百年大计
教育为本
Transportation of Target Signals

Receive

Transport

Return

Release

Sensor

Processor
Bio-information Processing

Simple Action

Group B

Group A
Bio-information Processing

Complex Action

Difficulty in avoiding unwanted cross-talk.
Bio-information Processing

Complex Reactions

Generator

Processor

Transporter

Spatial-segregation & Cell population cooperation
*E. coli* expressing binding module receives and carries signal molecules.
Signal molecules will be transported to the destination on *E. coli*. 

How Does It Work?
How Does It Work?

Waiting at the end, another strain expressing knives will release the signal again.
How Does It Work?

*E. coli* can move back and start a new cycle.
Human Practices

Inspiration

Experiments

Significance

Modules

E. coli LIMOUSINE

Transmembrane Protein

HIV Protease Cleavage Site

Receptor

Ligand tag

SH3

Receiving

iGEM
E. coli Movement

Tumble

Swim
Inversion of promoter changes movement direction

Transition and Working Cycle

Human Practices

Significance

Experiments

Modules
Inspiration

Modules

Experiment

Significance

Human Practices

Experiment Modules

Receiving

Releasing

Movement
OmpA-HIV cleavage site - SH3

pSB1C3
Signal Module

proline-rich – mCherry plasmid

His-tag  proline-rich  mCherry

pSB1C3

Experiment

IPTG Induction

Ni Column

Human Practices

Significance

Modules

Inspiration

E. COLIMOUSINE
Signal Module

Inspiration

Modules

Experiment

Significance

Human Practices

E. CO

LIMOUSINE

Sonicated Supernatant Pellet Flow through Wash Resin 5mM Elution 20mM Elution 200mM Elution

Immidazole Elution 20mM 200mM

Anti-His tag blot

mCherry

His tag
Receive

Inspiration

Modules

Experiment

Significance

Human Practices

E. coli LIMOUSINE

Receive

without Receiving Module (200X)

with Receiving Module (200X)

Experiment
Releasing Module

OmpA-HIV protease plasmid

- OmpA
- HIV protease

pSB1C3

OmpA  HIV-site  SH3
Inspiration

Modules

Experiment

Significance

Human Practices

**E. coli**

**Limosine**

**Release**

$\text{Y} + \text{E. coli}$ with protease (200X)

$\text{Y} + \text{E. coli}$ without protease (200X)
Human Practices

Inspiration

Significance

Parts

E. Coli Limousine

Experiment Modules

Receiving

Movement

Releasing
Forming a Stable Gradient to Follow
Forming a Stable Gradient to Follow

With dialysis membrane and water outside...
Movement

Modeling: Gradient can be Generated Close to the Bar

Away from the bar
Along the gel bar
Movement

Generating the Gradient Using Orange Dye
Aspartate Gradient

Experimental results showing the OD600 measurements for +Aspartate and -Aspartate conditions. The graph compares blank end and AA end conditions, with the +Aspartate condition showing a higher OD600 value compared to the -Aspartate condition.
Various gradients in tunnels in chip
Movement

Resetting the system

Chemotaxis can be changed when arabinose is added.

Modified from Moon, T.S., et al., 2011, JMB
Resetting the system

- Serine
- Arabinose
- Aspartate
- Arabinose
Lab-on-a-chip

Final working model on a chip

- Signal generator
- Gradient tunnel
- Signal processor
E. coli 

Inspiration

Modules

Experiment

Significance

Human Practices

Experiment Modules

Receiving

Movement

Releasing
Delivering Information in a Bio-system

Expand the COMPATIBILITY
Specialization

Delivering Information in a Bio-system

ENIAC ➔ Laptop

Specific and Efficient
Scale up

Combined with lab-on-chip technology.

Chips made as printed circuit board (PCB)
Transporter as current in bio-circuits
Human Practice

Synthetic Biology Lecture in Tsinghua

China Meetup 2011, USTC

Help Xiamen University build their parts

Help Yangming University checked function of part BBa_K624021

Propose a new design for bio-safety
Safety

Poison and antidote pairs ensure

- Control biobrick spread into the environment
- Limit mutations in engineered bacteria
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E.COLIMOUSINE