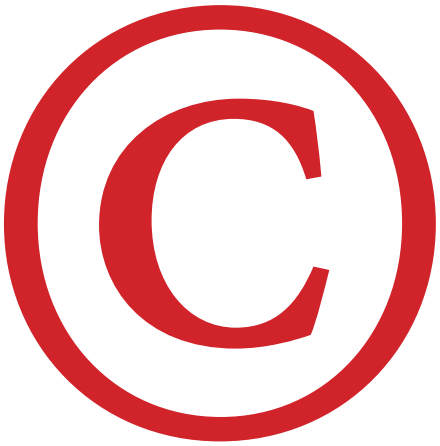
This material protected under U.S. Copyright act title 17



BOOK REVIEW

A Primer for Environmental Literacy. Frank Golley (1998). Yale University Press, New Haven, Connecticut, 254 pages, $40.00 (hardcover), $18.00 (paperback).

The science of ecology is, at once, alluring and intimidating. This internal tension stems from the shear comprehensiveness of its scope of investigation. Since Haeckel's 1969 address at the University of Jena, ecology has been defined as the study of the interactions of organisms with other biota and with the abiotic environment. So it can be accurately said that ecology addresses everything from the genetics, physiology, and ethnology of organisms (including humans) to watersheds, the atmosphere, geologic processes, and influences of solar radiation and meteoric impacts! As numerous commentators have pointed out, the dearth of unifying paradigms—which many other sciences enjoy—reflects the eclectic character of ecology. Consequently, ecology is a challenge to comprehend, let alone to reach.

In his latest book, *A Primer for Environmental Literacy*, Frank Golley makes a desperately needed contribution to ecological science in particular—and to environmental studies in general—by canvasing the basic concepts of ecology in a surprisingly simple and structured way. Consistent with the rest of his career, Golley takes a systems approach to ecology, an approach that analyzes myriad ecological entities such as fauna, flora, populations, ponds, forests, ecoregions, and so on, in terms of component parts and energy flows (in contrast to a natural history approach, which treats ecological entities as evolutionarily unique).

Thus *A Primer* is actually a logical extension of *A History of the Ecosystem Concept in Ecology*, published in 1993; the earlier book discerns the beginnings and traces the historical development of ecosystem ecology (to 1975 at least), while the latter book surveys the entire discipline of ecology from the perspective of ecosystem theory. Most importantly, *A Primer* applies the lessons of ecology to ethical issues about the human relationship to nonhuman nature. In this manner Golley's earlier work provides the descriptive foundation for the present book's prescriptive aim: "its primary purpose is to present a way of thinking that integrates what we know with how we value the environment" (p. vii). To this end, each chapter concludes with a discussion of the normative implications of the ecological concept in question.

As a former student of interdisciplinary Environmental Ethics Certificate Program (EECP) at the University of Georgia, I am aware that *A Primer* is the outgrowth of Golley's teaching experience. As an EECP faculty member, Golley has faced the challenge of teaching basic ecological concepts to graduate students of the natural sciences and humanities alike. Golley dealt with this problem by presenting the concepts in terms of nested ecosystems in a spatial hierarchy, and treating as integral parts of the wider ecological picture. This pedagogy made ecology accessible to a variety of students and faculty, from philosophers to physicists.

The book's elegantly simple structure derives from Golley's EECP experience; the text is built around the fundamental concepts of systems and hierarchical organization. Golley defines "systems" as objects made up of components (subsystems) that exchange matter, energy, and information with the field external to the system (i.e., the environment). A system has a recognizable wholeness.

Hierarchical organization arranges systems of various spatial scales by nesting smaller systems in larger systems. A fundamental nested ecological hierarchy would extend, top down, from the biosphere through biomes, ecoregions, landscapes, ecotopes, communities, and populations, to individual organisms. Therefore populations are subsystems of communities, and communities are subsystems of ecotopes, and so on. Golley is careful to point out that an ecological hierarchy is not the same as a human social hierarchy; in a human social hierarchy, such as an army, higher units control lower units, whereas ecological hierarchies do not exhibit this kind of control structure.

Golley analyzes the systems of two hierarchies (which he calls "clusters" of concepts) according to the nested hierarchy heuristic: physical systems and biological systems. The final cluster of concepts centers around constructing ecological systems from component physical and biological subsystems. In fact, the preceding analysis of phys-

©2000 Blackwell Science, Inc.

ical and biological systems only has value with a complimentary synthesis—if we can understand natural systems as wholes, perhaps we can use this knowledge in constructing ecologically sound artificial systems. As Golley says, "the assemblage of ecological systems from subsystems becomes a test of our knowledge and understanding. If we can construct viable systems, we know that we understand some of their key structures and functions. And if we understand how to construct natural ecosystems, then we can apply this knowledge to the built environment and, one hopes, create sustainable systems there" (p. 172).

The conclusion, "Ecology, Environment, and Ethics," outlines the normative implications of four general features of ecological concepts: dynamism, connectedness, creativity, and limitations. First, the dynamism and stochasticity of ecosystems should teach us not to be overly optimistic about our ability to control nature. Second, humans are intimately connected to nonhuman nature, which saddles us with a great moral responsibility to act appropriately. Third, there is intrinsic creativity and beauty in nature, and we ought to value this creativity, rather than diminish it. Fourth, a "limitation" of ecological science—which I view as a strength—is the necessary inclusion of humans into ecological study. As a result, ecology will probably never have a unifying paradigm like the mathematical sciences of physics and engineering.

In light of these implications, Golley ends by asking: "do we have an obligation to act differently from other organisms and limit and control interaction from our side of the interaction network?" (p. 235). The answer is yes—we need to change our worldview. We need to disabuse ourselves of the idea that *Homo sapiens* is separate from and superior to nature. We need to give up the optimistic (and arrogant) notion that humans can master the manipulation of natural systems. And because the gluttonous consumption of the wealthy so far exceeds vital needs, the industrial world ought to adopt more sustainable habits.

One of the most interesting aspects of the book is Golley's courage to make concrete moral judgments about ecosystem health. Though the condemnations of the dominate growth/consumption economic model may strike some as "radical," his measured writing style and obviously considerable knowledge and experience gives his claims credence. Unfortunately, the book ends right when the interface between ecology and ethics enters center-stage. But, as Golley readily admits, this is a timely topic for another work: "The nature of the relationship between humans and nature is one of the deep philosophical questions of our culture. Developing an answer to this questions is far beyond the boundaries of this book" (p. 224).

Evolutionary ecologists and natural historians may not like bleaching the uniqueness of varied ecological entities by the rather mechanistic treatment of systems and hierarchy theory, and Golley is fully aware of the shortcomings of his methodology. Yet the book succeeds in its purpose of providing a theoretical framework useful in making sense of personal experience: "Experience is the trigger for environmental literacy. It ignites the curiosity and tests the muscles [.] To build environmental literacy, it is necessary to go beyond books and libraries and experience nature directly. Only then do we gradually come to recognize a depth and complexity in nature that continually challenge and surprise us" (p. x).

A friend, who is a lawyer, is confronted with the formidable task of integrating ecological science with public policy in his function as Project Coordinator for the Independent Scientific Review Panel of the Northwest Power Planning Council, a group striving to mitigate the losses of salmon and other fish species due to hydroelectric facilities in the Columbia River basin, and also promote the recovery of negatively impacted species. For him, *A Primer* has proven to be extremely handy in identifying specific ecological concepts, such as hierarchical organization of watersheds, species diversity, and human ecology, which can be used in public policy decisions.

In short, *A Primer for Environmental Literacy* serves as an excellent introduction to basic ecological concepts to nonscientists interested in ecological science, as well as a concise exegesis of the basics of ecology for scientists already familiar with the field. The beauty of this small book is the breadth of its potential readership.

David R. Keller
Department of Philosophy and Humanities
Utah Valley State College
Orem, Utah, U.S.A.