Book reviews

Barley: Genetics, Biochemistry, Molecular Biology and Biotechnology. P. R. Shewry (ed.). C. A. B. International, Oxford. 1992. Pp. 610. Price £75.00, hardback. ISBN 0 85198 725 7.

This book is a major review of the current knowledge of barley genetics, biochemistry and molecular biology. There are 27 chapters divided into six sections covering: origin, evolution and wild relatives; basic genetics; analysis of metabolism and development; seed development, composition, germination and utilization; pathogen resistance; and biotechnology. Somewhat surprisingly, considering the title, there is no specific section on molecular biology.

Clearly of importance when considering the purchase of such an expensive textbook is how much of the content is distinct from that available already from other sources. There is a large degree of overlap between this text and *Barley Genetics VI*, Volume 2 (1992), (L. Munck, ed.) with 14 of the 27 chapters having direct equivalents in the earlier work. Indeed many of the chapters are by the same authors and differ very little in content and the reader is advised to compare the two volumes.

This is a well constructed textbook on the whole and draws on contributions from authors widely regarded as experts in their respective fields. The content of several chapters, however, look rather dated with apparently little effort having been made to update previously presented work. This is particularly evident in the section on origin, evolution and wild relatives, where no attempt has been made by the authors to include material drawn from even their own more recent publications addressing the use of molecular marker techniques.

A further problem, for a text considering barley genetics, is the conspicuous absence of a chapter on quantitative genetics. This is surprising, as such traits are a major interest of geneticists and plant breeders, and significant progress has recently been reported by several authors in the use of molecular markers and novel statistical approaches for the identification and analysis of quantitative trait loci.

There are several well written and interesting chapters which are characterized by their forward-looking approach to the application of biotechnological and molecular biological techniques. Had more such chapters been present, this could have been an outstanding textbook. However, as a basic introduction to current progress in barley research, it is a competent text and catalogues much basic information. The main problem with attempting to address such wide-ranging and technical aspects of the genetics of any plant is the fact that advances are constantly being made at such a rate that they can quickly render the text outdated. As a consequence, this book will find a wide audience amongst

students as a basic text, but will be of limited use to those involved at the cutting edge of barley research.

KEN CHALMERS
Scottish Crop Research Institute
Invergowrie
Dundee DD2 5DA
U.K.

Rice Biotechnology. (Biotechnology in Agriculture No. 6.) G. S. Khush and G. H. Toenniessen (eds). C. A. B. International, Oxford. 1991. Pp. 300. Price £45.00, hardback. ISBN 0 85198 712 5.

Rice is the developing world's most important food crop and, as such, an entire volume devoted to the rapidly advancing field of rice biotechnology is particularly welcome. The book consists of 13 chapters from different expert contributors and covers subject areas relevant to the problem of increasing rice production to feed the expanding population of rice consumers. It is aimed at research workers and it is this group who will find it most useful; it would have limited use as a student text. The chapters fall principally into two types, those which aim to give enough technical detail for methods to be adopted in other laboratories, and discussion chapters which review subject areas such as the challenges which must be faced if rice production is to keep pace with demand.

Christina David sets the scene in the first chapter by emphasizing the diversity of ecosystems where rice is grown and the variety of problems faced. In doing so, she hammers home the enormous and complex challenge which biotechnology must face. With such a task, and with limited funds for research, it is appropriate to ask how research priorities should be decided. This question is addressed in chapter 2 by Robert Herdt, who guides us in a logical sequence through the complex issues involved in assessing the contributions made, through solving particular problems, to the overall goal of significantly increasing rice production.

The next nine chapters are all concerned in some way with the genetic engineering of rice. They cover the sources of genes, their potential, their isolation and their introduction to rice. The sources of genes include wild *Oryza* species (chapter 3) and the biotechnologist's role may be important in this context because attempts to introduce resistance genes from wild relatives by intervarietal crosses often result in reduced fertility in hybrids. In chapter 11 Gary Toenniessen presents an excellent and highly readable discussion of potentially useful genes for rice genetic engineering. He shows how there are opportunities for genetic engineering to play an important role in increasing yield,

improving pest/disease resistance and enhancing stress tolerance in rice. Both the advantages and possible problems of transgenic rice culture are considered, thereby giving a very balanced view of the future potential of transgenic rice. There are two chapters looking at the molecular genetics of rice and these include a good introduction to RFLP technology and the importance of rice as a model cereal crop for molecular genetics. At this point it is worth mentioning one of the unavoidable problems with a book of this kind, namely that some of the information is already considerably out of date. For example, the rice RFLP map now approaches 1000 markers not the 230 described here.

The three chapters considering rice tissue culture and transformation also contain out-of-date information. They concentrate on protoplast technology and direct gene transfer techniques. It is no longer true to say that protoplast to plant systems are essential for rice transformation, as biolistic techniques now provide very efficient transformation procedures. Chapter 8 does include a section on the biolistic method, concluding that this will become more efficient in the future. This has proved to be a very accurate prediction. Chapters 7 and 8 both aim to give sufficient information on protoplast culture and transformation (through PEG treatment and electroporation) for the methods to be adopted by other laboratories. This leads to an unnecessary amount of repetition.

My only other criticism is that chapter 12, looking at molecular probes for disease diagnosis and monitoring, although a good review of the area, seems to have only tenuous links to the other chapters. It appears out of place between the chapter looking at potentially useful genes for rice genetic engineering and the summing up of prospects for the future by the editors. However, I do not wish these criticisms to detract from my overall favourable impression of this book. It would be an invaluable reference book for anyone entering the field of rice biotechnology. The book would also enable those already working in this area to see their work in the wider context of contributing to meeting the future demands which will be placed on one of the world's most important crops.

WENDY HARWOOD
Cambridge Laboratory
John Innes Centre for Plant Science Research
Colney
Norwich NR4 7UJ
U.K.

Population Genetics — Diversity and Stability. Yu P. Altukov. Harwood Academic Publishers, 1990. Translated from original text in the Russian Language by J. H. Appleby and edited by J. A. Beardmore. Pp. 352. Price £92, hardback. ISBN 3 7186 4984 5.

This unusual, attractive and inspired book is based upon Altukov's own views and collaborations in the former Soviet Union. The book is individualist and includes summaries of literature not easily obtained in the West. The value of this English translation of an original Russian text is that it makes

a reader, with some knowledge of population genetics theory, think quite hard at times and invites a questioning approach. For these reasons it is a refreshing contribution. The book is expensive and fairly well produced. There are some cavalier spellings, particularly of heterozygosity, that might irritate some readers. On page 179 the formula for the statistical correlation of allele frequencies is printed with a square-root sign that extends to both numerator and denominator!

It is not surprising, given the original publication date, that an appraisal of DNA diversity has not been included. However, the absence of such data does not detract from the ideas that are presented, although many may well be better tackled by molecular data. Altukov's foundations are based upon the philosophies of Muller and Dobzhansky. He develops his ideas through studies of allozyme loci in laboratory and natural populations. The text is introduced with a sound theoretical basis. The dynamics of gene frequencies, including stochastic considerations, are used to give an idea of equilibrium expectations of genetical diversity in relation to population size, migration, mutation and selection following the standard models of Wright and Kimura. Observed levels of diversity are discussed in the context of these expectations of neutral genes in an attempt to assess the evolutionary significance of protein diversity. As such this account deals with explanations for the distribution of rare alleles, causes and origins of mutations and an analysis of the causes of spatial patterns of allele frequencies in natural populations. A convenient tabulation of alternative explanations (selection or drift) of the distribution of variation in natural populations is also included. The chapter concludes with a discussion on the functional differentiation of enzyme loci as related to observed levels of polymorphism. Altukov uses this as an overture to his obvious interests in environmentally plausible functional differences in allelic products as a way of interpreting the ecological significance of molecular variation. The chapter does, however, seem to conclude with a rather fragmented set of questions that are presumably meant to be thought provoking although I found them poorly structured and irritating.

From chapter 3 onwards, Altukov's enthusiasm and personal contribution become very evident. The section mainly concerns his own interpretations. It is heavily sourced by Russian literature. Rich, informative and fascinating descriptions of blood group and allozyme polymorphisms in fish — anchovies, salmonids and redfish — are related to population biology, physiochemical variations of the environment and seasonal life-cycles. Based on a case-history approach, the biogeography of species is described and causal reasons for spatial variations of allele frequencies are analysed. The chapter includes studies of multilocus individual loci and some multilocus considerations. A detailed analysis of lactate dehydrogenase and phosphoglucumutase polymorphism in sockeye salmon is eagerly presented. Some care is needed in reading these accounts and I was concerned that no clear cautionary note was expressed when he tried to estimate fitness from observed and expected numbers, assuming Hardy-Weinberg equilibrium. Hence, although inspired by the studies, I felt that some of the analysis could mislead a reader or lead a student into fatal traps. It is, there-