American Scientist online
THE MAGAZINE OF SIGMA XI, THE SCIENTIFIC RESEARCH SOCIETY

see list of all reviews from this issue: January-February 1998

LIFE SCIENCES

Last Year's Model

Marcel Holyoak

Population Dynamics in Ecological Space and Time. Olin E. Rhodes, Jr., Ronald K. Chesser and Michael H. Smith, eds. 388 pp. The University of Chicago Press, 1996. $50 cloth, $17.95 paper.

Population Dynamics in Ecological Space and Time explores the role of spatial and temporal organization in population biology, including maintenance of genetic diversity and the application of these subjects to disturbed ecosystems. The editors start from the premise that the movement of individuals between populations is more important to population processes than are births and deaths within populations, and that organisms respond to physical and biotic factors at a variety of spatial and temporal scales. Although the generality of this premise is still an open question, the viewpoint does make for a lively fusion of the topics covered and helps to build bridges between population and ecosystem processes.

The book covers a wide range of topics and most, but not all, are united into an integrated whole. The four sections encompass individual contributions that blend theory, historical perspective, examples and future directions. The first section, "Population Models," covers the types of population structure in which space has an explicit role in persistence. Metapopulations emphasize movement between extinction-prone local populations, and source-sink systems stress movement and habitat-specific demography.

The second section, "Population Responses in Space and Time," reviews life-history and behavioral strategies for coping with variable environments. The overlapping of generations through long-lived life-history stages, metamorphosis as a way of exploiting different habitats, and migration are considered as possible mechanisms by which a population may cope with a changing environment. The chapters by Henry Wilbur and Nelson Hairston, Jr. *et al.* provide a valuable synthesis of the role of metamorphosis and long-lived life-history stages as factors influencing both population dynamics and genetics. The chapter on migration seems displaced from the rest of the book. Although the topic is interesting, it is a poorly understood part of spatial population dynamics. Integration of these concepts with current evolutionary and demographic thinking would have made this a more valuable chapter.

"Genetic Organization in Space and Time," the third section, focuses on factors that maintain genetic diversity. The chapters on plant genetics and bacterial population genetics are strongly skewed towards the unique aspects of the genetics of these study organisms. The third chapter covers the maintenance of genetic diversity. All of these chapters compare and contrast the study material from the perspectives of within-population versus between-population processes. These chapters illustrate that population genetics and complex spatial population

dynamics (of the kind considered in section one) are only beginning to be synthesized in the literature. The interplay of genetic and spatial population processes is an exciting area, and the contributions make interesting reading.

The final section, "Population Perturbations in Space and Time" applies spatial population theory to ecotoxicology and landscape ecology. Raymond O'Connor's excellent contribution applies spatial and temporal dynamics to ecotoxicology, looking at the toxic effects of pesticides on birds and is creditably fused with spatial population dynamics. The chapter on landscape ecology is a disappointing essay that sells landscape ecology short: There are clear links between landscape perspectives and spatial population processes, and a careful review of existing theory and empirical work would be more helpful.

For the most part, however, this is a readable, accurate and useful book. The chapters on population models and population responses in space and time are valuable and merit its purchase. The field is changing as rapidly the populations discussed, and this volume documents the progress in our understanding of population dynamics.—*Marcel Holyoak, Entomology, University of California, Davis*