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Spatio-Temporal Analysis of Cell-Cell Signaling in a Living Cell Microarray UTKUR MIRSAIDOV, Beckman Institute, The University of Illinois at Urbana-Champaign, WINSTON TIMP, Whitehead Institute, Massachusetts Institute of Technology, KAETHE TIMP, Beckman Institute, The University of Illinois at Urbana-Champaign, PAUL MATSUDAIRA, Whitehead Institute, Massachusetts Institute of Technology, GREG TIMP, Beckman Institute, The University of Illinois at Urbana-Champaign — Cell-cell signaling plays a central role in biology, enabling individual cells to coordinate their activities. For example, bacteria show evidence of intercellular signaling through *quorum sensing*, a regulatory mechanism that launches a coordinated response, depending on the population density. To explore the spatio-temporal development of cell-to-cell signaling, we have created regular, heterotypic microarrays of living cells in hydrogel using time-multiplexed optical traps for submicron positional control of the cell orientation and location without loss of viability. We studied the *Lux* system for quorum sensing; splitting it into sender and receiver plasmids, which were subsequently introduced into *E. Coli*. Induced by IPTG, the sender cells express a fluorescent reporter (mRFP1) and the *LuxI* enzyme that catalyzes the synthesis of a molecular signal AHL that diffuses through the cell membrane and the extra-cellular scaffold. The receiver cells collect the AHL signal that binds to the *LuxR* regulator and reports it through GFP production. We have measured the time-delay between the onset of mRFP1 and GFP dependence on intercellular spacing in the array.

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