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Book reviews

Control of Messenger RNA Stability. Joel Belasco and George Brawerman (eds). Academic Press (Harcourt Brace Jovanovich) London. 1993. Pp. 517. Price £53, hardback. ISBN 0 12 0847825.

That mRNA decay plays an important role in controlling gene expression is obvious. What has been less widely appreciated is that the decay rates of many mRNAs are differentially regulated by a variety of signals and that these changes are homeostatically and developmentally important. The stability of a given mRNA is determined by the interaction between *cis*-acting sequences and *trans*-acting factors. We know something about the former and rather less about the latter.

The editors of this book say that there has not been a comprehensive review of this field of research for specialists and this is intended to fill it. It does. The book is divided into three sections; Prokaryotes, Eukaryotes and Methods of Analysis, the latter consisting of just one chapter. The prokaryotic section has six chapters which cover RNA determinants of stability, RNases and the effects of translation on mRNA stability. The eukaryotic section has eleven chapters. Different examples of mRNA decay are discussed, including AU sequence-rich mediated decay (cytokines and protooncogenes), translationally coupled decay (tubulin), iron modulated decay (transferrin receptor) and decay of non polyadenylated mRNAs (histones). It also contains chapters describing hormonally regulated mRNA decay, mRNA turnover in yeast and in organelles, control of polyA length, mRNA stability in cell free systems, and nucleases. The chapters are written by leading workers and refer to work published up to 1992 and in a few cases 1993, as well as discussing unpublished work.

The editors also hope that non-specialists will find much to interest them in this volume. They will. The first two sections are each preceded by an overview chapter. All the chapters are self-contained and can be read individually. This means that there is some overlap between the chapters, a helpful feature for the non-specialist. The chapters are well written and illustrated, with few errors of any sort that I could detect. In particular, many of the line diagrams are so good that the reader does not really have to refer to the accompanying text.

So, I think this is a good book which plugs an important gap in the library shelves. Anyone interested in gene expression and RNA metabolism (including advanced undergraduates) will benefit by reading it. Library representatives should make sure that their Institutional library has a copy and consider buying one for the Departmental library. What about a personal copy? At this price borrow it first.

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Mitochondrial Genomes. International Review of Cytology (Vol. 141). D. R. Wolstenholme and K. W. Jeon (eds). Academic Press (Harcourt Brace Jovanovich) London. 1992. Pp. 377. Price £47.00, hardback. ISBN 0 12 364544 1.

All molecular biologists with a taste for the strange or the downright bizarre should read this book and marvel at what a couple of thousand million years of evolution can do given a free hand. With sizes ranging from maybe 6 kb (*Plasmodium*) to an estimated 2400 kb (muskmelon), mitochondrial genomes are a wonderfully diverse collection of oddities, with immense variation in structure, behaviour and mechanisms of expression. They include the fastest (animal) and slowest (plant) evolving genomes known, a variety of different genetic codes, in some cases tRNAs and rRNAs which are so modified from standard structures that they are barely recognisable, and at least three different forms of RNA editing. This book contains some excellent reviews which should be required reading for budding mainstream molecular biologists who have a tendency to think (and be taught!) that normal mechanisms of gene expression are universal.

The first six chapters cover various groups of organisms whose mitochondrial genomes have been studied in more or less detail; ciliates (D. J. Cummings), trypanosomes (K. Stuart and J. E. Feagin), fungi (G. D. Clark-Walker), higher plants (M. R. Hanson and O. Folkerts) and animals (D. Wolstenholme, D. A. Clayton). All six reviews are written by researchers recognized to be among the leaders in their respective fields of interest, and consequently as one would expect are of generally high quality. Given the many extreme dissimilarities between the mitochondria in these different groups, readers new to the field may well be surprised to discover in the final chapter that Michael Gray comes down in favour (if only tentatively) of a monophyletic origin for all mitochondria. This marathon final chapter (124 pages!),

entitled 'The Endosymbiont Hypothesis Revisited' is a very impressive piece of scholarship, covering the origin and evolution of plastids and mitochondria, with a few words on the origin of the nuclear genome thrown in for good measure. It would merit a book all by itself, and I think would have been better placed at the beginning of this volume where it could have served as an introduction to the other reviews. Other than this minor point, my only reproach is the usual one for this type of book; all the reviews have dated somewhat since they were written in late 91/early 92, and researchers working on mitochondria from a particular organism will probably find 'their' review old hat and rather disappointing. The real value of this book is the bringing together of valuable information that is otherwise difficult to find in one place; the superficial differences between the systems described here should not be allowed to obscure the fundamental similarities, and I certainly recommend it to colleagues looking to broaden their outlook.

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The Structure and Confirmation of Evolutionary Theory. Elizabeth A. Lloyd. Princeton University Press, Princeton. 1994. Pp. 235. Price £11.95, paperback. ISBN 0 961 00046 8.

There are a number of persistent problems in evolution which seem to be mired in debates about definitions and epistemology. Examples are the central apparent tautology of natural selection itself, units of selection, taxonomic methods, speciation, and species concepts. The persistence of these apparently sterile debates strongly implies that we may be asking the wrong questions. Philosophical analysis ought, at least in principle, to be able to solve these problems and guide research onto a more fruitful tack. This book proposes such a system, and uses it to treat units of selection and sociobiology in detail.

Surprisingly, Lloyd does not deny that natural selection ('survival of the fittest'; where the 'fittest' are 'those that survive') is a tautology, but states that this doesn't really matter provided that evolutionary theories have testable assumptions and testable predictions. She also agrees with the late Karl Popper that evolution is not scientific in the same sense as physics, instead of arguing (as I would) that natural selection is not tautological and that Popper was wrong about evolutionary theory. Lloyd adheres to a new mini-school of philosophy of science called the 'semantic approach to theory structure', which apparently allows her to view evolution as a science even if it is tautological. This approach remains almost as mystifying to me now as it was obscure before I read the book: in the semantic approach 'we concentrate on the (theory) structures themselves, rather than attempting to reconstruct, in some theoretical language, the sentences of the theory, as demanded by the axiomatic and positivist approach to theory structure'. If you want to understand the approach, you had better gird your loins for a lot of wrangling about axioms, laws, models, state space, and so on. As far as I can see, although Lloyd prefers the term 'confirmation' to 'falsification', she agrees with Popper that the best theories make bold, new, testable predictions. I quickly gave up on the semantic approach and read the examples.

It is clear that Lloyd's views on evolution are very close to those of Richard Lewontin. For instance, she agrees that kin selection must be seen as a subset of group selection acting on groups of kin. Whether kin selection is an opposite of, or is contained within, group selection is an argument I have tried to penetrate at various times without much success. I still find the minimalist Uyenoyama & Feldman (1980) definition, where group selection is essentially the same as frequency-dependent selection, as compelling as any; at least it has the virtue of being easily grasped. Lloyd has mastered all of the conflicting literature by Mike Wade, Len Nunney, Elliot Sober and others, but quibbles with the lot of them. In response to the argument of Uyenoyama and Feldman we are informed that 'in regular frequency-dependent selection, there is no group level trait that is correlated to group fitness', whereas in Lloyd's group selection, 'group level traits' are the key. But since the frequency of individual traits is itself a trait at group level, this definition collapses back to frequency-dependent selection with hard to soft selection determining the outcome in structured demes. I remain unconvinced by Lloyd's argument here.

Lloyd also deconstructs Richard Dawkin's argument for universal gene-level selection, and finds it wanting. Again, this is Lewontin territory, and here I found myself agreeing with Lloyd, though I doubt that gene selectionists will suddenly change their minds. This book is a must for those with an interest in units of selection, from gene selection to species selection, but it is unlikely to help us to root out the central epistemological confusions that still lurk in population genetics and evolution.

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