understanding of process (e.g. causal analysis of the mechanisms of selection on morphology). The renaissance concerning analysis of comparative patterns originated with the realization that phylogeny confounds modern phylogenetic analysis. Given the recent origins of rigorous statistical solutions to such problems[1], there have been many methodological advances in phylogenetic analysis since *Ecological Physiology*. As such, Losos and Miles' chapter in *Ecological Morphology* provides a useful overview of the methods and insights from phylogenetic reconstruction of morphological transitions.

In addition, *Ecological Morphology* is replete with excellent examples of integration (a chief goal of the authors), particularly in the first half of the book, which deals with conceptual issues. Issues dealing with the influence of morphological evolution in shaping community ecology are clearly outside the realm of physiological ecology, but within the realm of ecological morphology. The integrative nature of the entire discipline of ecomorphological analysis and the potential for future work is epitomized by three complementary methods that are described for studying the role of ecological morphology in shaping community organization: (1) the multivariate approach (Chapter 2, Ricklefs and Miles); (2) an approach to community assembly rules based on phylogenetic reconstruction (Chapter 4, Losos and Miles); and (3) a complementary approach to community assembly based on paleontological reconstruction (Chapter 7, van Valkenburgh). The notion that communities resemble one another is not a new idea (e.g. convergence). However, the idea that communities 'evolve' according to taxon-specific assembly rules that are driven by ecomorphological principles is likely to receive greater coverage in future research.

Likewise, conceptual issues covered in the first half of the book are well integrated with the 'model systems' described in the second half of the book (Chapter 8: intertidal, Chapter 9: bat flight, Chapter 10: lizard performance, Chapter 11: salinity tolerance in mosquitos, Chapter 12: salamander metamorphosis). However, readers interested in other well-developed conceptual areas of ecomorphological work found in this book (e.g. allometry of feeding, Chapter 6) will have to look to other sources for details as they are not found in the chapters on model systems. For example, feeding in fish and birds are historically well-developed fields in ecological morphology (p. 2–4) but these two fields are paradoxically not included as model systems.

With regard to the editors' explicit goals, the detail provided in conceptual chapters and model systems is more than adequate as a useful starting point for students undertaking comparative studies that are rooted in the new modern paradigm of phylogenetic analysis. However, the second modern paradigm of ecological morphology, involving studies of morphology, performance and fitness, is not as well developed. A more thorough treatment of empirical studies of selection would have made the book more self-contained for students new to the field. Whereas several of the chapters build on the conceptual aspects of Arnold's paradigm (Garland and Losos add analysis of behavior, Chapter 10), it is clear that there are very few studies in which the complete paradigm has received empirical treatment. This is clearly an area for future research. An additional aspect involved in this paradigm[2], heritability of morphology and performance traits received little coverage and is another area for future research.

In summary, the strengths of *Ecological Morphology* lie in its consolidation and integration of conceptual advances, such as those involved with phylogenetic reconstruction. Its weaknesses largely reflect current limitations of the field. Our knowledge of the mechanisms of natural selection that shape morphology, while a well-developed conceptual area, is not as well developed empirically. It remains to be seen whether the emerging field of ecomorphological research will fill this empirical void.

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# Biodiversity and sociobiology

## Naturalist

*by E.O. Wilson*

Island Press, 1994.
$24.95 hbk (xii + 380 pages)
ISBN 1 55963 288 7

As an undergraduate who consumed and was sparked by books such as *Biophilia* and *The Diversity of Life*, I welcomed E.O. Wilson's autobiography. I was looking for a boost of inspiration from this accomplished scientist and Pulitzer Prize winning author at the beginning of my graduate studies in population biology. Wilson paints an exciting and majestic picture of a man destined to grow into the creative and powerful force in biology that he is today.

Wilson beautifully writes a modest and personal account of his own development, only occasionally slipping into ego, revealing consciousness of his own status. Although often indulging the reader in passages of natural history, the material is largely fresh and provides an in-depth look at his influences – not just why he loves biodiversity. Wilson adds flavor by highlighting major life-changing events like the loss of sight in one eye, which he says sealed his tryst with entomology. Other serendipitous encounters and outcomes with people and organisms provide insight into Wilson's later academic interests.

Dividing the book into two parts, loosely by student (Daybreak in Alabama) and professor (Storyteller), Wilson describes first his introverted upbringing, made more unstable by constant moves and his parents' divorce. Through his military school training and undergraduate career at the University of Alabama, the stress is on Wilson's own astonishingly curious, synthesizing and devoted mind, steered clear of physical and mental pollutants.

Wilson also gives the reader an early taste of his belief in human sociobiology. I was disturbingly surprised at the level to which he is willing to ascribe a single physical shortcoming to 'hereditary deficit'. Wilson frequently mentioned that he kept his mental and physical health by running, only to draw boundaries on his own limits and proclaim that with regard to his speed, 'Heredity was destiny after all'. Although many would agree that our genetic composition does impose limitations on certain traits, Wilson is boldly self-indulgent in assuming that he was at his genetic limits, and that further or superior training would not have been beneficial. In reading this passage (p. 121) I began to sympathize with some of sociobiology's critics who so passionately state the dangers of genetic determinism. In part two of the book, Wilson devotes two chapters to sociobiology; however, he concentrates on the development in his thought process and description of the controversy that resulted.

Of great interest to students like myself were the accounts of a young Wilson's 'Marlboro Circle' study meetings with biologists such as Robert MacArthur, Richard Lewontin and Egbert Leigh, which abounded with ideas on the future of evolution and ecology. As a beginning professor, Wilson intimately discusses the benefits of controversy with faculty peers, and of learning from his graduate students. A detailed memoir of the development of the theory of island biogeography recounts his own deficiency in mathematics, balanced by a synthesizing vision that led to fruitful partnerships with Robert MacArthur and Daniel Simberloff.

E.O. Wilson is truly an entertaining story teller in the tradition of the classical

naturalists. Wilson sets forth his vision of the importance of natural history, while focusing on ideas that advance the fields of evolution and ecology. *Naturalist* is well worth reading for those who have followed his career and for new students alike. Wilson's account of his development as a scientist with undying perseverance to explore, produce and communicate cannot fail to be inspiring.

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# Lizard ecology: the next generation

## Lizard Ecology: Historical and Experimental Perspectives

*edited by L.J. Vitt and E.R. Pianka*

Princeton University Press, 1994.
$39.50/£33.50 hbk (xii + 403 pages)
ISBN 0 691 03649 7

Biologists study lizards because of the inherent attractions of reptiles, and because lizards are indeed model systems for addressing fundamental questions in ecology and evolution. Early workers amply illustrated the latter with studies on behavioral thermoregulation, interspecific competition and life history, with an emphasis on natural populations.

Laurie Vitt and Eric Pianka's book, a direct product of this heritage, is the latest installment of a roughly decennial tradition: edited volumes arising from symposia focusing on lizard ecology. The current volume results from the third such symposium ('Lizard Ecology: The Third Generation'), held in 1993 in Austin, Texas, USA. Established ecologists Art Dunham, Stan Rand, Ray Huey and Ted Case introduce, respectively, sets of chapters on reproductive biology, behavioral ecology, evolutionary ecology, and population and community ecology. The section introductions and the individual chapters each provide good summaries and indicate directions for future research.

Nowhere is the impact of lizard research more obvious than in the field of evolutionary ecology. Incorporating evolutionary principles into ecological studies is still a challenging task. Some major advances in the field have been ushered in by work involving lizards. One such field is introduced and summarized by Lin Schwarzkopf, who reviews the rich literature on costs of reproduction and life history trade-offs in lizards. Barry Sinervo presents a detailed account of his 'phenotype engineering' studies that were among the first to experimentally examine life history trade-offs in free-living animals. Peter Niewiarowski summarizes some of his pioneering studies exploring genetic and environmental contributions to geographic variation in life history traits. Lizard ecologists were also early workers in examining relationships between morphology, performance and fitness, by combining field and laboratory studies. Initially, this voyage into uncharted realms was captained largely by Ray Huey and his academic crew, and these and later endeavors revolutionized the ecological study of the phenotype and its fitness consequences. Chapters by Don Miles, Ted Garland and Jon Losos each illustrate the richness and sophistication of this area in lizard ecology research.

As indicated by the book's subtitle, two major contributions of lizard ecology to the field of evolutionary ecology involve using historical perspectives and using novel experimental techniques. Emília Martins and Ted Garland each have made major contributions in developing modern comparative approaches, and each has a chapter in this volume. Martins' chapter explores the evolution of territoriality in lizards, illustrating the use of recently developed phylogenetic comparative techniques. Miles, Losos and Garland also each incorporate explicit phylogenetic perspectives in their chapters. Losos provides an excellent entrée into another entirely novel area in evolutionary ecology – the incorporation of phylogenetic perspectives when studying community structure. Bill Cooper uses modern phylogenetic hypotheses to explore the coevolution of prey chemical discrimination and foraging mode.

The second general contribution by lizard ecologists to ecology and evolution has been their ability to capitalize on experimental manipulation. Chapters by Niewiarowski, Karen Overall (egg survivorship), Sinervo, Craig Guyer (mate limitation), Jean Colbert and coauthors (dispersal) and Robin Andrews and Joe Wright (population fluctuations) all present experimental studies. These authors illustrate that lizards are especially appropriate subjects for a diverse array of topics and approaches. A major limitation of lizards (and many other vertebrates) is the logistic difficulty of getting data on the quantitative genetics underlying the phenotypic variation that lizard ecologists study.

An experimental area not well covered (aside from some treatment in one chapter) is the use of hormones to explore phenotype–fitness relationships. This shortcoming is not the fault of the editors but is because this field has just kicked off. Studying how hormones mediate behavior and reproduction in an ecological context is a rapidly growing field, pioneered in avian systems[1]. Stereotypy of lizard behavior makes lizards especially suited for manipulative studies, as illustrated by a spate of new studies on lizard field endocrinology. Studies by Marler and Moore[2] on territorial behavior and by Sinervo (this volume) on life history traits have already become textbook examples of the hormone manipulation approach. The hormonal basis of individual variation in patterns of spatial use and aggression associated with reproduction in lizards is an especially active research topic[3–6], producing novel insights[7]. Lizard research is at the forefront yet again, and field endocrinology will certainly deserve a chapter in the fourth *Lizard Ecology*. In sum, the current volume should interest not only lizard biologists but also a more general audience because of numerous current and integrative presentations on major topics in evolution and ecology.

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## Erratum

**McCourt, R.M. *Trends Ecol. Evol.* 10, 159–163 (April 1995)**

In Fig. 2a, three square symbols were erroneously superimposed on the artwork at late proof stage. We apologize for this error.