

SEMINAR NOTICE

Preston M. Green Department of Electrical and Systems Engineering

LECTURE 3

Feedback and Control in Biological Circuit Design

Richard Murray

Thomas E. and Doris Everhart Professor

Control & Dynamical Systems and Bioengineering at Caltech

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 control and dynamical systems in the analysis and design of biological feedback circuits at the molecular level. After a brief survey of relevant concepts from synthetic biology, I will present some recent results that combine modeling, identification, design and experimental implementation of biological feedback circuits. These results include the use of intrinsic noise for system identification in transcriptional regulatory networks, development of an in vitro circuit for regulating the rates of transcription of two independent genetic sequences, and design of dynamics of for an in vivo oscillator using transcriptional delay. Using these results as examples, I will discuss some of the open problems and research challenges in the area feedback control using biological circuits.

Wednesday April 11, 2012

10:00 - 11:30 a.m.

Green Hall, room 0120

Host: Hiro Mukai

Short Bio: Richard M. Murray received the B.S. degree in Electrical Engineering from California Institute of Technology in 1985 and the M.S. and Ph.D. degrees in Electrical Engineering and Computer Sciences from the University of California, Berkeley, in 1988 and 1991, respectively. He is currently the Thomas E. and Doris Everhart Professor of Control & Dynamical Systems and Bioengineering at Caltech. Murray's research is in the application of feedback and control to networked systems, with applications in biology and autonomy. Current projects include specification, design and verification of networked control systems, novel control architectures using "slow computing", and biological circuit design.

The Annual Zaborszky Lecture Series was created in 1990 to honor the founder and first chairman of the Department of Systems Science and Mathematics, Professor John Zaborszky. Each year a distinguished scholar is invited to present a series of three lectures in his/her field of expertise.