ΣwissBricks++

ETH iGEM - Team 2006

The Half-Adder: A biological computaion unit

iGEM 2006

ETH Zürich

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1. ETH Zurich iGEM Team
2. Introduction
   - What is a half adder?
   - Pattern Recognition with a half adder
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4. Biological Implementation
   - The XOR-gate
   - The AND-gate
   - Chemical Sensing
   - Light Sensing
5. Modeling and Simulation
6. The Experiments

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Who are we and where are we from?

Switzerland
ETH Zurich

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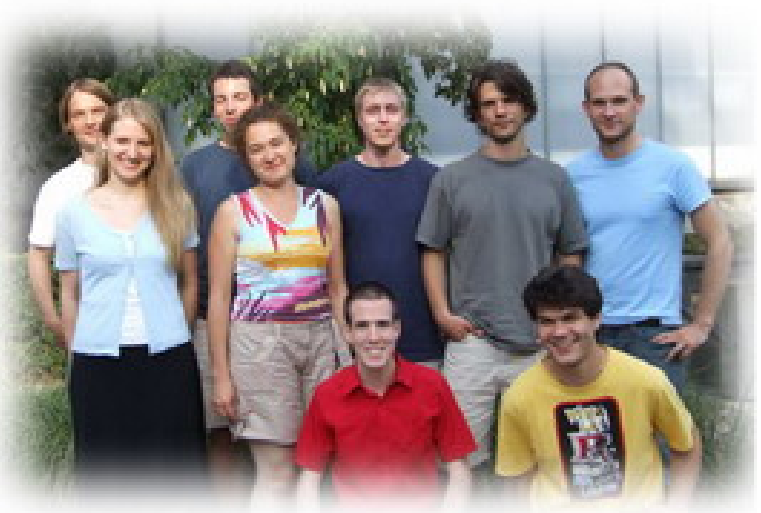
ETH iGEM team 2006

5 undergraduates,
4 graduates
and 3 advising profs



What is a half adder?

- Addition is the most important operation in digital calculations
- An adder is a device, which performs the addition of two numbers
- A one-bit-adder consists of two half-adders

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Half-adder

Inputs: 2 one-bit numbers A,B
Outputs: 1 two-bit number, arithmetic sum A+B

Pattern Recognition with a half adder

Implementation (Engineering point of view)

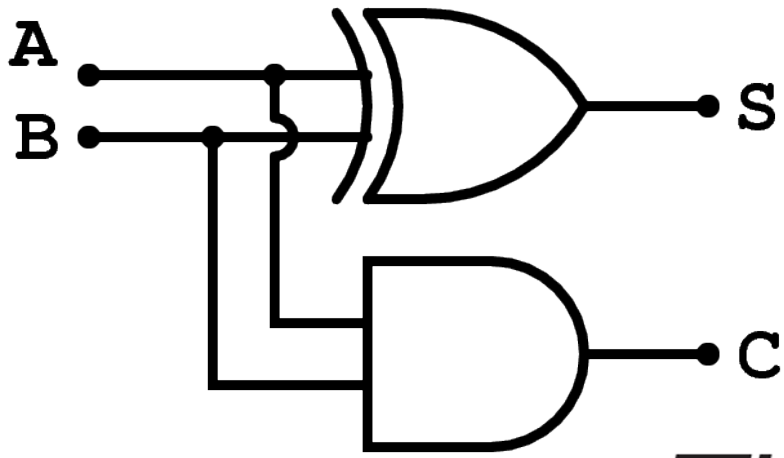
Half-adder

Inputs: 2 one-bit numbers A,B

Outputs: 1 two-bit number, arithmetic sum A+B

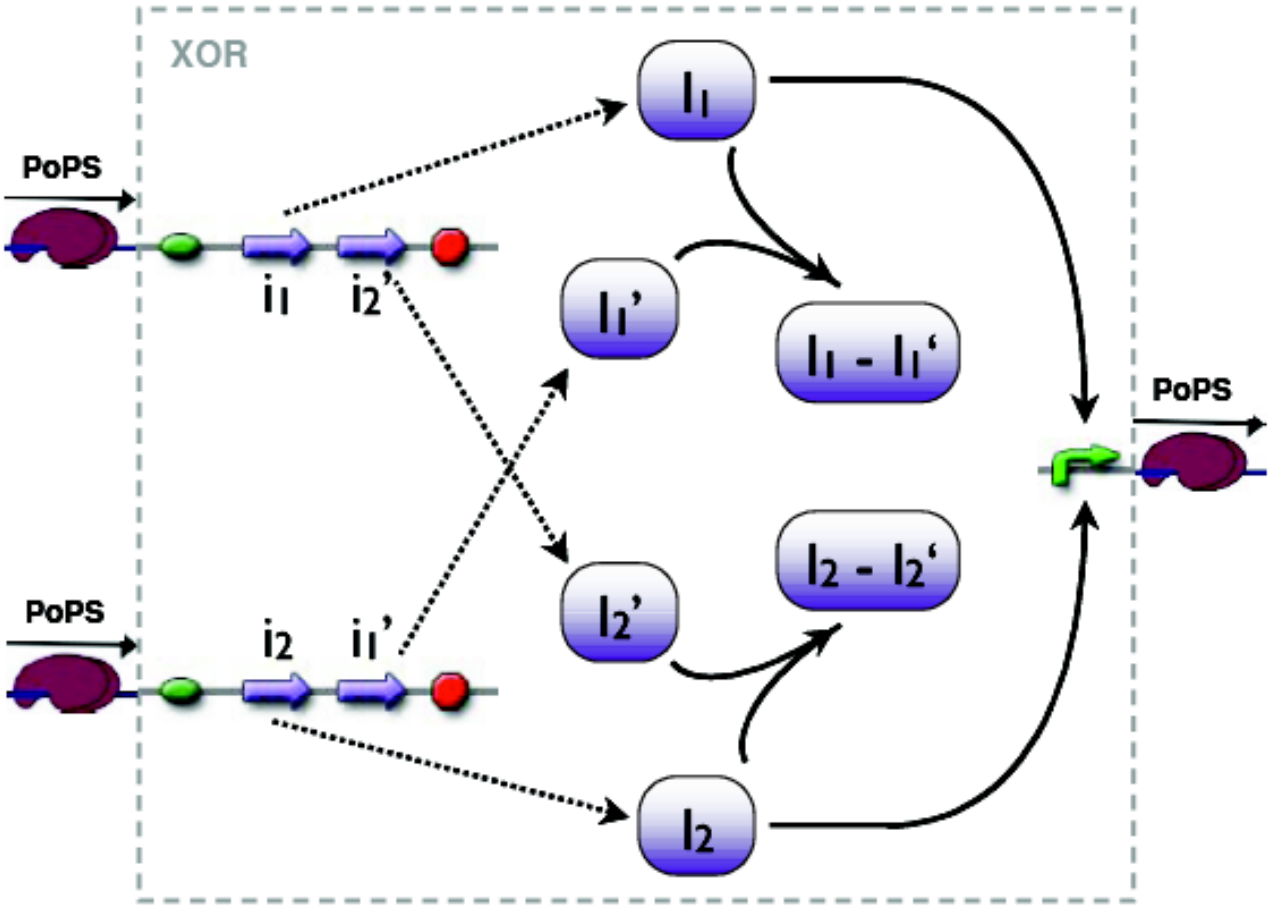
Inputs		Outputs	
A	B	C	S
0	0	0	0
0	1	0	1
1	0	0	1
1	1	1	0

A half-adder consists of two gates:
XOR-gate and AND-gate

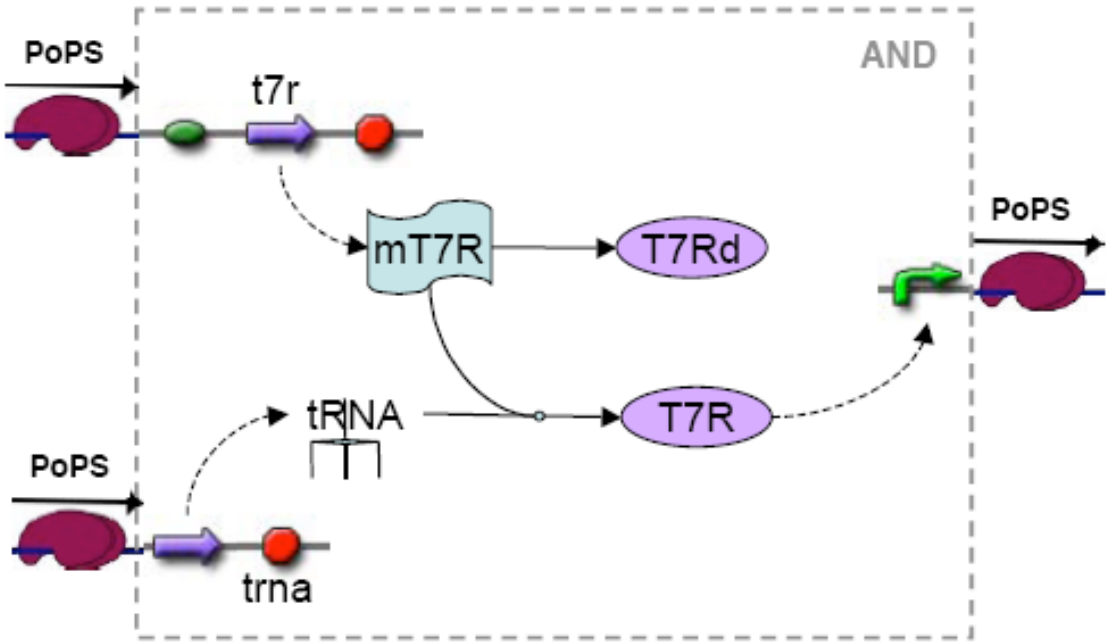


Biological Implementation: Overview

he AND-gate

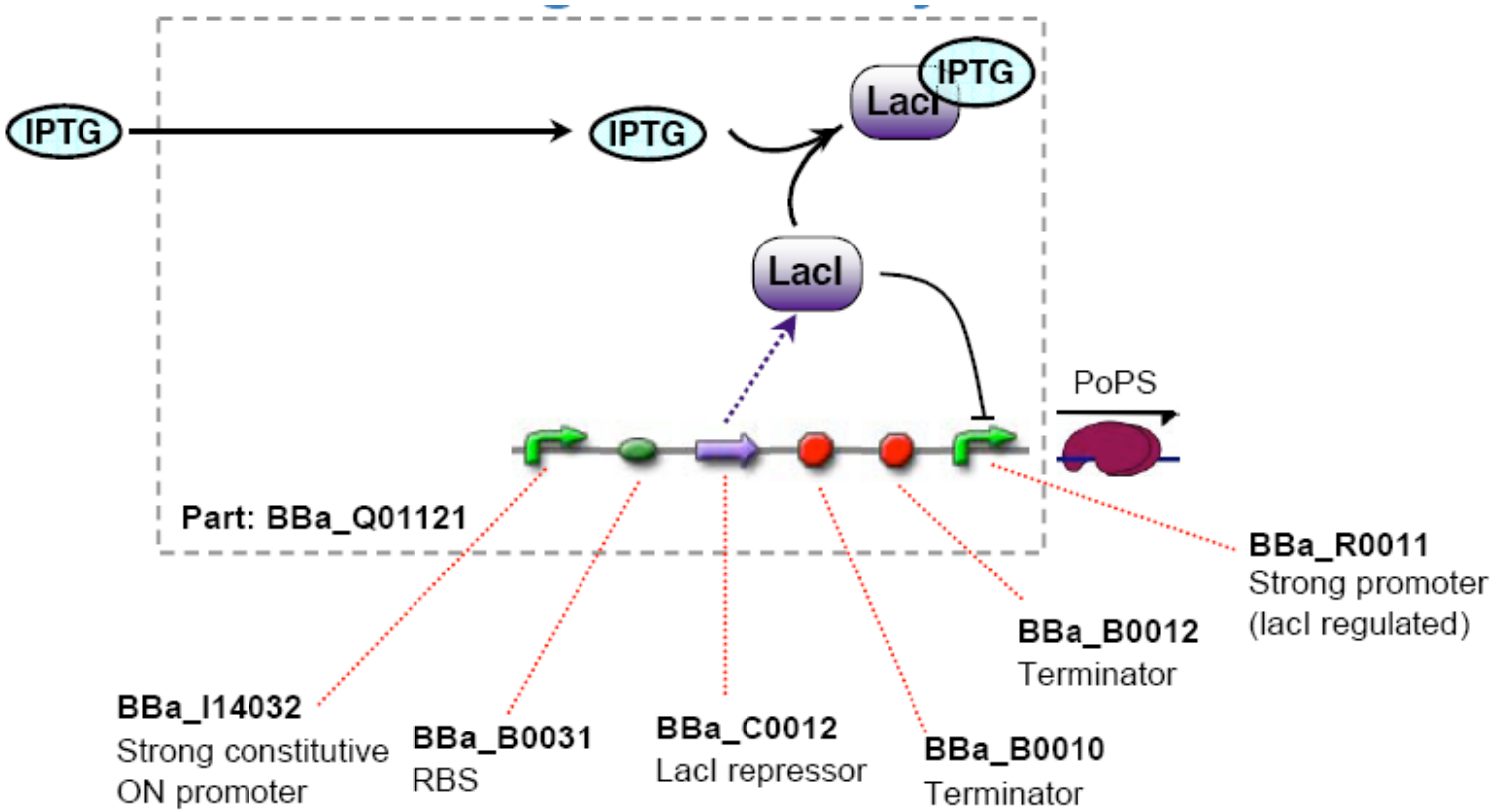


The AND-gate



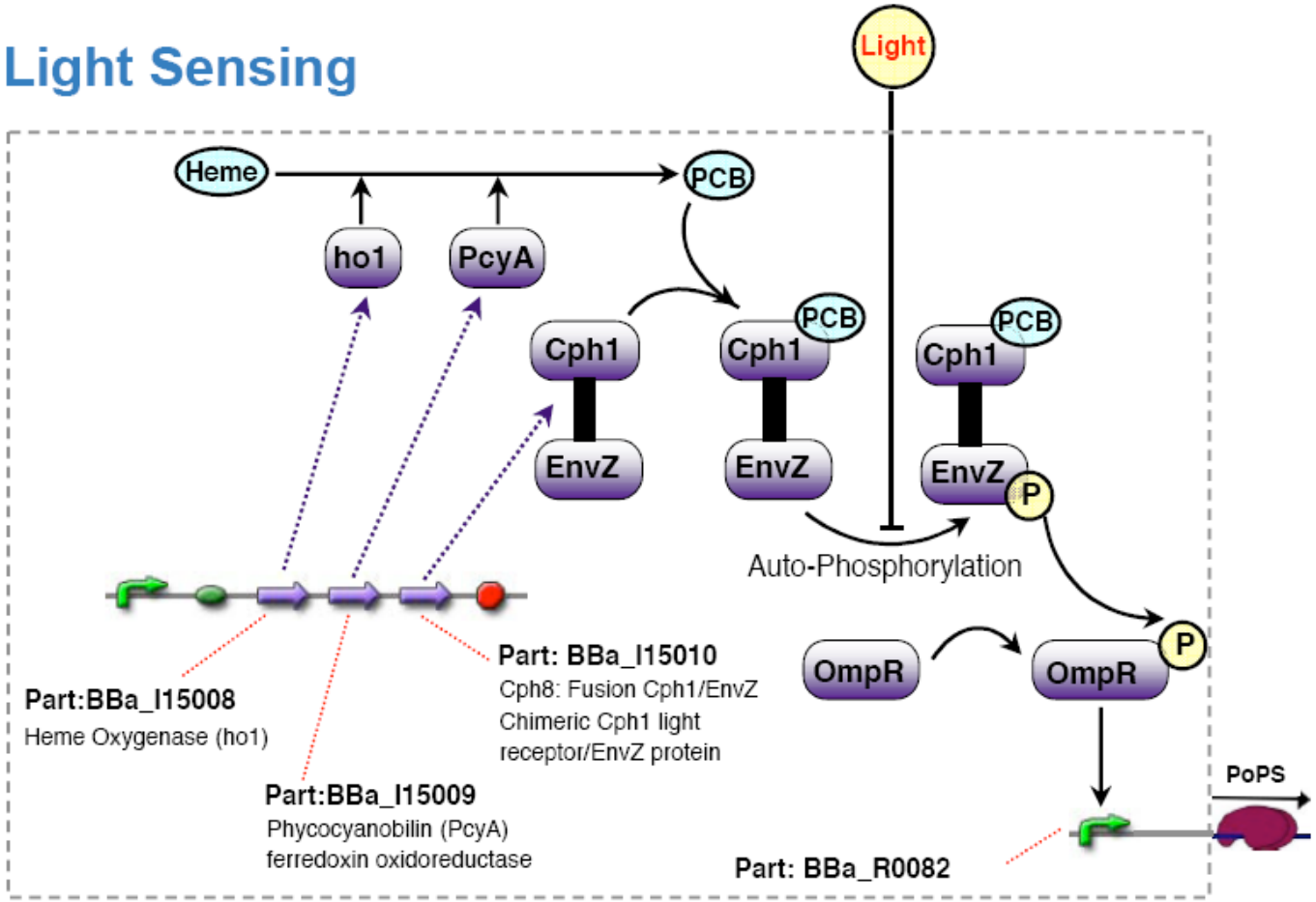
T7R:	T7 RNA Polymerase
T7Rd:	deficient (inactive) T7R
mT7R:	mRNA for T7R
tRNA:	tRNA to repress „early stop“ translation

Chemical Sensing Part



IPTG binds to LacI and activates expression from BBa_R0011 = PoPS signal

Light Sensing Part



The model

Simulation Results

Sensitivity Analysis

??The Experiments??

Experimental Results