PHYSICAL MATHEMATICS SEMINAR

Stochastic modeling and analysis of blood vessel growth

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ABSTRACT:

Angiogenesis is a multiscale process by which blood vessels grow from existing ones and carry oxygen to distant organs. Angiogenesis is essential for normal organ growth and wounded tissue repair but its imbalance contributes to many diseases such as age related macular degeneration (AMD) and cancer. I will present stochastic models of angiogenesis at the cellular level and at the mesoscale. Numerical simulations of stochastic models at the cellular level help understanding angiogenesis and may offer clues on ameliorating exudative AMD. Simpler mesoscale models track the motion of blood vessel tips advancing toward a region lacking oxygen. I derive a deterministic integrodifferential description of the vessel tip density from the stochastic model and show that the density advances as a soliton (similar to the Korteweg-de Vries soliton) whose shape and velocity change slowly. Analyzing these collective coordinates paves the way for controling angiogenesis through the soliton, the engine that drives this process.

TUESDAY, OCTOBER 19, 2021
2:30 PM – 3:30 PM

https://math.mit.edu/sites/pms/

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Meeting ID: 955 9772 1876

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