

physiology and biochemistry of gene action. Four reviews pursue this theme (Kacser, Bulfield, McKay, Smith & McMillan), while the last two reviews discuss the genetic basis and technology of transgenics (Church, Bishop & Al-Shawi).

The distinction of the caste of authors is obvious. The standard of their contributions is high, and it is clear that they have taken trouble to write well-constructed reviews because of their high regard for Alan Robertson. Anyone interested in evolution and/or animal breeding will find this book both a pleasure and a stimulus to read.

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Process and Pattern in Evolution. By CHARLOTTE J. AVERS. Oxford University Press. 1989. 590 pages £28.00. ISBN 0 19 404174 7.

This is one of a new kind of evolution text, aiming to integrate traditional evolutionary material with a full treatment of the mass of modern experimental results relating to processes of molecular evolution. One must admire Charlotte Avers' courage in tackling single-handed almost all topics relevant to modern evolutionary biology, from cosmology and creationism through cladistics, continental drift and finally to cultural evolution. Her command of the relevant literature is impressive and the writing generally clear. However, such an ambitious book deserves critical assessment: it proves to be somewhat flawed.

In the area of molecular and cellular biology (which is not the field of the reviewer) Avers is successful in presenting a clear account of exciting and complex developments which – during the last couple of decades – have transformed our understanding of the way in which evolution has operated at this level. There is excellent coverage, for instance, of the origin and evolution of primeval life, of the endosymbiotic and other theories of the origin of eukaryotes, and of the five-kingdom system of classification. Similarly, the chapter on phylogenetic analysis, which discusses methods based on morphological, protein and DNA studies, is very welcome and generally a model of clarity (although one may be forgiven a double-take at the statement on p. 384 that 'Even if it is constant, the rate of {molecular} change may vary at different times in a group's history'). Here and throughout the book there is a welcome willingness to expose students to controversy and to alternative hypotheses.

A decision faced by all writers of evolution texts is to decide how extensively (if at all) to treat 'the march of life': Should students be presented with information as to which group succeeded which, and when, and (possibly) why? Avers gives only the briefest of sketches, covering the history of life in the Phanerozoic in about 20 pages. In contrast to the thumbnail coverage in this general section, there are over 80 pages on the evolution of the primates and the

hominines. Emphasis on humans in general textbooks is sometimes criticized on the grounds that the biological principles are better explained using other examples. I sympathize with Avers' implicit view that biology students should have the opportunity to gain an understanding of what is – and what is not – known about human evolution, especially since both molecular and paleontological data can now be brought to bear. Avers' thorough treatment will undoubtedly be useful, but it is perhaps unduly long, and the writing is in places noticeably less polished than in other parts of the book. The author also occasionally gets bogged down in the complexities of primate taxonomy, for instance in the discussion of sister clades on p. 487.

Unfortunately, the chapter on natural selection and adaptation, which should perhaps still rank as the core material for a general evolution text, is the weakest in this one. It gets off to a bad start with a diagram (on p. 213) which will strike a chord with experimental microbiologists but which, in its implication of all-or-none success and failure, is liable to mislead students as to the way in which selection normally works in natural populations.

I may not be alone in finding unfortunate the extensive use of the word 'strategy' in such contexts as (p. 227): 'Balancing selection, or heterozygote advantage, is a strategy by which stable polymorphism is maintained in populations.' Those who try to ensure that students view with caution arguments appealing to group selection will also be uneasy at the reference (p. 231) to 'adaptive diversity in populations' and at what is apparently the only discussion of the evolution of reproductive rates (pp. 463–4): 'The relatively few young born to mammals, compared with the number of eggs produced by reptiles, are an economical reproductive measure made possible by a greatly reduced mortality rate due to predators.' It is perhaps significant that the name of G. C. Williams seems to be absent from the book.

A surprising feature is the deliberate avoidance of the concept of quantitative inheritance. The section (pp. 221–226) that discusses stabilizing, directional and disruptive selection entirely in terms of a single locus, but with accompanying figures with normal curves showing frequency distributions of phenotypes, makes very strange reading. In the same chapter, the explanation of Batesian mimicry (p. 224) primarily as an example of diversifying selection is inadequate and confusing. A similar failure to give enough information occurs elsewhere. For instance, treatment of the Darwin finches (pp. 295–7) without bringing out the crucial fact that many species coexist on the same island, must be frustrating to the curious student.

This omission is actually only one aspect of a striking lack of ecological perspective in the book: Avers seems to draw the line at ecology. Neither Robert MacArthur nor the author of 'Evolutionary Ecology' rates a mention, none of the Grants' recent

work on natural selection in the Darwin finches is discussed (though one of the relevant papers is listed), and there seems to be no treatment of character displacement. To those who believe that the evolutionary play can be performed only in an ecological theatre, this is no trivial matter.

The production of the book is workmanlike, with non-glossy but generally clear figures. A nice feature is the inclusion in the legends of precise references to their sources, and individual chapters have substantial bibliographies. The use of bold type for technical terms that are defined in the glossary is helpful, while emphasizing the jargon load with which biology students are burdened. In some places the text could have been improved by a more critical editorial eye, and there is a sprinkling of misprints.

Overall, I would welcome this as a timely and impressive book, but look forward to a second edition in which the few weaknesses can be eliminated. In the meantime it is likely to be frequently adopted in a new breed of evolution courses for the 1990's, which should demonstrate to students in all areas of biology that their subject still makes no sense except in the light of evolution.

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Molecular Biology of RNA. UCLA Symposia on Molecular and Cellular Biology, New Series, Volume 94. By THOMAS R. CECH. New York: Alan R. Liss and Sussex, England: John Wiley & Sons. 1988. 392 pages. \$80.00 from Alan R. Liss. ISBN 0 8451 2693 8.

Not so many years ago, RNA was the focus of attention for biochemists interested in nucleic acids. DNA was inert and long; it was a forbidding barrier to studies of gene expression, and progress in sequencing DNA was slow. Some sequencing techniques even involved priming to incorporate ribonucleotides into the copy DNA. Restriction enzymes changed all that; cloning and rapid sequencing of DNA followed, and RNA was left to one side except for the purpose of mapping the transcribed segments of DNA. DNA sequences sufficed to describe RNA sequences, and studies on the mechanisms of processing RNA were naturally the concern of enzymologists; few people were interested in the properties of RNA *per se*.

'The Molecular Biology of RNA', therefore, is a stimulating title for a symposium and a book; it tells us that RNA is once again the primary focus of attention for many scientists. Nonetheless, the title is not very informative. The phrase 'molecular biology' encompasses both an emphasis on the processes of gene expression and an interest in the atomic structure of macromolecules; rarely do the twain meet. In this case it is plain that to many workers RNA is a passive

substrate, and to others it is an absorbing type of molecule with its own activity. The revival of interest in RNA is the outcome of the realisation that the regulation of gene expression operates at many levels, most of which involve RNA as a substrate, together with the discovery in the early 1980s that some RNA molecules are intrinsically reactive or catalytic. At present, conferences on RNA tend to hold these divergent aspects together, and possibly with good reason: who knows, nowadays, when an RNA substrate will be found to contribute to the reaction, or when an enzyme will reveal an RNA component? Nonetheless, the dichotomy of views is there.

The book reviewed here is a compilation of contributions to the 1988 UCLA Symposium on the Molecular Biology of RNA. The editor is Thomas Cech, whose pioneering work on inherently reactive RNA has been followed by a string of rigorous and elegant studies on its properties; with justice, this work has been praised widely, and it has done much to stimulate the current interest in the properties of RNA. In his preface, the editor remarks that a number of meeting topics are not represented, and he lists some of these: NMR of RNA structure, the activity of group II self-splicing introns, self-cleaving infectious RNA of plants (hammerheads etc), enzymes with RNA substrates, tRNA-synthetase interactions and mechanistic studies of RNA splicing. If there was deliberate selection, these omissions are unfortunate. The scope of the book is very wide, and it might have been worthwhile to concentrate on, say, the more chemical work on RNA, or to have divided contributions into two volumes with different emphases.

Can a book be useful if it comprises only short accounts of results which, by and large, were published before the book was printed? In some cases, the answer must be positive. I can imagine that a comprehensive compilation of accounts in a given area would be of use to those for whom the area is interesting but usually peripheral; such a book would be a good starting point for systematic study of the most recent work. However, this book contains too few entries for each of too many topics to be useful in this regard: for example, there are no entries from Cech's own group under 'RNA Catalysis', and there are only one or two entries out of 36 relating to pre-mRNA splicing (a useful point of comparison is that splicing was the subject of about half of the papers presented at the 1989 Cold Spring Harbor meeting on RNA Processing). With such deficiencies, was it worth while including these topics at all? Another merit of such a volume might lie in accessibility, i.e., the short accounts might be more digestible than the principal primary reports to an outsider, or there might be mini-reviews of each topic. Instead, the accounts here are written in much the same style as in the primary literature. Claire Moore and David Draper do summarize discussions on particular topics, but, useful as the summaries are, it was disappointing to find that