Ecology of Cities and Towns: A Comparative Approach

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The book begins with a brief introduction by the editors, and is then divided into four parts: (I) learning, (II) avian cognition, (III) decisionmaking, and (IV) cognition and sociality. The editors conclude with a brief prospectus on the future of cognitive ecology. Dukas and Ratcliffe (2009) define cognition as "neuronal processes concerned with the acquisition, retention, and use of information" (p. 1). Although this definition will be comfortable for cognitive psychologists, it may seem overly broad to behavioral ecologists, who might wonder whether there are any aspects of behavior that are not "cognitive."

Part I has two chapters on learning in insects. Dukas presents a theoretical overview of mechanistic and functional questions about learning, and then focuses on his own model system, *Drosophila*. Fahrbach and Dobrin discuss neural plasticity in the honeybee. The importance of a developmental perspective is clear as both physiology and neuroanatomy undergo dramatic changes. As a behavioral ecologist who studies birds, I found these chapters interesting and informative.

Part II comprises four chapters on avian cognition. Beecher and Burt update their 1998 chapter from *Cognitive Ecology*. Searcy and Nowicki also address song learning, with an emphasis on development and stress in a variety of species. Pravosudov discusses spatial memory and the hippocampus, with a focus on nutritional stress and brain development. Sol asks whether advantages such as behavioral flexibility compensate for the expense of producing and maintaining large brains in birds. These four chapters provide comprehensive and readable reviews of song learning, spatial memory, behavioral flexibility, and the effects of developmental stress.

Mate choice and predator-prey decisionmaking are considered in part III. Ryan, Akre, and Kirkpatrick examine signaling and decisionmaking during mate choice in several invertebrates and vertebrates from both mechanistic and functional perspectives. In contrast, Phelps and Ophir focus on the mating strategies of one species, the monogamous male prairie vole. Warkentin and Caldwell use signal detection theory to examine what they call decisionmaking by the embryo of the red-eyed tree frog, which must "decide" whether to hatch prematurely under the threat of predation. Ratcliffe considers the coevolution of moths (prey) and bats (predators) from the perspectives of both parties. These chapters do a masterful job of walking the reader through a wide variety of species, topics, approaches, and evolutionary responses, although I must admit to wondering whether a frog embryo and a moth can be reasonably considered "cognitive."

Part IV provides three considerations of sociality. Manser offers a detailed account of referential signaling in meerkats. Kendal, Coolen, and Laland discuss explanations for copying behavior in fish. Federspiel, Clayton, and Emery advocate an integrative "3 Es" (ecology, evolution, and ethology) approach to the study of social information in birds. These three chapters were informative and thought provoking. The editors then provide a brief prospectus to conclude the collection, as they did in the first edition of *Cognitive Ecology*.

Dukas and Ratcliffe have done a good job selecting a representative and interesting range of topics in cognitive ecology. Some topics are clearly follow-up considerations of material from the 1998 version, but many are not, and some subjects from the 1998 book are not covered here. Any reader might quibble about the content choices, but I can enthusiastically recommend this book for its breadth of taxa and approaches and its balance of mechanism, development, function, and evolution. I intend to assign this book in my course in animal behavior, an advanced undergraduate elective for students majoring in biology, psychology, and anthropology. As with any compilation, the chapters vary in style and level of detail, but each deals with both the theoretical and empirical, and all attempt to evaluate the current state of knowledge as well as speculate about future developments. Perhaps *Cognitive Ecology II* will help extend the bridge between cognitive science and behavioral ecology that is currently still under construction. I look forward to the publication of *Cognitive Ecology III* in another 10 years.

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ECOLOGY OF CITIES AND TOWNS

Ecology of Cities and Towns: A Comparative Approach by Mark J. McDonnell, Amy K. Hahs, and Jürgen H. Breuste, eds. Cambridge University Press, 2009. 736 pp., illus. $72.00 (ISBN 9780521678339 paper).

Somewhere around 3500 BP, humans began to build structures we now commonly refer to as cities and towns. Since then, human settlements have evolved into ever larger and more complex entities eclipsing simple architecture and emerging as quasibiological entities, complete with their own growth patterns and metabolic processes. As cities have grown to dominate the global landscape and our knowledge of ecology has evolved, both the impact of these structures on the original ecological functioning of the land surface and the internal functioning of the cities themselves as specialized ecosystems have become subjects of interest. These two perspectives unfortunately drive two

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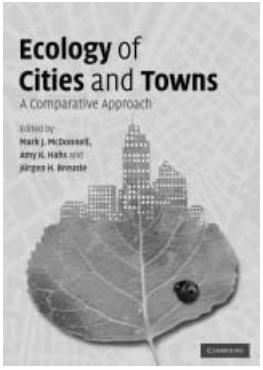
very different approaches to the study of urban ecology and carry with them the disparate objectives and methodologies required for a full-blown identity crisis. Issues of scale and the interconnectivity of processes loom dauntingly on the research horizon even after one has selected a theme, which could include anything from biogeochemical cycles to economics, culture, and politics.

This is the interdisciplinary science world into which *Ecology of Cities and Towns: A Comparative Approach* arrives. The book begins with a synopsis of the many issues addressed and the approaches taken by previous researchers, attempting to order them in a framework that makes sense in the light of modern ecological theory. Paramount is the development of a definition for urban ecology that establishes principles adequate for comparing results of previous approaches as well as providing guidelines for future studies. This is a tall order. And although the editors wisely do not attempt to have the final word, the first chapters of the book do a useful job of contextualizing urban ecology in the concepts of island biogeography and the functioning of urban systems in a world of dynamic disequilibrium. The tone of the book, then, is set by outlining two approaches to the study of urban ecology—*in cities* and *of cities*. The *in-city* approach takes the classic road of comparing differences in the physical environment, soils, fauna, and flora inside and outside urban areas, generally employing a gradient from urban core to nonurban zones. The *of-cities* approach builds on the *in-city* methods but looks at the urban system as a separately identifiable ecosystem.

Divided into four parts, the book takes the reader on a tour of the widely varied studies of urban ecology. Part I, "Opportunities and Challenges of Conducting Comparative Studies," is the best-organized section, featuring approaches for making comparative studies. Examples include the establishment of frameworks for gradient and patch dynamics studies of the New York metropolitan area and other large cities, urban impacts on marine habitats, comparative ecology of historical urban development, and ecological research in rapidly urbanizing developing countries. Most compelling in this first set of chapters is the discussion around the fundamental question confronting all of ecology—whether humans should be placed inside or outside the ecological framework. This issue, also central to the in-cities versus of-cities argument, is discussed in terms of established ecological theory. A case is made for the human ecology model using a set of intensive studies of New York and Baltimore.

Part II, "Ecological Studies of Cities and Towns," is somewhat scattershot but not at all unrepresentative of the diverse nature of urban ecological studies. Need-driven objectives range



from assessing impacts of urban development on the composition and structure of forests to biodiversity in the near-shore marine environment. The first chapters feature examples of classic ecological studies describing urban development patterns and their effect on various biological communities. Later chapters feature work addressing issues such as the impact of urban lighting on insect populations, urban influences on vegetation cover in Shanghai and Beijing, and the effect of development on carbon and nitrogen cycling in large urban areas. Because the chapters are separate contributions from various experts in the field, the writing style varies considerably and many references are repeated. While some chapters can be a bit tedious in their description of results, there are some gems: Chapter 15 describes the "vacuum cleaner effect" of street lighting. If unwisely positioned, street lighting can draw insects away from their habitats over surprisingly large distances, with dire consequences for local populations of some species.

Part III, "Integrating Science with Management and Planning," enters the sphere of urban structural analysis. Although some of the questions addressed in part II are repeated here, this section draws on the considerable experience of European and New Zealand investigators, providing an interesting view of the cultural perspectives important in defining applied goals in urban ecological studies.

Part IV, "Comments and Synthesis," completes the book, summarizing and knitting together the primary themes and addressing questions such as, "What is the main object of urban ecology?" It also identifies the opportunities and limitations presented by the previous chapters.

It is inevitable that any book covering such a broad subject will have shortcomings. Readers seeking a better understanding of how remote sensing is enabling urban ecology studies, for example, will be disappointed. Although several chapters use some form of remotely sensed data in their results, the treatment of the subject is weak and there are too few references provided for even a cursory understanding of this rapidly emerging tool. Interested readers would be better served looking at *Urban Remote Sensing* by Qihao Weng and Dale Quattrochi or *Applied Remote Sensing for Urban Planning, Governance and Sustainability*, edited by Maik Netzband, William L. Stefanov, and Charles Redman. The text is quite long (700-plus pages), rendering the work somewhat ponderous, and some chapters don't seem to fit the theme as well as others. The book also weakens a bit in the final synthesis.

However, these shortcomings are minor. With more than 100 pages of references and 73 contributors, *Ecology of Cities and Towns* is a useful compendium of carefully selected

studies carried out by very experienced scientists dedicated to advancing urban ecological studies in a rigorous manner. The book accurately reflects the multiple personalities inherent in an extraordinarily multidisciplined field of study that is experiencing a rapid upsurge in public interest. At the same time it offers perspectives for implementing frameworks that would enable a comparative approach for tying together the range of work considered.

Ecology of Cities and Towns cogently defines many of the philosophical issues confronting scientists in structuring urban ecology studies and breaks the inertia created by entrenched perspectives, making it an excellent addition to any library. The work presented will surely influence future directions in the field.

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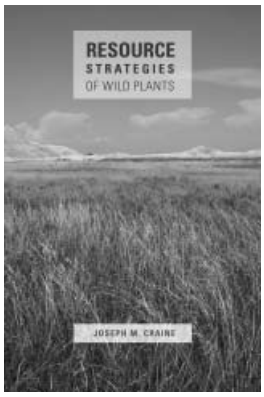
WANTED: A GENERAL AND PREDICTIVE THEORY FOR TRAIT-BASED PLANT ECOLOGY

Resource Strategies of Wild Plants. Joseph M. Craine. Princeton University Press, 2009. 352 pp., illus. $45.00 (ISBN 9780691139128 paper).

We are currently in the midst of an exciting new synthesis between plant physiology, evolutionary biology, and community and ecosystem ecology. In plant ecology, many older ideas and debates that seem to have left the field scattered and mired in controversy have been recast and focused around a trait-based plant science. There is hope that new analytical tools, phylogenies, large data sets, and recent insights in linking traits with ecosystems will enable plant ecology to become a more synthetic and predictive science. Arguably, a central aspect of this synthesis is a renewed interest in measuring traits and understanding plant strategies in different environments—a foundation that has long been part of plant ecology and is now heralded as its central paradigm (Westoby and Wright 2006).

Joseph M. Craine is a research professor at Kansas State University. In his book *Resource Strategies of Wild Plants,* he presents a scholarly overview of the building of a trait-based plant ecology. The book is a hybrid academic saga and scholarly text explaining how, since the 1970s, plant ecologists have tried to make sense of the enormous diversity of seed plants. The book is well written and fascinating. Craine focuses on the concept of plant strategies as central to the problem of understanding diversity and for linking pattern and process in ecology and evolution. The antagonist of the story is natural selection. Specifically, how has selection shaped functional diversity in different environments? According to Craine, a plant strategy is a reflection of functional convergence, and the goal of plant ecology is to identify the main strategies that characterize different environments. Specifically, strategies "are sets of traits that lead to successful growth and reproduction in a particular environment." The fundamental assumption is that because of trade-offs, "traits that lead to success in one environment do not lead to success in another environment." Thus, understanding how traits vary with the environment and with each other is the basis of a search for plant resource strategies as well as a potential means of addressing how climate change will influence ecosystem function.



In the first part of *Resource Strategies,* Craine introduces the concept of plant strategies by following its historical development. The protagonists of this academic story are ecologists Philip Grime, Terry Chapin, and David Tilman. Craine compares and contrasts the similarities and differences of their work as well as the debates and insights that emerged from it. Rather than saying who was more wrong or right, his goal is to set straight the historical record that underlies our modern understanding of plant strategies. Along the way he points out how our understanding of plant competition has changed and how differing types of resource limitation influence selection of plant traits.

Although I found the first half of the book interesting, most of the second half follows a more laborious bearing. Here, Craine leads us on a long slog through past and current literature. The approach is detailed and at times overly narrow, but in the end, Craine provides some new empirical patterns and summarizes the key traits that characterize plants in different environments (low nutrient, high nutrient, low light, low water, etc.). Along the way, he also notes which ideas of Chapin, Tilman, and Grime have survived.

Clearly, any attempt to synthesize a rapidly growing field will not cover all bases or appease everyone. And although I thoroughly enjoyed this book, I found many of its central goals and arguments to be not entirely realized, and the book's logic at times was not clear. First, despite giving the impression that he intended to provide an unbiased overview, by the end Craine does significantly inject his own opinions. This is certainly reasonable, but it leads to a somewhat colored and sectarian perspective on trait-based ecology. For example, a significant fraction of the book is focused on nitrogen limitation as *the* primary constraint shaping

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