Applied Mathematics and Scientific Computing Seminar

Room 617 Wachman Hall

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Two Tales of a Microbial City

by Isaac Klapper

Temple University

Abstract.

Microbes form a large and central part of the global ecosystem. As a consequence of their short reproductive time and their proficiency at exchange of genetic material, it seems plausible that microbial communities operate at high efficiency (in terms of free energy and nutrient usage) in many contexts. One obvious issue of interest would be the description of species within a microbial community and its dependence on the local environment.

Description of niche structure of organisms and how that structure impacts competitiveness has long been a topic of interest among ecologists. It is natural for modelers to suppose organisms exhibit a simple, generic response to, say, variable (in time) conditions — for example, a Gaussian response function with width related to amplitude of environmental variability is often chosen. Here, in the context of a chemostat in an oscillating environment, we do not constrain the functional form but instead allow organisms to choose an optimal response function, and show some consequent predictions that differ in important ways from predictions arising from constrained response functions.