

# BI-CO MATHEMATICS COLLOQUIUM

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## *“Agent-Based and Continuous Models of Locust Swarms”*

*Monday, October 2, 2023*

*Talk at 4:30 – Hilles 109*

*Tea 4:00 – Foyer outside of H109*

### **Abstract:**

Locust swarms pose a major threat to agriculture, notably in northern Africa, the Middle East, and Australia. In the early stages of aggregation, juvenile locusts form hopper bands. These are coordinated groups that march in columnar structures that are often kilometers long and may contain millions of individuals. In later stages locusts swarms become airborne and can decimate crops over hundreds of kilometers potentially leading to famine and widespread ecological disruption.

In this talk we will discuss two strategies for modeling locust swarms. Agent-based models (ABMs) yield ordinary differential equations for groups of interacting individuals and are easy to implement but challenging to analyze. Homogenizing these models replaces the individuals with population densities that are governed by partial differential equations (PDEs) which are more difficult to simulate but which can be analyzed via dynamical system methods.

Finally, we will discuss the challenges of informing models with experimental observations and report on an ongoing study that uses motion tracking of tens of thousands of locusts in the field to shed light on how behavior is influenced by social interactions.

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