Foundations of population genetics

Foundations of Mathematical Genetics. By A. W. F. Edwards. Pp. viii + 119. (Cambridge University: Cambridge, London and New York, 1977.) £5.80.

JUDGING from the title, you might expect this book to be a history of population genetics. It is a fine book; but it is not a history, certainly not in the conventional sense. The book discusses the foundations of population genetics, and to A. W. F. Edwards that mainly means the single locus, infinite population, discrete generation, random mating, constant fitness model. There is some justification for focusing on this model and closely related ones, for, as Edwards points out, " . . . the elementary mathematical theory [of population genetics] has reached a sufficient maturity to be presented . . . as a piece of mathematical standing in its own right" (page vii). The approach is purely mathematical, therefore, and the book will be useful to mathematicians and statisticians who wish to have a concise introduction to the essential terminology and concepts of population genetics. It will also be useful to population geneticists, evolutionary biologists, or ecologist who want a thorough review of some of the fundamental models of population genetics.

In elaborating in detail the implications of a few fundamental models, Edwards goes somewhat counter to what has been and remains an historical trend in population genetics, a trend toward generality at the expense of precision. How this trend became established is not completely clear, but Edwards attributes it to the genius of the founders: "One of the inevitable corollaries of the fact that the structure of mathematical genetics was created by three men of exceptional calibre, R. A. Fisher, J. B. S. Haldane and S. Wright, has been that the ground floor of the edifice is scantily furnished. They ascended rapidly to the upper storeys, not always by the same staircase" (page vii).

On the other hand, the quest for generality has characterised not only population genetics but also much of theoretical evolutionary biology. Emphasis has been on the search for principles that apply at all times and to all situations; special cases, or principles with a restricted range of validity, are anathema. What we have learned in the past fifty years is that there are precious few general principles, and these few are so abstract as to be not especially useful.

Edwards has in any event countered the trend towards a superficial analysis of a multitude of models. This seems thoroughly appropriate for a book whose purpose is to present elementary population genetics as a branch of mathematics. Whether the approach is equaly valid for those whose interest is in actual, evolving populations is another matter.

In focusing on a few specific models, Edwards has discovered that, as the creators of population genetics ascended to the upper storeys, they left a number of important theoretical gaps below, in the analysis of the simple, fundamental models of population genetics. In a number of instances Edwards has plugged the gaps himself, so the book contains much that is new.

The book focuses on the discrete-generation models of selection in diallelic, triallelic, and multiple allelic autosomal loci as well as sex-linked loci; brief sections are also devoted to models with differential viabilities in the sexes, selection in heterogeneous environments, and selection with two linked, diallelic autosomal loci. Throughout the book, emphasis is on finding conditions for the existence of polymorphic equilibria and determining when the gene frequency will actually converge to the equilibrium. Considerable attention is also given to the behaviour of the mean fitness function. One attractive feature about the book is a consistent and clever use of triangular coordinates, following a century-old treatise on the subject by Reverend N. M. Ferrers, one of Edwards' predecessors as Fellow and Tutor of Gonville and Caius College.

All in all, *Foundations of Population Genetics* is a thorough, scholarly treatise, and a useful addition to any professional's library.

Daniel L. Hartl

Daniel L. Hartl is Professor of Biology at Purdue University, West Lafayette, Indiana.

Molluscan atlas

Atlas of the Non-Marine Mollusca of the British Isles. Edited by M. P. Kerney. Pp. v + 202. (Conchological Society of Great Britain and Ireland: Luton, UK, 1976.) £3.

IT is ironical that a major contribution to the study of land and freshwater molluscs in the British Isles should have been published in a year when a catastrophic drought produced a major perturbation on many molluscan populations. The production of this atlas is therefore apposite in providing basis for monitoring ensuing changes. Moreover, it commemorates a century of cooperative endeavour in recording the distribution of molluscs by a succession of dedicated enthusiasts.

This volume deserves recognition by a much wider audience than malacologists, for it summarises in graphical form information collected during the most detailed survey undertaken in this country on any invertebrate group of comparable size. Indeed, it represents a milestone in the development of mapping schemes, and should provide a catalyst to other small organisations undertaking similar projects.

The distribution of 192 taxa is presented on the now conventional 10-km grid maps used by the Biological Records Centre and the information is categorised on the basis of recorded living before or after 1960.

A further refinement is included: the records of the relevant fossils are plotted for those species where there is evidence of changes in the distribution since the last Postglacial period. A promised set of transparent overlays will provide information on a range of environmental parameters and thus enhance the interpretation of the maps; these are eagerly awaited

Results have already accrued from this survey and these are reflected in the recording of several species new to the British Isles and in the re-assessment of the distribution or taxonomic status of others. Nevertheless, the enduring value of this type of work is the enormous impetus and stimulus it should provide for a wide range of research programmes and other activities.

Many biologists and naturalists will regret the adoption of a number of unfamiliar innovations in nomenclature even though they will applaud the desire to establish uniformity of treatment throughout Europe. This laudable objective would have been more palatable by the addition, to each map, of references to more widely known synonyms. An indication of the habitat range and extra-territorial distribution of each species would have further facilitated an understanding of the recorded patterns. Such limitations, however, should not detract from the value of this atlas.

J. F. Peake

J. F. Peake is Head of the Mollusca Section and Deputy Keeper of Zoology at the British Museum (Natural History).