Book reviews

Transgenesis Techniques: Principles and Protocols. Methods in Molecular Biology (Vol. 18). David Murphy and David A. Carter (eds). Humana Press Inc., Totowa. 1993. Pp. 467. Price £46.50, paperback, comb-bound. ISBN 0 896 03245 0.

On being asked to review this book I looked forward to reading about all the varied methods of producing transgenic animals and plants. So I was initially disappointed when I found that the scope was restricted predominantly to mammalian systems. However, there are short chapters on *Drosophila*, zebrafish, the commercially important fish, *Tilapia* and salmonids. The majority of the book covers the work on three mammals: mouse, rat and sheep, and this it does very comprehensively. There is all the information required for the absolute beginner to set up their own transgenic mouse laboratory.

The first five chapters cover the background to DNA transformation and describe the application of transgenic techniques to answer questions about gene regulation in the central nervous system and the generation of transgenic models for the study of cancer and the immune system, as well as the exploitation of such technology for commercial purposes. The authors also point out the potential pitfalls in designing transgene constructs and the limitations in applications to commercially important species.

The chapters on mouse injections and the generation of embryo stem cell lines are particularly thorough and will be very useful to those wanting to set up the techniques in their laboratories. The mouse chapters are complemented by short chapters describing routine husbandry and the physiological manipulations necessary for producing transgenic rats.

There are considerable resources being devoted to producing transgenic sheep and the chapter by Nancarrow, Marshall and Ward describes the enormity of the problems involved in applying transgenic technology to such an animal. However, despite the potential benefits of transgenic sheep to the agricultural and pharmaceutical industries I was not inspired to expand my own research into that field.

The final third of the book is devoted to the identification of the transgenic animals and the subsequent analysis of the transgene expression. This is again very thoroughly dealt with and the relative merits of the different methods are discussed. Although the methods are largely available in other molecular biology texts it is useful to have them collected together in a volume focused on transgenic techniques.

One serious omission is the lack of a description of non-radioactive *in situ* hybridization on whole embryos and paraffin-embedded tissue sections. The majority of laboratories examining gene expression now use non-radioactive probes as they are more convenient and offer better resolu-

tion than radioactive methods as well as the possibility of identifying different transcripts (Hauptmann & Gerster, 1994; Jowett & Lettice, 1994; Strähle *et al.*, 1994). A further omission is that of the use of retroviral vectors for generating transgenic animals. Their use in mice and chick is well established and work is actively being pursued in applying the same technology to other animal systems including zebrafish (Lin *et al.*, 1994).

Despite these inevitable omissions, the text provides a useful laboratory manual for those wanting to embark on research in the exciting field of transgenic technology.

References

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Genetics and Evolution of Aquatic Organisms. A. R. Beaumont (ed.) Chapman and Hall. London. 1994. Pp. 539. Price £69.00, hardback. ISBN 0 412 49370 5.

We live in a wet world, but our knowledge of the genetics of aquatic creatures lags far behind that of terrestrial organisms. Yet the sea is where most animals live. It has recently been suggested that the deep ocean alone may house several times more species than inhabit the rest of the planet. The sea also provides some of the most heavily exploited creatures on Earth. Andy Beaumont's volume, resulting from a conference held in Bangor during September 1992, serves a useful purpose in bringing together up-to-date information on a

variety of subjects, with a specifically aquatic bias. Unlike many conference volumes, the contributions are arranged in a logical manner, and the 44 papers are shared almost equally between nine 'chapters': Speciation and wide-scale genetic differentiation; Gene flow and population structure; Heterozygosity, heterosis and adaptation; DNA technology and genetics of aquatic invertebrates; DNA technology and phylogeny of fish; Genetics of aquatic clonal organisms; Chromosomal genetics; Genetics and pollution; Genetics and aquaculture.

Each chapter is introduced by a brief review of the field. Although several of the topics have been reviewed more fully elsewhere, the introductions give a coherence to the volume as well as providing succinct introductions to both the theory and literature in each subject area. Parts of these sections are aimed unequivocally at readers lacking a background in genetics, for instance the largely verbal explanation of *F*-statistics (Goudet *et al.*, p. 82). The reviews would undoubtedly be a very useful starting-point for, say, a new research student with minimal genetic training.

There are so many interesting developments afoot that inevitably some are overlooked. The ability to identify biochemical and genetic indicators of stress in organisms with no outward manifestation of it may have major repercussions for the way in which pollution effects are monitored, and we were disappointed not to learn much about such advances in a 'review of the state of the art' entitled 'Genetics and Pollution'. In general, the range of organisms discussed is quite broad: crustacea and clams are well represented, but there are also papers dealing with snails, urchins, barnacles, sponges, algae and, unlike the oceans, there are plenty of fish.

The original papers are, as usual with a conference volume, variable in quality. Those dealing with pollution and aquaculture seem least novel, but the general standard is high. Even so, there is perhaps little to convince the mainstream geneticist that work of vital significance is underway on aquatic organisms. Nonetheless, some sections are certainly worthy of a broader readership, as they address basic genetic problems in the light of the unique or unusual properties of aquatic organisms. Marine species are often characterized by enormous population size, high fecundity, widespread dispersal, and massive early mortality dependent largely on the timing of reproductive events in relation to oceanographic conditions. Dennis Hedgecock (p. 122) argues that the resulting enormous variance in reproductive

success will reduce the effective population size to a tiny fraction of the actual population numbers. This generates the paradox that random evolutionary forces, such as genetic drift, may predominate, despite very large observed population sizes.

Aquatic organisms possess a huge range of life-cycles and reproductive modes, giving them great potential for the investigation of basic questions in evolutionary genetics. For instance, two-thirds of animal phyla include forms capable of clonal reproduction and a large proportion of these are aquatic. It is a pity therefore that *Daphnia* seems to be the only clonal aquatic animal known to many geneticists, a bias reflected in this volume. Gary Carvalho's review (p. 291) makes a convincing case that clonal aquatic animals possess considerable advantages for the experimental study of fundamental evolutionary patterns, and will in future contribute significantly to our understanding of such problems as the evolution and maintenance of sex, the relationship between reproductive mode and population structure, local adaptation, and the origin and preservation of genetic diversity.

Aquatic plants also exhibit an amazing degree of reproductive versatility and complexity. Many marine algae have a haplo-diploid life history in which meiosis and syngamy are separated by a haploid generation. The maintenance of this pattern is analysed by Sophie Richerd and others (p. 359) under the hypothesis that its fundamental advantage is to offset the two-fold cost of sex by spreading the process over two generations.

The presentation of the volume is acceptable. The print is rather small but this has allowed a lot of text to be crammed into 539 pages. The illustrations are in general fine, although fig. 1.4.2 looks like an unsuccessful attempt to decipher Linear B, and some of the colossal lists of allele frequencies such as those for sand hoppers and salmon, are tables that only a geneticist could love.

In summary, there is much here to acquaint aquatic biologists with what is going on in genetics, and the book might also alert geneticists to the potential of aquatic organisms for addressing problems in genetics and evolution.

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