ACMS Applied Math Seminar

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Thursday, April 23, 2026
154 Hurley Hall
3:30 PM – 4:30 PM

Mathematical Modeling of Polymerization Processes in Physiology

Polymerization, or aggregation, is essential for many physiological systems. For example, the emergence of a fibrin polymer mesh during the formation of a blood clot is required for a stable clot and long-term, sustained intracellular transport in cells rely on persistent yet dynamic polymers that comprise the microtubule cytoskeleton. In the first part of the talk, I will discuss a kinetic modeling framework that represents the growth of fibrin polymers through tracking the polymer size distribution up until gelation occurs. With this modeling framework, we can investigate how other aspects of the blood clotting process can impact gel structure (such as concentration of branch points) and gel time. In the second part, I will introduce a stochastic modeling framework of intracellular microtubule dynamics which aims to capture behavior of microtubules seen in neurons. Using in vivo experiments in a Drosophila model system, we glean information about individual parameters of microtubule behavior. We then combine these experiments with in silico mathematical models to understand how various mechanisms work together to generate both robustness and flexibility within the neuron.