IEM SEMINAR SERIES

TUESDAY
March 7th, 2017

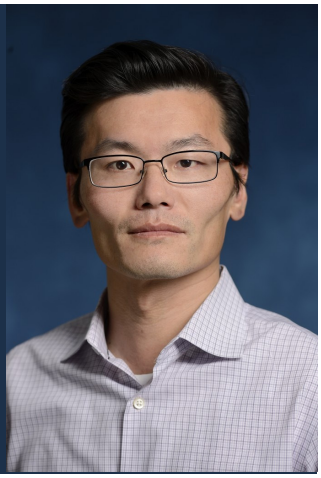
Mechanical Modeling of Cell Shape, Cell Volume and Cell Motility

Institute for Engineering in Medicine

UNIVERSITY OF MINNESOTA
Driven to DiscoverSM

Dr. Sean Sun

Professor and Vice-Chair of Mechanical Engineering
John Hopkins University



FREE event, no registration required.

Pizza and Beverages will be provided from 11:45 am

12:00PM - 1:00PM
Nils Hasselmo Hall
Room 4-101

For additional information on Dr. Sun's presentation please contact:
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The Institute for Engineering in Medicine (IEM) is pleased to announce a seminar by Dr. Sean Sun, "Mechanical Modeling of Cell Shape, Cell Volume and Cell Motility."

The global shape, size and movement of cells have important consequences in biochemical processes in living animal cells. We analyze a mechanical picture of the cell actomyosin cortex, and consider cellular processes that allow the cell to balance osmotic pressure, membrane tension and myosin contraction at the cell surface. This force balance condition also explains how cells can use Ca signals to achieve a homeostatic cell volume and membrane tension at varying environmental conditions. From the force-balance condition, we also find an emergent prediction on how cell size is related to cell spread area. Experiments on cell size reveals a tight relationship between substrate stiffness, myosin contraction and global cell volume, and some unexplained observations. Finally, by considering water flux and actin polymerization together with a 2-phase model of the cellular cytoplasm, we find a unified picture of cell motility that predicts water dominated cell movement when environmental frictional forces are very large. This result explains why cells in 2D culture move by actin polymerization, but in other types of environments, pumping of water by ion channels can also drive cell movement.

For more information on the IEM Seminar Series, visit www.iem/umn.edu/SeminarsLectures/Seminars_index.html