

of the genome and the ability of the organism to recombine? A different approach has been to analyse the fitness effects of naturally occurring variants in the laboratory (Dykhuizen). This has generally suggested that the variants are neutral with respect to one another, although the resolution of the system is limited. However, variants which are similar in one environment can be quite different in another (Lenski, Dykhuizen). Experimental populations have also demonstrated how incredibly easy it is to evolve plasmids carrying multiple antibiotic resistance genes (Levin).

The volume is rounded out with good chapters on the population genetics of restriction systems (Barcus and Murray), insertion sequences (Werner *et al.*), adaptive mutation (Foster) and phase variation (Saunders). In one of the last chapters, Roger Pickup describes what is one of the most exciting areas of bacterial population genetics; the use of PCR to study the community structure of unculturable microbes. This approach has greatly increased our understanding of community ecology at the microbial level. Despite our relative ignorance of bacterial population genetics the future looks bright for the study of both natural and experimental populations. We can learn a lot about both the basic evolutionary mechanisms which affect a huge proportion of the earth's biota, and also many of the organisms which are medically and economically important. This book offers good reviews on many of these aspects.

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Non-Neutral Evolution: Theories and Molecular Data. Brian Golding (ed.). Chapman and Hall, London. 1994. Pp. 249. Price £29.95, paperback. ISBN 0 412 05391 8.

A lot of time and soul searching must have gone into the title of a volume which defines evolution in terms of what it is not, rather than what it is. The phrase 'Non-Neutral Evolution' tacitly acknowledges that the Neutral Theory of Molecular Evolution has frustrated virtually all attempts to pin the observed patterns of molecular variation to adaptive models of evolution. The title, more than anything, illustrates just how much things have changed in the last ten years.

This volume is the result of a recent workshop, sponsored by the Canadian Institute for Advanced Research, which brought together some of the World's most respected evolutionary biologists to assess the state of play. As such it provides an accurate cross-section of current research, ranging from largely descriptive empirical work to purely theoretical contributions. My most basic criticism is that the interaction of theory and experimentation is rarely shown to bear fresh fruit. However, this is perhaps understandable in a field which openly laments

the fact that it provides 'fodder for the theoretician, but little solace for the experimentalist' (Chapter 1).

Despite this reservation there is evidence that the deluge of DNA sequence data is providing new ways of looking at old problems. One of the clearest predictions of the Neutral Theory, the existence of a quantitative relationship between levels of DNA sequence variation within and between species (they are both products of the same combination of mutation and drift), is challenged repeatedly here using data from *Drosophila* species. The conclusions are firm; the null hypothesis of the Neutral Theory can be rejected, some sequence variation clearly isn't strictly neutral. Unfortunately, as several authors go to some length to point out, this does not necessarily mean it is adaptive either.

An instructive example comes from an excellent series of chapters on the relationship between recombination, variation and selection. Regions of reduced meiotic recombination exhibit low levels of intraspecific variation, but interspecific levels of variation are normal. This has been cited as clear evidence for the presence of linked loci under positive directional selection. However, the observed levels of within- and between-species variation can be explained equally well by selection against linked deleterious loci being maintained by mutation. While the theoreticians are busying themselves trying to find conditions under which the competing explanations can be discriminated we can conclude one thing for certain; empirical proof of natural selection and confirmation of Darwinian evolution remains as elusive as ever at the molecular level.

There is some clear, informative writing here, particularly where a relatively well-defined problem or small body of work can be covered comprehensively. There is also a healthy mix of novel and established work which broadens its appeal. Ultimately, however, the volume is disappointing simply because of the intractability of the subject matter. So many chapters detail the pattern of sequence variation at so many loci in so many species and in so many different ways, yet come up with so few firm conclusions. I suppose that's just the way it is always going to be when you take snap-shots of molecular variation and try to extrapolate the pictures across the millenia.

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Stress-Induced Gene Expression in Plants. A. S. Basra (ed.). Harwood Academic Publishers GmbH, Chur. 1994. Pp. 287. Price £84.00, hardback. ISBN 3 7186 5466 0.

Stress-Induced Gene Expression in Plants, according to the description on the back cover, 'is a book aimed at