

# Mathematics Colloquium

The Dept. of Mathematics is proud to host a talk by **Professor Jerome Goddard II** of Auburn University

## **Title: How small is too small? Modeling the effects of habitat fragmentation via reaction diffusion equations**

**Abstract:** Habitat fragmentation occurs when an organism's preferred habitat is divided or broken into smaller fragments (called patches) and can be caused by natural events, such as geological processes, or human activity, such as land conversion. Habitat fragmentation is often cited as a contributor to animal species becoming threatened or endangered. Two important aspects of habitat fragmentation are the size of fragmented patches of preferred habitat and the inferior habitat surrounding the patches, called the matrix. Ecological field studies have indicated that an organism's survival in a patch is often linked to both the size of the patch and the quality of its surrounding matrix. In this talk, we will focus on modeling the effects of habitat fragmentation via the reaction diffusion framework. The reaction diffusion framework has been extensively employed in population dynamics providing important biological insight into the patch-level consequences of various assumptions made on individual behavior in ecological systems. Such models have seen enormous success both in their empirical validation with actual spatio-temporal distribution data and their ability to yield general conclusions about an eco-system based on the analytical results of these theoretical models. First, we will introduce the reaction diffusion framework and a specific reaction diffusion model with logistic growth and Robin boundary condition (which will model the negative effects of the patch matrix). Second, we will use mathematics to explore the dynamics of the model via the well-known quadrature method and ultimately obtain a causal relationship between the size of the patch and the quality of the matrix versus the maximum population density sustainable by that patch. This important example regarding habitat fragmentation will hopefully serve to illustrate the usefulness of mathematical models in helping to understand complex biological relationships.



**When: Monday, Sept. 22 at 2:30pm**

**Where: Ballroom B (Student Center)**

**Join us for Coffee @ 2pm in the Ballroom & meet the speaker!**