CDB SEMINAR

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Thursday, June 23, 2011
11:00~12:00 A7F Seminar Room

Synthetic Cell Biology: Visualizing and Manipulating Cell Signaling

Summary

Complexity in signaling networks is often derived from co-opting particular sets of molecules for multiple operations. Understanding how cells achieve such sophisticated processing using a finite set of molecules within a confined space is critical to biology and engineering as well as the emerging field of synthetic biology. We have recently developed a series of chemical-molecular tools that allow for inducible, quick-onset and specific perturbation of various signaling molecules1,2. Using this novel technique in conjunction with advanced fluorescence imaging and microfluidics, we investigated positive-feedback mechanisms underlying the initiation of cellular chemotaxis (known as symmetry breaking). We found that the chemical gradient was sufficient to direct cells towards the chemical source, regardless of their initial direction of polarization or lack thereof. We have also recently developed new chemically inducible system with which we generated two representative logic gates that function on a timescale of just seconds, a timescale that is hundreds-of-times faster than conventional logic gates consisting of gene circuits.

1. Komatsu T. Kukelyansky I, McCaffery JM, Ueno T, Varela LC and Inoue T. "Organelle-Specific, Rapid Induction of Molecular Activities and Membrane Tethering" Nature Methods 7, 206-208 (2010)
2. Umeda N., Ueno T., Pohlmeyer C., Nagano T. and Inoue T. "A photocleavable rapamycin conjugate for spatiotemporal control of small GTPase activity" Journal of American Chemical Society 133(1), 12-14 (2011)

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