Any evidence of a planet around a main-sequence star is subtle indeed. The gravitational pull of such a planet may change the star's radial velocity by a few meters per second, or (for a nearby star) its position by a thousandth of an arc second. If the planet's orbit is fortuitously aligned, a transit in front of the star may dim its light by about a percent for a day or so at intervals of years or decades. These effects are barely within the measurement capabilities of ground-based instruments, which must retain precision and consistency for years. Space-based observations are more feasible, at least from a technical standpoint. The contributors describe a wide variety of ingenious techniques. Few, if any, can be contemplated by NASA in its present financial straitjacket. Indirect detection, no matter how convincing, cannot compare with the appeal of an actual picture of an extra–solar-system planet. To obtain one requires a space-borne telescope of larger size and better optics than Hubble. There are several descriptions of such instruments, but cost estimates are conspicuously absent. Surely the funding will be harder to find than the planets themselves.

The larger the planet, the easier it is to detect by any method. Evaluations of detection techniques and search strategies tend to assume optimistically that giant planets are abundant. Among the theorists, G. Wetherill raises the disquieting suggestion that Jupiter and Saturn might be exceptional. His study of the orbital evolution of comets shows that gravitational perturbations by these planets prevent most short-period comets from entering the inner solar system. Without this barrier, Earth would have had hundreds of times more cometary impacts over its history, frustrating the evolution of life. Wetherill's result revives a form of the anthropic principle—if we owe our existence to the presence of giant planets, there is no assurance that they are typical stellar companions. A lack of "Jupiters" around other stars would make the search for planets much more difficult.

The discovery of a single planet, or system of planets, about another star would be an exciting event. Still, the examples of the pulsar planets and our own solar system show the limitations of uniqueness. Real understanding will come only with the discovery and characterization of multiple examples, allowing meaningful comparisons. A search program that can accomplish such a goal will not fall under NASA's rubric of "faster and cheaper." It remains to be seen if the commitment is there.

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Traits Related to Fitness

Ecological Morphology. Integrative Organismal Biology. PETER C. WAINWRIGHT and STEPHEN M. REILLY, Eds. University of Chicago Press, Chicago, 1994. viii, 367 pp., illus. $65 or £51.95; paper, $22.95 or £18.25. Based on a symposium, San Antonio, TX, Dec. 1990.

In 1983, Stevan Arnold formalized an emerging conceptual framework for evaluating the evolutionary importance of morphological and physiological traits. By combining laboratory and field studies of the relationship of morphology to organismic performance with field measurements relating performance to fitness, Arnold suggested a path-analytic method for integrating organismic studies of function with evolutionary analyses of natural selection. Arnold's insight connected functional morphology and physiology with mainstream evolutionary biology and helped stimulate a field of evolutionary physiology. *Ecological Morphology* provides a timely and up-to-date summary of the progress made in this field subsequent to Arnold's proposal.

This book has many appealing aspects, starting with the fact that the editors and most of the authors are younger researchers. As illustrated by Garland and Losos's encyclopedic chapter on squamate reptiles, an impressive body of empirical work has developed on the relationships among morphology, performance, and fitness. Losos and Miles provide a fine overview of the conceptual issues and methodological difficulties involved in analyzing morphological and physiological adaptation in a phylogenetic context, a theme that appears in many chapters. Travis gives an insightful discussion of the challenges of demonstrating the adaptive nature of phenotypic plasticity, focusing on the interesting dichotomy between discrete and continuous plasticity. Wainwright reviews the relationships among morphological variation, performance, and resource use and makes the important point that, in the absence of evidence of the ecological importance of maximum levels of performance, the emphasis placed by functional morphologists and physiologists on maximal performance may be misguided.

As in most collective volumes, the contributions are not well integrated. For example, Norberg's adaptive interpretations of wing design in bats pay little attention to the comparative cautions described by Losos and Miles; in turn, Losos and Miles do not address how comparative methods can best address the ubiquitous morphological plasticity documented by Travis in the next chapter. Ricklefs and Miles nicely document how morphology is often a useful predictor of ecological characteristics, but they also skirt the issue of plasticity. In fact, these juxtapositions provide a service, as they highlight some profitable directions for future research.

Although *Ecological Morphology* provides a good overview of recent advances in evolutionary functional morphology and physiology, it suffers from three limitations that in part reflect shortcomings of the field in general. First, the book contains few nonvertebrate examples: the only discussion of insects comes in Bradley's brief chapter on osmoregulation in mosquitoes; plants and marine invertebrates make substantive appearances only in Denny's summary of his studies of wave-swept shores. Second, there is little discussion of the genetic bases and genetic architecture for variation in morphology or performance, which limits considerably the evolutionary conclusions that may be drawn from these studies. Third and most fundamental, there is a curious lack of ecology (as opposed to evolution) here. Emerson, Greene, and Charnov's chapter provides the most notable exception: by combining biomechanical analyses and foraging theory, the authors derive some intriguing predictions about the morphological scaling of predator-prey interactions. Ricklefs and Miles review multivariate analyses of species packing and community structure. Beyond these contributions and Wainwright's brief discussion of resource use, there is little in the book of direct interest to population and community ecologists. The irony here is that, as initially envisioned by Hutchinson and MacArthur, the study of ecological morphology relates the morphological characteristics of species to patterns of resource use, competition coefficients, species diversity, and other issues central to population and community ecology. In the absence of a compelling conceptual and analytical framework that integrates functional morphology and ecological interactions, analogous to that provided by Arnold for evolutionary studies, "ecological morphology" is likely to remain primarily evolutionary in the near future.

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