biologist with many details. It is much more important to provide a solid frame of concepts, and this has been well done. There are a few selected references for all but the first chapter, although there is only one 1975 reference, a few of 1974 and the rest farther back.

Fincham's extremely disciplined style has allowed him to present on 138 pages a well-balanced documentation of microbial and molecular genetics. The text is very condensed and certainly a challenge for speedy readers. Aside from being a beginner's text it will be extremely useful for the more advanced student to revive previously acquired knowledge and incorporate it into a sound conceptual framework and this in a matter of a few hours' reading.

F. K. ZIMMERMANN
Institüt für Mikrobiologie, Technische Hochschule, Darmstadt, West Germany

ECOLOGICAL GENETICS. E. B. Ford. Chapman and Hall, London (4th edition). Pp. 442+12 text-figures, 18 plate-figures. Price: £11·60.

When a work that has already become a scientific classic is reprinted as a major new edition, it deserves more than a cursory glance. Indeed, it should be carefully scrutinised, and comparisons with earlier editions become legitimate. When it first came out, this book was hailed by some as a triumphant vindication of the author and his colleagues, but others were more sceptical, and criticised its apparent imbalance of content.

As the majority of readers will know, *Ecological Genetics* started essentially as a review of some methods and principles of the subject, backed up by examples taken from studies at Oxford University during the halcyon early days of the 1940's, 1950's and early 1960's. A few chapters were devoted to research by Oxford graduates after their departure, but little else was reported from outside. The fourth edition brings many of these studies up to date and extends the coverage to include some of the recent developments in biochemical genetics. It remains, however, one man's sometimes idiosyncratic view of the successes and failures of the science that he has helped to establish as one of the cornerstones in our understanding of biological evolution.

Despite several years' additional data the phenomena of variation in *Panaxia dominula* and *Maniola jurtina* remain as enigmatic as ever. Ford's annual survey of *Panaxia* at Cothill Fen has been continued up to 1972, and the *medionigra* gene remains at a low level. There can now be little doubt that natural selection is in some way responsible for controlling the gene frequency, but there seems to have been little success in establishing the real nature of any selective forces apart from non-random mating. It is disappointing to learn that there has not been a more recent analysis of the full population data since that of Williamson in 1960, despite the accumulation of another 15 generations of information.

Maniola jurtina presents one of the most curious stiuations in current evolutionary genetics. Patterns of apparently widespread stability contrast with two or three areas where phenotype frequencies fluctuate markedly from site to site, and from year to year. Sometimes the border between areas shows a cline, sometimes a reversed cline, and sometimes a more patchy

pattern. The recent results show that this situation continues, but it seems to involve too many individuals to be random. Ford has long suggested that natural selection is responsible, but has not been able to show the systematic effects that are operating to control the phenotype frequencies. Under some conditions the heritability of the character is so low, and the beast is always so difficult to rear in the laboratory, that experimentation is exceedingly difficult.

Ford comments upon some recent results by Handford that have shown marked fluctuations in the frequencies of enzyme alleles within the boundary zone, suggesting that this region is one of genetic instability. However, the situation still remains confused. One wonders why Ford has not considered applying catastrophe theory to this system. An individual might have some genetically-based predisposition towards one class, but two or more continuously varying environmental parameters might cause the epigenetic pathway to switch from one phenotypic outcome to another. In this way, populations might change their phenotype without markedly altering their genotype—which seems to be the main problem in the purely selectionist explanation.

Turning briefly to the chapters on land snail ecological genetics, the author continues his belief, also expressed in the earlier editions, that the shell phenotype polymorphisms in *Cepaea nemoralis* are maintained by heterozygous advantage. To the best of my knowledge there is still no direct evidence that this is so. Also, it is interesting to note that the results of Clarke and Murray's research on *Partula* in Moorea are awaited " with interest ", just as they were in the first edition. A casual survey of the literature revealed at least ten papers on that subject published between 1966 and 1973 when this edition went to press.

Small weaknesses like these creep into the text when Ford is reporting work that is not his own. This tendency is very obvious in the section on protein polymorphisms. Little has emerged from the Oxford laboratories on this subject, and the coverage is somewhat superficial. The state of turmoil into which population genetics was reduced in the mid-1960's following the discovery of large amounts of genic heterozygosity in nature does not come over very well. Indeed, the massive surveys of natural populations and the detailed experimental analyses of some enzyme systems are scarcely reported at all. Consequently, the book gives an unbalanced view of *contemporary* studies in ecological genetics, although to be fair the author claims in the preface that he is not attempting to cover the literature but to develop principles.

Perhaps the most surprising omission of all is in the section on natural selection and human populations. Sickle-cell anaemia, ABO blood groups and Rhesus all find their place. But there is nothing about the histocompatibility loci, whose alleles are perhaps more strongly associated with susceptibility to disease than those of any other locus. This omission occurs despite the proximity of Ford's own laboratory to that of Bodmer and his colleagues, who have published extensively upon the subject.

Despite these reservations, this remains a beautifully written and stimulating book. The style of presentation is magnificent, and the typesetting and illustrations are first class. I was one of many post-graduation (Ford hates " post-graduate ") students who, at the beginning of my research, was told to go away and read it. Advanced students in ecological or popu-

lation genetics should still do so. Although at £11·60 the price is high, British grants have trebled since the book first appeared.

DAVID T. PARKIN
Department of Genetics, University of Nottingham

CELL GENETICS IN HIGHER PLANTS. Proceedings of an International Training Course. Edited by D. Dudits, G. L. Farkas and P. Maliga. Académiai Kiadó, Budapest, Hungary. Pp. 251+58 text-figures+tables. Price: £8·60.

In this rapidly developing area of research some major problems have yet to be overcome and these are highlighted by the articles written by leading scientists in the first part of this book. The second and shorter part contains details of experimental methods used in cell genetics in higher plants.

After a short introduction by G. Melchers, the next six articles are about methods which do not involve the use of protoplasts. The maintenance of cell cultures and the isolation of mutants from them are adequately discussed; the main problems are maintaining the ploidy level and the regeneration of plants from single cells. A good account of methods used for obtaining biochemical mutants in *Arabidopsis* is given. P. F. Lurquin gives a critical review on the integration of exogenous DNA into plants, and some preliminary observations on the use of bacterial plasmids in plant cell genetics are added by F. Cannon.

The remaining ten articles concern the use of plant protoplasts. Although reliable methods for plant protoplast fusion are now available, and are described in the book, the selection and regeneration of hybrids has so far been possible in only a few special cases. E. C. Cocking presents evidence that the natural differential sensitivities of different kinds of protoplasts to various substances may be made use of for selecting hybrids. Several authors report that after a concerted effort to regenerate cereal protoplasts they have had no success, even though an enormous number of different media have been tried. Little work has been done on organelle transfer into protoplasts and it is this, I think, which makes the accounts of this subject seem poor. The importance of protoplasts in plant virus research is discussed. L. Ferenczy describes the characteristics of inter- and intra-specific hybrids obtained by protoplast fusion in *Aspergillus* and although the subject-matter is not directly concerned with higher plants the article does not seem to be out of place. Experience gained from systems using fungi and lower plants may prove to be invaluable to higher plant studies at a later date. Indeed, this could well be a very worthwhile approach.

The practicals in the second part of the book describe methods for pollen culture, protoplast culture and fusion, organelle transfer into protoplasts, and uptake of bacterial plasmids by plant cells.

The choice of authors has ensured a good coverage of the topics. Unfortunately many articles contain frequent grammatical errors, presumably due to poor translation. The main attribute of the book is that it contains numerous up-to-date references.

N. H. GRIMSLEY
Department of Genetics, University of Cambridge, England