

*Department of Mathematics,  
University of California San Diego*

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## Co-hosted seminar (Controls & Department of Mathematics)

**Richard M. Murray**

California Institute of Technology

## Biomolecular Feedback Control Systems for Cooperative Behaviors in Engineered Cells

### Abstract:

Biological systems make use of feedback in an extraordinary number of ways, on scales ranging from molecules to cells to organisms to ecosystems. In this talk I will discuss the use of concepts from feedback control theory in the design of feedback circuits at the molecular, cellular, and multicellular level. After a brief survey of relevant concepts from control theory and synthetic biology, I will present some recent results that demonstrate how feedback controllers can be implemented in cells, including ratiometric control of protein concentrations, reference tracking of cell concentration, and fractional control of cell populations. Using these examples and others from the literature, I will discuss some of the common features and possible architectures for implementation of biomolecular feedback control systems, some limits on performance predicted by the theory, and some implementation challenges that require more effort and new approaches.

**Friday, September 28, 2018**

**3:00 PM**

**EBU II RM 479 (Warren College)**

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