Theory and Applications of Dynamical Systems in Biology
Théorie et applications des systèmes dynamiques en biologie
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How weak competition can affect the persistence of species in a Lotka-Volterra reaction-diffusion system

Lotka-Volterra systems describing two species competing for resources in heterogeneous environments have been widely studied in the context of random diffusion. One of the most striking results states that, when two species undergoing random diffusion are identical in all parameters except for their diffusion rates, the slower diffuser wins the competition. However, the introduction of directed dispersal into reaction-diffusion models can drastically change this outcome. In particular, there exist dispersal strategies, known as evolutionarily stable strategies, that allow a species adopting them to resist invasion by competing species following any other dispersal profile. In this presentation, I explore how species adopting an evolutionarily stable dispersal strategy can still be driven to extinction when interspecific competition is weaker than, but close to, intraspecific competition.

TURNER SILVERTHORNE, University of Toronto

MARIA SISKAKI, University of California, Los Angeles
Dynamical Systems from Day One: Reimagining the First University Math Course for Life Science Majors

Modern biology requires foundational quantitative competencies such as modeling nonlinear feedback mechanisms, analyzing point and limit cycle attractors, classifying stability, and interpreting bifurcations. However, standard undergraduate curricula channel students through the calculus sequence, which is a pathway that emphasizes analytical techniques at the expense of dynamical systems modeling. Consequently, calculus is increasingly scrutinized as the default math prerequisite for biological sciences. In this talk, I present UCLA's alternative approach: an introductory course on dynamical systems targeting first-year

students, without requiring the standard calculus pipeline. This course is aligned with national reports on quantitative biology education, and provides an immediate, relevant foundation in dynamical systems techniques starting from the students' very first term in college.

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