
Book Reviews

Ecological Morphology. Integrative Organismal Biology. Edited by PETER C. WAINWRIGHT and STEPHEN M. REILLY. University of Chicago Press. 1994. 367 pages. Price £18.25, US\$22.95 paper; £51.95, US\$65.00 cloth. ISBN 0 226 86995 4 paperback; ISBN 0 226 86994 6 hardback.

According to the editors of this collection of articles, ecological morphology is concerned with 'the relationship between the morphology of the organism and its environment' (p. 2). (I must confess to not having encountered the term before.) This is a rather broad definition, and the articles cover a wide range of topics, ranging from statistical analyses of correlations between aspects of morphology and ecological variables, to experimental studies of the relationships between morphological variables and measures of physiological performance. The central theme seems to be the search for evidence of adaptation: can a particular feature of an organism, such as the shape of the wing of a species of bat, reasonably be interpreted as the product of evolution by natural selection? The focus is almost exclusively zoological; plants are apparently still an abominable mystery as far as adaptation is concerned.

The problem of adaptation, as posed by Darwin, was not to demonstrate that most features of organisms exhibit the appearance of having been designed to serve a function. Rather, it was to devise a mechanism by which natural processes could bring about the evolution of such adaptive features. Natural selection is the only such mechanism that has withstood empirical scrutiny. The work of theoretical population geneticists provided a secure foundation for our understanding of the efficacy of natural selection as an evolutionary force; the absence of such an understanding was the chief weak link in Darwin's theory. The work of the ecological geneticists has documented the pervasive action of natural selection on phenotypes in natural populations, filling the other main gap in classical Darwinism. There is thus essentially no general problem of evolution at the level of morphology, other than the question of how apparently non-adaptive traits may have evolved. The standard answers to this question are (i) the trait is indeed adaptive, but we do not know enough to prove this to be true, (ii) it is not itself adaptive, but is the

outcome of a correlated response to selection on another trait, (iii) it is selectively neutral, and its evolution occurred by mutation and genetic drift.

The research described in this book is mainly aimed at providing evidence that particular traits or suites of traits are indeed adaptive, and possibility (iii) is barely considered. The only article to devote much attention to it is Chapter 8, by Mark Denny. Denny reviews evidence that different species of intertidal algae have about the same drag coefficients in rapidly moving water (p. 187), and hence similar susceptibilities to being uprooted by waves. He concludes that their shapes may be neutral, at least with respect to this aspect of selection. However, this conclusion must be regarded with suspicion, given that experimentally undetectable difference in fitness may have profound evolutionary consequences. The comparison of data on the rates of morphological evolution with the predictions of the neutral theory of the evolution of quantitative traits, as carried out recently by Michael Lynch on mammals and Gregory Spicer on *Drosophila*, seems a more fruitful approach to testing for neutrality.

This raises the question of whether the research program of ecological morphology is really going to tell us anything radically new about the process of evolution, or is simply providing further details about individual traits. My impression is that the latter is the case: the main interest of the book is the wealth of documentation about individual systems, and the use of sophisticated statistical and phylogenetic methods for applying the comparative method. The chapters by Blaire Van Valkenburgh on the interpretation of fossil evidence, by Ulla Norberg on wing design in bats, and by Timothy Bradley on the physiology of habitat use in mosquitoes, are fine examples of specific case studies. I found the chapters by Robert Ricklefs and Donald Miles on the relationship between morphology and ecology, and by Joseph Losos and Donald Miles to give valuable accounts of methodological advances. It is somewhat surprising that so little space is devoted in this book to the controversies over whether evolutionary stasis and punctuated equilibria require revisions to standard neo-Darwinism. The only chapter to make much mention of this topic is the one by Joseph Losos and Donald Miles. Overall, there is not much in this book about evolution

as a process that would have greatly surprised Charles Darwin, and little of relevance to the concerns of geneticists.

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The Genetics of Populations. By JAY L. LUSH. Edited by ARTHUR B. CHAPMAN and ROBERT R. SHRODE, with an addendum by JAMES F. CROW. Iowa State University. 1994. Available from R. Willham, 239 Kildee, Iowa State University, Ames, IA 50011-3150. 900 pages. Price US\$45.00. No ISBN number.

Not many scientists have enough impact on their chosen discipline to have their books published twelve years after their death. Dr J. L. Lush (1896–1982) was, for most of his long life, the supreme authority on the application of quantitative genetics to animal breeding, and his influence through his research and teaching – particularly his teaching – was incalculable. His book *Animal Breeding Plans* was first published in 1937, so no one still at work has much experience of life before Lush. The book had reached its fourth edition by 1949, but by that time it was already being superseded by a set of mimeographed notes. These notes, initially prepared by Lush for his students, were much more explanatory than the book, and set out the statistical derivations in a much more satisfactory manner. They eventually became widely circulated though often difficult to obtain. Dr Lush, in his characteristic quest for perfection, kept on revising and improving them until his health failed, when he asked Dr Chapman to complete the task. With further help from Drs Shrode and Crow, this was finally achieved and the present volume is the result.

The editors wisely resisted the temptation to introduce extensive alterations, though they do supply some valuable footnotes and an addendum. The addendum, by Professor Crow, lists a number of points of clarification or correction. What we have is a book very much like what Lush himself might have written had he completed it himself. It is his thinking, and the clarity of his thought, that comes through the 900 pages. This is the strength of the volume.

The cover is adorned with a well-known formula on progress under family selection. Inside the covers, there are plenty more formulae of the same ilk, bringing the comfort of familiarity to those of us for whom this was bread and butter for most of our working lives. The material still is, and will remain, the essence of the teaching of animal breeding for some time to come. The text surrounding the formulae can still be read with pleasure, and few readers will fail to gain new insights into what they thought they understood. For all that, we are grateful. We should

be more grateful still had we been provided with a subject index. Despite a fairly detailed table of contents, not everything falls neatly into place. For instance, there are some incisive comments on the effect of linkage on genetic limits at the end of an early chapter on Mean and Variance – not at all where you might first think of looking.

However, nothing stands still. We are told in the preface that Lush himself had wanted to re-write certain parts of the book in the context of the developments in molecular genetics. It would be interesting to speculate what he might have said. Nor is that all. Since Lush died, there has been a spectacular explosion in the adoption of breeding methods that owe their power to advances in computing technology. Nowadays, if acronyms like BLUP and REML do not trip easily off your tongue, you cannot even hold an intelligent conversation about animal breeding. This is all post-Lush. As Professor Crow states in the introduction to his addendum, the book shows its age and is strikingly dated. This, as Professor Crow is anxious to point out, is no fault of the author. Still, it says everything.

Why then publish such a volume? The reasons are set out in the preface.

We believe it to be a valuable document for those with interest in a scientific approach to the genetic improvement of animals and plants. The book is of historical interest and importance because of the role this scientific approach played in Lush's contributions to research and teaching in the field of animal breeding.

Few reviewers, I imagine, will fail to echo these sentiments.

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Animal Breeding. By GERALD WIENER. The Macmillan Press. 1994. 208 pages. Price £5.99. ISBN 0 333 57298 X.

Animal breeding (used here to imply genetic improvement rather than reproduction), is an essential component of any efficient production system in temperate or in tropical environments. There is, nevertheless, a dearth of good texts for students and for practical breeders at both the basic and advanced level. This book is a welcome addition to the literature.

It is published in a series entitled *The Tropical Agriculturalist*, intended as field guides and textbooks. The principles of improvement are not, of course, any different whether they are to be applied in a developing tropical country or a developed temperate country, although some variation in emphasis is appropriate. There are, however significant differences in the sorts of problems encountered in practice, and it is nice to see the critical ideas of genotype × environment interaction brought into the introductory chapter, for