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Engineered Systems for Understanding Tissue Homeostasis and Neurodevelopment

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Tuesday, November 12th, 2024
4:00 PM to 5:00 PM
Room 2540 GGB

ME Seminar Link
Passcode: 763919

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Abstract:
Biological systems are complex, autonomous, and deeply coupled, making it challenging to tease out the key regulators of biological processes. Designing engineered systems that precisely control the mechanical and biochemical microenvironment of cells and tissues offers unique opportunities to study fundamental cell biology and creat physiologically relevant models. In this talk, I will present our recent work in two key areas. In the first part, I will discuss how biophysical cues, such as geometrical confinement and strain gradient, regulate cell alignment, migration, and wound healing, which are crucial for tissue remodeling and homeostasis. In the second part, I will discuss in vitro modeling of neurodevelopment using human stem cells. Understanding human brain development is critical for revealing fundamental mechanisms for neurodegenerative and neuropsychiatric diseases. However, the complexity of human brains and the difficulty to access human brain tissues make it challenging to study brain development. To address this, we have designed novel engineered systems that regulate reaction-diffusion of endogenous and exogenous morphogens, enabling cell fate patterning and regionalization in both 2D neuroectoderm microtissues and 3D neural organoids. I will further discuss the potential applications of those engineered neurodevelopment models in drug discovery and cytotoxicity screening.

Bio:
Yubing Sun is an Associate Professor in the Department of Mechanical and Industrial Engineering at the University of Massachusetts Amherst, with an adjunct appointment in the Department of Biomedical Engineering. He received his Ph.D. degree from the Department of Mechanical Engineering at the University of Michigan, Ann Arbor in 2015, and his B.S. degree in Materials Science and Engineering from the University of Science and Technology of China. Dr. Sun has been recognized by NIGMS MIRA Award, NSF CAREER Award and Barbara H. and Joseph J. Goldstein Outstanding Junior Faculty Award at UMass. His current research interests include stem cell biology, organoid engineering, mechanobiology, cell migration, lab-on-chip, and biosensing.