Center for Engineering MechanoBiology

Mechanobiology Boot Camp
July 15-26, 2024
University of Pennsylvania

Date	Event
Monday, July 15	Welcome and Introductions
	Lecture 1: Amit Pathak, Animal Cell Adhesion
	Lecture 2: Becky Wells, Animal ECM
	Lab Sections
	Lab: Mechanics of biopolymer networks (Niranjan)
	Lab: MATLAB image analysis (Marina)
	Happy Hour for participants and TAs (Food, drink, and mini-golf provided)
Tuesday, July 16	Lecture 1: Charlie Anderson: Plant Cell Wall
	Lecture 2: Ben Prosser, Basic Nuclear Mechanobiology
	Lab Sections
	Lab: Soft Lithography and microcontact printing (David and Kapish)
	Lab: Mechanosensitive pathways 1 (Kevin and Meghan)
	Dinner with faculty
Wednesday, July 17	Lecture 1: Melike Lakadamyali: Nucleus and Chromatin Structure
	Lecture 2: Anders Carlsson: Measuring Forces
	Lab Sections
	Lab: Hydrogel fabrication and image analysis, cell cuture (Veronica)
	Lab: Theory, coding, and computation with Python for beginners (Suraj)
	Dinner with your team (optional) - with TAs
Thursday, July 18	Lecture 1: Paul Janmey, Basic Biochemistry and Biophysics
	Lecture 2: Ram Dixit: Plant and Animal Cytoskeleton
	Lab Sections
	Lab: Mechanosensitive pathways 2 (Kevin and Meghan)
	Lab: Theoretical cell mechanobiology (Mohammed)
	Dinner with faculty
Friday, July 19	Lecture 1: Bill Polacheck: Microfluidics for mechanobiology
	Lecture 2: Jason Burdick: Integrating Biology and Mechanics through Materials

	Lab Sections
	Lab: Micropipet aspiration for stiffness measurements (Alisya)
	Lab: Molecular dynamics tutorial on polymer simulations (Vinayak)
	Center-wide happy hour

Week 2 Group Projects

Monday, July 22	Matt Davidson: Scientific Illustrations
Tuesday, July 23	Julee Farley: Grant Writing and Broader Impacts
Wednesday, July 24	Ryan Miller/Weingarten Center: Strategies for Academic Writing
Thursday, July 25	Venus Fly Trap Outreach Demo (Amanda Cottone)
Friday, July 26	Final group presentations and Reception (open to CEMB)

Project Prompts:

1. Cells plated on hydrogels have widely varying shapes depending on the stiffness of the substrate. What elements of the cell determine stiffness-associated shape, and does viscosity play a role? Does this behavior vary according to cell type? What does theory allow you to predict about behavior in 3D?

2. Cells appear to migrate differently on 2D and 3D surfaces, but in vivo, cells are often faced with interfaces. Little is known about migration in this setting. Do cells migrate on 2D surfaces faster, or with different features, than at the interface between two substrates (like in a fascial plane)? Do the features of the interfaces matter in this regard?

3. Cells respond to growth factors with changes in behavior that include altered gene expression, migration, proliferation, and differentiation, changes that are all in some way associated with mechanical changes in cells. Are growth factor-mediated responses and mechanics always coupled?