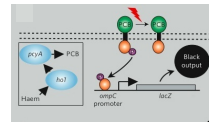


System Engineering

20.109 (F12)
Lecture M2D1
10.11.12

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"

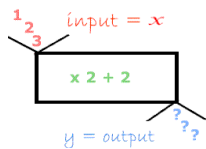
Roadmap for System Engineering Module

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



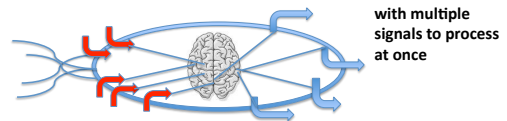
What is the best way to describe cells?

A cell as an input:output machine

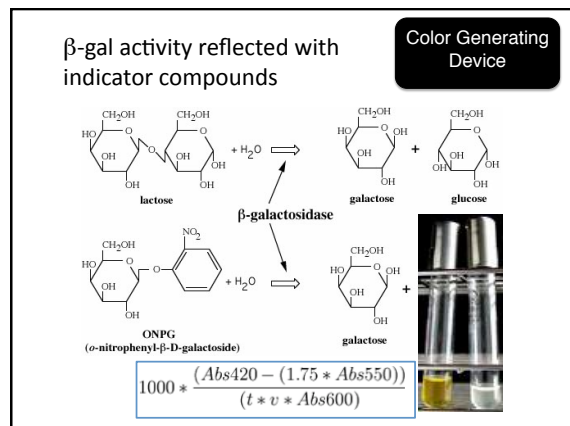
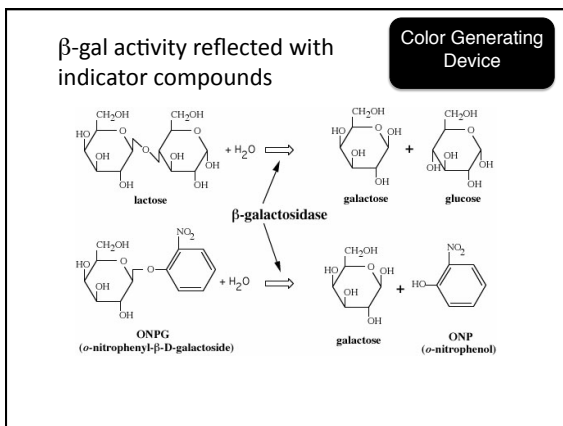
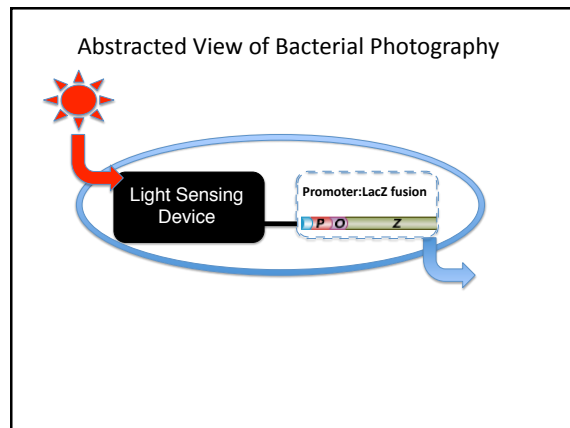
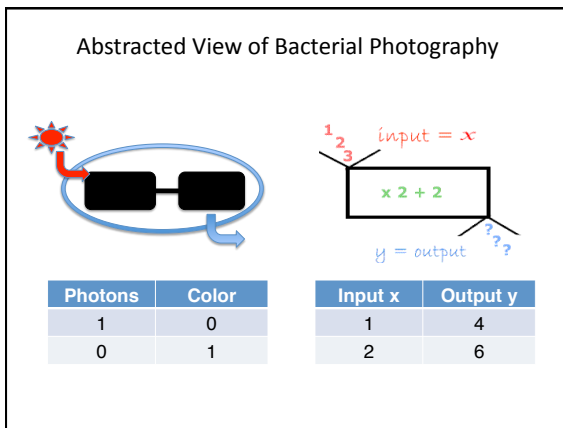
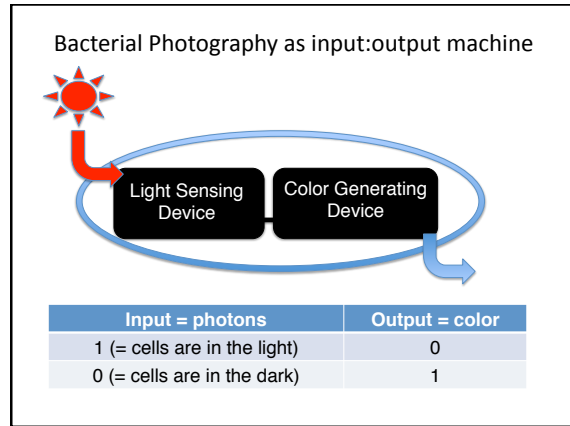
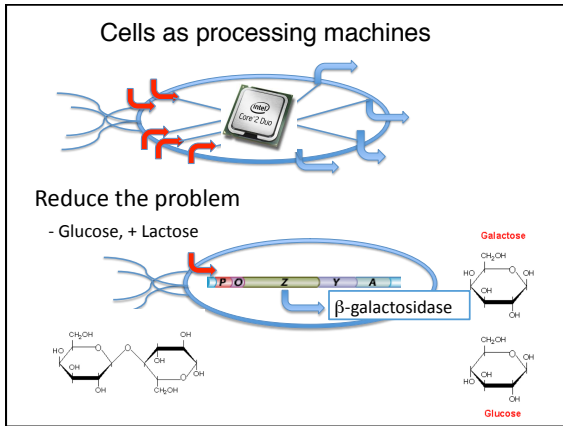


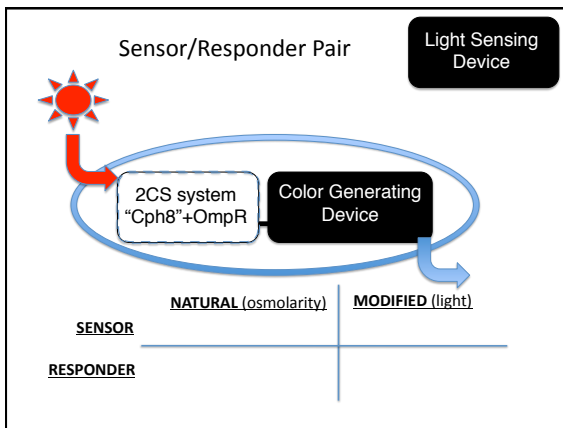
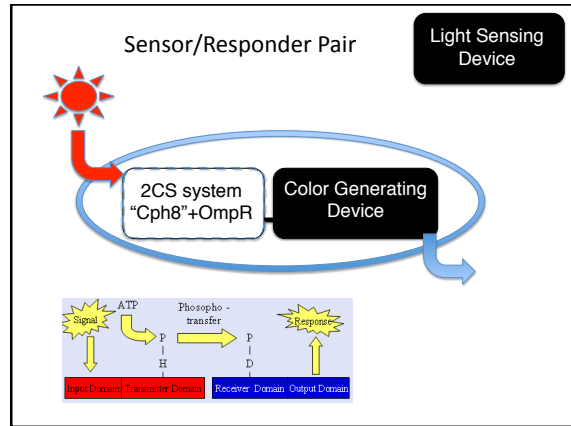
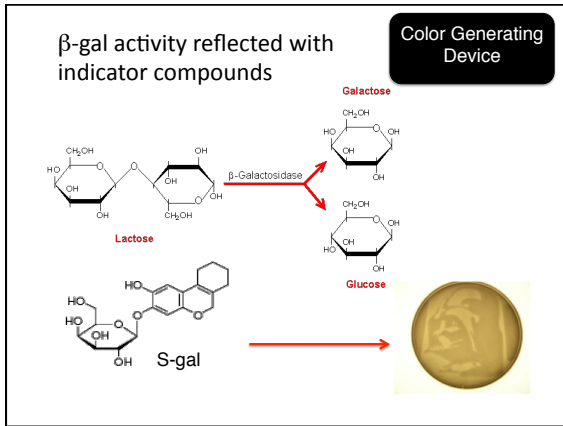
input value x	output value y
1	4
2	6
3	8

Cells as Input:Output Machines



INPUT	OUTPUT
Yummy food	Swim
Toxin	Swim, die, repair
Growth factor	Divide
Quorum sensing	Work together
Damaged DNA	DNA repair





Summary

Cells as processors of information

Reductionist view
e.g lac operon

Bacterial photography abstraction
β-gal measurement
light sensing

input = x

$x \times 2 + 2$

output = y

Input x	Output y
1	4
2	6

Photons	Color
1	0
0	1

S-gal