

Book reviews

Adaptive Evolution of Genes and Genomes. Austin L. Hughes. Oxford University Press, New York. 1999. Pp. 270. Price £45.00, hardback. ISBN 0 19 511626 7.

The author doesn't waste any time in letting the reader know that the account of adaptation and molecular evolution spun in his book will be a highly personal and opinionated one. In fact, the author admits up front that the majority of the examples in the book come from his own work on a large range of molecular evolutionary subjects. As the book is about adaptation, the author also quickly lets the reader know that one of the more influential papers of the 1970s on this subject — Gould and Lewontin's spandrels classic — is nothing more than non-adaptationist story telling. According to Hughes, adaptationism thrives today because of an even more important paper from the 1970s by Maxam and Gilbert, that shepherded the DNA sequence age into evolutionary biology. This book, therefore, is about this 'so-called' adaptationist triumph from a molecular or genomic perspective.

Accordingly, the book is organised to firstly establish the prevalence of adaptation at the molecular level and its importance in modern evolutionary biology. Hughes then describes the methodology used to examine adaptation at the molecular level and how the neutral theory fits into the picture. These introductory chapters are followed by five chapters on specific molecular evolutionary systems, that address balancing selection, directional selection, evolution of new protein function and genome evolution. Along the way specific analytical approaches are explained and used, and specific genes or gene families are chosen as examples of the principles being discussed. The author concludes with a chapter that places modern molecular evolutionary studies in the context of Neo-Darwinism and characterises evolutionary biology as 'a boat that we continually repair while remaining afloat in it' (after Otto Neurath, p. 234). The implication is that all we have learned in the past four decades from molecular evolutionary studies can be completely understood in the context of the Neo-Darwinian paradigm.

The author had to know that a phylogenetic systematist (cladist) would review the book sooner or later and in this respect I have reservations concerning the approach he has settled upon. Of the 36 phylogenetic trees in the book, 34 are Neighbor Joining trees and there is no real explanation of that method, how it works or of its philosophical basis. I do not really want to discuss here the foundations of the various means of phylogenetic analysis, but rather wish to take issue with Hughes' suggestion that 'some systematists have continued to view the field from the perspective of old controversies that are no longer relevant' (p. 34) and that new molecular data have 'made many old controversies obsolete' (p. 34). The special nature of molecular data that Hughes implies should make them immune from controversy, simply does not exist in

my opinion and his dismissal of problems with data analysis and embracing of phenetics is less than convincing to this phylogenetic systematist. An unconvincing discussion of maximum likelihood is also part of this chapter. Hughes characterises likelihood as 'less frequently used because it takes a great deal of computer time' (p. 37). The operational utility of an approach should never be used as an argument against its use, simply for the reason that the operation of techniques almost always get better and better with time. I suppose that, to Hughes, I am simply promulgating these old controversies, but in the opinion of many non-morphological systematists, these controversies are at the core of what we do as molecular systematists. My comments about tree building methods would, in my view, be a damning criticism of the book were it not for the fact that much of what Hughes has to say about adaptation at the molecular level can be said independent of phylogenetic trees. In this respect, the utility of statistical methods developed around silent and replacement substitution theory is evident in many places in this book and these methods are clearly the methods of choice for assessing the relevance of the important topics of balancing selection, directional selection and adaptation.

A final, positive, aspect of the book is that the descriptions of the biological systems examined are incredibly clear and easy to read. The MHC system, perhaps one of the most difficult genetic systems to explain, is clearly described with concise text and informative figures. This facet of the book should not go unnoticed as it really makes digging into what is important about the author's approach much easier. Instead of wasting time trying to figure out the biology of the systems in the book, the reader can concentrate on the scientific methods used. Whether you agree or disagree with the analytical approaches taken by Hughes, you will not be confused by the molecular systems that he takes as examples.

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Methods for Risk Assessment of Transgenic Plants. Klaus Ammann, Yolande Jacot, Vibeke Simonsen and Gösta Kjellsson (eds). Birkhäuser Verlag, Basel. 1999. Pp. 272. Price sFr. 128 (DM 148), hardback. ISBN 3 7643 5917 X.

If I had been asked to invent imaginary titles of the world's most boring books a few years ago, I might well have included a volume on the risk assessment of some technical procedure, perhaps along with the complete encyclopaedia of soap operas and juggling for beginners. It is a strange world though and I

have to confess to laughing aloud when I recently found myself unwrapping a book entitled *Methods for Risk Assessment of Transgenic Plants* with the feverish excitement normally reserved for eight-year-old children at Christmas. What is more unnerving is that I know I am unlikely to be the only one. Indeed, in the space of a decade, risk assessment of GM crops has risen from complete obscurity practised by a few eccentrics, into a celebrated research field in its own right, with all of the top journals (including *Heredity*) featuring manuscripts on the area. Much more than that, I find that this is a subject on which everyone seems to have an opinion, almost irrespective of his or her area of knowledge. Thus, like politics, sex and religion, the risk assessment of GM crops is, for most people, a field with an extremely low fact to opinion ratio. For those of us who are prepared to have their views 'confused by the facts', however, I humbly suggest that volumes such as this can be at least worth a scan.

So much for the motivation, what about the content? Well, inevitably I suppose, this book is a compilation of contributions made by various authors at a conference on the subject hosted in Bern, Switzerland in 1999. Usually this is sufficient for me to replace a book onto a shelf and to move on. It is certainly the easy method of producing a book but editors rarely succeed in integrating all contributions together and any attempt to harmonize styles and standards seems to be almost destined to failure. The result, as often as not, resembles a volume from a specialist journal but without the benefits of peer review, features only one or two star contributions and a lot of papers that, quite frankly, do not measure up astronomically. This book is somewhat different. Firstly, the editors have not made the mistake of trying to pretend that this is not a "compilation album". On the contrary, they seem to make a virtue of the fact. The whole volume is in the form of a written documentary of the conference, complete with opening remarks and question and answer sessions. In consequence, the reader is left with the genuine feeling of having attended the meeting. However, having said that, I have been to many meetings where the best feature was the quality of the catering rather than the science on offer; no amount of skilful editing can paper over flimsy contributions. Once again, thankfully, this is not the case here. There are contributions from most of the major players in the field and all have taken care to present interesting papers of good quality.

The papers themselves are arranged into eight sessions covering ecological effects, modelling, short and long-term effects, monitoring methods, population genetics, harmonization, methodological lacunas and the final concluding section on future strategies. Overall, the standard of the papers was good and the writing style sufficiently well edited not to jar when progressing from one chapter to another. I particularly enjoyed the contributions from Alan Raybould *et al.*, Glynis Giddings and Terrie Klinger and Norman Ellstrand. There were some weaker papers, but not many. I also rather surprised myself by reading and enjoying the question and answer sessions, although I must confess partly for the wrong reasons. It is my experience that discussion sessions can vary in composition from rat-a-tat questions and answers, sensible and less sensible statements of fact (or opinion) through to yawn-inducing monologues by

the eminent and aspirants thereof. It is difficult to say whether the absence of the last category here was attributable to careful selection of participants, exquisite editing or extremely skilful chairmanship. In any event, the result is rather interesting, informative and surprisingly devoid of irrelevant comments.

All in all then, a jolly good read and well worth the money. Well, yes, but with a couple of provisos. Firstly, it should be remembered that this is not likely to be a long-term intellectual investment. GM risk assessment, like genetic modification, is a field that is progressing at a breath-taking speed and so the views and data presented here are likely to be published elsewhere in refereed journals or else superseded within a relatively short time frame. Secondly, excellent though the editing and index are, a composition publication such as this is never particularly well suited as a general reference book or as a teaching aid. Rather, it should be used as a record of the views and data of many of the leading names in the field at a crucial time in the history of agricultural research.

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The Meaning of the Gene. Celeste Michelle Condit. University of Wisconsin Press, Madison, WI. 1999. Pp. 325. Price \$19.95, paperback. ISBN 0 299 16364 4.

At the cross-roads of two centuries we are being presented with the first draft of the human genome. This is an era of genetic choice and the challenge will become more pressing for all of us as technology and scientific understanding progress, even though we do not yet know how many genes we have or exactly where each gene begins and ends. In *The Meaning of the Gene*, Celeste Condit clearly shows the development beyond a focus on heredity to a more wide-ranging and complex understanding that involves individuals, families, races, patients, social structures and the environment.

The works of scholars in genetics, sciences and history are not the source of the author's examination of how the meanings of gene evolved in the United States in the 20th Century. The analyses focus on the public voice expressed during 1900 to 1995; in newspapers, magazines, the *Congressional Record*, television news and documentaries. For technical and methodological reasons, the magazine source predominates, but it does not eliminate the other sources. Using quantitative methodologies and critical interpretation, the author segments the 20th Century into four major categories, or rhetorical formations, that represent the change processes in the way genetics are understood. The methods are carefully detailed in Appendices 1–3, with a clear recognition of the statistical and other limitations of the tools used.

The classical era of Eugenics was 1900–1935, in which the dominant metaphor was that of cattle-breeding. The