



BROWN



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IGEM

Lily Chan, Julius Ho, Tim Johnstone, Jen Kao
Ethan Richman, James Weis

International Genetically Engineered Machine (iGEM) competition

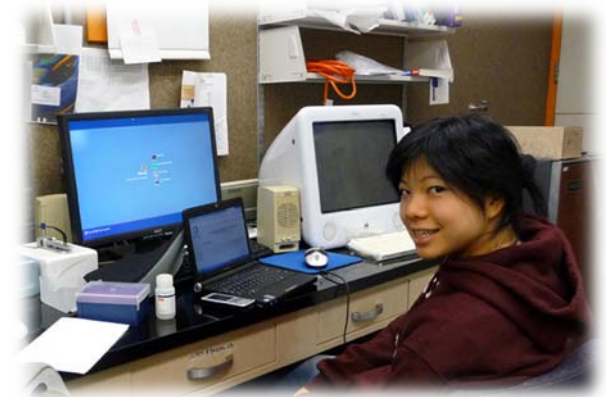
- 2010 iGEM Jamboree (128 undergrad teams)



- Synthetic bio competition held annually at MIT
- Project Tracks:
 - Food/Energy
 - Environment
 - Health/Medicine
 - Manufacturing
 - Information Processing
- Awards:
 - Best Software
 - Best New Application Area
 - Best Expt Model
 - Best Team Webpage
 - Best Presentation

Brown iGEM

- Established in 2006
- Undergraduate-led research team
 - Project design, lab maintenance, research experiments, etc.
- Advised by faculty member and graduate students
- iGEM is about applied biology



Brown iGEM 2011: Overview

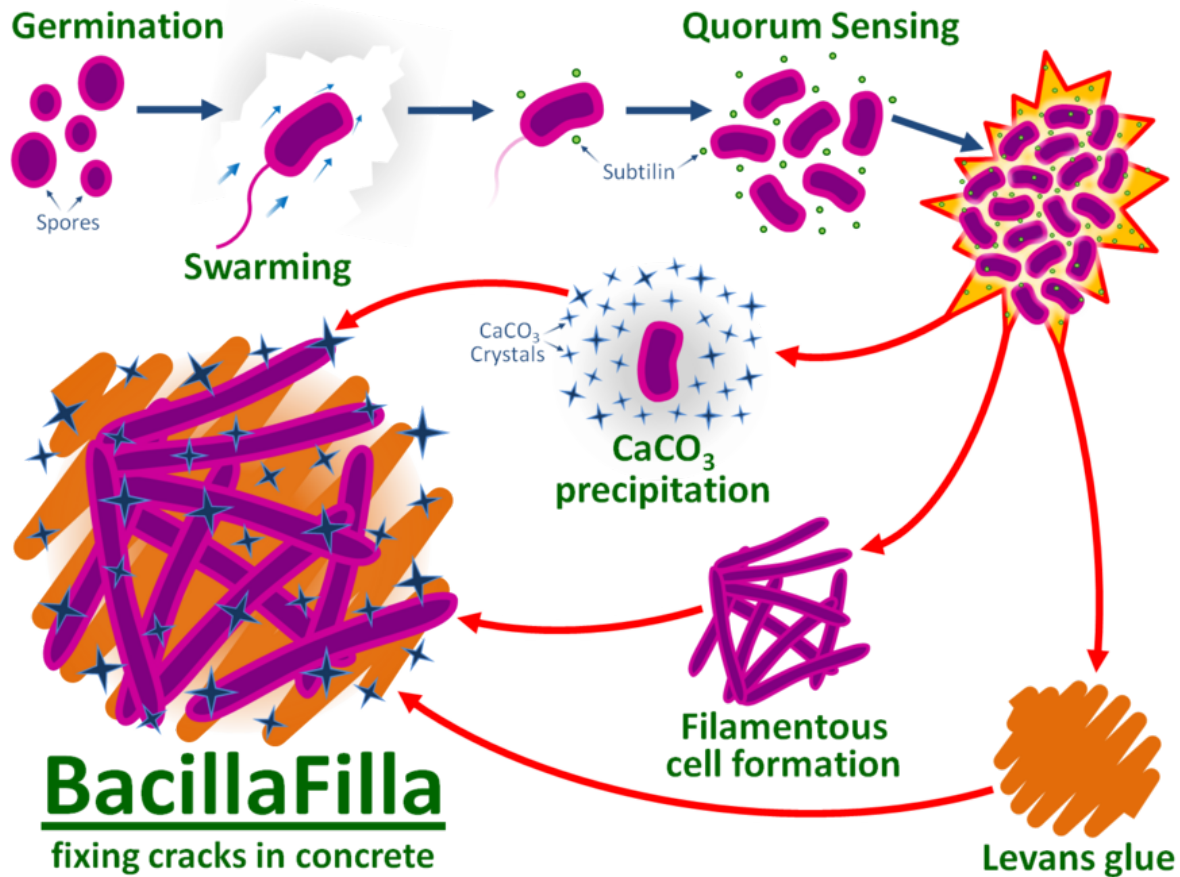
- A unique year!
 - ▣ Work with a Brown faculty advisor at the NASA Ames Research Center in CA
 - ▣ Conduct synthetic biology research at a world class facility
- Timeline
 - ▣ Application deadline: 11:59pm, February 4th
 - ▣ Team selection: by February 8th
 - ▣ February-May '11: training and background research
 - ▣ June-August '11: work on team project in CA
 - ▣ September-November '11: finish project, prepare for Jamboree

What is synthetic biology?

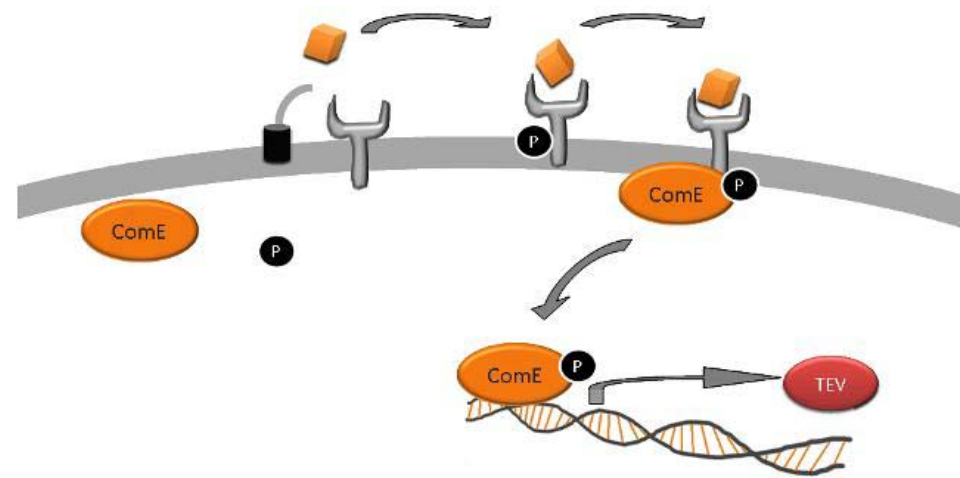
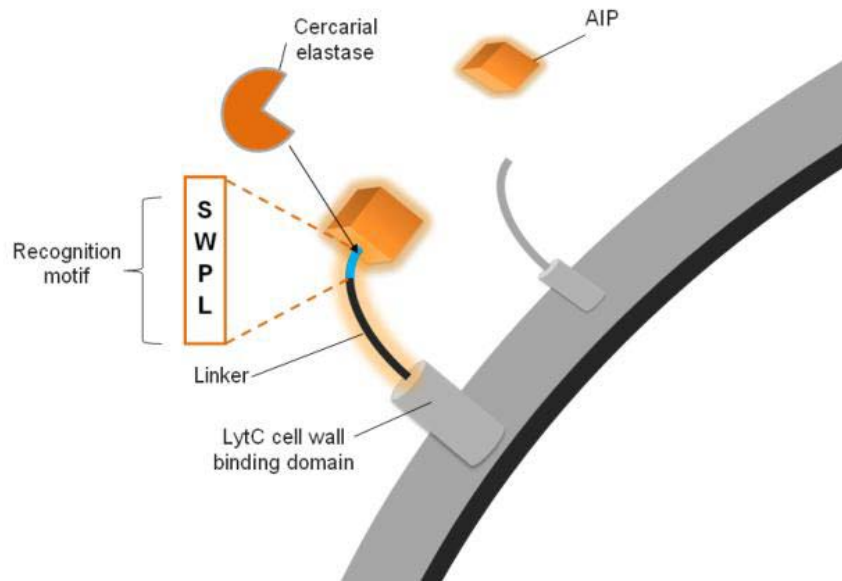


- Biological solutions to problems
 - cells, proteins, genes (instead of mechanical devices, chemicals, or electrical circuitry)
- Adding new modules to existing genomes
- Creating biological machines: the cell as a chassis

Newcastle University, 2010

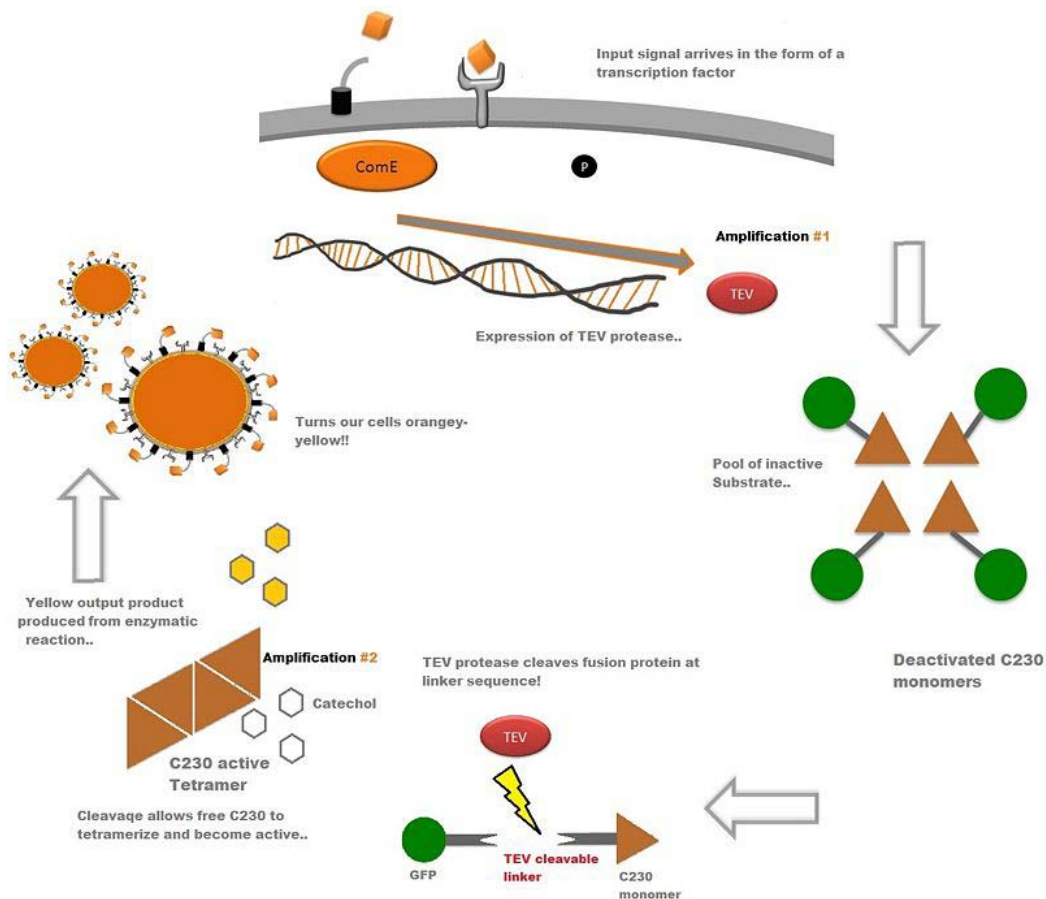


Imperial College London, 2010



- Device for rapid detection of waterborne parasites
- Using a protease secreted by *Schistosoma*

Imperial College London, 2010



- TEV protease releases enzyme monomers
- Tetramer catalyses color change
- Rapid signal amplification

Biobricks

- How do we combine all these different parts to construct a machine?
- Biobrick standardization
 - ▣ Adding a standard prefix and suffix to pieces of DNA
- Biobricks can be joined together, swapped like lego pieces

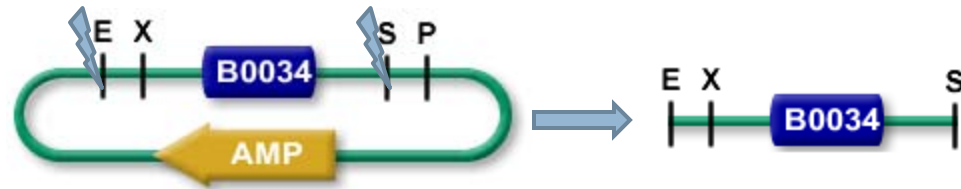


Prefix
gaattcgcgccgcttctag

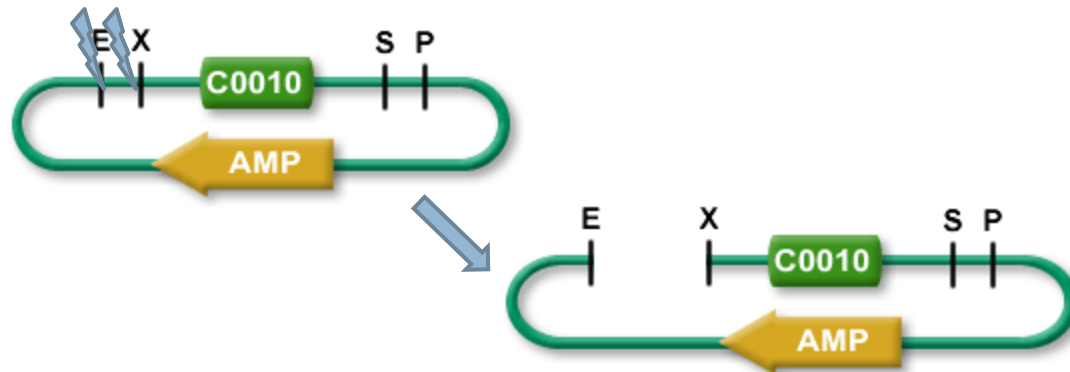
Suffix
tactagtagcggccgctgcag

How Biobricks work

- If you want to combine these two parts...



MIX!



How Biobricks work, cont.

E = EcoRI

```
5' ---G   AATTC--- 3'  
3' ---CTTAA   G--- 5'
```

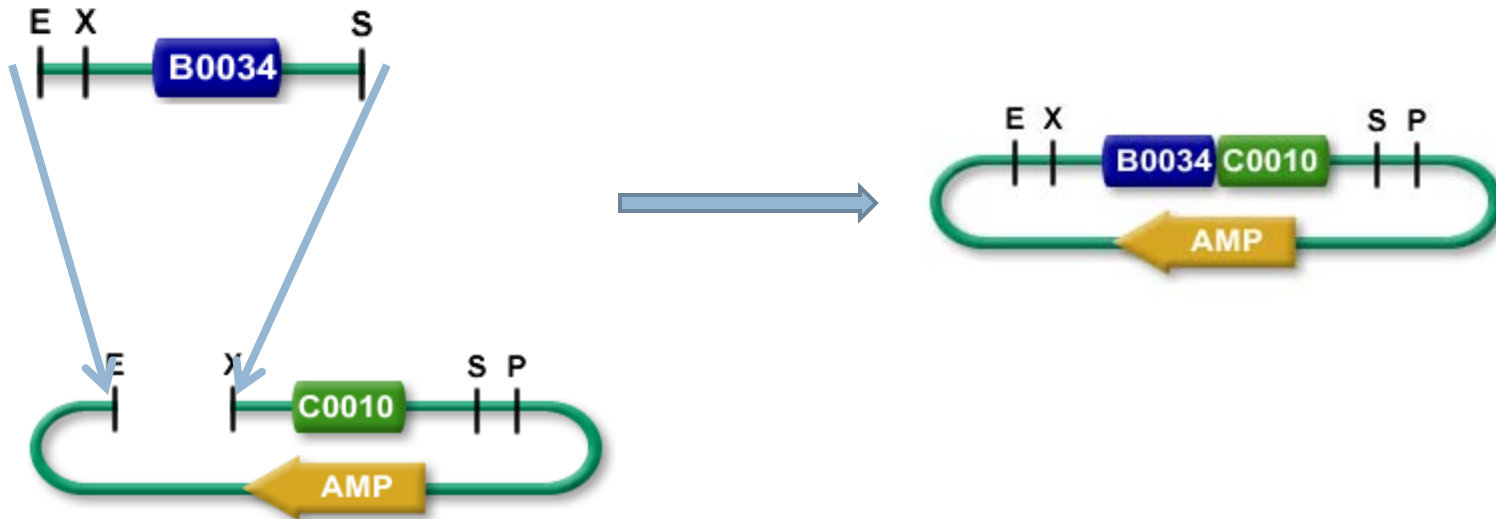
X = XbaI

```
5' ---T   CTAGA--- 3'  
3' ---AGATC   T--- 5'
```

S = SpeI

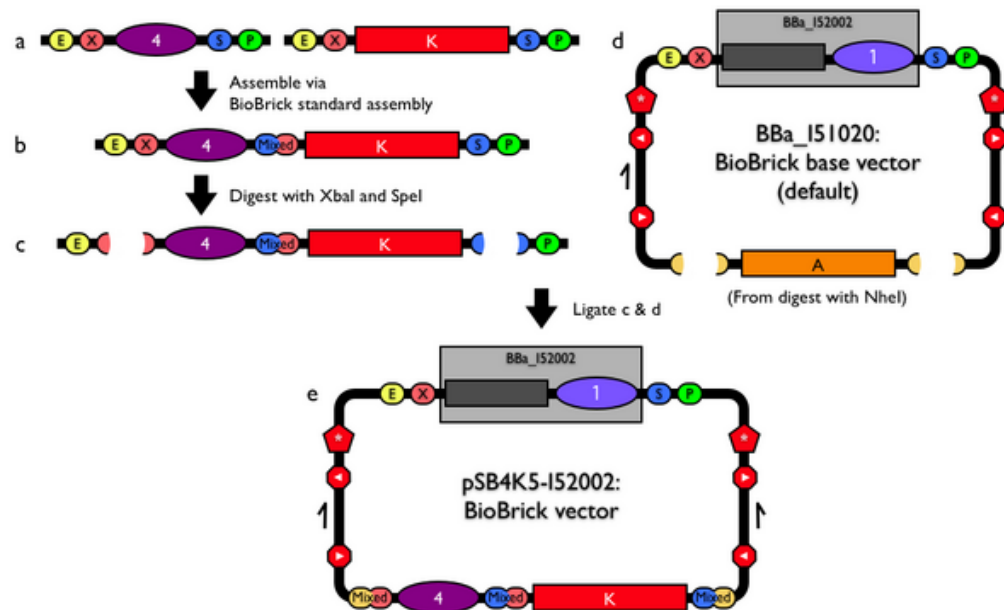
```
5' ---A   CTAGT--- 3'  
3' ---TGATC   A--- 5'
```

Sticky ends complementary!



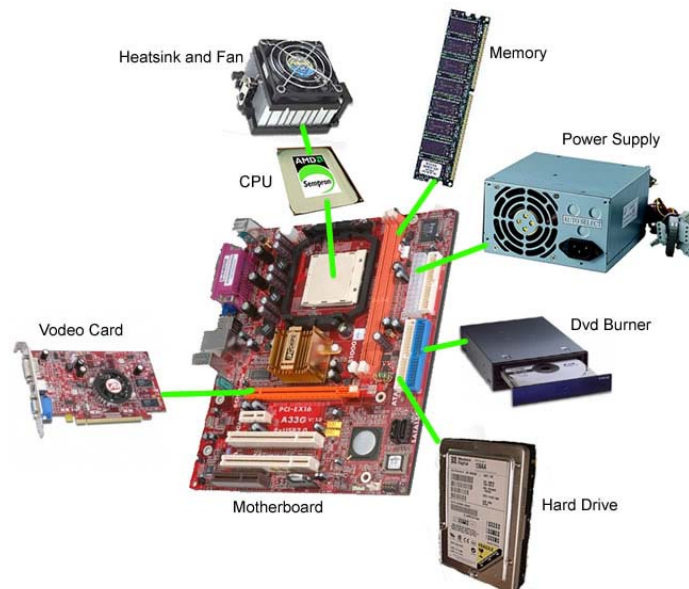
Biobricks to build a part

- Customized segments of a gene:
 - Regulators of expression
 - Protein coding sequences
 - Protein domains



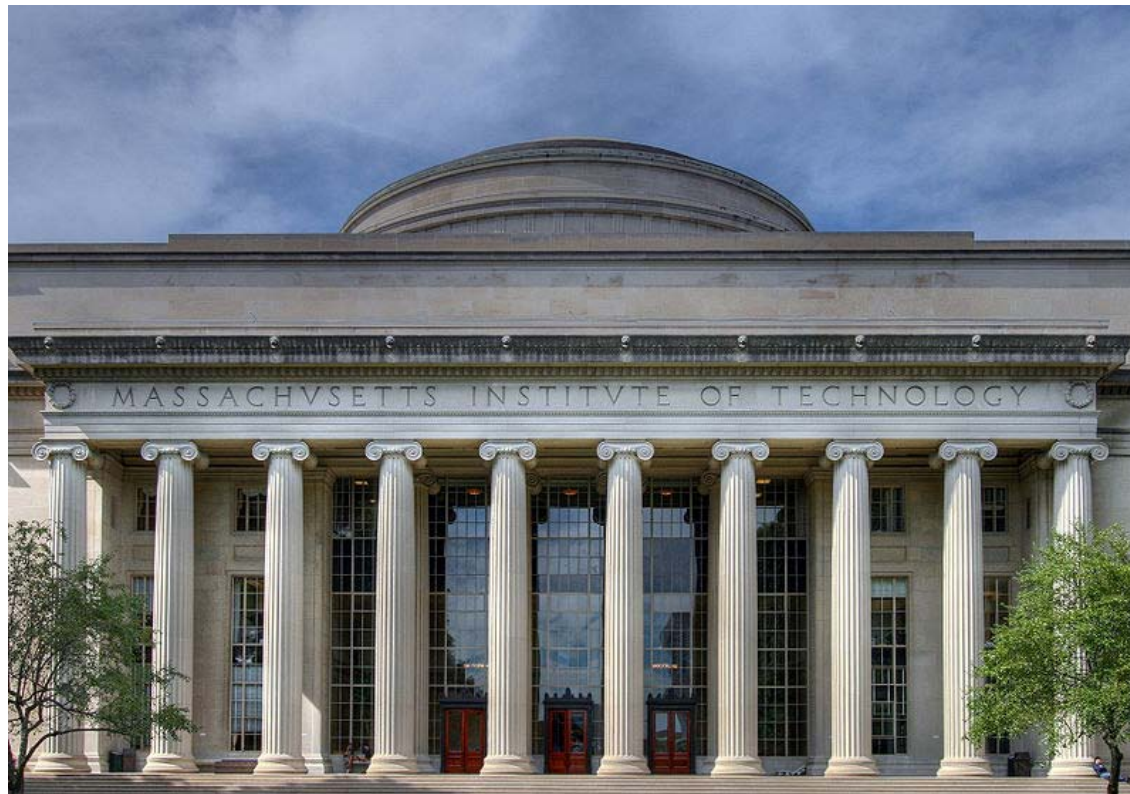
Biobricks to build a device

- ❑ Multiple parts incorporated into a chassis:
 - ❑ Protein generators
 - ❑ Switches
 - ❑ Measurement devices
 - ❑ Reporters



The Registry of Standard Biological Parts

- Database of Biobricks located at MIT, established in 2004
- Over 2000 characterized parts, 700 sent to each iGEM team



- Locate sample on distribution plate
- Rehydrate DNA, insert into bacteria



What Brown iGEM is looking for

- Variety of skill sets
- Creativity
- Independence

