NIMBioS
National Institute for Mathematical and Biological Synthesis

cordially invites you to an

Interdisciplinary Seminar

with

Dr. Alex Mogilner

on

"Mechanical pathways of cell polarization and motility initiation"

Tuesday, March 22, 2016
3:30-5 p.m.
Reception & refreshments at 3 p.m.

Hallam Auditorium, Room 206
1122 Volunteer Boulevard

Alex Mogilner is a Professor of Mathematics and Biology at the Courant Institute of Mathematical Sciences and a Professor of Biology at New York University. He is on editorial boards of Cell, Journal of Cell Biology, Molecular Biology of the Cell and Bulletin for Mathematical Biology. His theoretical models have investigated the assembly of the mitotic spindle, the behavior of the actin cytoskeleton, and the generation of cell shape and its relationship to cell motility. Some latest projects include modeling of polarization and turning of keratocyte cells, simulating cells as free boundary problem, investigating how cells sense electric field, understanding principles of actin-myosin contraction, elucidating mechanisms of rapid self-assembly and error-correction in mitotic spindle, modeling cell crawling in 3D.

Abstract: Animal cells move using a polarized dynamic actomyosin network adhering to the surface. While mechanics of motility based on actin protrusion at the front and myosin contraction at the rear are understood fairly well, explanation of spontaneous polarization remains elusive. I will present simulations of a 2D model of a viscous contractile actin-myosin network with a free boundary which, coupled with experimental data, suggests that a positive feedback between myosin aggregation and actin flow and a negative feedback between flow and stick-slip adhesion is the key to understanding self polarization of fish epithelial keratocytes. The model predicts, and experiments confirm, that upregulating myosin accelerates the polarization. On the other hand, epithelial IAR-2 cells self-polarize faster if myosin is inhibited. In that case, combined experiment and theory point out that competition of protruding and contracting actin networks for a common actin pool, coupled with cell movement, is the key to the self-polarization. I will discuss implications of these findings for design principles of cellular self-organization.

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The seminar will be live streamed. Visit http://www.nimbios.org/videos/livestream.
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