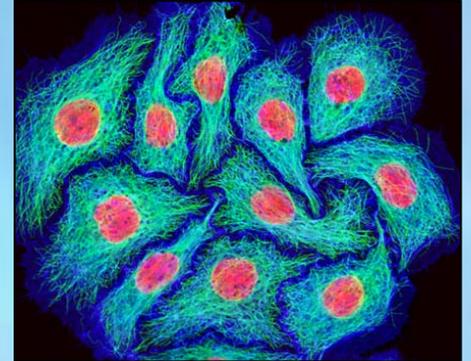


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“A local analysis of symmetry breaking with applications to HeLa cell polarization: Theory and experiment”

William R. Holmes
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NIMBioS-UT Math Interdisciplinary Seminar
3:30 p.m.*, September 6, 2011
NIMBioS, Blount Hall, 1534 White Ave.

Polarization, symmetry breaking, and more generally patterning play a vital role in many cellular functions including chemotaxis, the topic of this work. During chemotaxis, mammalian cells sense an external gradient of attractant (or repellent). This leads to re-organization of regulatory molecules (Rho-GTPases and Phosphoinositides (PIs)) that control the highly choreographed growth, contraction and destruction of the cytoskeleton, which is necessary for motion. Holmes will discuss recent collaborative work (with the experimental group of Andre Levchenko at Johns Hopkins Univ.) that explores the biomolecular interactions that lead to polarization in a specific cell type (HeLa). A “wave pinning”-based model incorporating Rho-GTPases and PIs with feedback between them will be presented. A brief overview of the relevant biochemical/biomechanical machinery responsible for motility will be given to present a complete picture. An overview of modeling techniques used in this field will be given with an emphasis on the mathematical basis of a new class of pattern forming models, referred to as “wave pinning” (Mori et al., Biophys J. 2008). New pseudo-analytic methods, involving only ODE techniques and the use of packaged numerical continuation software (eg. Auto or MatCont) for simultaneously performing linear stability analysis, Turing stability analysis, and detecting threshold based patterning (e.g. Wave pinning) will be presented. This will be used to analyze the discussed model and connect it to experiments, providing hypotheses about the underlying biochemical interactions responsible for polarization.

**Join us for refreshments in the NIMBioS Lobby on the 4th floor at 3 p.m.*

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