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Book reviews

Introduction to Molecular Cloning Techniques. G. Lucotte and F. Baneyx. VCH, Weinheim. 1993. Pp. 298. Price £32.50, hardback. ISBN 3 527 89613 9.

In vitro manipulation of genetic material has proven to be a powerful method of genetic analysis and is the basis of a host of research and industrial processes across a wide spectrum of biological fields. This diversity of applications, from agriculture to medicine, has led to refinements and modifications of techniques with relevance to particular needs yet the basic principles remain unchanged and are fundamental to the discipline of genetic engineering. The currently available literature reflects this diversity of applications but for the intrepid beginner, such directed texts are often confusing and omit the grounding on which the methodology is based. This book offers a simplified summary of the basic principles and techniques of genetic engineering.

The book is divided into six parts covering the fundamentals of the host (*E. coli*), restriction enzymes, cloning vectors, DNA and RNA preparation, cloning techniques and libraries. Individual chapters are structured, commencing with a concise introduction followed by examples of the most routinely used methods and concluding with a series of problems taking the reader from theory to practicality and hopefully ending with a measure of understanding.

Introductions are short, but easily digested, and contain enough relevant information to convey the principle. Access to more detailed information is provided through reference listings at the end of the book. The text itself is easy to read because much of the more weighty information, such as vector maps and enzymatic actions, is contained in extensive appendices and this prevents the reader from becoming overwhelmed.

Throughout the book, the coverage of experimental procedures is variable. In many cases it is comprehensive, but sometimes the text fails to convey small but essential details. For example, we are told that 'proteinase K is first heated to eliminate all traces of DNAase activity', but we are not told for how long or at what temperature. However, I do not feel that the authors intended the book to act as an essential methods book but rather as an insight for the beginner to the complexities involved in laboratory procedures. Many methods would have benefited from being presented in a more stepwise fashion rather than in essay form.

Probably the best feature of the book is the problem sections. These include a series of both practical and theoretical predicaments based on the preceding text, and answers are given later in the book. The questions raised require an understanding of the theory and not merely the ability to look back for the relevant phrase or statement.

The text of the book is supported throughout by a large number of illustrations, many of which are photographic reproductions of autoradiographs and agarose gels. Unfortunately, some of these are very poor and difficult to decipher and could have benefited from accompanying illustrative explanations.

Overall, *Introduction to Molecular Cloning Techniques* achieves its aim inasmuch as it is a concise summary of the basic principles and methods used in genetic engineering. Its target readership is probably students and research technicians, and this is appropriate. The text is easily understood and the reader is taken progressively through both theory and methodology. The book is ideal for those starting out in genetic engineering, whatever the biological field. It does not pretend to be the only text you'll ever need, but is an ideal stepping stone into a rapidly developing area of science.

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Statistical Analysis of Regional Yield Trials (AMMI Analysis of Factorial Designs). H. G. Gauch. Elsevier, Amsterdam. 1992. Pp. 278. Price £120.00, hardback. ISBN 0 444 89240 0.

Dr Gauch ends his book with a confident prediction of the benefits in increased crop performance that would result from universal adoption of the AMMI methodology in plant variety selection. "After a decade, about 4% of the world's food production would be attributable to AMMI analysis. This is a lot of food. It would be enough to feed over half of the United States or about a third of Africa." Such a dramatic claim needs sober evaluation.

Series of variety trials aimed at predicting future performance of new varieties in a specified region are usually analysed in two stages. Variety means are first calculated for individual trials and summarized in a variety-by-trials table; this is then submitted to an across-trials analysis to provide overall measures of variety performance for recommendation purposes. The design and analysis of an efficient trial system should therefore take account of several components of variation in variety performance: variation within a trial due to local factors such as trends in soil fertility, and the invariably much larger variation between trials due to environmental differences in locations and years.

AMMI stands for Additive Main Effects and Multiplicative Interaction and provides a nested sequence of models for analysing two-way variety by environment tables. The additive terms in the model represent the overall perform-

ance of individual varieties and environments while a variable number of multiplicative terms model the variety-by-environment (GE) interaction. AMMI is a straightforward extension of principal component analysis and one of a range of methods which have been found useful for exploring the pattern of GE interaction. Interestingly, Gauch has also shown that AMMI can give better estimates of variety comparisons for individual trials by using indirect information from other trials.

We now come to the author's main thesis. This takes AMMI methodology beyond its original purpose for GE pattern analysis and argues for its use in variety recommendation and selection. Remarkable gains in efficiency are claimed to result. However, GE interactions deduced from current trials data are only useful for predicting future variety performance in specific locations if the interactions are consistent over years. Unfortunately this is often not the case and the grouping of locations into recommendation domains, so called 'megaenvironments', by some breeding programmes does not stand up to close scrutiny. Notably, this book illustrates the megaenvironment concept with only hypothetical examples.

The author consistently ignores variability between environments and extrapolates recklessly from results for individual trials. He proposes that a farmer might base variety choice on results from the closest trial location, rather than average results for the region, which may in practice better reflect the range of environments the farm will experience from year to year. He continually emphasizes the benefits from increasing actual or effective trial replication, ignoring theoretical and applied results which show that the greatest constraint on progress in variety selection is unpredictable GE. Finally, he uses a set of additional replicates from the existing sample of trials as a validation set for assessing predictive ability of AMMI models: a more appropriate choice using parallel results from a further year of trialling indicates that the inclusion of AMMI interaction terms is seldom justified. If recommendations about the local adaptability of varieties are to be made, a much more detailed investigation of GE is required, which should ideally make use of additional covariate information on locations.

So should a plant breeder read this book? (The outrageous price will certainly discourage individual purchase). Despite its faulty logic and rather irritating, revelational style, the book still provides useful insights about modelling and the nature of pattern and noise. Unfortunately, the author has the habit of pointing out pitfalls clearly to others, and then falling into them himself. The analysis of variety yield trials deserves a more modest and thoughtful treatment than this.

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Ecology and Evolution of Plant Reproduction: New Approaches. Robert Wyatt (ed.). Chapman and Hall, London. 1992. Pp. 397. Price £45.00, hardback. ISBN 0 412 03021 7.

It is 10 years since the publication of Mary Willson and Nancy Burley's *Mate Choice in Plants*, 5 years since Jon and Lesley Lovett Doust edited *Plant Reproductive Ecology*. These books exuded a youthful enthusiasm, reflecting how the study of plant reproduction was being transformed by the application of sex allocation theory, game theory and, perhaps above all, kin selection theory. Could this impetus developed in the 1980s be maintained in the 1990s? The *New Approaches* subtitle of this volume hints at this. However, it turns out that what is being approached is a respectable middle age.

It is the book of a conference held in 1991. Half of its 14 chapters focus on the biology of the male function. The discussion by Maureen Stanton and co-workers on the difficulties of estimating the success of cosexual plants as paternal parents is particularly enjoyable, as is the account by Andrew Stephenson and co-workers of the physical factors that can influence pollen performance. James and Barbara Thomson provide a thoughtful chapter on pollen presentation in animal-pollinated plants, but their description of pollinator types as good, bad and ugly failed to make my day: mnemonically convenient it may be, but ugly pollinators are surely creatures that, along with flopsy bunnies and big bad wolves, belong in a fictional bestiary, not the real world.

The rest of the book ranges over a number of topics, and it is particularly in this part that the arrival of respectable middle age is most apparent, with several chapters indicating that the enthusiasm with which some assumptions have been held should be tempered. Kent Holsinger, for example, argues that it is not sufficient to shake the stick of inbreeding depression at the problem of the distribution of self-fertilization, whereas Joseph Travis takes issue with measures of fitness, arguing that fecundity may not always provide the best measure. Susan Mazer points out that the assumption that investment in the male function should be favoured under stressful conditions has failed to take into account the possibility that seeds may provide the best means of escape from a resource-poor environment, in which case increased investment in ovules may be an adaptive response to increased stress.

Perhaps the most provoking argument is made by Michael Donoghue and Samuel Scheiner who question whether it is helpful to apply kin selection theory to the problem of the evolution of the seed. They point out that arguments based on intersexual or kin conflict are not necessary to explain what we know about the behaviour of seed tissues. Problems with the application of kin selection theory are also explored by David Lloyd in an excellent chapter on evolutionarily stable strategies of reproduction. Lloyd argues that collective fitness may be more useful than inclusive fitness as a tool for investigating the selection of social acts in plant reproduction and he argues that although parent-offspring conflict during seed development is virtually ubiquitous it may have minimal