



2012 - 2013



MATHEMATICS COLLOQUIUM SERIES
UNIVERSITY OF CENTRAL FLORIDA

Dr. Stephen Cantrell
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will speak on

Nonlinear diffusion and resource matching in population dynamics

Abstract: In this talk we will discuss how parabolic partial differential equations may be used to study the evolution of dispersal strategies. We will begin with a brief historical overview to set our context. We will then focus on our primary interest, namely exploring the relative advantages of fitness-dependent and random dispersal in a two species competition model in a bounded spatial habitat. Both species have the same population dynamics, but one species adopts a combination of random and fitness-dependent dispersal and the other adopts only random dispersal. In so doing we regard the species as ecologically identical, differing only in their dispersal strategies. The model is realized as a quasi-linear parabolic system. Global existence of smooth solutions to the system may be established in two dimensions for any smooth bounded habitat and in 3 or more dimensions when the habitat in question is convex. When the single species which combines random and fitness-dependent movement is considered in the absence of its competitor, we show that a strong tendency for the species to move up its fitness gradient leads to a stable equilibrium that approximates the ideal distribution. For the two species competition model, such approximately ideal free dispersal is evolutionarily advantageous relative to random dispersal. Further, bifurcation analysis shows that the two competing species can coexist when one species has only an intermediate tendency to move up its fitness gradient and the other species has a smaller diffusion rate.

The work described in this talk is based on three papers due to: (1) R. S. Cantrell, C. Cosner and Y. Lou; (2) R. S. Cantrell, C. Cosner, Y. Lou and C. Xie; and (3) Y. Lou, Y. Tao and M. Winkler.

DATE: Thursday, March 21, 2013

TIME: 11:00am

PLACE: MSB 318

Refreshments will be served.