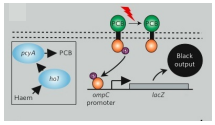
System Engineering

20.109 (F11)
Lecture M2D1
10.13.11

Overview of System Engineering Module

Experimental Context: Bacterial Photography System



Design Goal: Enhance contrast

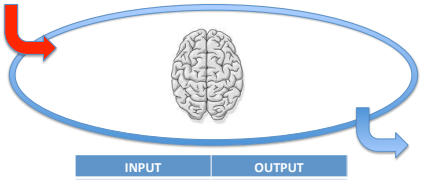
Approach: Screen a library of mutants

Overarching theme: Programmability of biology
"synthetic biology"

Roadmap for System Engineering Module

Day	Lab	Lecture
1	Testing v1.0	System Eng: Bact. Photography
2	Measuring	Two Component Signaling
3	Tools	Synthetic Biology + Genetics
4	Journal Club	Office hour/Journal Club
5	Re-tune	Tools for examining the C-dog
6	v2.0	Analysis at the DNA level
7	v2.0	Analysis at the protein level
8	Journal Club	Group Meeting/Journal Club

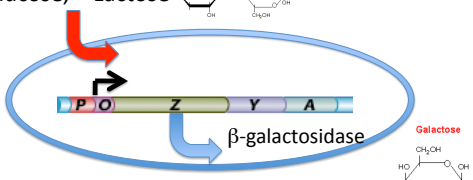
Cells as Input:Output Machines

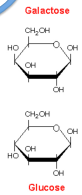


INPUT	OUTPUT

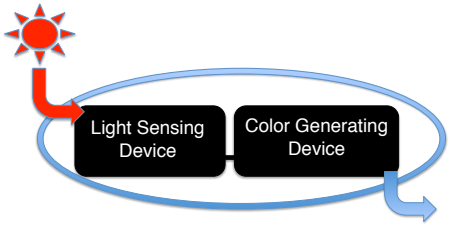
Reduce the problem, e.g. Lac Operon

- Glucose, + Lactose



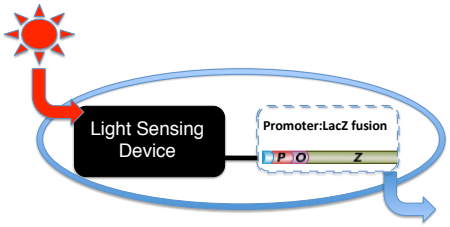


Abstracted View of Bacterial Photography



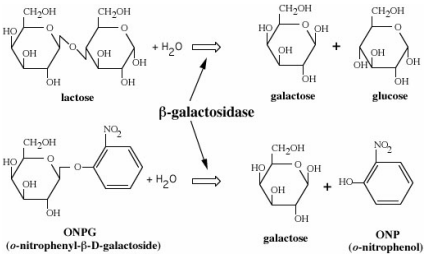
Photons	Color
1 (= cells are in the light)	0
0 (= cells are in the dark)	1

Abstracted View of Bacterial Photography



β-gal activity reflected with indicator compounds

Color Generating Device



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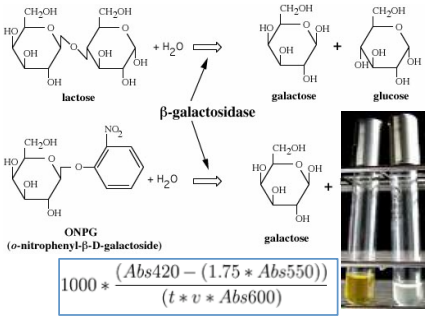
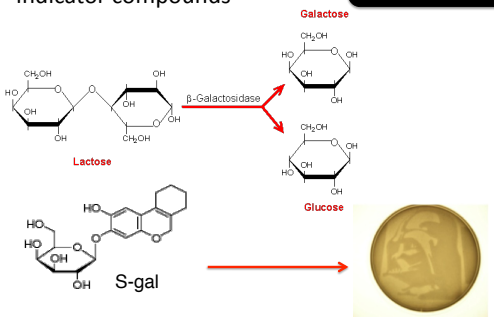


$$1000 * \frac{(Abs420 - (1.75 * Abs550))}{(t * v * Abs600)}$$

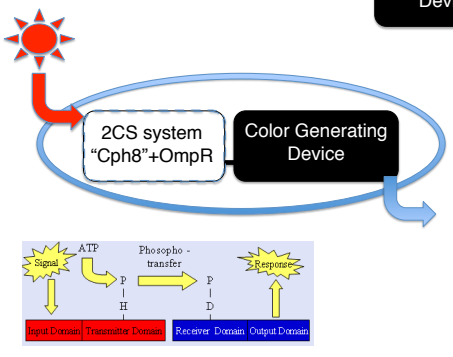
β-gal activity reflected with indicator compounds

Color Generating Device



Sensor/Responder Pair

Light Sensing Device



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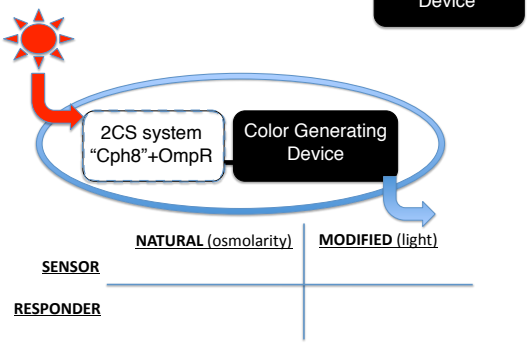

Sensor/Responder Pair

Light Sensing Device

pCph8

pPCB

Cyanobacterial light sensor = Cph1
EnvZ cytoplasmic responder

Synechocystis
haem into phycocyanobilin

Summary

Photons	Color
1 (= cells are in the light)	0
0 (= cells are in the dark)	1