

Book reviews

Microbial Genetics (Second Edition). S. R. Maloy, J. E. Cronran and D. Freifelder. Jones and Bartlett, London. 1994. Pp. 484. Price £20.95, hardback. ISBN 0 86720 248 3.

This well-known textbook, first published in 1987, appears in its second edition and is now co-authored by S. R. Maloy and J. E. Cronran following the death of David Freifelder. Like the first, this edition focuses entirely on bacteria and bacteriophages and does not deal with eukaryotic microbes. It is even admitted by the authors that in this respect the book might be more appropriately titled 'Bacterial and Phage Genetics'. However, the second edition retains the strengths of the first in terms of structure and objectives. It leads the student through the essentials of genetics and microbiology, the basic biochemistry of nucleic acids and proteins (in an accessible way), and on to in-depth descriptions of genetic systems at the molecular level. It is here that the book comes into its own with chapters on plasmids, transposable elements, bacterial transformation and conjugation, genetics of phage T4, lytic growth of λ , lysogeny, transduction and strain construction. Difficult concepts and complex mechanisms are explained clearly and here the use of line drawings is especially effective. The larger format of this edition improves the juxtaposition of text and illustrations and allows the inclusion of new examples panels. The success of the first edition has, in a sense, presented the authors of the second with a problem. What should be changed, and how? The solution here appears to have been to adopt a policy of minimal change. This is immediately evident, and even a cursory glance shows that each part, chapter and section of the first edition finds its almost identical counterpart in the second. Although the authors claim extensive rewriting, a closer inspection of the text reveals that much of this is merely cosmetic and occasionally the elegance of the original text is lost. There is evidence of significant reworking and improvement of some parts, for example the chapter on strain construction and the later sections on site directed mutagenesis and PCR.

My overall impression is that while the new edition retains the character of a solid practical textbook, the authors have missed the opportunity either to inject a sense of real excitement or to show how molecular genetics has advanced in the last seven years. In particular, this book notably fails to show how principles elucidated in model systems (mainly in *Escherichia coli*) have been shown to apply in a wide variety of Gram positive as well as Gram negative bacteria. In addition, the treatment of new technologies is scanty. For example, automated sequencing is not mentioned and the extensive uses of PCR technology are not fully described. The final section on applications of genetic engineering is disquietingly similar to its seven-year-old predecessor!

It would, however, be unfair to conclude without re-emphasizing the strength of the book which is in the clear explanation of molecular mechanisms. If this is what is required then this edition can be recommended and represents extremely good value for money.

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Peas: Genetics, Molecular Biology and Biotechnology. R. Casey and D. R. Davies (eds). CAB International, Wallingford, Oxon. 1993. Pp. 333. Price £49.95, hardback. ISBN 0 85198 863 6.

Every once in a while a scientific text comes along which represents a key publication marking the current position of human knowledge in a particular field of scientific endeavour and which is in the 'must have' category for any laboratory active in the field. This book, edited by Rod Casey and Roy Davies, is clearly in this category and presents review contributions on key aspects of study of the common or garden pea, *Pisum sativum*, as an experimental organism and important food crop. The editors are well-known pea scientists with world-wide reputations for their work. The book is organized into 11 chapters and the contributors are also well-known experts in different aspects of pea research. The concentration of contributors from the John Innes Institute in Norwich, U.K. is, of course, a reflection of the important role played by this institute in pea research.

Chapter 1, by Roy Davies, sets the scene with a brief overview of the status of the pea as an experimental plant species and as an agricultural crop. This briefly covers the reasons why the pea model has been selected for use in biochemistry and molecular biology as well as for physiological and genetic studies.

Noel Ellis, in chapter 2, plunges straight into the molecular genetics with a detailed and up-to-date description of the pea genome as studied by various modern approaches and also of the mechanisms which bring about heritable change. This chapter is extremely valuable, not only as a report on the current status of pea genetics, but also as a comparative illustration of the molecular approaches which are being used to probe genome structure and to map genes of importance. Noel Ellis has also contributed chapter 3, on the structure and function of the plastid genome. Inevitably, this is a much smaller contribution which concentrates

primarily on evolution and recombination within plastid genomes, with a brief mention of gene content, replication and transmission in progeny cells. It is, perhaps, rather disappointing that the plastid gene systems are not described in a little more detail.

Phil Gilmartin presents a review of regulatory mechanisms in pea gene expression in chapter 4. After a brief introduction to the different levels of control, and the methods used to study gene expression and its regulation, the bulk of the section describes detailed aspects of the molecular mechanisms of gene regulation. This deals almost exclusively with the regulatory and light responsive elements in the pea small subunit RUBISCO gene promoter. As might be expected from one of the most intensively studied plant gene systems, this is a highly detailed and comprehensive treatise. It is disappointing, however, that the review provides only a brief mention of other pea gene systems. Pea seed protein gene expression and regulation is dealt with separately in chapter 6.

Chapter 5, by Trevor Wang and Cliff Hedley, is an excellent review of the genetic and physiological analysis of pea seed development. The section covers many aspects of pea embryogenesis, from cellular development to deposition of storage reserves and maturation, including developmental differences between genetic lines and mutations. Of particular interest is the work on the genetic analysis and effects of the *r*-loci on embryo development. This has led to the so-called *r*-locus 'jigsaw', depicting inter-relationships between metabolism, physiological features and accumulation of specific storage reserves. The molecular bases of these interactions are unknown and, as the authors comment, have been largely ignored as an approach to understanding development.

Chapter 6, by Rod Casey, Claire Domoney and Alison Smith, deals with the biochemistry and molecular biology of starch and protein synthesis in seeds. This is justifiably one of the largest contributions, considering the wealth of research devoted to this subject and its importance. The section deals with the structure and synthesis of starch, the enzymes involved and the regulation of the synthetic pathway, as well as seed protein structure and molecular biology. The brief sections discussing prospects for the modification of pea starch and protein quality are commendable.

Chapter 7, by Ian Murfet and James Reid, is a 'tour de force' on the more than 400 developmental pea mutants which have been described. This section provides a comprehensive description of the mutations affecting developmental processes, including leaf, stem and pod development, branching habit, flowering, GA synthesis and GA responsive genes, photoresponsive genes and senescence. The chapter is liberally decorated with tables listing the mutant alleles, the resultant phenotypes, references and other useful information.

Chapter 8, by Alan Vivian, presents aspects of pea diseases and molecular tools used in studies of plant-pathogen interactions. This all-too-brief section covers topics such as phytoalexins and pathogenesis-related proteins, fungal and bacterial pathogen classification and isolation of avirulence genes, viruses and viral detection methods, and mapping of resistance genes.

Another major section, chapter 9, by Nick Brewin, Mike Ambrose and Allan Downie, describes the nitrogen fixation system of peas in considerable detail. This covers all of the important features of the nitrogen fixation machinery, including basic biology, structure and physiology of the root nodules, molecular biology and biochemistry (including nitrogen, oxygen, hydrogen and carbon metabolism). Useful tables collating information on the *nod* gene products, genetic loci and mutations implicated in nodulation and nitrogen fixation and nodulin cDNA clones are included.

The progress towards achieving efficient transformation and regeneration systems for peas is the topic of chapter 10 by Roy Davies and Phil Mullineaux. They discuss the technical difficulties in a résumé of the history of pea tissue culture and transformation, finishing with brief descriptions of those techniques which have proved successful and those which may form the basis of future methods.

Roy Davies finishes the book with a speculative chapter 11, in which the prospects and limitations for the improvement of the pea crop are discussed. The approaches discussed include conventional breeding, mutation and genetic engineering to improve crop yield, alter developmental characteristics, modify the proportions and quality of stored products and to improve resistance to insect pests, viruses, fungal pathogens and herbicides.

Overall, this is a nicely put together text covering a wide range of topics in sufficient detail to form a very useful reference book. An admirable feature in each contribution is the final concluding section in which the authors speculate about the future developments in their discipline and how these might affect the use and value of peas. Unlike some plant molecular biology texts, which have only transient value, this book should retain its importance for a much longer period. It would be hard to criticise the book, nor is it easy to identify any omissions other than the minor ones previously mentioned. Despite the relatively high cost, at approximately 15 pence per page, this book must be regarded as essential reading for all serious pea scientists, or indeed anyone working with legumes. The editors and contributors are to be congratulated and can be reassured that the book does provide a landmark publication upon which future research will be built. As a pea molecular biologist, I am extremely happy to have a copy of this text on my bookshelf.

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The Human Genome Project: Deciphering the Blueprint of Heredity. N. C. Cooper (ed.). University Science Books (W. H. Freeman), London. 1994. Pp. 360. Price £27.95, hardback. ISBN 0 935702 29 6.

In my experience it has been rare to find reading a book for review enjoyable. Usually this is a chore which is performed