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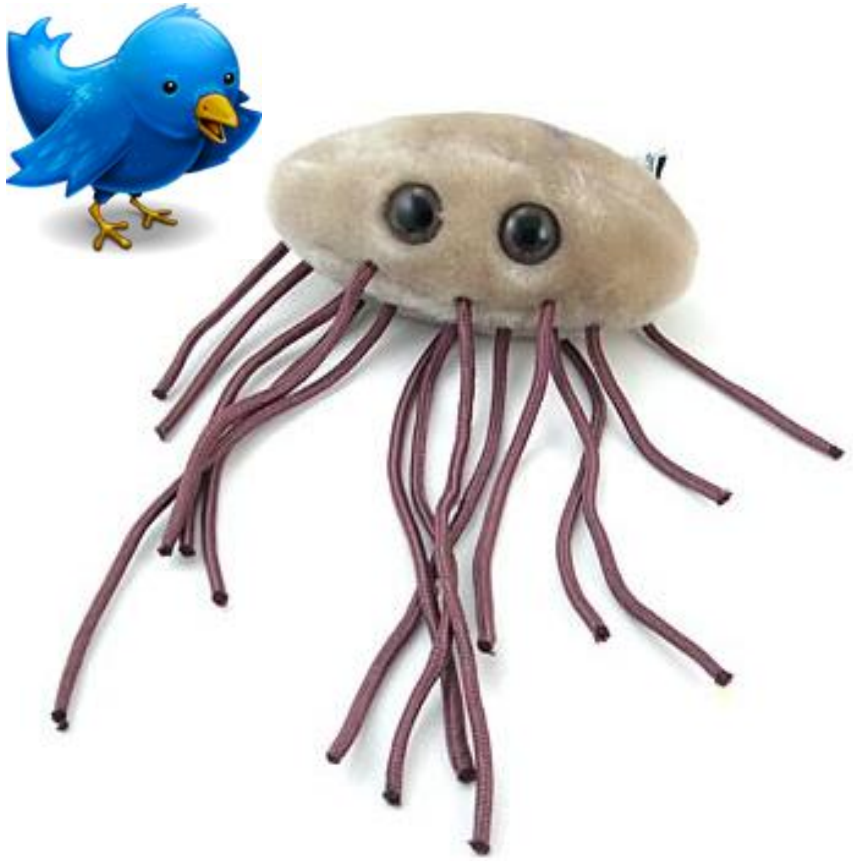
iGEM

Twitteria coli

16 July 09

Charles, Royah, David, Tianyi



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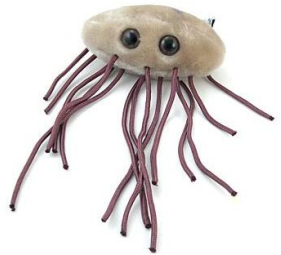
Overview

- Project description
- Background
- Application

- Solution
- Core pathway + bioconsiderations
- Engineering - constrains
- Data analysis

- Setup/ implementation

- Feasibility
- Expertise/resources needed
- Constraints



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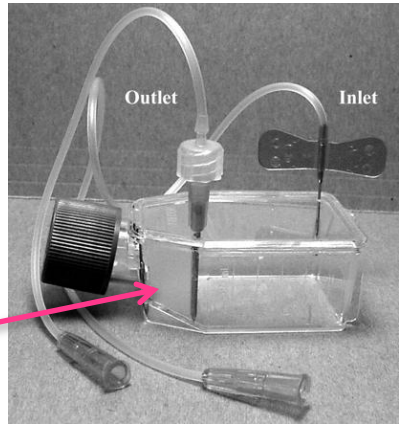
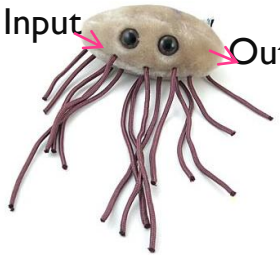
Project description

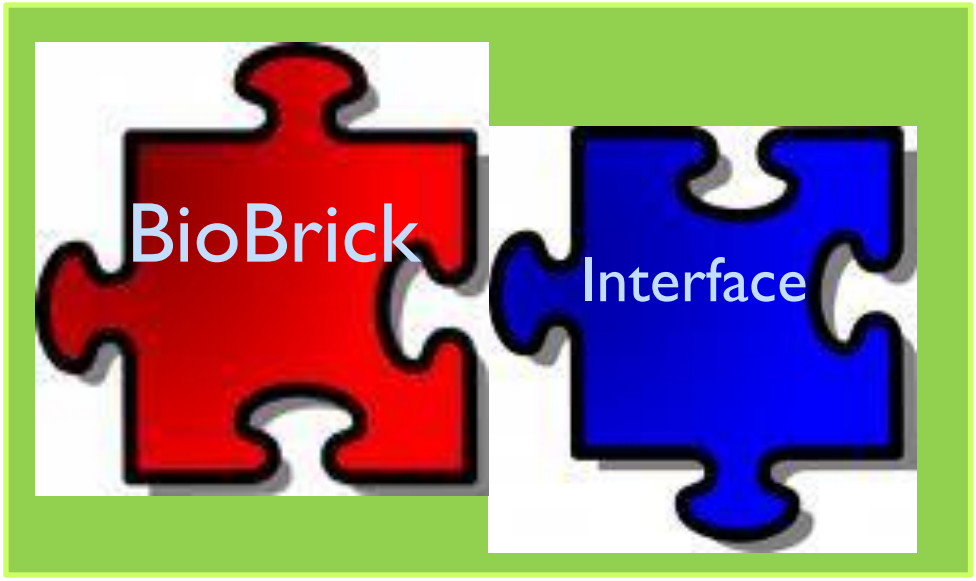
Input

Output



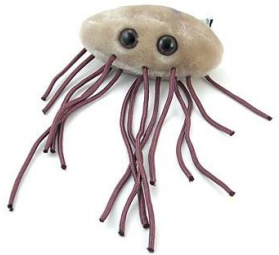


Integrating BioBricks with computational interface



- Creation of a library of new tools

- Input – Microfluidics
- Output
  - pH
  - Optical density
  - Fluorescence
- Self-automated platform for interfacing input and output to a processor



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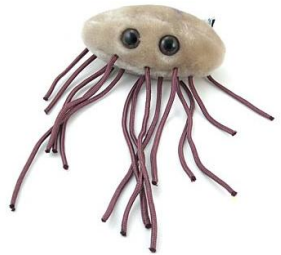
Background

- Multiple inputs and outputs
- Outputs of cultures are detected
- Processing by computer
- Corresponding action taken
  - Change in pH – add H+ or OH-
  - Change in colour of culture media – add new media
  - Temperature sensor
  - Sky's (or our abilities is) the limit
- Biology and computational engineering integrated system



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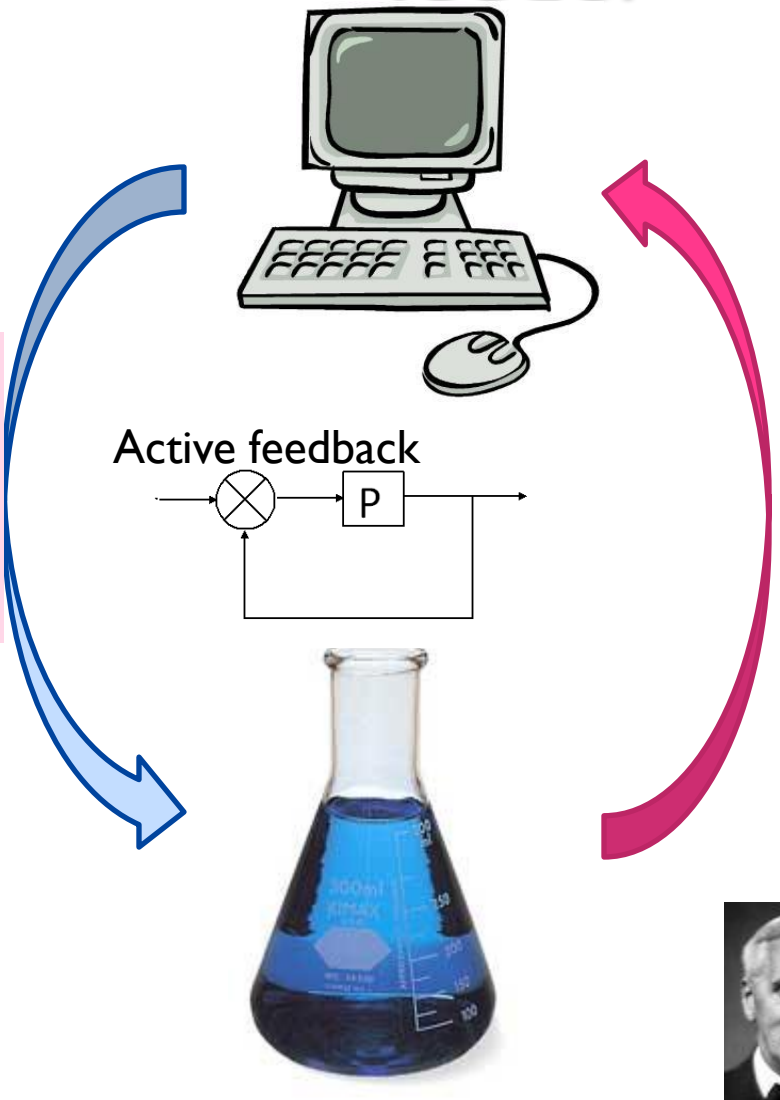
Application 1– automated cell feeder

1. pH probe – (senses change of pH)
2. Processor – automated changing of culture medium. Twitters



1. pH probe – senses that pH is back to normal
2. Processor – records this and twitters

Now I can go on my holiday without worrying about my cells dying!!!

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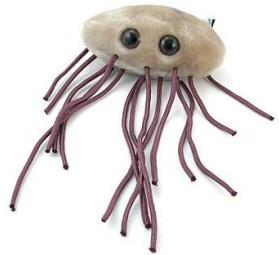

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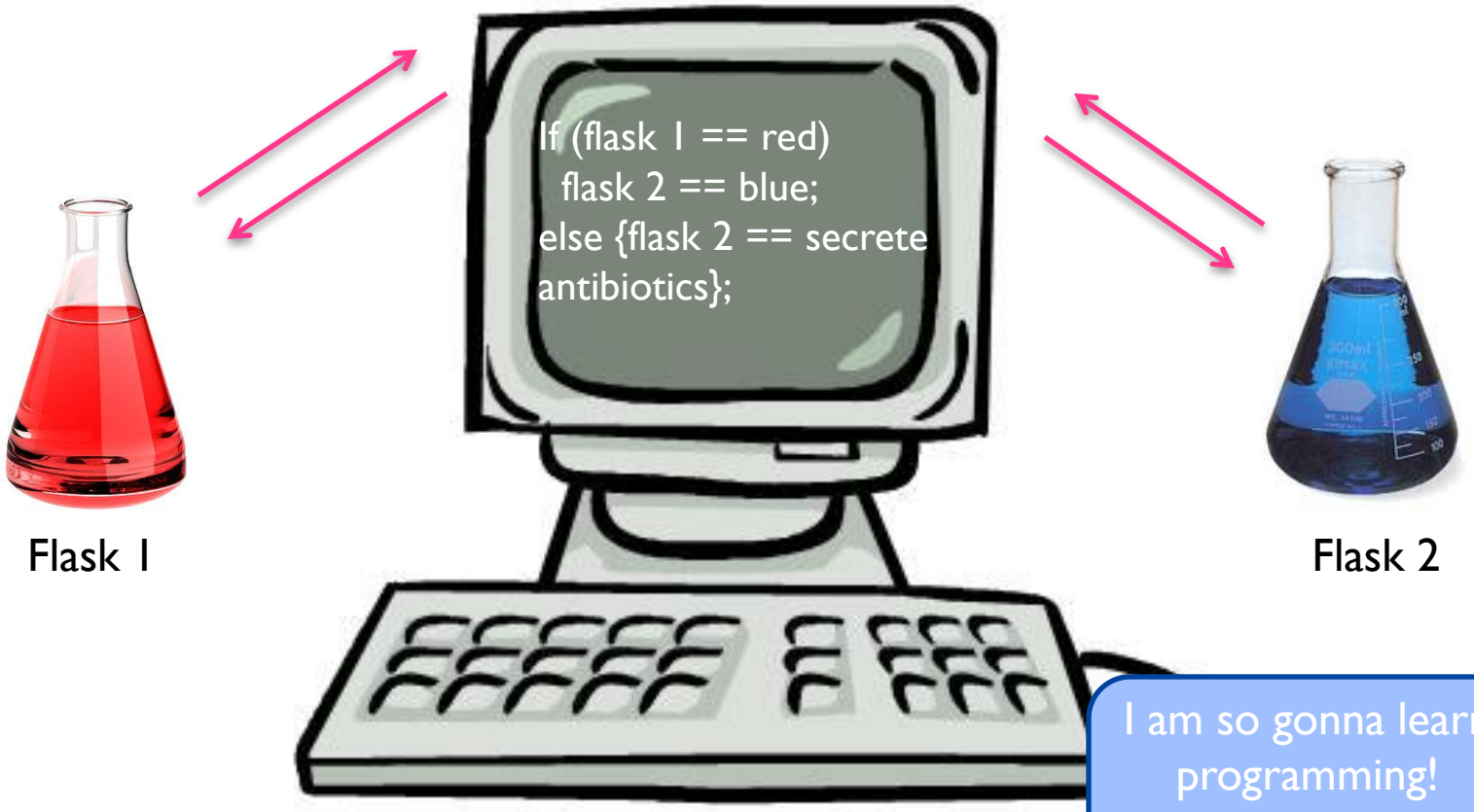
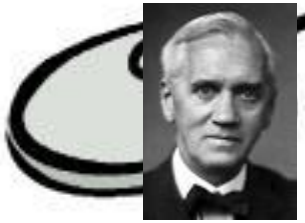
Application 2– Information transfer

Example program:



The bacteria have a preset number of generic inputs and outputs, programmable through the computer



I am so gonna learn programming! Makes my life much easier! ☺

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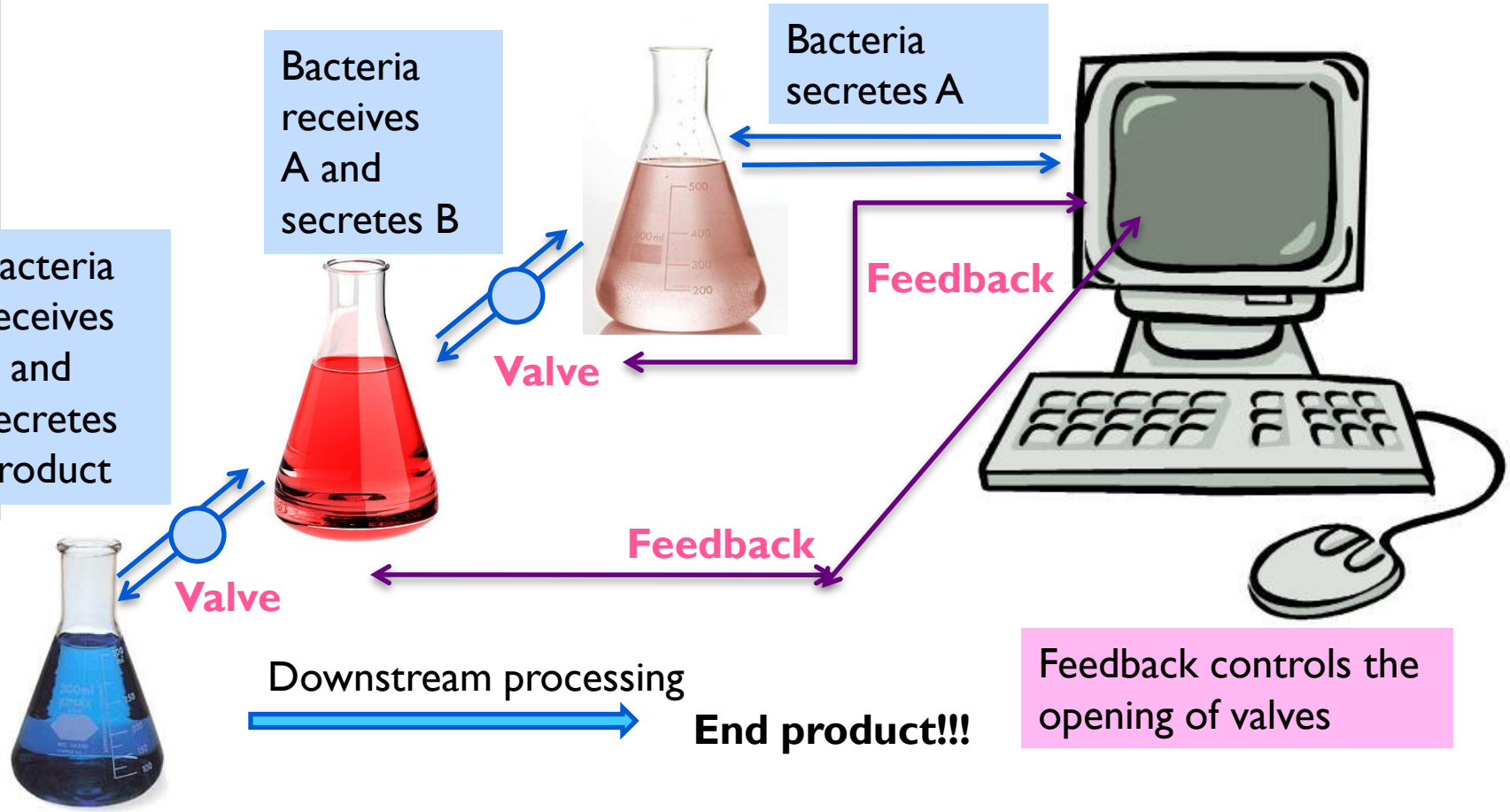
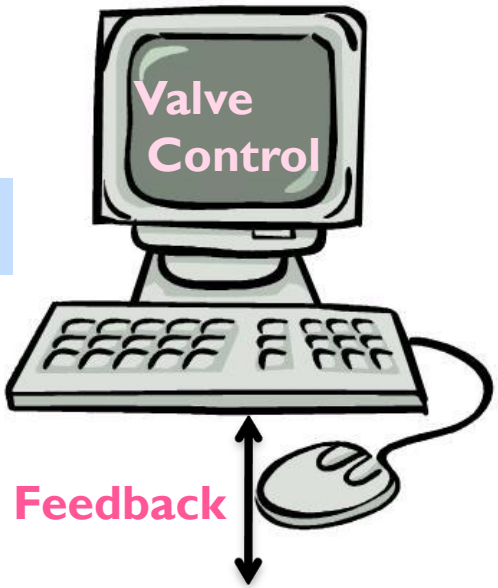
Application 3 – Production line



Application 4 – Centralised Assisted Growth



pH Compensator

Temperature Compensator

Trophic Compensator (Food)

Central Culture

Cell density Compensator

Variable	Reporter	BioBrick	Computational Sensor	Type	Registry Ref	Notes
Lack of glucose / switch to lactose metabolism	pH	placZ + EPAsynth		Detection of EPA when switching to lactose metabolism in deficiency of glucose.	New BioBrick can be created	doi:10.1007/s10529-008-9809-z
Cell growth	Optical density	N/A	Spectrophotometer	Computational	N/A	Needs sample in existing equipment - custom build something/adapt existing equipment?
Temperature	Light	RNA-thermometer	Lightmeter	Sensing luciferase	BBA_K115035	Under arabinose promoter
Temperature	Temperature	N/A	Thermometer	Computational	N/A	
QS/Cell growth	Fluorescence	pluxR + FP	Fluorometer	Sensing fluorescence	BBA_K131026 / BBA_I13272/3 / BBA_I731014 / pluxR = BBA_K091156	AHL inducible GFP, activated under presence of HSL
Cell growth	Turbidity	N/A	Turbidity sensor	Computational	N/A	

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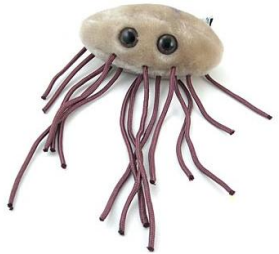
Pathways

- Charles & Royah!!!



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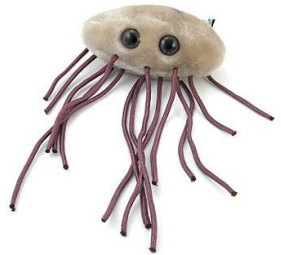
Engineering

- Programming
- Analysing output of sensors and act corresponding
- Creation of Biology integrated Brick (BiB)



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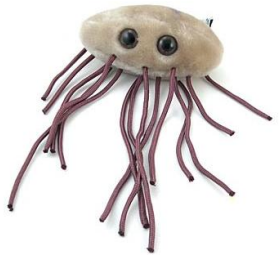
Data Analysis

- Done by computer



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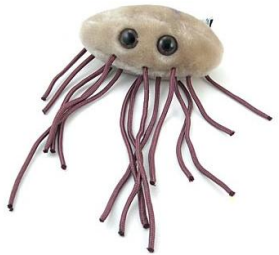
Feasibility

- yayee



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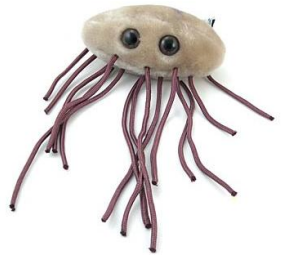
Expertise/Resources

- BioBricks for sensing outputs e.g. pH, temperature
- Existing infrastructure for automation



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Constraints

- Software processing time
- Compatibility restrictions??
- Writing a robust program