agriculture is for sentiment and culture, worthy nevertheless.

Those who write or speak on livestock conservation are in favour of it; sceptics are not invited or do not go to the party. The contributors to this volume include many of the regular party goers. It comprises papers given at an International Conference, called on behalf of the Rare Breeds Survival Trust, which was held in Warwick, England in 1989. Lawrence Alderson, who edited the volume, is Technical Consultant to the Trust and the driving force for much of the effort on livestock conservation in Britain. The Prince of Wales, Patron of the Trust, gave an opening address, arguing 'there is a long overdue requirement for a co-ordinated programme of genetic conservation in the developing world.... This obviously will require international collaboration on a grand scale, but if this is possible when tackling the greenhouse effect and the holes in the ozone layer, surely it can be done for global gene banks as well. In the long term they may be just as important for our continued survival.' His Royal Hype?

The volume is nicely illustrated and presented, and is in three parts: Regional programmes, Philosophy and methodology of conservation, and Research studies and biotechnology. The scientific quality of the 23 chapters (3 by Alderson) varies, but most are interesting.

There is an impressive amount of work going on around the world, obviously much of it on documentation, for a breed has to be identified before it can be conserved. Rules vary, for example in Britain a rare breed of cattle has *inter alia* to have had a herd book for six generations, with less than 20% immigration, less than 750 breeding females or four or less distinct male lines (no common parents, grandparents or great grandparents). As someone used to keeping laboratory populations of mice, this seems to me a large population, but of course the breed is not under one person's control and may well be more sensitive to inbreeding.

The difficult problem addressed by several authors is the genetic objective of rare breed conservation: For example is it to maintain the current mean and variance, or should the population evolve in a similar way to commercial breeds so some competitiveness is maintained? Is conservation only worthwhile if the animals can be seen in the flesh, or are frozen embryos or semen sufficient? The answers to these questions help to determine what are minimum population sizes, for example. Again, I was a little surprised to see how conservative people were; for example one suggestion was that at least 90% heterozygosity should be maintained for 200 years. These would imply rates of inbreeding below those found in commercial livestock or long term laboratory selection experiments. I found in the book several mentions of the need to maintain large numbers of males, none (that I noticed) emphasizing the importance of equalizing family size, but a lot on the less obvious value of subdividing into lines with rotational breeding. I also found no mention of the role of mutation in generating variation; judging by current estimates it is not trivial in populations of the size described here.

There are nice studies, e.g. by Bowling, of heterozygosity in populations, but other studies are more confused and some of the genetics is weak. I was, for example, intrigued by Gill and Kelly's opening sentence: 'The value of the coefficient of inbreeding, devised by Wright, as a measure of homozygosity has been subject to increasing criticism' (no reference given, but Alderson picked up the point in his preface). Yet Gill and Kelly describe co-ancestry of many animals in the Irish Moiled Breed before turning to polymorphisms, and they optimistically add: 'The combination of genetic markers generated by... blood group studies... enzyme polymorphism studies... [and] fingerprinting may then... allow a programme to be maintained which permits the maintenance of homozygosity for the breed-character genes whilst maximising the survival of variation at other loci.' I was also puzzled as to how Hodges thought that storage of particular regions of DNA was going to do much for livestock conservation.

In summary, this is an informative introduction to genetic conservation of livestock, to its problems, practices and prejudices.

W. G. HILL
Institute of Cell, Animal & Population Biology, University of Edinburgh

Genetic Data Analysis. By BRUCE S. WEIR. Sunderland, Massachussetts: Sinauer Associates, Inc. 377 pages. Price £21.95 (pbk). ISBN 0 87893 871 0/872 9 (pbk).

The subtitle to the book is 'Methods for discrete population genetic data'. Weir reminds us in the first chapter of the importance of this subject by reviewing the segregation data collected by Mendel (and, according to Fisher, adjusted). Analysis of discrete genetic data is not just an old-fashioned topic however, as illustrated by the last chapters on the currently very active subjects of statistical analysis of DNA sequence data and construction of phylogenies from them.

Among the other subjects covered are estimation of gene frequency data for multiallelic loci, estimation and testing for Hardy–Weinberg and linkage disequilibrium, analysis of gene frequency among populations and inferences of population structure, estimation of linkage and selection effects, and inferences about paternity. It is indeed a comprehensive coverage of analysis of discrete data. Analysis of continuous traits or of counts such as litter size is not discussed.

The book has its origins in a course for students of genetics or statistics and requires only a knowledge of the principles and little of the detail of either discipline.

Some understanding of basic mathematics helps. The exposition is clear and thorough, such that for geneticists the book is a good teaching manual for general statistical methods, such as (maximum) likelihood and the newer jackknife and bootstrap techniques.

An appendix of some 50 pages of listing of computer programs is included, for use in estimating linkage disequilibrium and *F* statistics and manipulating DNA sequence data. The programs are themselves useful, but I fail to see the point of these listings, as anyone wanting to use them would request them on disk rather than attempt an error-free retyping.

The book's most significant feature is that it is *useful* both as a teaching and reference manual, and I think it is likely to become a standard. One anecdote suggests this: As soon as I received a copy of the book, one of my students borrowed and kept it, reluctantly returning it for me to review because Christmas approaches and she hopes to get money to buy her own.

WILLIAM G. HILL
Institute of Cell, Animal & Population Biology, University of Edinburgh

Methods in Molecular Biology IV: New Nucleic Acid Techniques. Edited by JOHN M. WALKER. Clifton, New Jersey: Humana Press, and Chichester UK: John Wiley & Sons. 1990. 560 pages. £42. ISBN 0 89603 127 6.

My father was a marine engineer and the only manual I ever saw him consult was an ancient and weighty tome entitled *The Efficient Use of Steam*. Unfortunately, genetic engineers cannot pass on to their apprentices a similar compendium of timeless truths. Instead they can spend largish sums on technical manuals that rapidly become obsolete.

What should one look for in such a manual? Obviously they should describe new techniques with an adequate theoretical background and reference list. They should also be written by experienced practitioners who can provide clear and well tested protocols. Particularly if a technique is novel these requirements are not always achieved. This is most obvious in a couple of chapters of this volume where the authors are courageous enough to publish the photographic record of the experiment and the result is no advertisement for their protocol.

While this volume does provide a great deal of useful information, most of it can be found in published manuals. Whether or not it is desirable, a new generation of molecular biologists are being brought up on kits. These kits come with protocols which are sometimes poor but generally more detailed than the protocols presented here. Neither the kits nor this manual really attempt controlled comparisons between alternative novel techniques in a rapidly developing area such as the detection of single copy genes with chemoluminescent probes. This book is useful in parts but unlikely to become standard since the established manuals cover the basics more comprehensively and the attempt to concentrate on more recent and more specialized areas runs into problems of rapid obsolescence and competition from the 'kit protocols'.

DAVID ARNOT
Institute of Cell, Animal and Population Biology, University of Edinburgh