───────── **Book Reviews** ───────────────────────────────

**Charlesworth, B.: Evolution in Age-Structured Populations.** Cambridge Studies in Mathematical Biology, Vol. 1. Cambridge: Cambridge University Press 1980. 300 pp., 11 figs., 14 tabs. Soft bound £ 5.95.

The purpose of this book is to give a summarized review of the main results which have been derived by applying ecological and demographic models of age-structured populations to population genetics and evolutionary theory.

The individuals present in the population at any one time are not born in distinct generations and fertility and survival are dependent on age. This age-structure of the population had been usually ignored in the traditional theories of ecology and population genetics, which is correct for organisms with discrete generations such as annual plants. But otherwise, a description of a population should contain a classification of individuals by age and by genotype.

The consequences of age-structure for selection and genetic drift are of special importance for an interpretation of experimental data resulting from natural selection as well as for applications in breeding in the case of artificial selection.

The book has been divided into five chapters:

1) 'Models of age-structured populations': here notations, basic concepts and the mathematical theory of the demography and ecology of age-structured populations are given.

2) 'The genetics of populations without selection': approach to Hardy-Weinberg equilibrium, effects of genetic drift and special problems of finite populations (calculation of the expected frequencies of consanguineous matings) are the topics of this chapter.

3) 'Selection: construction of a model and the properties of equilibrium populations': changes of gene frequencies and equilibria under selection are examined — for example, the main result, that genetic equilibrium is generally possible only if there is demographic stability, i.e. stationary population size or constant growth-rate and constant age-structure.

Biological implications of this result are also discussed.

4) 'Selection: dynamic aspects': here weak and strong selection are investigated — the latter mainly by carrying out local

stability analyses. In addition to these deterministic local analyses, the stochastic properties of a mutant gene in a large population had been studied by branching processes. Finally, in this chapter some aspects of the theory of artificial selection on a quantitative character in an infinitely large age-structured population are considered.

These problems (selection differentials with age-structure, prediction of the response to selection) are of special relevance for breeding purposes.

5) 'The evolution of life-histories': This final chapter is concerned with life-history evolution in general — with particular consideration to a) age-specific gene effects and the evolution of senescence, b) evolution of reproductive patterns in relation to age and the c) reproductive effort model of optimal life-histories.

The author elaborates a detailed mathematical treatment of the problems studied — but nevertheless he succeeded in keeping the mathematics to a relatively elementary level. Only a knowledge of basic calculus and matrix algebra as well as elementary genetics is presumed.

For some special topics (study of density-dependent populations, temporally varying survival rates and fecundities, optimal control theory in life-history evolution) more advanced mathematical techniques are necessary. Here the author gives citations of the major papers on these subjects.

Furthermore, the implications of the theoretical results for empirical scientists are substantially worked out in all chapters of the book and many examples of the application of the theory to real experimental data are given. The book should therefore be of interest for experimentalists as well as for theoretical population biologists. Advanced studies of the different topics are facilitated by an extensive list of references of approximately 300 titles. In summary, I can recommend this book with great degree of enthusiasm to graduate students and research scientists in population genetics, evolutionary theory, demography, ecology, human genetics, gerontology and plant and animal breeding. This recommendation can be given without any restriction.      M. Hühn, Kiel