



May 30th, 12:00 PM - 12:30 PM

Getting in shape and swimming: the roles of cortical forces and membrane heterogeneity in eukaryotic cells

Hao Wu

University of Minnesota - Twin Cities, wuxx1798@umn.edu


Marco Ponce de Leon

University of Minnesota - Twin Cities

Hans Othmer

University of Minnesota - Twin Cities

Follow this and additional works at: <https://scholarscompass.vcu.edu/bamm>

 Part of the [Life Sciences Commons](#), [Medicine and Health Sciences Commons](#), and the [Physical Sciences and Mathematics Commons](#)

<https://scholarscompass.vcu.edu/bamm/2018/wednesday/18>

This Event is brought to you for free and open access by the Dept. of Mathematics and Applied Mathematics at VCU Scholars Compass. It has been accepted for inclusion in Biology and Medicine Through Mathematics Conference by an authorized administrator of VCU Scholars Compass. For more information, please contact libcompass@vcu.edu.

Getting in shape and swimming: the role of cortical forces and membrane heterogeneity in eukaryotic cells

Hao Wu, Marco Ponce de Leon, Hans Othmer

School of Mathematics, University of Minnesota Twin Cities

Recent research has shown that motile cells can adapt their mode of propulsion to the mechanical properties of the environment in which they find themselves - crawling in some environments while swimming in others. The latter can involve movement by blebbing or other cyclic shape changes, and both highly-simplified and more realistic models of these modes have been studied previously. Herein we study swimming that is driven by membrane tension gradients that arise from flows in the actin cortex underlying the membrane, and does not involve imposed cyclic shape changes. Such gradients can lead to a number of different characteristic cell shapes, and our first objective is to understand how different distributions of membrane tension influence the shape of cells in a quiescent fluid. We then analyze the effects of spatial variation in other membrane properties, and how they interact with tension gradients to determine the shape. We also study the effect of fluid-cell interactions and show how tension leads to cell movement, how the balance between tension gradients and a variable bending modulus determine the shape and direction of movement, and how the efficiency of movement depends on the properties of the fluid and the distribution of tension and bending modulus in the membrane.