NIMBioS
National Institute for Mathematical and Biological Synthesis

# NIMBioS Interdisciplinary Seminar

## 3:30 p.m.*, Tuesday, November 25, 2014


## Dr. Steven Abel

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**University of Tennessee, Knoxville**


### "Deconstructing Signal Transduction at the Cell Membrane"


Cells orchestrate responses to their environment by means of biochemical reaction networks that propagate molecular signals from the cell membrane to the interior of the cell. These signal transduction networks involve many components interacting in a noisy environment, and mathematical modeling is an essential tool for understanding how they collectively interact in space and time to generate reliable responses. Many key signaling reactions occur at the cell membrane, yet how the membrane environment influences the collective behavior of signaling networks remains poorly understood. In this talk, we use theoretical and computational methods rooted in statistical mechanics to investigate (i) how the membrane environment influences emergent properties of signaling networks, and (ii) what mechanisms control the spatial organization of membrane-associated molecules when cells are in contact. In the first part, we use stochastic methods to study signaling networks that exhibit bi-stability. We find that confining proteins to a membrane-like environment can markedly alter the emergent behavior by altering protein mobility, protein concentration, and spatiotemporal correlations between pairs of molecules. In the second part, we use field-theoretic methods to study the binding and subsequent spatial reorganization of complementary molecules on apposed cell membranes. When two or more molecular complexes with different natural lengths are present, the species segregate into distinct spatial regions, even in the limit of vanishing membrane surface tension and bending rigidity. This result is unexpected, as minimization of membrane bending energy is often suggested to be the driving force for molecular segregation.


***Location: Tom Hallam Auditorium, Room 206 at NIMBioS, Claxton Education Bldg, 1122 Volunteer Blvd.***

**Join us for refreshments at 3 p.m. in Room 205.*

For more information about this and other NIMBioS Seminars, visit http://www.nimbios.org/seminars

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