of the patch-clamp technique on more intact preparations such as brain slices.

The last section contains protocols on the combination of patch-clamp and molecular biological techniques. The chapter on single-cell RT-PCR gives a detailed description of the technical steps involved in this procedure. The authors show that the presence of different types of mRNA (and splice variants) can be analyzed within a cell after patch-clamp recording and, in some instances, correlated with the functional properties of the cell. The chapter on receptor/ion-channel expression gives hands-on procedures on oocyte DNA or RNA microinjection, two-electrode voltage clamp and oocyte patch-clamp.

Overall, this book will be an extremely useful tool for electrophysiologists and advanced students who wish to acquire practical skills and first-hand experience in the patch-clamp technique.

Andrés F. Oberhauser

**Introduction to Biocatalysis Using Enzymes and Micro-organisms**; Edited by S.M. Roberts, N.J. Turner, A.J. Willetts and M.K. Turner, Cambridge University Press, Cambridge, 1995, xii + 197 pp. ISBN 0-521-43070-4.

This timely and comprehensive introduction to biocatalysis not only provides the reader with historical perspective and the current state of the art, but addresses issues and challenges pertinent to the practitioner. Biocatalysis has evolved as a very interdisciplinary field, encompassing microbial biochemistry, enzymology, organic chemistry, and chemical engineering. More recently, the tools of recombinant DNA technology have added significantly to the field. This development has greatly expanded the range of enzymes available for study, the ease of studying new enzymes, and the potential to engineer novel features into existing biocatalysts. Overviewing this interdisciplinary and rapidly expanding field for the non-practitioner presents a unique challenge to the authors. Furthermore, since academic and industrial practitioners bring different perspectives and focus to this field, a comprehensive treatise needs to balance contributions from these sectors. These four experienced and well known scientists have handled this challenge very well.

The text consists of six chapters divided into four sections: a historical perspective (Chapter 1); an introduction to biocatalytic systems available and how to choose them (Chapter 2); reviews of biocatalyzed reactions arranged by three general reaction types –

hydrolytic, redox, and C–X bond forming (Chapters 3–5); and industrial scale applications of biocatalysis (Chapter 6).

In their introductory chapter, the authors place the recent surge of interest in biocatalysis (since the mid 80's) in proper historical perspective as a 'reconvergence' of the fields of synthetic organic chemistry and biochemistry which had diverged earlier to pursue separate agendas. Various examples of key biochemical technology developed early in the century are highlighted, including several which integrate biotransformations and organic synthesis. The five-step Reichstein process, developed in the 1930's for the synthesis of ascorbic acid, remains today as the primary industrial process for this important vitamin.

The second chapter addresses many of the practical aspects of biocatalysis, and is geared towards the 'non-microbiologist'. Topics include enzyme classification, enzyme cofactors and cofactor recycling, criteria for choosing between a whole cell versus 'free' enzyme system, and immobilization of enzymes and cells. The authors use the well studied Baeyer–Villiger type biooxidation to outline how a biocatalyst is chosen, where microorganisms can be obtained, and how they are grown, induced, and optimized for a given biotransformation. Since