The Center for Control, Dynamical Systems, and Computation
Spring Seminars
Presents

Population Dynamics at Multiple Spatial Scales in Advective Systems

by

Professor Roger Nisbet

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Abstract:

Theory relating to the dynamics of populations in media with strong unidirectional flow will be presented. Examples include drifting invertebrates in rivers and streams, marine organisms whose larvae are dispersed in local longshore currents, plants with wind or waterborne seeds, and microrganisms in the gut. For many simple models, there is an easily calculated “response length” that characterizes the distance downstream over which the impact of a point source disturbance is felt. The response length is also an important parameter for characterizing the response to non-point source disturbances at different spatial scales. Transient dynamics are frequently of great importance in rivers and streams, and preliminary results will be presented on the scale dependence of transients in advective systems.

About the Speaker:

Roger Nisbet obtained his PhD in theoretical physics at the University of St. Andrews (Scotland), and is currently a Professor in the Department of Ecology, Evolution and Marine Biology (EEMB) at UCSB. He previously held faculty appointments at the University of Strathclyde (Scotland) and the University of the South Pacific (Fiji).

For over thirty years, his main research interest has been ecological theory and modeling. He has a long-standing program on individual-based population models that aim to relate population dynamics to the physiology and behavior of individual members of a population. Underpinning much of this work is research on dynamic energy budget (DEB) theory, a powerful tool for relating phenomena at different levels of biological organization.

Individual-based models are also important in spatial ecology. Recently, he and his collaborators have developed new theory for populations in advective environments (for example, rivers and streams). Contributions include calculations of the speed of upstream propagation of invasion fronts, conditions for population persistence in the face of advection, and methodology for determining the effects of multi-scale spatial environmental variability on the spatial distribution of a population.