

## Book reviews

**Old, R. W.; Primrose, S. B.: Principles of Gene Manipulation. An Introduction to Genetic Engineering. Studies in Microbiology, vol 2. 4th edn.** Oxford, London, Edinburgh, Boston, Melbourne: Blackwell Scientific Publ. viii + 438 pp., several figs. and tabs. Soft bound £ 15.95.

This book is of particular value to all those who are working with recombinant DNA techniques and genetic engineering. The authors were able to follow the developments in this rapidly growing and rapidly developing technology. The book is especially very valuable to those who would like to know more about the theoretical background of various cloning techniques. Students will find a lot of information which they will need to become qualified in the field of genetic engineering. The range of topics covered is extensive and includes detailed descriptions of various laboratory techniques. Most of the attention is paid to the descriptions of cloning in *E. coli*. The book gives a good overview of cloning vehicles, like plasmids, phages and cosmid vectors, including the development of improved vector derivatives, which is of use in the screening of libraries in chromosome walking procedures. An example of such an improved vector is  $\lambda$ ZAP. Modern expression vectors like  $\lambda$ gt 11 are also described. For sequencing purposes, a description of single-stranded DNA vectors like M13 and its derivatives is given.

Much attention has also been given to side-directed mutagenesis with the aid of cloning vectors like M13. A standard lab technique is DNA sequencing. For those who are interested in this technique, this book offers a basic knowledge and some practical applications. Other techniques that are nicely described are those dealing with cloning strategies, gene libraries and cDNA cloning. Attention is paid to the very valuable technique of chromosome walking in the isolation of genes with unknown functions. The section on cloning in *E. coli* closes with a chapter on recombinant selection and screening and a chapter on the expression of cloned DNA molecules. Section 3 describes cloning in organisms other than *E. coli*. This is a more diverse chapter since it deals with microbial eukaryotes, plants and animals. In the case of the microbial eukaryotes, the development of yeast, including the use of *yac* clones, is an important aspect.

The book has a subtitle "Studies in microbiology, vol. 2". Therefore, the microbes get the most attention. This is noticeable in the chapters on gene transfer to plants and gene transfer to animals. The chapter on plants gives a description of the well-known *Agrobacterium* system, but does not pay much attention to *Agrobacterium*-derived transformation procedures. In total, the overview of the plant work covers the developments of the last years, including work with plant viruses as vectors. The work with animal cell culture systems is described in more detail and focusses on the analysis of the regulation of gene expression. Transformation techniques and selectable markers are described as well as the important role of SV40 promoter. With homologous recombination it is shown how a gene sequence can be altered both in vitro and in situ. In addition to presenting work with animal cell cultures, the book gives the state-of-the-art concerning the transfer of genes to oocytes, eggs and embryos. *Xenopus* and *Drosophila* are described as model systems for studying growth and development. The procedures for producing transgenic mammals via the germ line are also presented.

In section 4, the authors give a technical description of the applications of recombinant DNA technology, in particular on nucleic acid probes and their application (e.g., the PCR reaction) in DNA fingerprinting.

The book ends with an overview of novelties that have been obtained with the basic methods of genetic engineering. Novelties are presented at the level of proteins, cloning hosts, novel plants and novel animals.

The conclusion is short: for anyone involved in genetic engineering this is a very valuable book. It is of the greatest value to students and teachers because it is written in a very easy style with simple, clear figures. G. J. Wullems, Nijmegen

**Scholz, F.; Gregorius, H.-R., Rudin, D. (eds.): Genetic Effects of Air Pollutants in Forest Tree Populations.** Berlin, Heidelberg, New York, London, Paris, Tokyo, Hong Kong: Springer 1989. 201 pp., 34 figs. Hard bound DM 75,-

This book results from an international symposium on the genetic aspects of air pollution on forest tree species, held in August 1987 at the Federal Institute of Forest Genetics and Tree Breeding in Grosshansdorf near Hamburg, Germany. The aim of this meeting organized by three IUFRO working parties was to discuss the genetic consequences of continuous air pollution stress on present forest tree populations and to present measures for the necessary preservation of forest gene resources.

The book, which comprises 15 papers and a final conclusion emphasizing the "knowledge gaps", is divided into four chapters. In the first chapter, "Methods of Sampling and Genetic Analysis", one paper outlines theoretically the relationships among phenotypic, genetic and environmental variation, while another paper reviews cases in which isoenzymes can be used either as indicators of environmental effects or as stable gene markers. In chapter 2, "Variation in Response to Pollutants", phenotypic and genetic variation in response to air pollutants and acid deposition are considered in several papers. One topic is the pollution effects on reproductive processes demonstrated by several tree species. The papers included in chapter 3, "Selection Effects of Pollutants", deal with pollution-caused changes in the genetic structure of populations based on various enzyme gene loci. This biochemical-genetic approach is capable of revealing differences in allele frequencies at single gene loci between different localities, subpopulations or generations, thus demonstrating the action of selection processes, although the enzyme loci under study may not be directly involved. In the papers of the last chapter, "Preservation of Genetic Resources", the necessity for the preservation of gene resources of endangered tree species is stressed, and several concepts underlying the preservation measures and procedures are outlined.

In general, the book provides an up-to-date overview of the potential and actual effects that air pollution stress has on the gene pool composition of forest tree species. It therefore fills a gap among the overwhelming literature on other air pollution problems. In addition, this book will draw attention to the fact that many or nearly all man-made changes in the environmental conditions have genetic implications for plant and animal populations, even though they are not visible at first glance.

K. Gross

**Hawkins, J. D.: Gene Structure and Expression.** 2nd edn. Cambridge: Cambridge University Press 1991. 216 pp., 114 figs., 41 tabs. Soft bound. £ 13.95.

This book was first published in 1985. Since that time remarkable progress has been made in our understanding of the genome. In this revised edition, therefore, the author has included new methodological developments, described new vectors, and re-wrote and updated the section of eucaryotic gene organisation.

The book is divided into 12 chapters. The structures of DNA and RNA are described in the first part. The following topics provide some information on the methodology that is currently applied in this field and the vectors used in work with recombinant DNA. Procarlyotic gene organisation and the operon concept follow next. A detailed description of eucaryotic gene organisation and expression is outlined in chapter 7. In the following sections the reader is provided with information on oncogenes and the genes for haemoglobin. Chapter 10, on proteins of the immune system, is again fine reading and shows the structure and expression of a well-studied gene system of higher eucaryotes. Some gene families, including collagen, cytochrome P450 and different hormone genes, are treated in chapter 11 followed by a short description of mitochondrial and chloroplast genomes. In the last chapter the differences between the procarlyotic and eucaryotic genomes are reviewed, and some evolutionary aspects are discussed. At the end a glossary of useful terms and a list of leading references are included.

This concise and clearly written book is a valuable introduction into the still expanding field of molecular genetics. It is not only recommended to undergraduates but also to those who are interested in this fascinating area of biology.

D. Gröger, Halle/Saale

**Stone, Edwin M.; Schwartz, Robert J. (eds.): Intervening Sequences in Evolution and Development.** New York, Oxford: Oxford University Press 1990. 203 pp., 54 figs. Hard bound \$ 39.95

More than ten years after the first published speculations on the phenomenon of exon shuffling, the process is emerging as a major mechanism in evolution, and may also play an important role in regulating gene expression. Most of this book is concerned with reviewing the discoveries and hypotheses which have led to the current consensus that exon shuffling probably emerged very early, perhaps even in the progenote, and continues to play a major role in eukaryotes. It is an exciting story to read, and a number of the main players in its development are represented. The evolutionary aspects are covered in chapters by Rossmann, Holland and Blake, W.F. Doolittle, Stone and Schwartz, Stein et al., and Perlman et al.; together with a chapter on alternative splicing by Smith et al. The multiauthor construction of the volume leads to some repetition as the historical background of the field is covered to some extent anew in each of the first five chapters. This is, however, a minor drawback and the book is heartily recommended.

A. W. Schwartz, Nijmegen

**Pirone, Thomas, P.; Shaw, John G. (eds.). Viral genes and plant pathogenesis.** 1st edn. Paris, Tokyo, Hong Kong, New York, Berlin, London: Springer. 215 pp., 52 tabs. Hard bound DM 89.00.

Sixteen chapters are detailed versions of papers presented at a symposium held at Lexington, Kentucky, 1989, supported by the R. J. Reynolds Tobacco Company. Sessions were: Virus-encoded proteins potentiating movement; DNA caulimoviruses and gemini viruses; potY virus-encoded proteins; molecular biology topics including genetic mapping and mutational analysis.

Session Chairmen were respectively M. Zaitlin, R. Hull, and R. Goldbach, who provide summary and comment, and B. D. Harrison, who provides a very useful review of current trends in molecular studies. The latter suggests that recent advances contribute to as well as benefit from both theory and practice in a wider context and he cites from the symposium, crop genetic engineering (Beachy), and development of ribozymes (Gerlach). His review, however, ranges more widely than the book, which inevitably reflects a symposium mostly presenting work in progress.

Unlike the Federation of European Microbiological Societies Symposium 32 (1985) *Molecular Biology of Positive Strand RNA Viruses* (eds. Rowlands, Mayo, Mahy; Academic Press), this Symposium has not provided a comprehensive review and lacks the useful juxtaposition of animal and plant viruses. An expanding area such as movement proteins, however, receives much more attention, and the DNA virus session combines detailed reports with a real sense of discovery. Viroids and virusoids are also well represented although there is a lack of a significant European contribution.

The NIH (USA) have called for a major initiative on the use of ribozymes for HIV therapy. Gerlach, who did part of the early work on ribozymes, comments that plant virologists must "wait and see what happens". For much fundamental work on ribozymes we must look to Cech's lab. (*Nature* 1991, 350: 628–631). Meanwhile, the book reports the widespread use of molecular biology tools in plant virology including transformed plants, Ti plasmid mediated infection (agroinfection) and RNA transcript infection, which promises further fruitful investigations.

As a small footnote of caution about practical applications this Reviewer notes the reply to a question of one contributor (Bisaro), "Yes, but we have not done the experiment. One of the problems is the risk of creating a different virus".

P. S. Harris, Edinburgh

**Sharma, T. (ed.): Trends in Chromosome Research.** 1st edn. New Delhi: Narosa Publishing House, Springer Verlag 1990. 301 pp., numerous figs., numerous tabs. Hard bound DM 198.00.

This book is an illustration of the fact that the Indian scientific community, either homeland based or abroad, does well in the field of cytogenetics. It is dedicated to Prof. S. P. Ray-Chaudhuri, and the preface by T. C. Hsu about him explains much of my first statement. The book, edited by T. Sharma with the help of R. Raman, contains 18 chapters that cover a relatively wide area. There is a mixture of Indian and non-Indian authors, many considered to be top experts in their field. Eight chapters address chromosome organization with lines to gene activity (and dosage compensation), DNA replication, bandings and the design of the centromere. The chapter by G. P. Holmquist on banding is especially illuminating and stimulating. The treatment of the various other subjects – chromosome aberrations, meiosis including aneuploidy, oncogenes and neoplasia plus part of the spectrum of technical approaches – is more fragmentary. Technical aspects that rated discussion include flow-cytometry, restriction enzyme banding and in-situ nick translation. However, as cytogenetics is specializing so rapidly, the endeavour to bring together its various headings is very sympathetic to say the least. If this has been the goal the editor set to himself, the book is a successful production. The quality of the printing and of the illustrations is not entirely up to standard, but relative to the pleasure of reading, this is only a minor criticism. The book suffers from a complaint more commonly encountered: references cover the literature up to 1988. However, I do not feel this to be a major drawback.

P. de Boer, Wageningen

Lai, E.; Birren, B. W. (eds.): **Electrophoresis of Large DNA Molecules. Theory and Applications.** No. 1 in series Current Communications in Cell and Molecular Biology. Cold Spring Harbor: Cold Spring Harbor Laboratory Press 1990. i–ix, 1–156 pp., 45 figs., 3 tabs. Soft bound \$ 34.00.

This latest volume from the Cold Spring Harbor Laboratory Press describes pulsed field gel electrophoresis (PFGE), which is used to manipulate large DNA molecules, bridging the gap between cytogenetic techniques and methods for detailed physical mapping. It is appropriate that Cold Spring Harbor is responsible for this book, as it was there that the first description of the technique was put forward in 1983. The present book is devoted to several approaches describing the migration and re-orientation of large DNA molecules in PFGE, organized in 9 chapters by different authors. The book begins with a chapter on the best ways to describe resolution in gel electrophoresis, wherein the "resolution length" concept is put forward. This chapter is followed by an extremely informative section on agarose gel chemical and physical properties, and then several chapters dealing with theoretical and practical aspects of DNA movement in PFGE. For instance, one chapter describes the use of linear dichroism spectroscopy to study this subject; another considers velocity of linear DNA during PFGE, another fluorescence microscopy and computer simulations of DNA movement on PFGE, and yet others on theoretical considerations alone and high resolution zero integrated field electrophoresis. The book concludes with a consideration of applications of PFGE to long-range genetics and a summarizing chapter on perspectives for PFGE. The book adequately shows the power of the method and gives users and would-be-users an insight into how it works and what its true potential might be. The book has an index.

J. F. Jackson, Glen Osmond

Rose, M. D.; Winston, F., and Hieter, Ph.: **Methods in Yeast Genetics; a Laboratory Course Manual.** 1st edn. Cold Spring Harbor: Cold Spring Harbor Laboratory Press 1990. 198 pp., many illustrations. Soft bound.

For research on mitochondrial genetics, but also for certain aspects of eucaryotic cell biology and genetic engineering (e.g. gene replacement), *Saccharomyces* cells provide an ideal study material. The present laboratory course manual is a welcome entry to experience "what makes them thick" genetically. The book is based on the Cold Spring Harbor Yeast Genetics course that was taught for 17 years. The authors claim that, after completion of the course, "one should be able to carry out all of the techniques commonly employed by yeast geneticists and be able to follow the literature with greater ease". After a short elucidation of the peculiarities of yeast genetic nomenclature, 12 experiments (all concerning *S. cerevisiae*) are presented, e.g. isolation and characterization of mutants, meiotic and mitotic mapping, gene replacement, etc. Each experiment starts with a short, clearly written introduction, followed by a list of the specific strains, a schedule of the experimental procedure, a list of materials, and references. The last 80 pages contain useful information on techniques, protocols, media, stock preservation, etc. Reading the book, one feels the authors' practice and their long experience with the matter, and one is willing to believe that even the first ascus dissection will yield satisfactory results. There is no experiment specifically devoted to mitochondrial genetics, which in fact is an essential contribution of yeast to the picture of eucaryote genetics – this is my only criticism of the book. For the rest it can be strongly recommended to every (micro)biologist who is interested in the principles of yeast genetics.

C. K. Stumm, Nijmegen