Building and design

Janet M. Thornton

Protein Engineering. Edited by Dale L. Oxender and D. Fred Fox. *Alan R. Liss: 1987. Pp.365. $36, £25.75.*

SUCCESSFUL protein engineering requires expertise in two distinct disciplines, molecular genetics and structural biophysics. A protein engineer should, at minimum, understand the basic principles of each of them. This text attempts to provide an introduction to both subjects, although it includes substantially more biophysics than genetics.

The book was conceived at a Genex–UCLA Symposium in 1985, with the aim of providing a supplement to introductory biochemical textbooks. It includes contributions from 30 laboratories, grouped into four sections. The first two describe basic methodology for structure determination, gene manipulation and protein biochemical analysis, and are followed by a section on "Energetics and Protein Design". The last section, "Purposely Modified Proteins and Their Properties", includes results of experiments on particular proteins. Each contribution is short (on average ten pages) and, to provide cohesion, overviews of each section written by eminent scientists are included. This ploy is only partially successful and the text resembles a collection of short stories rather than a novel.

The quality and level of the chapters is variable, although most are good and a few are outstanding. The methodology contributions are necessarily introductory; for example, in nine pages it is possible to describe X-ray diffraction only at a rudimentary level. There is also some repetition, especially with regard to basic structural principles and our lack of understanding of the relationship between sequence, structure and function.

The multi-author approach comes into its own when the contributors discuss results from specific protein and peptide systems. This book brings together accounts of some of the first successful experiments on modifying and designing proteins. Many of these contributions are informally and fluently written and capture some of the authors' doubts and excitement in designing novel molecules. They are complementary to the standard descriptions to be found elsewhere and provide interesting reviews for budding protein engineers and lecturers in this field. For example we are treated to an insight into the approach and problems of designing completely novel molecules, the design of 'minimal' amphiphilic peptides which retain biological activity, the detailed analyses of the contribution of specific residues to catalytic activity and attempts to increase protein stability.

This book provides only a limited introduction to the detailed methodology involved in protein engineering. However, the non-specialist will find in it a delightful assortment of some of the first and most interesting experiments performed by protein engineers. □

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Steel sidewinder — the twisted railroad tracks at Lázaro Cárdenas on Mexico's Pacific coast are a vivid scar left by the earthquake of September 1985, which killed over 9,000 people. The picture is taken from The National Geographic Society — 100 Years of Adventure and Discovery *by C.D.B. Bryan, a beautifully presented collection of photographs from the magazine's archives with accompanying commentary. The book is published in the United States by Abrams and in Britain by Phaidon.*

New light on signals and connections

David Attwell

The Retina: An Approachable Part of the Brain. By John E. Dowling. *Harvard University Press: 1987. Pp.271. $37.50, £29.95.*

THE retina has two functions: it converts light into an electrical signal in rods and cones and then it processes this signal, with four layers of neurons, before despatching it along the optic nerve to the brain. Compared to other parts of the central nervous system, the retina ought to be easy to understand. Its input signal, the visual image entering the eye, is known, and its output at the optic nerve can be measured relatively simply: the only problem is to work out what goes on in between, and why.

The Retina reviews our current understanding of 'what goes on in between', to which John Dowling and his collaborators have made major contributions over the past 25 years. The book includes an impressive and amply illustrated summary of the anatomy of retinal neurons and the synapses between them, a description of the electrical responses of the retinal cells, and chapters on synaptic pharmacology, visual adaptation and phototransduction, and the electroretinogram and glial cells. The last book of this scope devoted to the retina, R.W. Rodieck's excellent *The Vertebrate Retina,* published by W.H. Freeman in 1973, is now rather dated, so Dowling's book is sure to find a place in libraries and on researchers' shelves.

Nevertheless, I found two aspects of the book — the overall structure and the weight given to different topics — rather unsatisfying. For the intended readers (presumably graduate students), a more systematic exposition of the subject matter would have been helpful. Inadequate linking of different sections of the book, and a tendency to present retinal anatomy in great detail without any functional context, often make it difficult to find a coherent account of one topic. For example, although the shape of horizontal cells is described on page 22, and their output synapses on page 60, it is only on page 110 that the physiological significance of this anatomy and synaptic connectivity is revealed. Ganglion cell light responses are presented in two unrelated sections, which describe extracellular and intracellular recordings. Similarly, although the reader is told briefly, after 80 pages, that the photoreceptors are hyperpolarized by light, an account of how this happens is deferred to the penultimate chapter.

In the preface, Dowling states that he