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

on these two groups of organisms a strong dichotomy has emerged. While research on malaria parasites and an increasing number of other parasitic protozoa dealt with in *Molecular Genetics of Parasitic Protozoa* remains essentially oriented towards practical goals in human and animal health, that on the African trypanosomes has become an almost exclusively academic exercise in the study of gene expression.

Mervin Turner and David Arnot have collected a series of 28 short dissertations mainly of 4 to 6 pages based on the presentations at a meeting at The Banbury Center in October 1987. As stated in their introduction the objective of this meeting was to bring together workers interested primarily in the basic genetic and molecular processes of the parasitic protozoa. The significance of these organisms as pathogens or their immunological interactions are not addressed. As may be appreciated from my comments, only the African trypanosomes are sufficiently well studied to warrant an in depth examination at a molecular level. This the editors readily concede. Developments in other parasitic protozoa have not, however, been without interest. The past 2 or 3 years have seen parasitic protozoa such as *Theileria* and *Giardia* come under study by molecular biological methods, while among the traditional performers, the trypanosomes and malaria parasites, some equally satisfying new developments have opened up.

Thus in the area of genetics of malaria parasites recombinational events which accont for remarkable changes in the sizes of otherwise homologous chromosomes following cross fertilization between genetically distinct clones of *Plasmodium falciparum* are discussed by D. Walliker *et al.* and by T. E. Wellems. The relatively new and somewhat surprising evidence for genetic recombination in African trypanosomes, *Trypanosoma brucei*, an organism previously believed to undergo only asexual reproduction, is discussed by A. Tait *et al.* and by R. W. F. Le Page *et al.*

Among the newer entrants into the field of molecular biology is the agent of East Coast Fever in African cattle, *Theileria parva*, an organism with the unique property of immortalizing the lymphocytes which the parasites infect. Aspects of the development of this organism, including the expression of infection-specific antigens on infected lymphocytes and autocrine control of lymphocyte immortalization, are discussed respectively by F. R. Hall *et al.* and by R. O. Williams *et al.* The human intestinal protozoan, *Giardia lamblia*, has been shown by T. E. Nash to be capable of undergoing antigenic variation, one of the common devices by which parasitic protozoa evade the host immune response.

Other organisms and topics covered include studies of the minicircle sequences in kinetoplast DNA of *Leishmania mexicana* by W. O. Rogers and D. F. Wirth and of virus-like nucleic acids in *Leishmania* by K. Stuart *et al.* and of virus-like particles in *Giardia* and Trichomonads by A. L. and C. C. Wang. Dihydrofolate reductase-thymidylate synthase gene amplification and folate transport in *Leishmania* are discussed respectively by S. M. Beverley and B. Ullman. Accounts are generally readable and informative.

The main body of discussion, however, centers, as would be expected, upon the expression of the Variant Surface Glycoprotein (VSG) genes of *T. brucei*. The contributions are generally technically detailed and precise but are clearly directed at initiates in the field and do not make for light reading. Antigenic variation in trypanosomes is based on the selective expression of any one of a large number of variant genes coding for the VSGs. Expression of any one variant may be associated with the transposition of the relevant VSG gene to an active expression site in the chromosome. Alternatively, antigenic switching may result from the mutually exclusive expression of different sites containing VSG genes. Most of the contributions on *T. brucei* relate to the molecular aspects of VSG gene expression. Together they represent a valuable summary of much of the current activity in this field.

RICHARD CARTER
Department of Genetics
University of Edinburgh