

from any concerned academic discipline. It is a truly excellent piece of writing. Dutfield takes the reader through the modern history of plant genetic resources exploitation and how IPR regimes have coevolved. He pays particular attention to the impact of the CBD (particularly through Articles 8 (j), 15, 16, and (17) and the so-called TRIPS (Trade Related Intellectual Property Rights) agreement reached in 1995 as part of the Uruguay Round of trade liberalization, now managed by the WTO (World Trade Organization). Using simple language he shows how the new trading context (designed to promote economic growth) can conflict with the new environmental context (designed to promote conservation and equity) and what this might mean for public policy analysis and action.

He explains who the various agencies are, and what are their respective roles and interests. He also spends some time analysing modern trends in technology, especially the new biotechnology, and how these are beginning to impinge on economic possibilities in related fields, particularly in pharmaceuticals and agrochemicals. He provides a range of illustrative examples of national and regional initiatives that have arisen to grapple with these issues. He also gives content to his remark using clearly portrayed case study examples, like the infamous 'terminator technology' patent that has so exercised the minds of the popular press. Finally the book contains a series of valuable appendices dealing with recent workshop proceedings on these issues and, especially valuable, a 62-page annotated bibliography of (210) source texts. This is in addition to a very complete reference section, though there is some overlap.

But, apart from its ease of access, what commends this book to me is the balanced nature of its analysis. Each issue is explored objectively with all sides of the argument given due weight. This is much needed. We have seen, for example in Seattle, the hysterical nature of popular reaction to recent globalization trends where many groups simply have not understood the complexity of the related issues. It is on this point that action needs to be taken as popular confusion has at its roots intellectual confusion as well. Our universities and research institutes must now realize that dividing the academic quest into disciplinary boxes may add value of a narrow, research-based, kind. But major world issues do not fit nicely into these

well-ordered compartments. On the contrary they require a deep understanding of the interrelationships between disciplines. Graham Dutfield's book is a marvellously disinterested example of what can be done in this sense.

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### PRAXIS MAKES PERFECT?

Awise, J.C. (2000) *Phylogeography: the history and formation of species*. Harvard University Press, London. viii + 447 pp, tables, figs, index. Hardback: Price £30.95. ISBN 0 67466 638 0.

The word phylogeography has the ring of a fictional science, an absurdly specialised discipline and sure-fire cocktail party conversation stopper: 'So what do you do?' — 'Oh, I'm a phylogeographer ...'. I am pleased to say that this notion is far from the truth. John Awise's book, like its eponymous topic, is both wide-ranging in scope and firmly rooted in the real world. The remit of this timely text is concisely described in its first sentence: 'Phylogeography is a field of study concerned with the principles and processes governing the geographic distributions of genealogical lineages, especially those within and among closely related species.'

Fifty years ago, this sentence would have described a purely theoretical discipline. With no means of reconstructing the ancestral relationships among members of natural populations, researchers were confined to mathematical modelling of genealogical patterns. Such models have a long and auspicious history — the first was described in 1874 by H. Watson and F. Galton in order to explain the disappearance of (paternally inherited) family names among the British peerage. More recently, genealogical modelling has been invigorated by the development of coalescent theory — a simple yet powerful framework which describes how population-level behaviour can be inferred from a small sample of individuals.

The ever-increasing resolution of modern genetic methods has rendered genealogies reconstructed from genetic data commonplace throughout the

biological sciences. Phylogeography aims to provide a conceptual framework for analysing such phylogenies, and for interpreting the spatial distribution of their component lineages. The book begins with a straightforward history of applied population genetics, with specific reference to animal mitochondrial DNA and its advantages as a genetic marker: high genetic diversity, high copy number, limited recombination, and maternal transmission.

The second chapter outlines coalescent theory and several other spatial genealogical models. Mathematical ideas are explained deftly through the use of figures rather than equations, resulting in an accessible yet thought-provoking discussion. The take-home message is that genealogies carry the indelible stamp of past demographic processes such as migration, reproductive isolation and population size change. Given the right analytical tools, reconstructed molecular phylogenies can provide important information about biogeographic events and processes.

The middle third of the book is occupied by a large and comprehensive review of intra-species genetic variation in animals, preceded by a short overview of similar analyses of human genetic diversity. Here the pace of the book seems to slow under the weight of examples and references. The author imposes order by defining five broad phylogeographic categories which, although somewhat arbitrary, provide a necessary framework for interpreting the myriad examples.

The following chapter, entitled 'Genealogical Concordance', is much more satisfying. Genes within a population are considered concordant if they support the same distinctive phylogenetic clades. Similarly, species within a geographic region are concordant if the spatial distributions of their genetic lineages are alike. Avise illustrates these concepts by reference to the ecology and biogeography of the south-eastern United States. Maritime and freshwater species in this region consistently exhibit geographic differences in mtDNA variation on either side of the Florida peninsula. Although the true explanation for this concordance may be complex, it is likely that the peninsula itself has promoted physical and ecological separation of Atlantic and Gulf populations.

The author also gives considerable thought to the reasons for phylogenetic disagreement among genes, and rightly so. How can we possibly make inferences about evolutionary or demographic processes from genetic data if different genes from the same species are telling different stories? In the final chapter Avise suggests an answer; divergent gene genealogies can be considered as separate pathways through the same population pedigree — a concept formalized mathematically in multi-locus coalescent theory. The author goes on to argue that this phylogeographic perspective can be used to reconcile incompatibilities between the biological and phylogenetic species concepts. Avise's conclusion is cogent and leaves many open doors for future research. I would just like to add that differences among gene genealogies can be as informative as similarities. One memorable example is the detection of sex-specific gene flow among Hindu castes, as demonstrated by differences between mtDNA and Y-chromosome genealogies (Bamshad *et al.*, 1998).

Phylogeography's greatest achievement is its ability to integrate theory and practice, or more specifically, coalescent theory and empirical genetic data. It also succeeds in maintaining a productive balance between the influence of historically contingent events and predictably repeatable processes. The future success of this nascent discipline now depends on the progress of new genetic technologies capable of resolving intra-specific genetic variation. If these technologies continue to develop as fast as they have done then phylogeographers will certainly have plenty to talk about at cocktail parties.

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## REFERENCE

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