ies, considered together, suggest that sit-and-wait foragers generally defend home ranges whereas defense of territory by active foragers is usually limited. Such analyses can readily be extended to include other squamates, and doing so sharply focuses comparisons between lizards and snakes.

Clearly, after another decade, lizard ecology is alive and well. But are lizards still "model organisms" for ecological studies? The response now seems to be tempered—yes for some questions, no for others. In fact, a number of "herpetological defections," in the words of Huey, have occurred among investigators who initially posed questions with lizards and who now find bacteria, *Drosophila*, and other organisms more suitable as models. Another important change during the past decade has been the rapid growth of ecological studies on snakes especially, and to a lesser extent on turtles and crocodilians. Interesting and intriguing contrasts are already apparent in such areas as life history, sex determination, and sexual dimorphism. Lizard envy, or the notion that other reptiles have less to offer the ecologist than lizards, is rapidly dissipating. Integrative studies that include these other reptile groups are already a reality or soon will be, as evidenced by the comments of some of the contributors here, including Losos, James, and Cooper. No doubt this trend will continue, and it promises to enlarge and enrich perspectives on lizards.

Peter Grant's commentary at the conclusion of *Lizard Ecology* II accurately foreshadowed the increasingly important role of long-term life-history studies coupled with experimental manipulations in advancing understanding of population phenomena and their evolution. The initial emphasis on physiological ecology evident in the first two volumes provided a solid foundation for the current growth apparent in behavioral and evolutionary ecology. The editors of *Lizard Ecology* III have done an excellent job of organizing, editing, and introducing these representative contributions by a third generation of ecologists working with lizards. The volume is attractively designed and is embellished with lizard drawings by Pianka. The commentaries by Dunham, Rand, Huey, and Case are particularly welcome. Taken together, their perspective not only provides a context in which to view these individual studies but opens a unique window on lizard ecology past, present, and future.

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Endangered Millions

Insect Conservation Biology. MICHAEL J. SAMWAYS. Chapman and Hall, New York, 1994. xvi, 358 pp., illus. $81.95 or £49; paper, $29.95 or £17.50. Conservation Biology Series.

On 9 October 1986 President Miguel de la Madrid of Mexico issued a decree that clearly defined the extent and level of protection to be accorded to five overwintering locations of the North American monarch butterfly in Mexico. These forested slopes, high in the mountains west of Mexico City, provide a winter refuge for hundreds of millions of butterflies and represent the annual coalescence of practically all members of a single species from an almost continent-wide summer distribution. Such a dramatic aggregation, coupled with seemingly inevitable overexploitation of timber from the overwintering forests, led to monarch overwintering's becoming the first "threatened phenomenon" designated as such by the International Union for the Conservation of Nature in 1983. These inspirational conservation measures are a wonderful example of the roles that legislators, scientific researchers, and conservation organizations such as Monarca A.C., the Xerces Society, the World Wildlife Fund, and the IUCN can play in insect conservation.

In *Insect Conservation Biology*, Michael Samways gives us a global insight into the biology, theories, and research methods and results that are essential for moving legislators to such action. The goal of the book is to provide a "broad introductory text" that highlights the "ecological, economic and intrinsic value" of insects "within the context of the human-pressurized world." Toward this goal, the book looks for ways of resolving the conflict between control of a small minority of serious insect pest species and conservation of a large number of threatened and endangered insect species. Samways frames this examination with an effort to be upbeat about the depressing demise of biodiversity by emphasizing the importance of an individually responsible worldview and sustainable conservation.

Insect Conservation Biology is successful as a broad introductory text, clearly written, informative, and enjoyable. All the expected and choice acronyms are there, from SLOSS and SLOPP to PVA and MVP, so that we know something about the lively debate over "single large or several small" and "single large or plentiful patchy" reserves, "population viability analysis," and "minimum viable population" sizes—although, regrettably, we do not learn very much about the underlying shift from island biogeography theory to considerations of metapopulation dynamics and experimental manipulations. Nevertheless, the concepts expounded are important ones that provide a fascinating backdrop for the discussion Samways provides of how we might go about counting the insect species in the world and then make objective decisions about their conservation. Whether there are 1.84, 2.57, 8.75, or even nearly 80 million insect species on Earth, there is no doubt that insects are essential, small to mid-sized components of all terrestrial and freshwater ecosystems. With only 1.1 million insect species named they face a desperate plight of being lost to extinction faster than we can name them, as environments they inhabit have been stripped of their natural resources by our species over the last thousand years. This well-illustrated book makes many intriguing comparisons among insect communities around the world and describes in some detail the impact of different degrees of anthropogenic habitat modification. Thus, although most of the examples come from the author's work in western Europe and southern Africa, the text does describe most of the insect ecology relevant to understanding what needs to be done for effective conservation of insects around the world.

Samways's attempt to address "what needs to be done" meets with less success. Effective conservation requires considerable political, sociological, economic, legislative, and legal wisdom, and very few biologists can hope to master the requisite skills. Although monarch butterfly overwintering sites are legally protected in Mexico, these forests are being exploited commercially, and no biologist as such could navigate the current turmoil of Mexico's political and economic transition into the North American Free Trade Agreement. Perhaps the monarch should be taken as an environmental symbol for NAFTA and focus the inspirational efforts of Monarca A.C. to develop a strongly interdisciplinary approach to insect conservation, based on the sound science described in Samways's book. But such books, and conservation biology in general, should focus on providing the objective information that is necessary for effective implementation. Such information need not present as much of a "doom and gloom" scenario as Samways intimates, and we do not have to be upbeat "greenies" either. What we need is a sound, objective, and thorough appreciation of insect conservation ecology and make sure that we communicate the information. Samways does a good job of communicating the science, but I wish he had steered clear of the simplistic, sustainability-oriented worldviews characteristic of introductory environmental science textbooks. Like the familiar but bogus "Chief Seattle" letter extract that follows

the preface, these are moving and intuitively appealing sentiments, but they dilute the developing and much needed rigor of conservation biology.

Ogden Nash mused that "God in his wisdom made the fly and then forgot to tell us why." But as conservation biologists our task is to find out why there are flies and how they live and then to explain to others why they and monarch butterflies and all the other insects are important and worth conserving before we swat them all or clear away the few remaining habitats available for some of them.

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Vignettes: Indoor Zoology

Movie theaters used to be a fine place to get mice. They were open to the public. Every theater had a popcorn stand. Spilled popcorn kept the mice concentrated and breeding. We used the pounce system for catching them, but sometimes we took off our boots and laid them along the wall. Each mouse that chose to hide in a boot was very easy to catch—in fact it was essentially caught.

—*Frances Hamerstrom*, in *My Double Life: Memoirs of a Naturalist* (University of Wisconsin Press)

The distinctions made by legal minds are often puzzling from an entomological point of view. . . . Doutt (1959) lamented, "Entomologists, although they may be saddened, will not be surprised to learn that in many insect cases that reach the courts the judge cannot resist ponderous attempts at judicious humor." One such case was *Ben Hur Holding Corp. v. Rox* (1933), in which a small number of crickets was deemed insufficient cause for withholding rent. The judge reasoned "while a cricket is technically an insect and a bug, it would appear from the study of his life, that instead of being obnoxious, he is an intellectual little fellow, with certain attainments of refinement and an indefatigable musician par excellence." Contrary to legal opinion, crickets and cockroaches are not appreciably different except for the fact that cockroaches at least have the decency to remain silent at night.

—*May Berenbaum*, in *Bugs in the System: Insects and Their Impact on Human Affairs* (Addison-Wesley)

Other Books of Interest

Arabidopsis. ELLIOT M. MEYEROWITZ and CHRIS R. SOMERVILLE, Eds. Cold Spring Harbor Laboratory Press, Cold Spring Harbor, NY, 1994. xii, 1300 pp., illus. $175. Cold Spring Harbor Monograph 27.

This volume is an attempt to synthesize what is known about the biology of the small mustard that has become a central model system for plant molecular genetics in the past decade. In current practice "*Arabidopsis*" generally refers to the species *A. thaliana*, and in fact, according to R. A. Price *et al.* in the opening chapter of the work, the genus as such is not well defined; it is native to Asia and bears a relationship to such economically important plants as cabbage and broccoli (Brassicaceae or Cruciferae) as well as to some familiar ornamental plants. The properties of *A. thaliana* that underlie its usefulness in biology are related to its "unconventional" nuclear genome, which is unusually small and has relatively little dispersed repetitive DNA, being thereby especially amenable to cloning but otherwise not atypical of flowering plants. Its genetics is the subject of the next eight chapters in the volume, which cover chloroplast and mitochondrial DNAs, molecular cytogenetics, quantitative genetics, mutagenesis, and tissue culture and transformation; also included in this section is a "historical view" by C. Koncz and G. P. Rédei, who trace studies of genetics with *Arabidopsis* back to 1945 and provide some comparisons with other model organisms from Mendel's peas to more recent predecessors such as *Drosophila*, *Neurospora*, and *Escherichia coli*. The treatment of genetics is followed by nine papers on development, from seed through root and flower to fertilization, and seven on growth, including discussion of ethylene, giberellin and abscisic acid, auxin and cytokinin, light signal transduction, circadian rhythms, tropisms, and effects of physical stimuli on root growth. Five papers are then devoted to biotic (viral, microbial, and nematode) and abiotic (light, water, heat shock, and cold) stress. The last and longest group of papers is devoted to biochemistry and cell biology, with 11 contributions covering such topics as photosynthesis, secondary metabolism, the cell wall and cytoskeleton, and the biosynthesis and assimilation of starch, nitrate, phosphate, and iron. The volume ends with two appendixes, one a brief account of electronic *Arabidopsis* information sources and the other an updating of Meyerowitz and Pruitt's 1984 Green Book listing genetic variants of *A. thaliana*, and a 32-page subject (but not author) index.

Katherine Livingston

The Cognitive Neurosciences. MICHAEL S. GAZZANIGA, Ed. MIT Press, Cambridge, MA, 1994. xiv, 1447 pp., illus., + plates. $95 or £64.95. A Bradford Book.

In the 1960s there flourished a broadly based effort known as the Neurosciences Research Program intended to facilitate the coalescence of the neurosciences as a discipline. A number of workshops held under its aegis culminated in a month-long conference in Boulder, Colorado, in 1966 and the publication in 1967 of a large collective work entitled *The Neurosciences: A Study Program* (see *Science* **162**, 1114 [1968]). Now in *The Cognitive Neurosciences* we have a still larger work following in that tradition but directed more explicitly to addressing the "explanatory gap . . . between biologic process and the processes of mind." Developed out of a summer institute held at Lake Tahoe, the work consists of 92 papers grouped in 11 sections, each with a separate editor or pair of editors who provide an introduction for it. The two opening sections, edited by Ira B. Black and by Pasko Rakic, are devoted to molecular and cellular plasticity and to neural and psychological development. Sensory systems, which provide "the gateway to cognition," are the subject of the third section, edited by Colin Blakemore and J. Anthony Movshon; with 17 papers, 10 of which are devoted explicitly to vision, this is the largest section of the book. Motor systems and their proprioception are addressed under the broader heading Strategies and Planning, with Emilio Bizzi as editor. Attention ("orienting to sensory stimuli") and memory are treated next, the respective editors for these topics being Michael Posner and Endel Tulving. A group of papers on language edited by Steven Pinker considers language acquisi-