"Creating synthetic biological systems with coupled genetic and non-genetic control elements”

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Abstract:
Synthetic biology is a multi-disciplinary field, which integrates understanding in biology with principles from engineering, physics, and chemistry for the design and creation of new biologically-relevant systems. Synthetic biology has made tremendous recent strides in engineering synthetic cellular systems using minimal cell components, creating an experimental platform for characterizing the behavior of isolated cellular modules and a form of biotechnology for the controlled operation of synthetic cells. The robustness and efficiency of these systems are nonetheless challenging to control, in part because a synthetic gene circuit is often engineered by focusing only on genetic control elements. Here, I demonstrate how non-genetic control elements, including host growth rates and molecular crowding, can lead to emergent dynamics of synthetic biological systems. My work has implications for efficient and robust control of both synthetic and natural cellular circuits and underscores the critical need to account for non-genetic control elements when engineering gene circuits. In addition, my work establishes a foundation towards integrating synthetic cellular components of biological circuits and artificial cells for biotechnological applications.

A BME “Chalk Talk” is scheduled for Friday, February 8th at 3:00PM in Biological Sciences 3, Room 2622. The talk is entitled “Engineering Antibacterial Artificial Cells Using a Synthetic Biology Approach.”