Department of Applied Mathematics and Statistics
The Johns Hopkins University

SEMINAR

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Wednesday, February 8
114 Barton Hall
Refreshments: **2:30 p.m.**
in 301 Whitehead Hall
Seminar: **3:00 p.m.**

ON PATTERN FORMATION AND CELL AGGREGATION IN BIOLOGY

Abstract

In this talk I will review recent progress in modeling collective behavior in Myxobacteria using stochastic discrete systems. Myxobacteria are social bacteria that swarm and glide on surfaces, and feed cooperatively. When starved, tens of thousands of cells change their movement pattern from outward spreading to inward concentration; they form aggregates that become fruiting bodies. Cells inside fruiting bodies differentiate into round, nonmotile, environmentally resistant spores. Traditionally, cell aggregation has been considered to imply chemotaxis, a long-range cell interaction. However, myxobacteria aggregation is the consequence of direct cell-contact interactions, not chemotaxis.

I will also present the foundation of a unified, object-oriented, three-dimensional environment for modeling morphogenesis, which allows one to integrate multiple submodels at scales from subcellular to those of tissues and organs. Our current implementation combines a modified discrete model from statistical mechanics, the Cellular Potts Model, with a continuum reaction-diffusion model and a state automaton with well-defined conditions for cell differentiation transitions to model genetic regulation.