Donnelly Centre
for Cellular + Biomolecular Research
UNIVERSITY OF TORONTO

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"Deconstructing and Encoding Emergent Behaviors of Cells"

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The Donnelly Centre
James Friesen | Cecil Yip
Red Seminar Room

Abstract:

Can we describe complex behaviors of biological systems, arising from millions of intracellular and intercellular interactions, in simple quantitative models without dizzying number of parameters? For two examples of complex biological systems, I combined simple quantitative models and experiments to show that this is possible. First, I used tools of systems biology and a "top-down" approach to reduce the complexity of a budding yeast cell's growth from glucose consumption to a phenomenological model with two parameters - Cell's perception of and uptake rate of glucose. Second, I used a "bottom-up" approach and synthetic signaling circuits in budding yeast to show that a cell can tune how much it "talks" to itself versus to its neighbors by secreting and sensing just one signaling molecule. Encoding who talks to whom, a population of "secrete-and-sense cell" realizes a rich repertoire of complex behaviors. These two approaches, a top-down systems biology and a bottom-up synthetic biology approaches, provide intuitive descriptions of complex biological systems that can complement more detailed large-scale approaches.

Host: Grant Brown