Centre for Biosystems Science and Engineering

S E M I N A R

at 4:00 PM on September 21, 2015
Seminar Hall, MRDG, Biological Sciences

The watchmaker's apprentice: building a synthetic genetic oscillator with parts borrowed from nature.

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Richard Dawkins writes of evolution as a 'blind watchmaker', paradoxically capable of generating complicated entities through a process of random variation and natural selection. Synthetic biology works in the opposite direction, to design and construct complicated devices with desired properties by borrowing parts from the watchmaker's toolkit. This design process is very much an art, and failed devices are common – new experimental and theoretical approaches will be required before synthetic biology can mature into a true engineering discipline. I will first mention a few key success stories in which "circuits" like amplifiers, flip-flops, and oscillators have been built by inserting a handful of genes into the bacterium E. coli. I will then present our own work on using engineering principles to design, build and test cell-to-cell communication systems. Finally, I will show how we used an iterative design process, going from simple to complex circuits, to successfully build single-cell genetic oscillators that synchronise with one another by exchanging chemical signals.

About the speaker:

Mukund Thattai obtained a B.A. in physics from Cornell University in 1999, and a Ph.D. in physics from the Massachusetts Institute of Technology in 2004. Since 2004 he has been on the faculty at the National Centre for Biological Sciences, and is a member of the Simons Centre for the Study of Living Machines. Dr. Thattai has previously made contributions in the area of synthetic biology, a field which attempts to combine genes into biological circuits. His present research interests deal with the ancient origins of complex eukaryotic cells.