Genet. Res., Camb. (1989), **53**, *pp.* 71–73 *Printed in Great Britain*

Book reviews

Genetic Manipulation in Crops: Proceedings of the International Symposium held in Beijing, October 1984. Natural Resources and the Environment Series Volume 22. London: Cassell. 1988. 446 pages, £25.00 ISBN 1 85148 022 6

In recent years plant breeding has been invaded by new techniques designed to supplement and sometimes replace traditional methods. Nowhere has the new approach, especially in anther culture, been taken up more enthusiastically than in China. It was therefore fitting that the 1984 Symposium on the Genetic Manipulation of Crops was held in Beijing. Gametoclonal and somaclonal genetics in the service of higher productivity were the main themes, although many related topics were also considered. This volume consists of the papers or short versions of them presented at this meeting. Among the 253 contributions Chinese authors predominate. A surprisingly large number of species of cultivated plants belonging to many different families and genera have provided material for successful experiment, including the major cereals, sugar cane and other grasses, vegetables, fruit and forest trees, ornamentals and medicinal plants. More than 80 species are referred to in this volume.

This is still an area where pragmatism and trial and error reign supreme. Related species and even cultivars often differ in how amenable they are to the various methods of *in vitro* manipulation. Hence special cases rather than general principles occupy the field of view. Although there are a few papers which offer general perspectives the contributions deal with primary evidence, not with how the new information is to be integrated with more traditional methods. This is therefore a book for the specialist in search of recipes, methods and comparative evidence from a wide range of species.

A sense of unpredictability is perhaps the chief impression generated by such a formidable array of first-hand information. There are many parameters and they all vary. With *in vitro* culture of anthers and ovaries there is great species variation in the genetic status of the derived embryoids or plants. In some cases the derivatives are almost entirely or predominantly haploid, in others diploids, triploids, higher polyploids, aneuploids or other aberrations of chromosome number contribute to the total. The relative frequency of the different categories may be influenced by the past history of the donor, its genotype, the composition of the culture medium, especially the hormone concentration, temperature etc. The origin of the induced embryoid in pollen culture is not constant. In some species it is the generative nucleus which divides, in others the vegetative nucleus makes a contribution and there are other possibilities as well. In some instances of ovary culture the egg cell gives rise to the embryoid and in others it is the synergids which assume this role and, again, there are other alternatives. But, in spite of such heterogeneity there is no doubt about the practical value of the gametoclonal technique in revealing genetic variation between individuals derived from the F1, F2 or F3 of crosses and in establishing pure lines quickly via induced or spontaneous chromosome doubling in the haploids.

In vitro culture of plant cells generates new genetic variation by means which are still obscure. The phenomenon includes both chromosomal and non-chromosomal variation. Several papers deal with the ways in which the plant breeder can turn this apparently unlimited source of novel variation to practical use, augmenting it by mutagenesis if need be. Isolation of mutants due to single gene changes can be especially valuable when it permits the improvement of particular traits, without disturbing the rest of the genotype, which may have been put together at the expense of considerable time and effort.

Somaclonal variation offers scope for the selection of quantitative characters and a number of papers deal with successful tissue culture selection for such traits as tolerance to salinity, resistance to aluminium poisoning or metal stress, as well as selection for increased tissue content of amino-acids, resistance to particular herbicides and also to bacterial and virus diseases. For such selection to be effective the relevant differences must be expressed in both mature plant and cultured cell. It appears, from the examples quoted, that this happens often enough to make this approach an inexpensive and quick way to produce quantitative changes, provided there are no problems about the eventual regeneration of whole plants. In analytical terms embryogenesis in cultured cells also offers a convenient system for the investigation of totipotency.

Protoplasts receive a lot of attention both in ways

to handle them and to induce them to regenerate viable plants. Protoplast fusion is considered as a way to by-pass obstacles to sexual hybridisation between plants which belong to different species or even genera. Although the derived product is likely to be sterile there is the possibility that successive rounds of tissue culture and regeneration may give rise to sufficient fertility to open the way to worthwhile introgression.

A number of papers deal with the approach to gene transfer by alternative means. Progress in this field is so fast that 1984 may seem like the distant past but the report of successful transfer of the *Adh1* gene from maize into tobacco by the *Agrobacterium* method is at least of historical interest.

Although the frontier in the genetic manipulation of plants has been pushed forward since the date of this symposium, the advance is very uneven. There is so much information packed into the 440 pages of this attractively produced and clearly illustrated report that anyone concerned with virtually any aspect of haploid induction, somaclonal variation, somatic morphogeneis, the behaviour of protoplasts and related topics would need it as a handy reference text.

FORBES W. ROBERTSON
41 Braid Farm Road
Edinburgh EH10 6LE

Merino Improvement Programs in Australia. Proceedings of a National Symposium, Leura, New South Wales 1987. Supervising editor, B. J. McGuirk. Australian Wool Corporation, Melbourne. 535 pages. ISBN 0 642 115311

An effective animal breeding programme requires sound objectives, a good scientific foundation and efficient organisation. The geneticist can help the breeder to think rationally about objectives, can provide the scientific basis of the programme and a breeding structure which can be operated effectively. This volume is the proceedings of a symposium conducted as part of a review of research on genetic improvement of sheep. The authors are all based in Australia, the breeding objectives are set in the Australian merino breeding context, and the work reported is largely Australian, but the coverage is sufficiently comprehensive to be of interest to a wider audience. In particular, all facets likely to be relevant, from defining objectives and techniques of recording to genetics of disease resistance and gene transfer are discussed. It is an unusual volume in that it comprises over 50 chapters dealing with what many geneticists might regard as the rather limited field of sheep breeding, but it serves to help applied breeders in designing their programmes and to bring them and the researchers up to date.

The broad aim is exposition and review, rather than to break new ground or provide basic analyses. There is very little mathematics presented, and the book should, for the most part, be accessible to a non-technical audience. I would contrast, however, the discussions of genetic variation in disease resistance by Nicholas and in fly strike resistance by Raadsma and Rogan which do take pains to be generally understandable, with that by Molloy *et al.* on antisense RNA and gene regulation, which does not. The breadth and level of treatment is such that the book gives overall an air of worthiness rather than excitement.

As some guide to content, the section headings are (1) Breeding objectives (2) Servicing industry needs (3) Measures of progress and factors affecting progress (4) Technical knowledge – wool traits and body weight (5) Technical knowledge – reproduction (6) Technical knowledge – selection strategies (7) Technical knowledge – genetics and disease resistance (8) Exploiting all possible genetic variation (9) Physiology and genetic engineering. Editing all this was clearly a major task, and Brian McGuirk and colleagues did well to put the volume together in a coherent way.

For the Australian research geneticist, advisor or progressive breeder, this book will clearly function as the gospel for some years to come. Those from elsewhere should find it an interesting guide to the Australian breeding industry, its problems and its prospects, and to the diverse elements which have to be considered in genetic improvment programmes.

WILLIAM G. HILL
Institute of Animal Genetics
University of Edinburgh

Molecular Genetics of Parasitic Protozoa; Current Communications in Molecular Biology. Edited by Mervyn J. Turner and David Arnot. New York: Cold Spring Harbor Laboratory. 1988. 204 pages, Paper $25.00. ISBN 0 87969 313 4.

Studies on the molecular biology of protozoan parasites have expanded rapidly since their inception in the late 1970's. Early work centered around a few discrete objectives in two major groups of organisms, the African trypanosomes, causative agents of sleeping sickness in man, and the Plasmodia or malaria parasites. In both groups the original objectives had much to do with the identification and cloning of parasite genes which might encode antigens which could form the basis of vaccines. In the African trypanosomes these studies centered on the variant cell surface glycoproteins (VSGs) of the blood stage trypanosomes; in *Plasmodium* a large number of different antigens from different stages of the parasite's life cycle have been studied; that which has received the most attention is the circumsporozoite protein (CSP) on the surface of the sporozoite stage inoculated into the blood stream of a human host by an infected anopheline mosquito. In spite of the similar aspirations of the vaccine development behind the studies