



**CSB**  
Cell & Systems Biology

# Seminar Series

## 2013 Fall

### Professor Jeff Hasty

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University of California, San Diego

### "Engineered Gene Circuits: From Oscillators to Synchronized Clocks and Biopixels"

This talk will focus on the development of synthetic gene oscillators and their synchronization. I will first describe an engineered intracellular oscillator that is fast, robust, and persistent, with tunable oscillatory periods as fast as 13 minutes. Experiments show remarkably robust and persistent oscillations in the designed circuit; almost every cell exhibits large-amplitude uorescence oscillations throughout each experiment. Theory reveals that the key design principles for constructing a robust oscillator are a small time delay in the negative feedback loop and enzymatic protein decay that functions as an "overloaded" queue. I will then describe intercellular coupling that is used to generate synchronized oscillations in a growing population of cells. Microfluidic devices tailored for cellular populations are used to demonstrate collective synchronization properties along with spatiotemporal waves occurring on millimeter scales. While quorum sensing proves to be a promising design strategy for reducing variability through coordination across a cellular population, the length scales are limited by the diusion time of the small molecule governing the intercellular communication. I will conclude with recent progress engineering the synchronization of thousands of oscillating colony "biopixels" over centimeter length scales.

**Friday, September 20, 2013 at 2 p.m.**  
**Ramsay Wright Building, Room 432**

Host: Prof. Sergio Peisajovich

*Refreshments will be served. All are welcome*

**Video Conferencing at UTM (DV 4001) & UTSc (MW 229)**

*Ramsay Wright is a Wheelchair Accessible Building*