Yale Institute for Nanoscience and Quantum Engineering

Friday-September 8, 2017

12:00-1:00 PM

BECTON SEMINAR ROOM
Light lunch will be served at 11:45 a.m.

Mark D. Shattuck
Department of Mechanical Engineering and Materials Science, Yale University
Benjamin Levich Institute and Physics Department, The City College of the City of New York,NY

"Computational Studies of Cell Monolayers"

We aim to develop a minimal physics-based model for cells, which would have application in tissue and tumor growth, wound healing, and embryogenesis. Current physics-based models, including soft-sphere models, Vicsek model, vertex model, and self-propelled Voronoi model, have a number of drawbacks. We have devlopled a more versatile and realistic model based on the "single cell vertex model". This 2D model solves an number of problems with other similar models including arbitrarily deformable cells with volume and perimeter preserving properties, control over individual cell motions, adjustable cell-cell interactions including attractive, repulsive, and frictional, definable extra-cellular space, and is easily extended to 3D. This model is also interesting outside of the biological arena as a model for deformable particle suspension like emulsions and for packings of deformable particles. For example in deformable polygon packings, we identify a new phase transition between non-confluent and confluent systems that occurs when the particle shape factor is comparable to the average shape factor for Voronoi polygons of disk packings.

Adam Saffer
Department of Molecular, Cellular, and Developmental Biology, Yale University

"Pectin Controls the Chirality of Plant Cells"

Although specific organs in some plant species exhibit helical growth patterns of fixed or variable handedness, plant organs typically grow in a linear and non-chiral fashion. I am investigating the sources of chirality in plant growth and the factors that allow most plant tissues to grow non-helically. Plant cells are surrounded by cell walls composed primarily of polysaccharides, which control growth and cell expansion. I have found that decreasing the abundance of a specific cell wall pectic polysaccharide causes dramatic left-handed helical growth of petal epidermal cells, leading to left-handed twisted petals. These findings reveal a novel source of left-handed plant growth caused by changes in cell wall composition and implicate pectin in the control of plant cell patterning. In this talk, I will discuss ongoing work into how cell wall composition controls the chirality and helical growth of plant cells and organs.

Host: Professor Corey O'Hern