UCLA Engineering
HENRY SAMUELI SCHOOL OF ENGINEERING AND APPLIED SCIENCE

BIOENGINEERING

PRESENTS

Inferring the design rules of development by tissue reconstitution

Thursday, March 9, 2017
12:00 – 1:00 PM
2101 ENGINEERING V

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ABSTRACT:

The emergence of gut villi, the branching of the airway epithelium, and the wrapping and closure of the neural tube are all developmental transitions that convert flat tissue structures into more complex forms. I believe that a systems-level understanding of tissues sufficient to study their malfunction in disease will come through reconstituting their developmental transitions ex vivo. I will describe our synthetic system for recapitulating the mechanics of mesenchymal condensation, a core vertebrate developmental program that encodes transitions in tissue complexity in diverse contexts. These efforts will enable fundamental studies on the interplay between tissue mechanics and morphogenesis, and instruct our efforts to bring developmental principles under engineering control for applications in basic science, regenerative medicine, and stimuli-responsive biological materials.

BIOGRAPHY:

Alex J. Hughes studied chemical engineering at the University of Auckland, New Zealand before pursuing a Ph.D. at the University of California, Berkeley, where he developed microfluidic applications to precision proteomics. Here he created a western blot assay performed simultaneously on thousands of single cells in order to study signaling and differentiation responses in neural stem cells.

As a Jane Coffin Childs postdoctoral fellow at the University of California, San Francisco, his efforts first turned to building and studying large arrays of tissues with precise composition to understand collective cell behaviors in reconstituted occult tumors. Secondly, he studied how mesenchymal condensation, a core vertebrate developmental program, can mechanically coordinate curvature and folding of reconstituted tissue interfaces. He also developed processes to use annotations from untrained crowds to interpret biological imaging data both directly and in tandem with machine learning algorithms. His future interests lie in applying quantitative engineering approaches to the construction and study of developmental systems.