

Book reviews

Evolutionary Genetics — From Molecules to Morphology. Rama S. Singh and Costas B. Krimbas (eds). Cambridge University Press, Cambridge. 2000. Pp. 702. Price £60.00, hardback. ISBN 0 521 57123 5.

This volume is the first of three volumes from a Festschrift marking the occasion of Richard C. Lewontin's 65th birthday and the approximate time of his retirement. The volumes were planned and invitations to authors were formalized in 1996. This first volume appeared in 2000, but a celebration, colloquially referred to as *Dickfest*, was held on September 6, 1998 at the Museum of Comparative Zoology at Harvard. The frontispiece is a photograph of 115 friends, former students and post docs that attended *Dickfest*.

Dick Lewontin has been a leader in population genetics and evolution for over 40 years, and his influence has been enhanced by interactions with more than 100 graduate students and postdocs. He is most widely known for the innovation of using electrophoretic surveys of proteins to quantify genetic variation within and among populations. This innovation triggered thousands of studies of plant, animal, and microbial populations, providing the data that inspired the neutral theory and fuelled the festering debate between neutralists and selectionists. Lewontin also made numerous theoretical contributions, most notably on linkage disequilibrium and units of selection.

The book contains 32 chapters organized into eight sections: historical perspectives on population genetics; molecular evolution; selection, linkage and breeding systems; quantitative genetics; gene flow and population structure; population genetics and speciation; and behavioural ecology. Each section begins with a preface that provides historical perspective and organizational overview. The book has a subject index and a listing of Lewontin's publications, currently 274 and still growing. I wish they had included a diagram of his academic genealogy.

Because the 32 chapters are grouped into eight sections, the coverage of any section is sketchy and partially dependent on the historical contingency of the author being associated with Lewontin. This Festschrift will be valued as an historic marker, the celebration, hosted by his academic family, of an accomplished scientist, rather than as a focused academic effort. Nevertheless, this volume contains some fine papers.

The first chapter, by Dick Lewontin, entitled 'The Problems of Population Genetics', is a familiar theme that Lewontin treats with authority. Parts of the chapter are echoes of earlier reviews, a litany of what we do not know and cannot know. Some of this is unjustified pessimism commonly mistaken for scientific rigor. Other parts, such as his discussions of codon bias and comparisons of coding and noncoding sites, are novel and uncharacteristically optimistic.

Several chapters were particularly noteworthy. Bruce Wallace provided an historic analysis of heterosis, pointing out that 'neutrality of phenotypic variation arises as an average of many, non-neutral selective roles played by individual variants during decisive encounters'. Andrew Berry and Antonio Barbadilla showed that, while recombination is most important for exchanging fragments between loci, gene conversion is much more important for generating diversity within a locus. Eleftherios Zouros and David Rand provided a thoughtful, comprehensive overview of the evolutionary forces influencing the evolution of mtDNA, and the implications of various forms of selection for phylogeographic studies. Jerry Coyne and Allen Orr summarized recent progress on the genetics of speciation.

The second volume from *Dickfest* appeared in 2001, and the third is in preparation.

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The Ecology of Adaptive Radiation. Dolph Schluter. Oxford University Press, Oxford. 2000. Pp. 288. Price £19.95, paperback. ISBN 0 19 850522 1.

Adaptive radiation is defined as the evolution of ecological diversity within a rapidly multiplying lineage. Dolph Schluter takes as his starting point Simpson's *Major features of evolution* (1953) and other classic texts of the mid-20th Century. He aims to examine the evidence assembled over the succeeding half-century for what he calls 'the ecological theory' of adaptive radiation, which proposes that both the origin of species and the evolution of phenotypic differences are caused by divergent natural selection, driven by environmental differences and interspecific competition.

I found Schluter's book concise and well written, in the 'journal review article style' of the *Oxford Series in Ecology and Evolution*. Researchers in the field should find the volume indispensable for the clarity with which the author summarises existing information and delineates just what has and has not been supported by empirical evidence. Seemingly plausible ideas are often less well supported than one might expect. Schluter concludes that there is no real evidence that adaptive radiations tend to be founded by generalist taxa that give rise to progressively more specialised daughter forms. There is little evidence that speciation rates are related to ecological opportunity. We do not really seem to know whether adaptive radiations tend to run out of steam as vacant niches are filled up, or whether the proliferation of species leads to a

proliferation of new niches. Of Schluter's six key tests for cases of character displacement, the one least often fulfilled is that similar phenotypes actually compete for resources, although this may be because of a lack of effort by investigators. However, I suspect that sceptics of character displacement might sometimes require a rather higher burden of proof, although they must surely admire the clarity with which Schluter presents his criteria.

I found the penultimate chapter of this book difficult to assess. It deals with a statistical, comparative, quantitative-genetic approach investigating how much adaptive radiation proceeds along lines of 'genetic least resistance'. The approach is elegant, but it is not clear to me that the results demonstrate a potential to greatly increase our insight. However, I would not try to convince readers to reject the Null Hypothesis of my own dimness.

Schluter's overall conclusion is that the ecological theory is in pretty good shape, although parts of it still lack much empirical support. The main area of contention remains the process of speciation. The principal alternative to the ecological theory is seen as the possibility that speciation may be driven by divergence in mate preferences resulting from sexual, rather than natural (=ecological) selection. Little evidence for or against this proposition is presented, probably because there have been few incisive empirical studies, in the wake of recent renewed interest by theorists. Schluter devotes very little attention to the role of random processes, such as founder

effects, but not really say why. Perhaps, he considers that such processes ought to churn out species independently of divergent natural selection, but this is surely also true of sexual selection.

Alternatively, he may think that we can now be fairly certain that founder effects are not nearly as important as was once believed. In the concluding chapter, Schluter concentrates on suggesting how the study of adaptive radiation might progress through a focus on the role of selection and how it is mediated by the genetic architecture of the organism. I suspect that this will be the agenda of speciation research in general for the next 50 years, and that this excellent book will play an important part in setting that agenda. Essential reading for anyone interested in the topic, from advanced undergraduates onwards.

Reference

SIMPSON, G. G. 1953. *The Major Features of Evolution*. Columbia University Press, New York.

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