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Elucidating principles of biological signal processing using microfluidic and optogenetic tools

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Date: Thursday, January 30, 2014 at 4:00 pm
Location: CIRES Auditorium, Third Floor, Rm. 338

Abstract:

Biological networks, like electrical circuits, take specific inputs (nutrient availability, stress, hormones) and convert them into appropriate outputs (transcriptional responses, metabolic remodeling). Electrical engineers uncover the inner workings of such circuits by measuring the transfer function between input voltage and output voltage. However, unlike electrical engineers, biologists are more limited in the input signals they can generate to interrogate such networks. We are developing microfluidic and optogenetic tools to generate dynamic inputs to interrogate and control natural and synthetic biological networks. In this talk I will discuss our use of microfluidics to dissect the mechanisms and kinetics of signaling in stress response networks in the budding yeast Saccharomyces cerevisiae. In addition, I will discuss our recent efforts to develop real-time optogenetic control of protein concentration as a tool for manipulating biological networks.

Bio:

Dr. McClean is a Lewis-Sigler Fellow in the Lewis-Sigler Institute for Integrative Genomics at Princeton University. She received a B.A. in Applied Mathematics at the University of California, Berkeley before moving to Harvard University to pursue a Ph.D. in Applied Mathematics in the lab of Sharad Ramanathan. While at Harvard she transitioned from mathematician to experimentalist. Her research seeks to understand cellular signal processing using a combination of mathematical modeling, microfluidics, optogenetics, and quantitative microscopy.

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