ECOLOGICAL ORBITS: HOW PLANETS MOVE AND POPULATIONS GROW.

By Lev Ginzburg and Mark Colyvan. Oxford and New York: Oxford University Press. $29.95. xv + 166 p; ill.; index. ISBN: 0–19–516816-X. 2004.

Ecologists have never quite gotten over physics envy, and this short book explores the analogy between planetary motion and population growth in a novel way that provides some exciting insights into the fundamental structure of theoretical population biology. Ginzburg and Colyvan argue persuasively that our fundamental starting model of population growth is flawed in its focus on direct density dependence, and needs to be replaced with an inertial model of population growth that includes time lags as an essential feature to model population change. The analogy here is between planetary motion involving Newton's view that uniform motion of bodies is the default state, and the view that exponential population growth is the ecological equivalent. In both physics and ecology we then ask what forces cause deviations from the default state, and they argue convincingly that we should ask which environmental forces affect the rate of change of exponential growth (the acceleration of population size) rather than focus on the rate of growth directly. Populations do not respond immediately to changes in their environment, as ecologists have known for more than 50 years, and the time lags these changes generate are critical to understanding population trajectories.

In the process of arguing for this interesting metaphor, Ginzburg and Colyvan digress into critical examinations about whether ecology has laws such as those in the hard sciences. Throughout these discussions of laws in ecology, they make some refreshing statements about the role of theoretical ecology: they emphasize the "maternal

effect" model for inertial population growth and point out that this model produces cycles in population abundance with the strong prediction that the period length of these cycles cannot fall below six generations in length. The competing models for cyclic dynamics are the predator-prey models. Ginzburg and Colyvan argue that most existing predator-prey models are overfitted with too many variables and thus fail the demand for simplicity. In a final chapter they explore some of the practical consequences of adopting the inertial model of population growth for fisheries management and conservation problems.

My only complaint about this book is that the term "maternal effects" is used too loosely to mean all delayed effects by which one generation affects the biology of the following generations, rather than being restricted to the biological mechanisms that underlie strict maternal effects. Nevertheless, this small volume is a delightful read that will interest all who care about population dynamics and ecological modeling.

Charles J Krebs, *Zoology, University of British Columbia, Vancouver, British Columbia, Canada*