The Biological and Biomedical Joint Seminar Series

(Hosted by the departments of Molecular & Cellular Biology, Chemistry & Biochemistry, Cellular & Molecular Medicine, and Plant Sciences)

"Multi-Cell Systems: Synthetic Adhesion, Self-assembly, and Optical Control"

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ENR2 Room S107 @ 11AM

Hosted By: Ted Weinert

Multi-cellularity enables organisms and symbiotic systems to achieve complex tasks through collective emergent phenomena and division of labor among cells. My lab utilizes synthetic biology, systems biology, and biophysics approaches to facilitate the engineering and understanding of such multi-cell assemblies. I will demonstrate an orthogonal library of genetically encoded heterophilic cell-cell adhesion pairs that enables the self-assembly and patterning of bacterial aggregates at the 5 µm scale [Glass Cell'18], furthermore the optogenetic control of homophilic cell-cell adhesion that enables the programming of biofilm patterns onto surfaces at the 25 µm scale ('Biofilm Lithography') [Jin PNAS'18]. Furthermore, I will demonstrate how we can use interactive, multimodal light-stimuli to control and program the behavior of microswimmers, which then also led us to the discovery of striking polygonal swimming behaviors caused by a simple cellular control-feedback loop in order to achieve optimal phototaxis [Tsang Nature Physics'18]. Overall, our work aims at a deeper understanding and control of multi-cellular self-assembly, the physics of active matter, and the evolutionary transition to multi-cellular life.

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