SCHOOL OF NATURAL SCIENCES

SEMINAR SERIES

Multi-Scale Models in Cell and Developmental Biology

Many biological processes in cell and developmental systems require an intricate and well-coordinated regulation of spatial-temporal dynamics at multi-scales. How to incorporate the dynamics at different scales in one system is a big challenge in modeling of developmental systems. We developed several multi-scale models for different systems to study the spatial-temporal dynamics in system development, pattern formation and cell migration. These model systems include: 1) a 3D model for hair follicle development and wave propagation, where follicle growth is regulated by the coupling of activator/inhibitor signaling that is described by stochastic PDE, and we show that the co-option of these signals into skin macro-environment produces wave-like coupled hair growth; 2) hybrid models for pattern formation during embryo development, with gene regulation network described by stochastic PDE/ODE and cells modeled by sub-cellular element method, where we explore how global information incorporated chemical signaling directs cell fate decision making and guides cell movement; 3) models for amoebae cells and mini aqua robots swimming in viscous fluid, where we either use techniques from complex analysis in a 2D model or asymptotic analysis on 3D linked-sphere type models, so to explore how various modes of cyclic deformations lead to cell movement in viscous fluid.

Friday, 01/19/18	**3:00pm - 4:20pm**	**COB 1, Rm. 267**	For more information, contact: Professor Francois Blanchette at fblanchette@ucmerced.edu

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Qixuan obtained her bachelor's degree in mathematics at Peking University, China. She went on to graduate school at University of Minnesota, Twin Cities, where she obtained her Ph.D. in mathematics under the supervision of Dr. Hans Othmer. During her doctoral studies, she developed mathematical models and computational methods on cells swimming at low Reynolds number. As a postdoctoral scholar in Dr. Qing Nie's lab at University of California, Irvine, she developed hair follicle development and regeneration models, and spatial models on embryo development and pattern formation.