

Molecular & Cellular Biology Faculty Search

“Biophysical, Synthetic, and Interactive Approaches to Multi-Cell Assemblies”

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ENR2 Room SI07 @ IIAM

Hosted By: Ted Weinert



I will describe my lab’s synergistic bottom-up / top-down approach to investigate behaviors and pattern formation at the transition from single- to multi-cellularity:

(1) We utilize synthetic biology and biophysics approaches to facilitate the engineering and understanding of multi-cell assemblies by controlling cell adhesion in bacteria (*E. coli*). 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 [1], 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’) [2]. (2) We pioneered ‘Interactive Biotechnology’ that enables humans to directly interact with living swarms of motile phototactic cells (*Euglena gracilis*). I will provide the rationale for this interactivity, demonstrate multiple educational applications, e.g., tangible museum exhibits [3], biology cloud experimentation labs [4,5], and biotic video games [6]. I will also show how this technology aided the discovery and biophysical analysis of novel phototaxis behaviors in *Euglena* cells caused by feedback-control between its eyespot and flagellum [7].

[1] Glass, *Cell* '18; [2] Jin, *PNAS* '18; [3] Lee, *CHI ACM* '15; [4] Hossain, *Nature Biotech* '16; [5] Washington, *PNAS* '19; [6] Cira, *PLoS Biology* '15; [7] Tsang, *Nature Physics* '18.

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