Bacterial Communication using a Quorum Sensing Network

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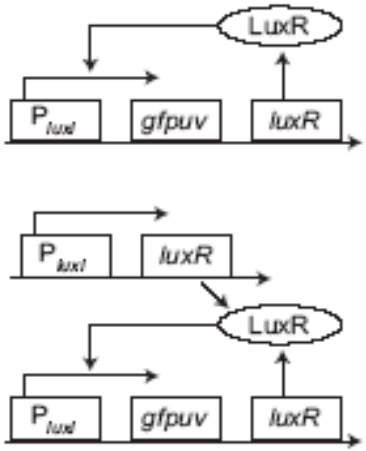

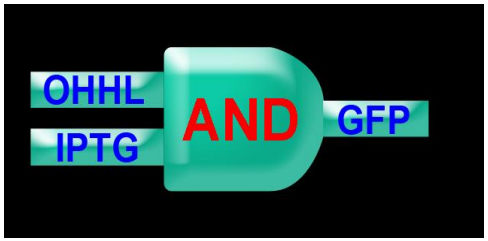

Two examples of circuit components constructed by the Sun Research Group: the positive feedback loop (left) uses the LuxR transcription activator to amplify the response of the P_{LuxI} to the signal molecule OHHL, and the AND gate (right) which initiates transcription and expresses GFP only when both signal molecules OHHL and IPTG are present.

A major challenge in applications of natural biological systems lies in the complex interactions of their components, and consequently, difficulty in manipulating these networks to produce a desired output. Synthetic biology is an emerging field which aims to analyze much simpler biological networks to understand their behavior, and use them as tools to engineer complex functional systems whose behavior can be predicted and regulated. Using the LuxI-LuxR quorum sensing network, which allows bacteria to sense population density by local concentration of a signal molecule, simple biological circuit components have been constructed and analyzed. These circuit components can be applied to the engineering of more complex synthetic systems that can be controlled to manufacture desired products.

References:

http://www-unix.oit.umass.edu/~sungroup/research.html
Sayut, D. J., Niu, Y., Sun, L. (2006) Construction and engineering of positive feedback loops, *ACS Chem. Biol.* 1, 692–696

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