conservationists, planners, NGOs and politicians in different geographical areas.

References

1 World Conservation Union (IUCN) (2003) *World Parks Congress V: Recommendations*, IUCN (http://www.iucn.org/themes/wcpa/wpc2003/english/outputs/recommendations.htm)

2 Terborgh, J. (2004) Reflections of a scientist on the World Parks Congress. *Conserv. Biol.* 18, 619–620

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Book Review

Transport phenomena research: journeying towards integration

Transport Processes in Nature: Propagation of Ecological Influences through Environmental Space by William A. Reiners and Kenneth L. Driese, Cambridge University Press, 2004. £70.00/£35.00 hbk/pbk/CD-ROM (314 pages) ISBN 0521800498/0521804841

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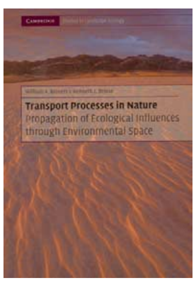

In their preface to *Transport Processes in Nature*, Reiners and Driese express how their dissatisfaction with the prevalent 'point-oriented' approach of ecologists has led them to the ideas presented in this book. In their view, point-oriented experimental ecology has not suitably incorporated a variety of transport phenomena, such as air pollution and river floods, in spite of their profound influence on ecosystems at multiple scales. Consequently, Reiners and Driese advocate integrative research of transport processes and their impact across heterogeneous landscapes. Brown [1] has recently recommended macroecology along similar lines: 'while lacking some of the rigor and power of the experimental approach, the macroecological research offers greater potential for generality and synthesis'. Ongoing developments in landscape ecology also reflect increasing recognition of the importance of ecological studies that cover several levels of organization across multiple spatial and temporal scales. More recently, the emergence of biocomplexity research highlights the growing recognition for broader, more integrated perspectives in studying natural systems. In *Transport Processes in Nature*, Reiners and Driese take an important step towards this goal.

Reiners and Driese broadly define transport processes to encompass the flow of energy, matter and information across environmental space, and cover diverse initiating events, transport vectors and ecological influences. They discuss phenomena as distinct as the diffusion of pheromones, spread of fires, foraging of animals, transfer of light and propagation of sound. This broad coverage dictates, as the authors admit, that none of the topics can be treated exhaustively. Why, then, is this book an 'important step' in the study of complex natural systems?

There are two main reasons. First, unlike previous accounts of transport processes from the perspective of a single discipline, Reiners and Driese attempt to bridge the gap between various long-lasting research enterprises developed in near-complete isolation within the disciplines of hydrology, micrometeorology, oceanography, geomorphology, epidemiology, aerobiology and, to a lesser extent, ecology. Second, although their approach advocates, as does macroecology, a shift from small to large scales, it does not sacrifice the direct study of natural processes for the analysis of large-scale patterns. Instead, their approach emphasizes the study of the actual mechanisms. The important step made by these authors is the introduction of a new conceptual approach for directly studying the mechanisms underlying a diverse array of transport processes across different disciplines.

The book is organized into two sections. The first outlines an integrated conceptual framework for the study of transport processes in nature. The authors provide useful and broadly applicable definitions of basic terms and overview the major initiating causes, entities, vectors and ecological influences of transport processes. They also elucidate how the concept of environmental space is perceived in different disciplines in general (e.g. physics versus geography), and within landscape ecology in particular. This section concludes with a strong emphasis on the importance of spatially explicit models for simulating and exploring transport processes in heterogeneous environments, highlighting GIS-based models in particular.

The second section provides an overview of transport processes mediated by eight different vectors. The selection of topics is remarkably diverse, from fluvial transport to animal movement, to electromagnetic radiation and sound propagation. Although some might argue that this broad coverage indicates a lack of focus, I find the challenge of making sense of this seemingly strange mixture a refreshing idea. The underlying mechanisms

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and the modelling techniques, selected in a rather eclectic manner, are briefly described for each vector. These overviews are not meant for experts but for a broad readership; interested readers are directed to more-detailed accounts of each topic. Each chapter ends with an interactive GIS-based example, provided in an accompanying CD-ROM. Although variable in their competence and elegance, these examples do help stress the authors' assertion that the typical heterogeneity in environmental space cannot be ignored (and, in fact, should be explicitly incorporated), owing to its overriding influence on transport processes.

The authors target their book at 'thoughtful ecologists willing to examine their discipline in a fresh and challenging way'. Yet, they do not make special efforts to facilitate such transitions: in the absence of 'textbook facilitators' such as instructive boxes, notes in the margin, highlighted texts and glossary, readers are required to thoroughly read the (clearly written) text to grasp the take-home messages. Similarly, although the GIS-based examples enable exploration of different scenarios and parameter values, the authors do not guide readers on how to make the best use of them for gaining a better understanding of transport processes. This could be improved by including a 'guided tour' through the examples. Most importantly, although the authors state their goal 'to provide general insights from across [different] disciplines', linkages between disciplines are randomly scattered throughout the text, and are neither highlighted nor summarized.

Transport Processes in Nature does not provide ground-breaking insights into transport processes, but it makes an important contribution to making such insights possible. It is also an excellent introduction to a broad spectrum of transport processes, which should stimulate ideas and promote integration across different disciplines. This timely contribution proposes an attractive road towards important, even revolutionary, advances in understanding and predicting transport processes.

References

1 Brown, J.H. (1995) *Macroecology*, The University of Chicago Press

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doi:10.1016/j.tree.2004.09.016

Understanding organisms: the architectural imperative

Phenotypic Integration. Studying the Ecology and Evolution of Complex Phenotypes edited by Massimo Pigliucci and Katherine Preston, Oxford University Press, 2004. £35.00 hbk (443 pages) ISBN 0195160436

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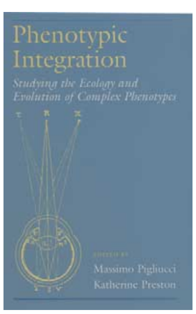

There is much drive, ambition and hope in the editors of, and contributors to, this intellectually overwhelmingly rich volume about 'phenotypic integration'. As suggested early in *Phenotypic Integration*, many 'subtle and interesting research programmes' in ecology and evolution run the risk of degenerating into '*nothing more* than parameterization of single-trait optimality models' [italics are mine] if they do not consider the adaptation and constraints that are implicit in the evolution of any complex phenotype. Although this might be true, it comes close to stating that many historic and current research efforts in (behavioural) ecology are somewhat trivial. *TREE* readers take note! I was interested to see what an evolutionary or behavioural ecologist, particularly someone who is interested in (particular aspects of) the phenotype of his or her favourite organism(s), would get from this book.

Reflecting the lack of coherence in this volume, one encounters various definitions of 'phenotypic integration'. According to the opening words, Olsson and Miller dedicated a 1958 treatise to develop the concept of integration as the 'complex aspects of an organism's phenotype' [1]. Although this is rather unhelpful, on the next page we see 'integration' (defined here as 'increased genetic and functional relationship among traits') contrasted with 'parcellation' ('decrease in integration by decoupling of formerly related traits to form quasi-independent modules'). However, on pp. 155–156, co-editor Pigliucci gives his personal definition of integration as 'simply… whatever set of evolutionary and developmental processes result in an observable network of multivariate relationships among phenotypic traits that define the morphology and life history of a living organism'. Again referring to Olsson and Miller [1], Merilä and Björklund define phenotypic integration in more statistical terms as 'a pattern and magnitude of covariation among a set of traits'. This is enough to give us a flavour of what phenotypic integration is all about. As Pigliucci points out, even concepts that elude exact definition (such as that of a 'species') can nevertheless have immense heuristic value (we are reminded of the insightful work on 'speciation').

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