



Building with Biology

Activities and Conversations about Synthetic Biology

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David Sittenfeld

NISE Net Network-Wide Meeting

This project is funded by the Advancing Informal STEM Learning (AISL) program in the Education and Human Resources Directorate of the National Science Foundation through award no. DRL-1421179



SYNTHETIC BIOLOGY!

The background is a solid teal color. It features several white DNA double helix structures scattered across the frame. Overlaid on these are thin, white, interconnected lines forming a network or geometric pattern, reminiscent of a molecular structure or a data network.



Why syn bio, why now?

What is syn bio?

How might **you** engage with syn bio?

WHY SYN BIO, WHY NOW?

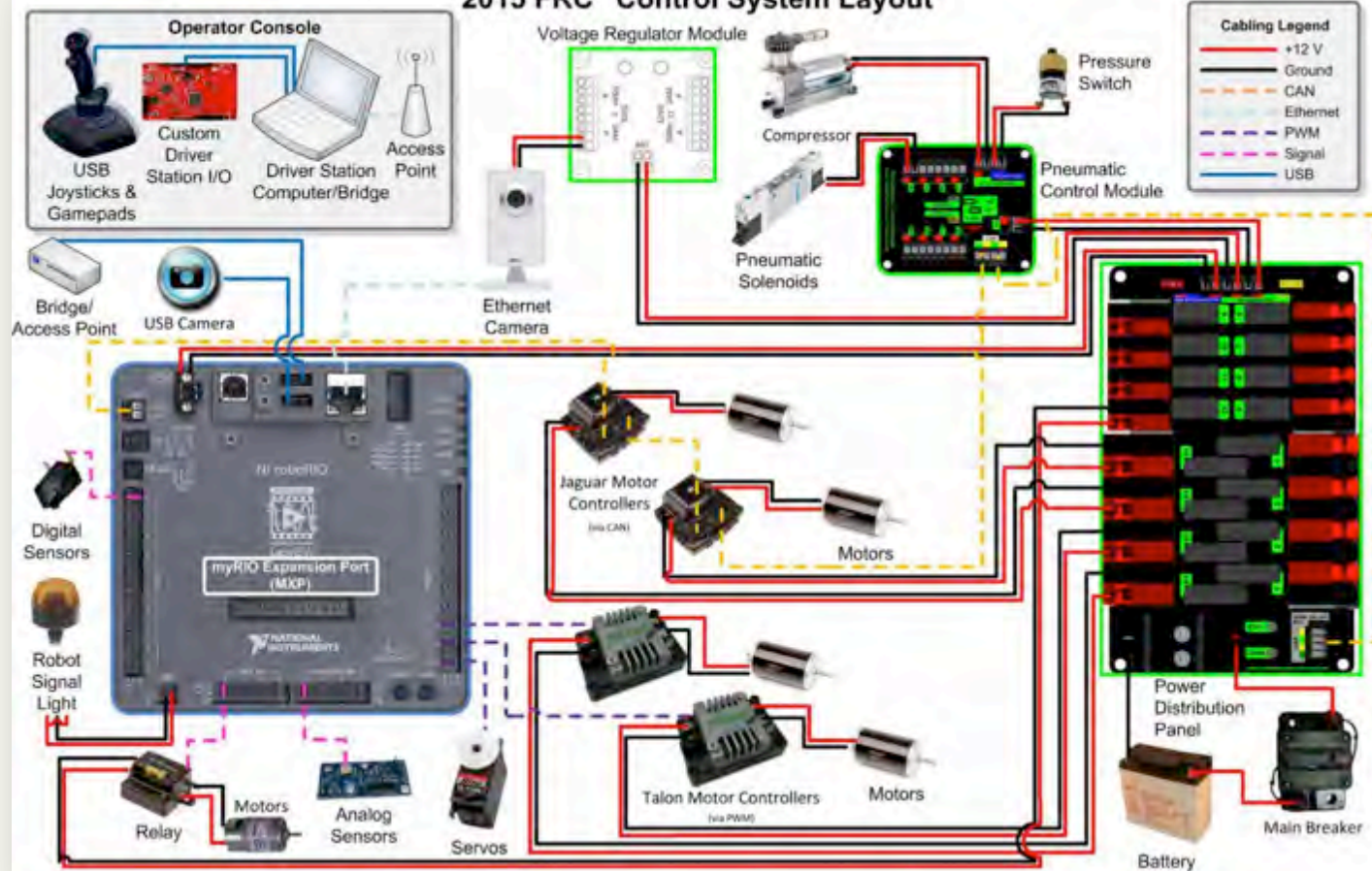
First....**A STORY**



Building 
with Biology



2015 FRC® Control System Layout







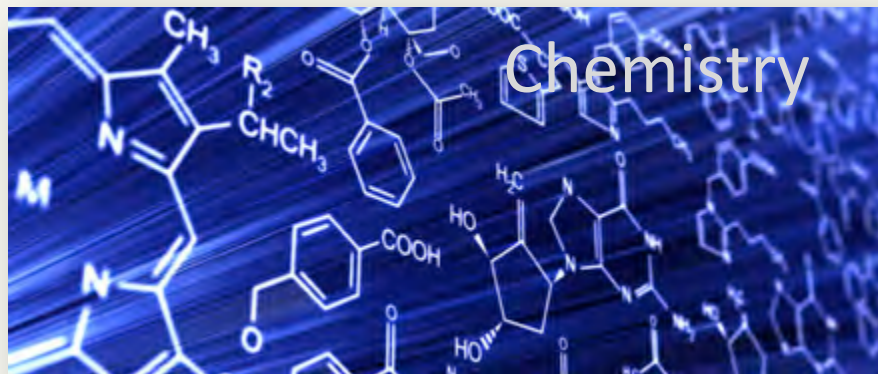
SPORTS & ROBOTS

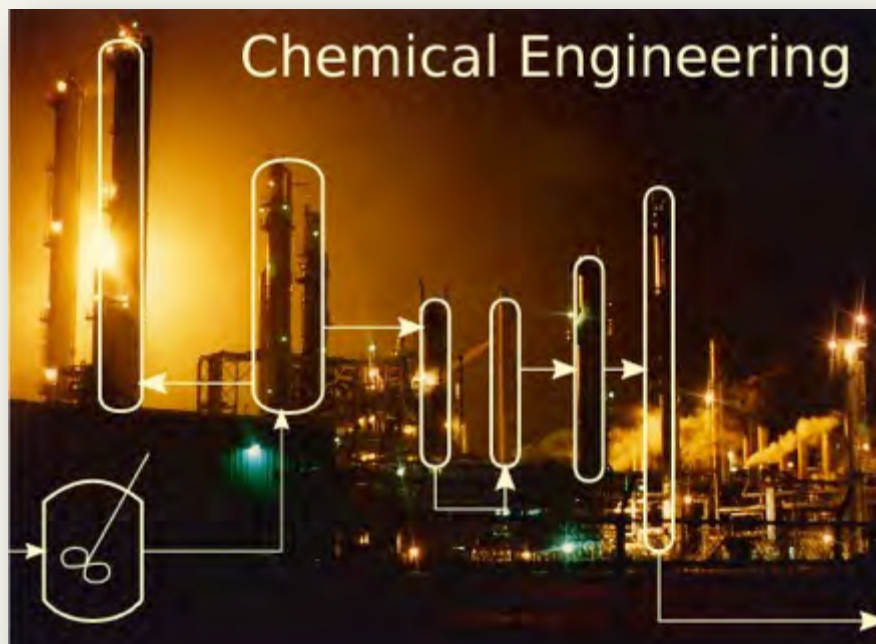
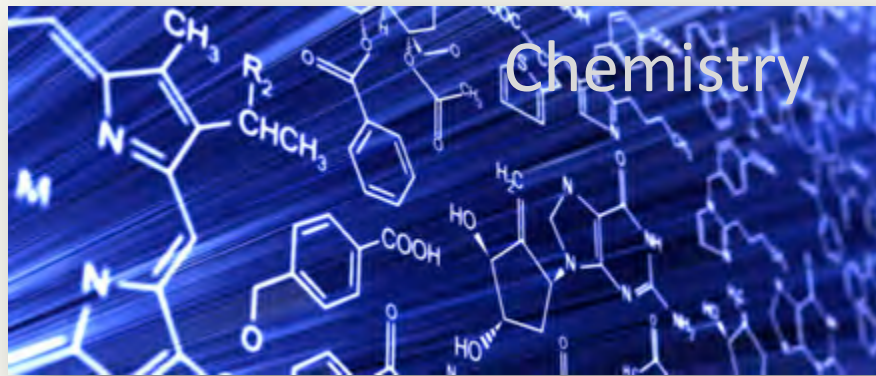


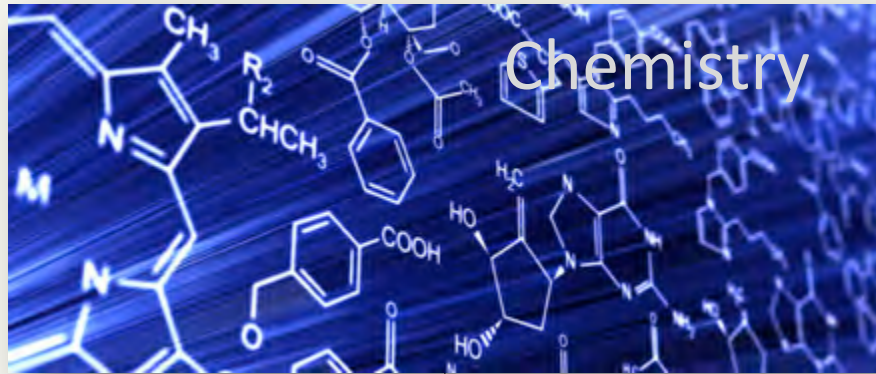




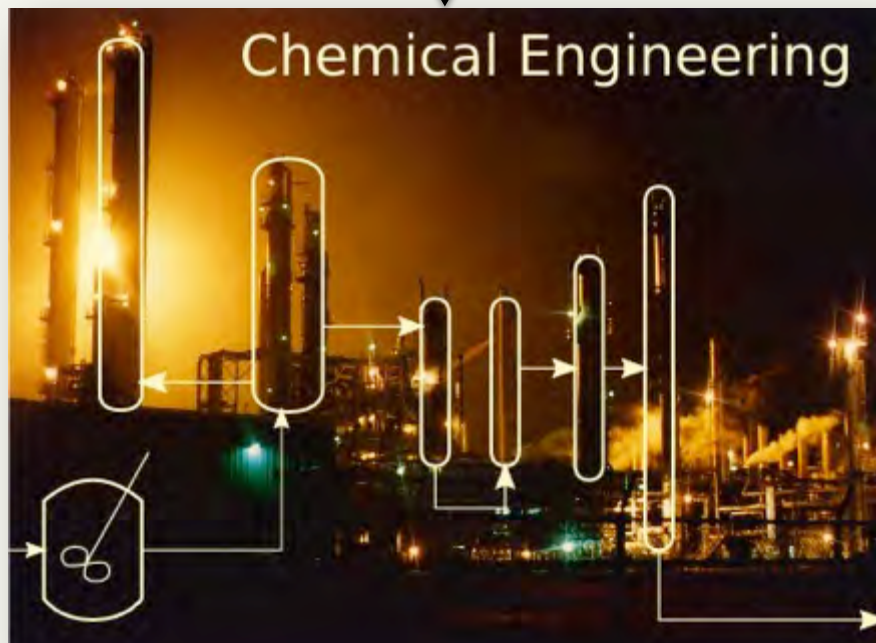


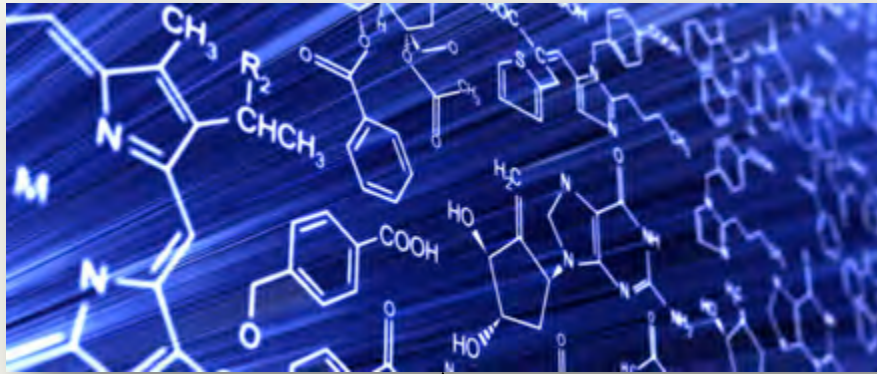






Systems Engineering Principles: e.g. Abstraction, Modularity



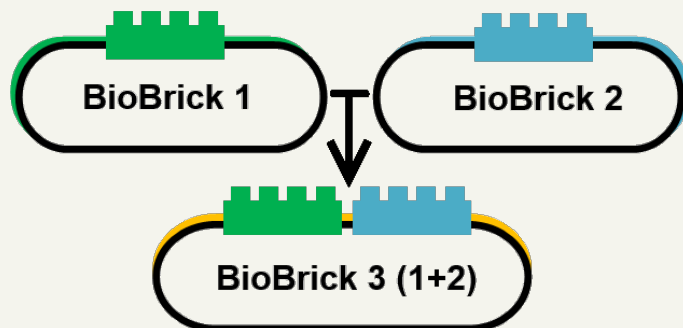


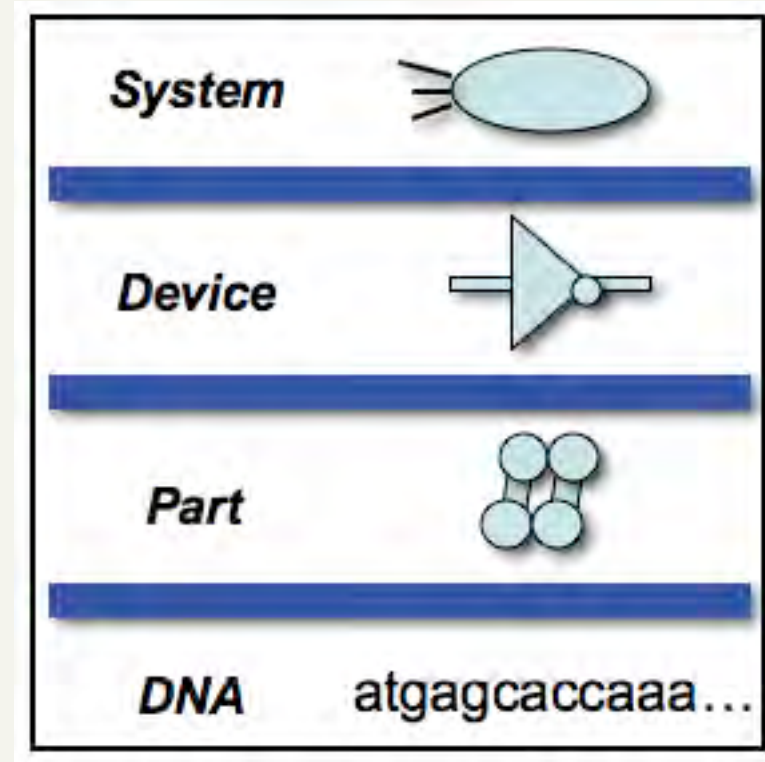
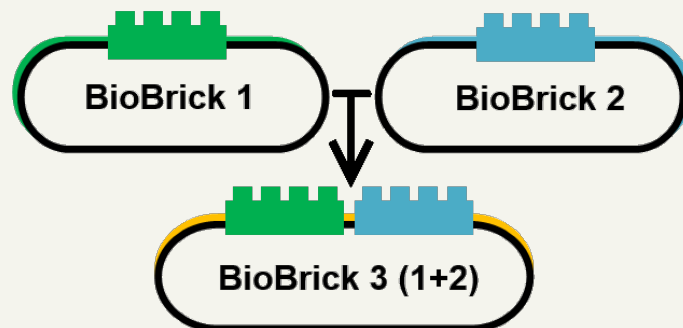
Systems Engineering Principles: e.g. Abstraction, Modularity



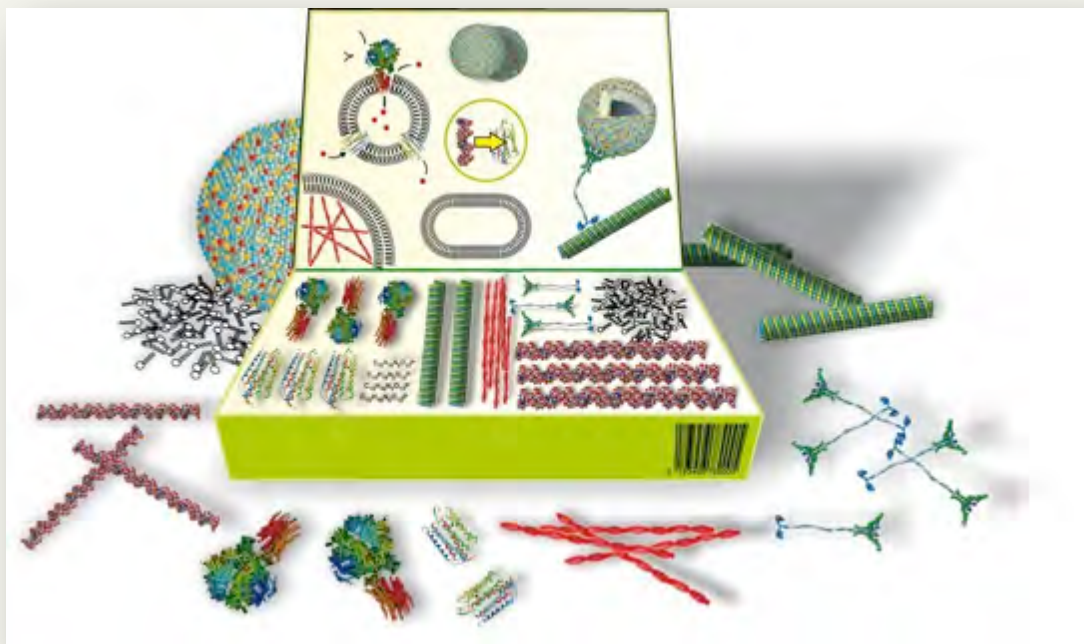




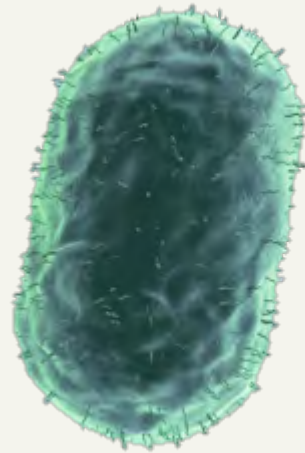




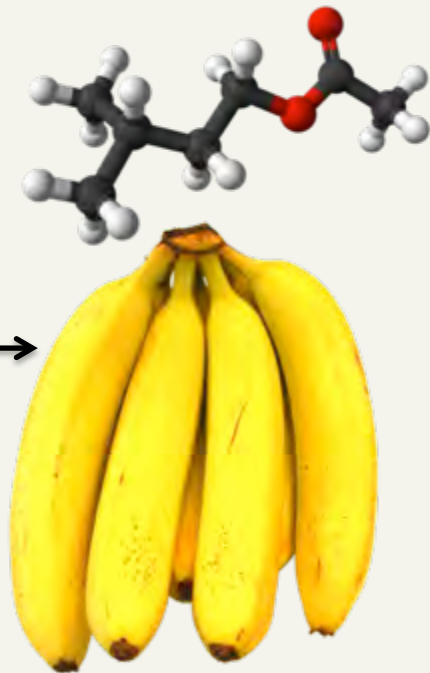
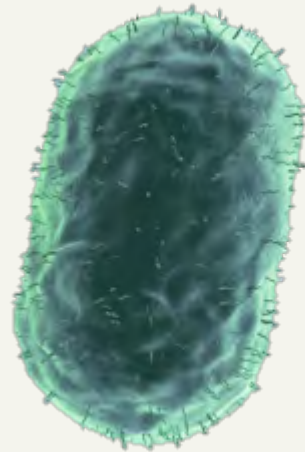




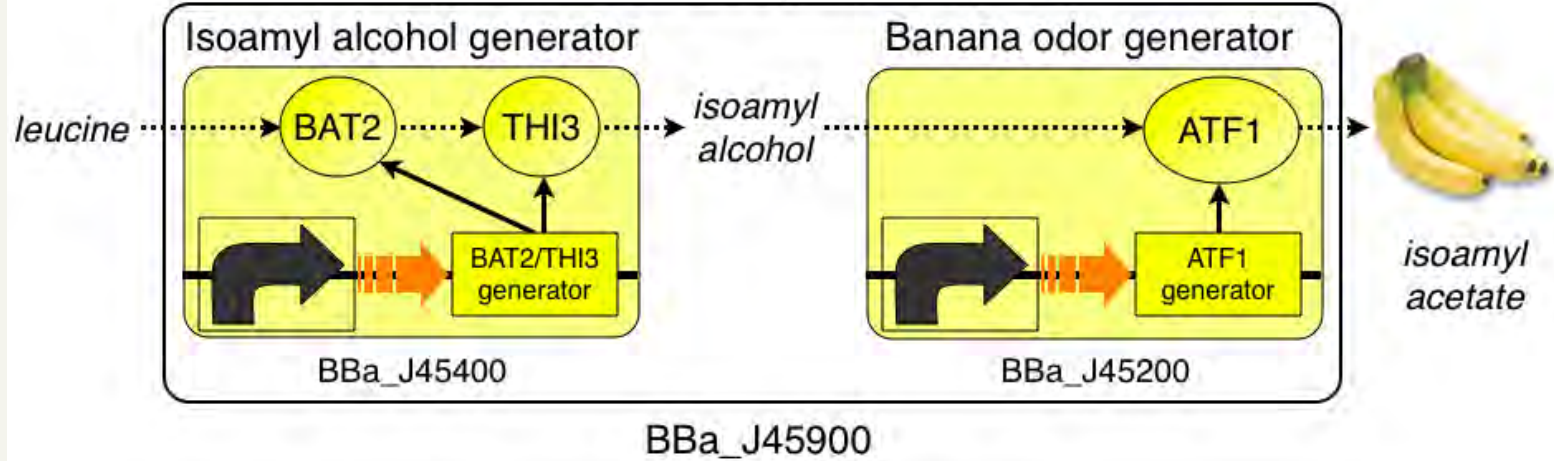




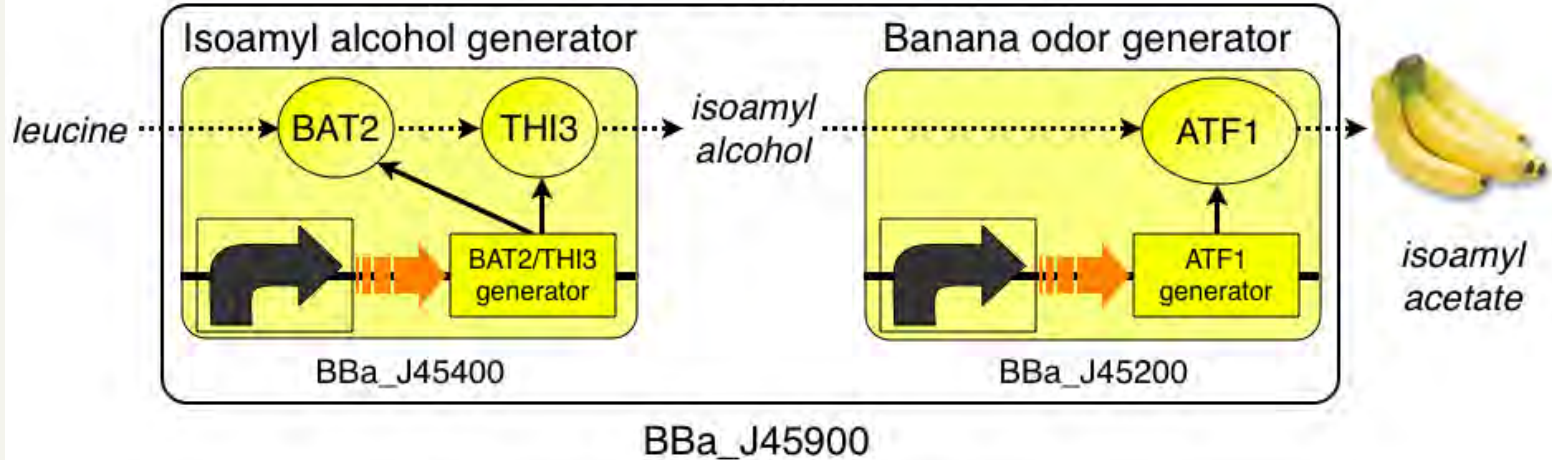
INPUT →



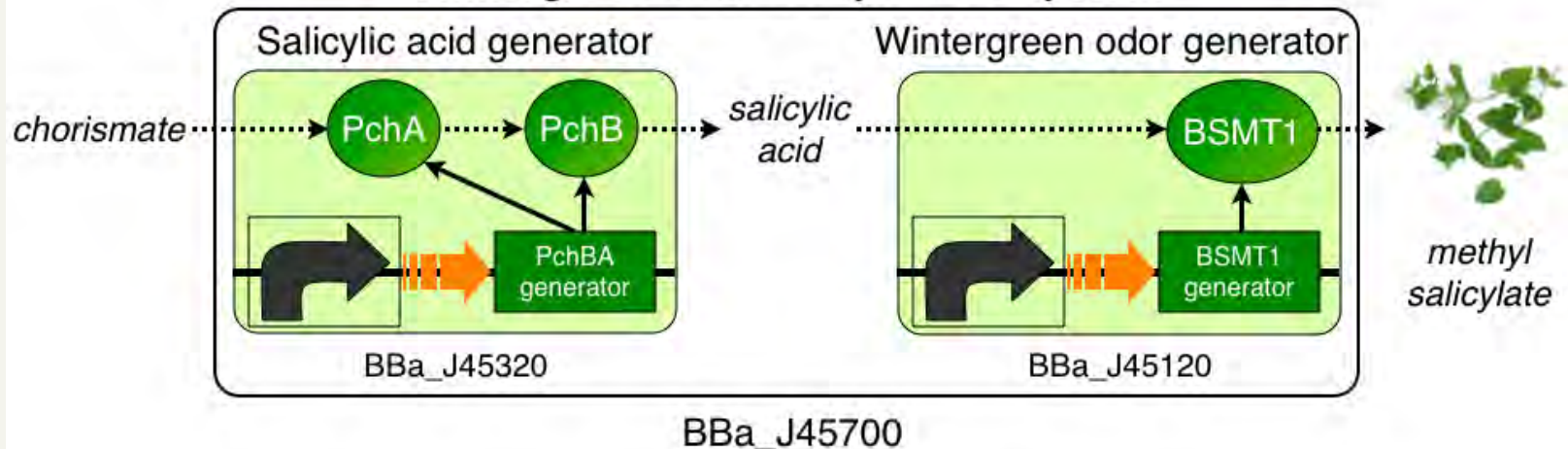
Banana odor biosynthetic system

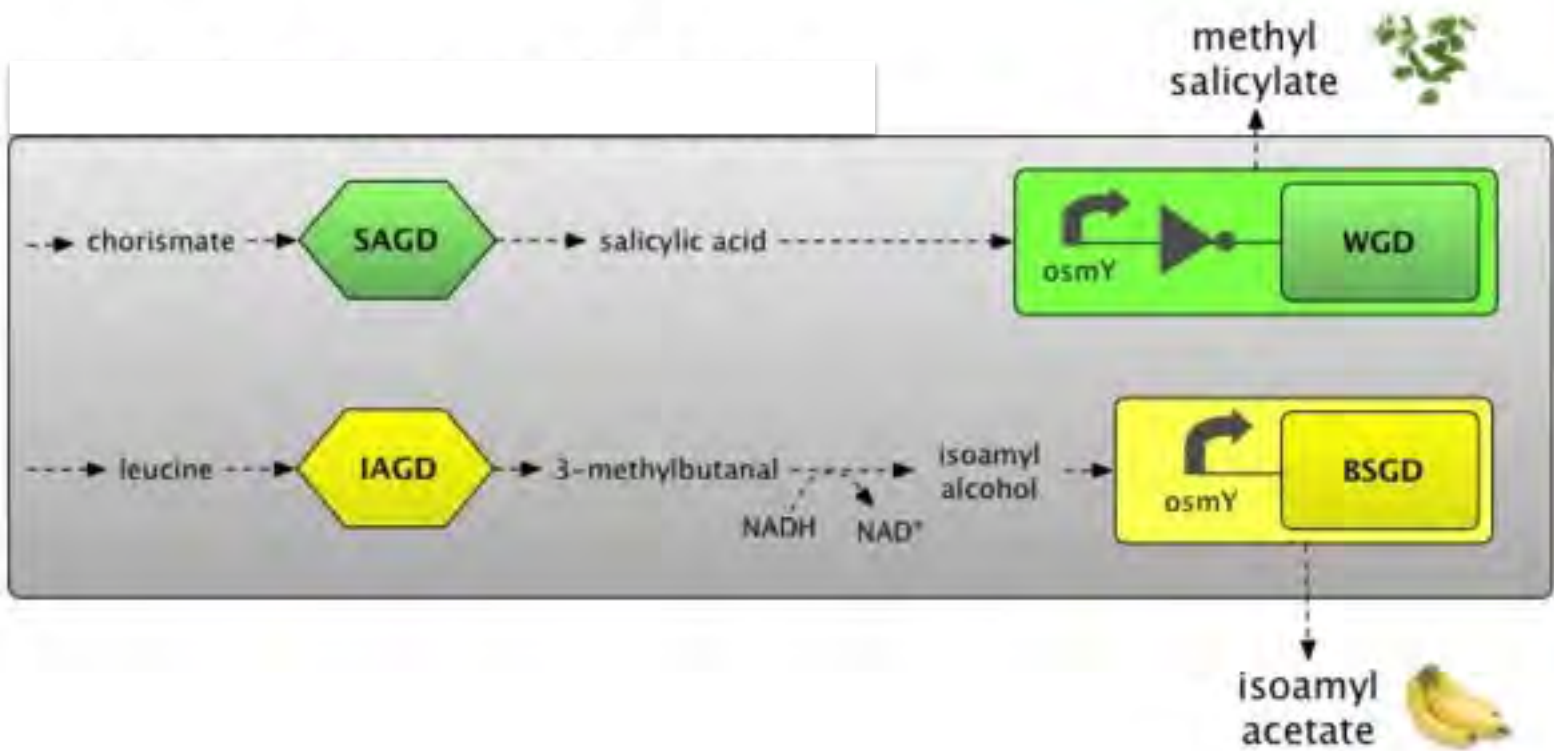


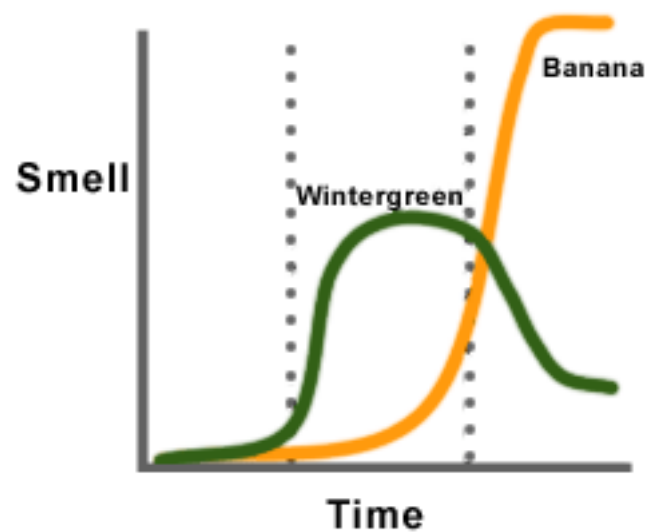
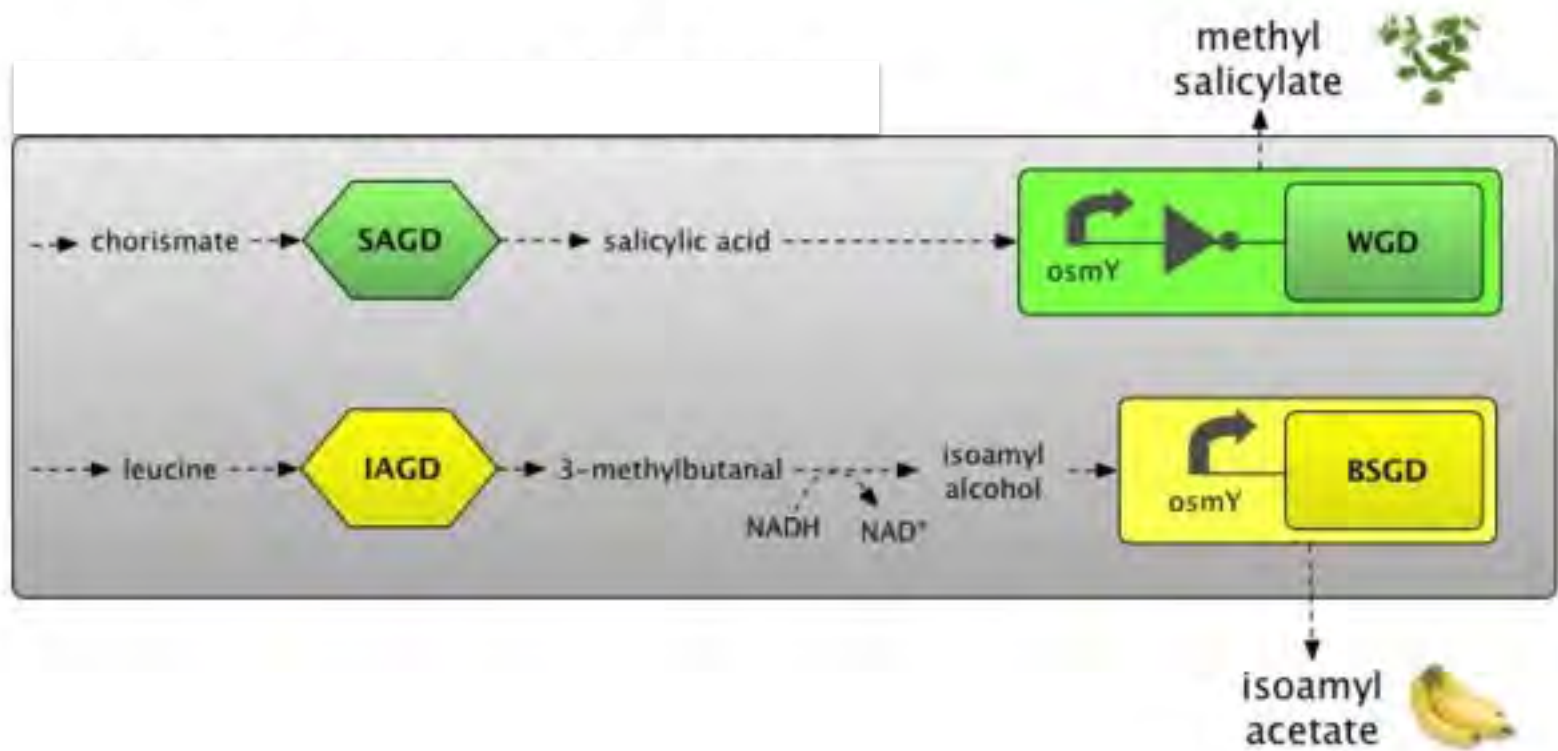
Banana odor biosynthetic system

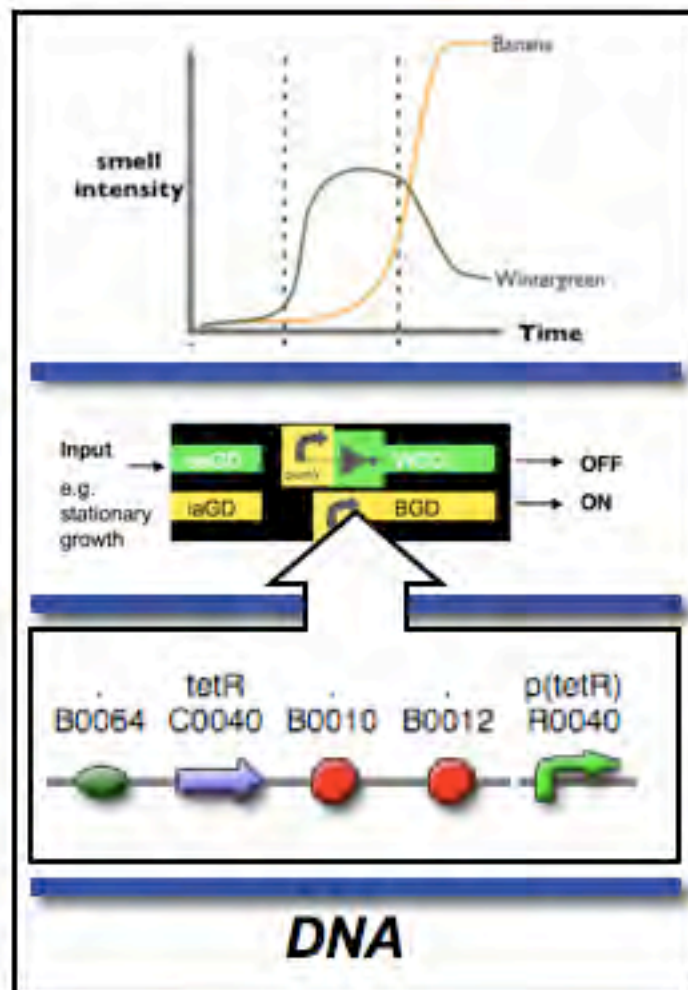
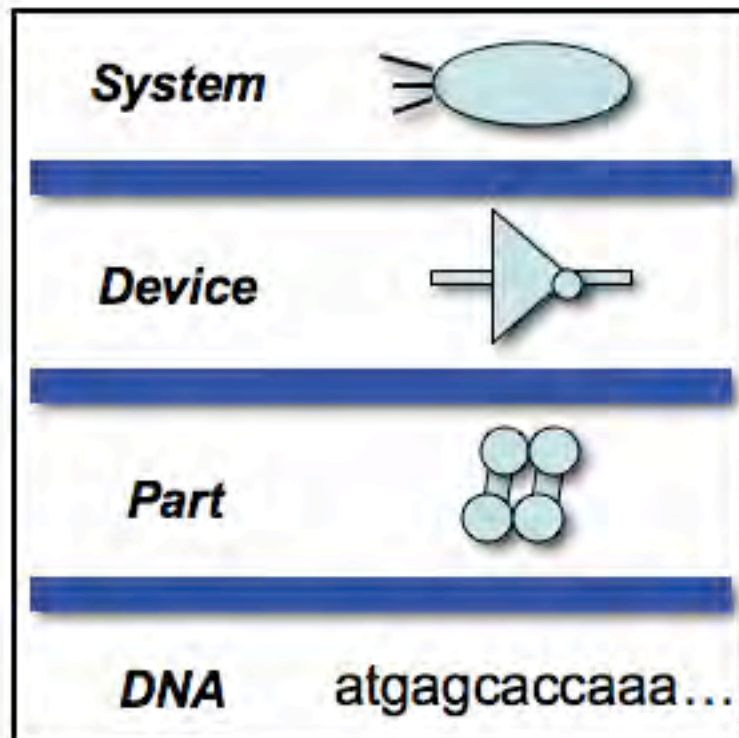


Wintergreen odor biosynthetic system









Registry of Standard Biological Parts

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[BBa K274370 Main Page](#) [Part Design](#) [Physical DNA](#) [Hard Information](#) [Experience](#) [Tools](#)

Part:BBa_K274370

Designed by Vivian Mullin Group: iGEM09_Cambridge (2009-10-19)



Composite

[DNA Planning](#)

[Experience: Works](#)

[Get This Part](#)

PoPS -> P2 ogr - PF promoter -> PoPS

n/a

Sequence and Features

Format: Subparts Ruler SS DS	Search:	Length: 473 bp	Context: Part only	Get selected sequence
<p>1746350 B0010 B0012 1746360</p>				

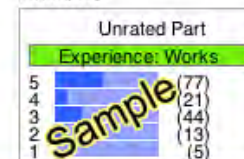
Assembly Compatibility: [10](#) [12](#) [21](#) [23](#) [25](#)

[\[edit\]](#)

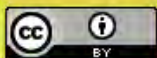
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Building with Biology





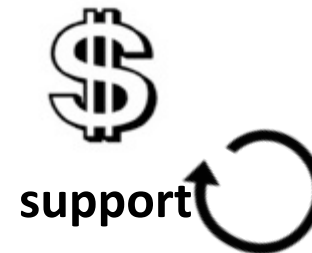
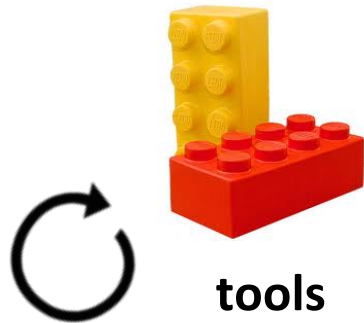
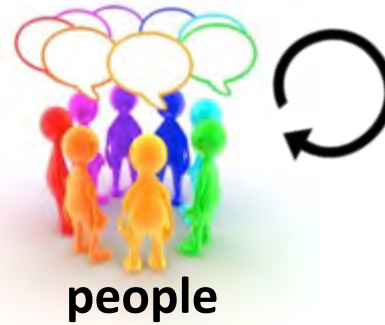








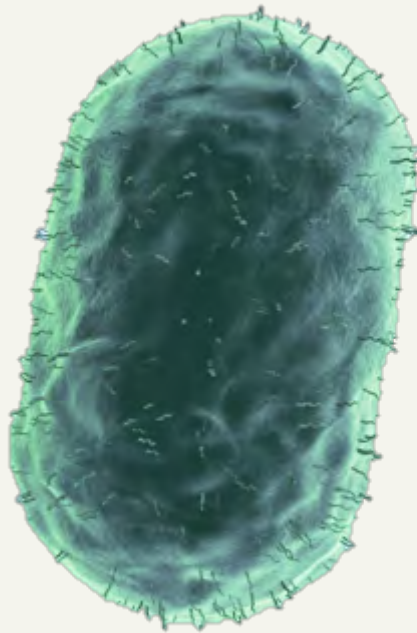
organization
norms
incentives





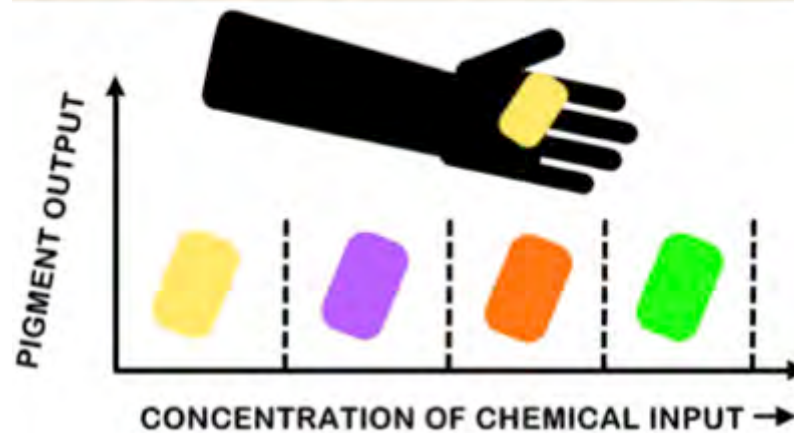
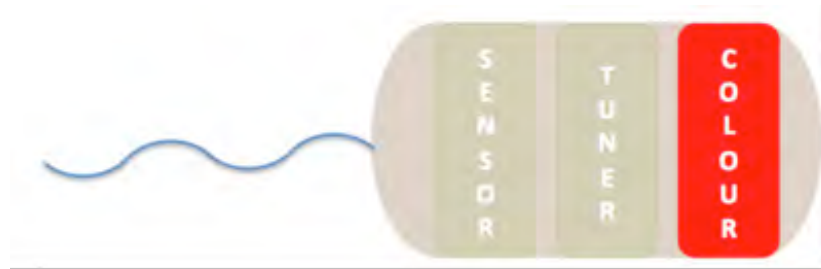


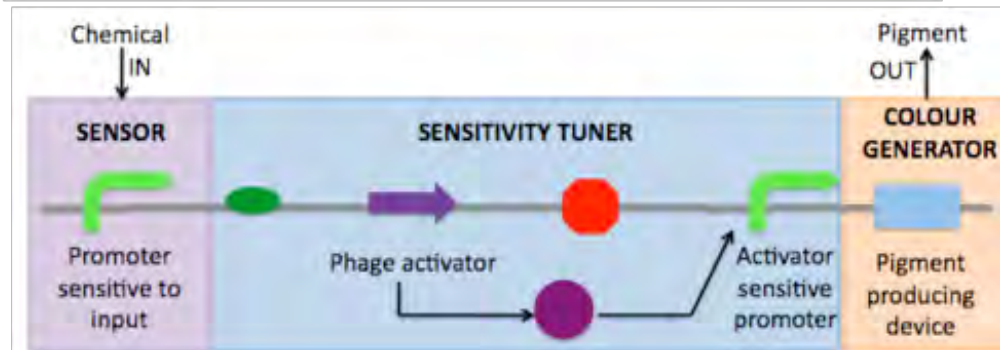
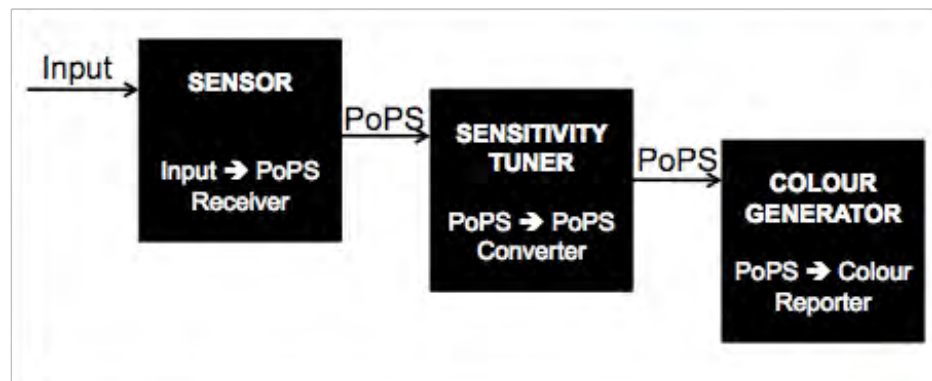






<https://vimeo.com/19759432>







1. Drink

Drink a bottle of *E. chromi* Scatalog probiotic once weekly. Anhydrobiotic granules contain synthetic bacteria.



2. Colonise

The gut is colonised by *E. chromi* bacteria that secrete colours in presence of chemical signals.



4. Personalise

Genetic susceptibility can be managed easily.

3. Monitor

If change is detected, bacteria produce a colour signal visible in faeces.



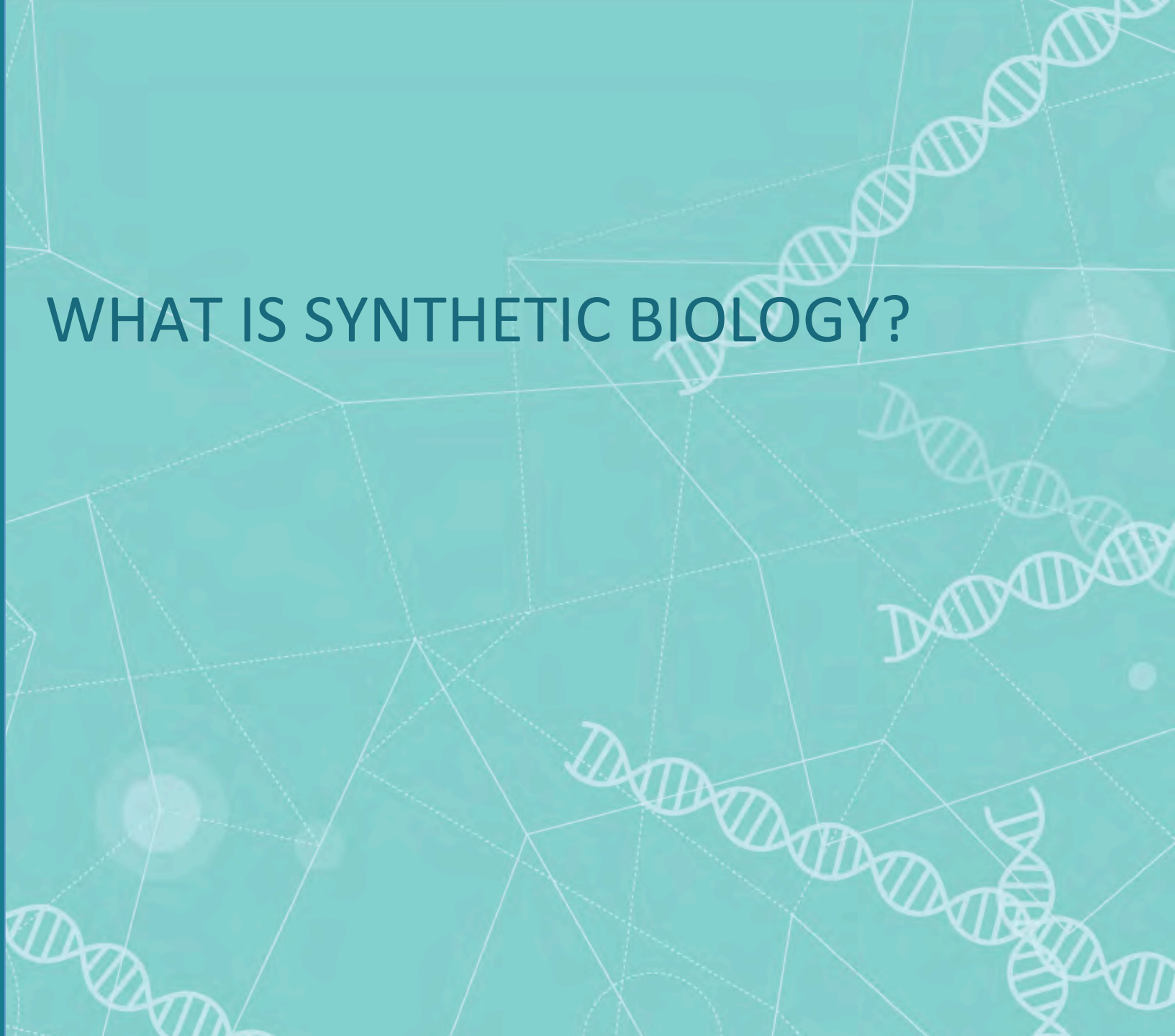
E. chromi

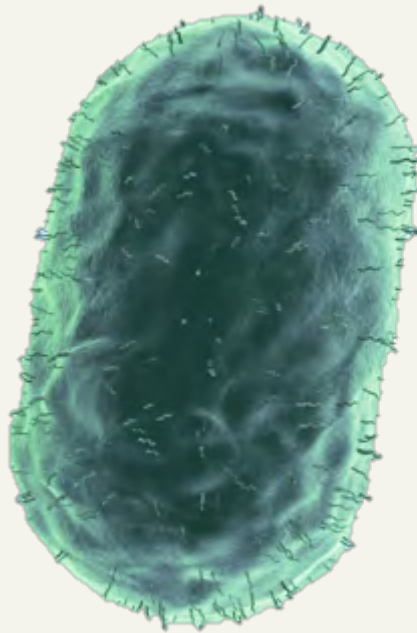
Cheap, Personalised Disease Monitoring
using synthetic bacterial technology

with **Biology**



WHAT IS SYNTHETIC BIOLOGY?



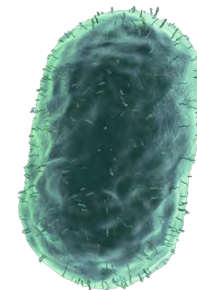


011100010101



+ reproduces, evolves

CATGTTGCACTG



digital

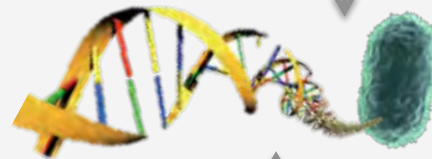
edit

CATGTTGCACTG

sequence

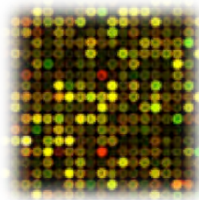
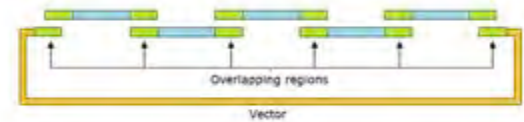
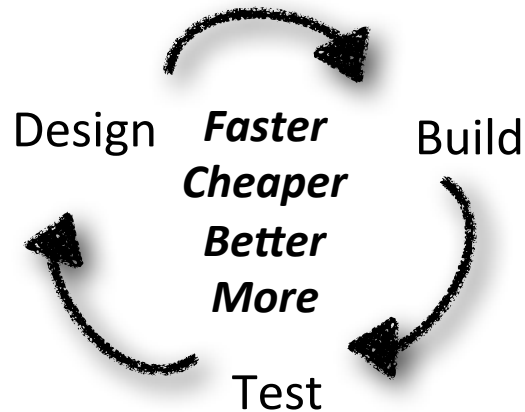
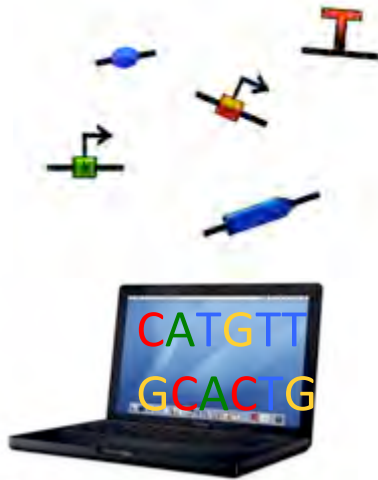
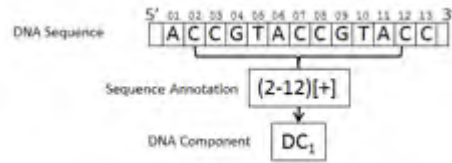
synthesize

physical

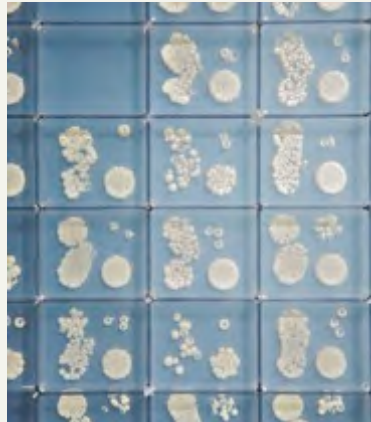


evolve

Engineering Design Cycle





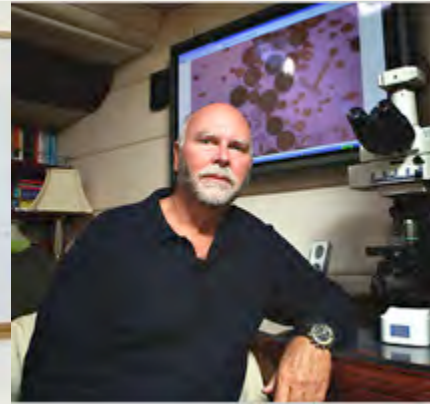




**Single
Genes**



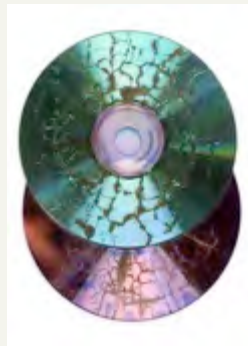
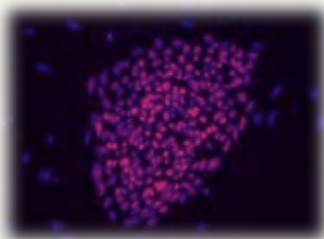
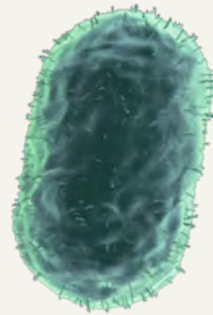
**Multiple
Genes:
Pathways**



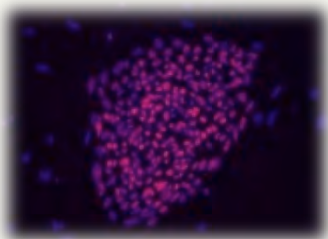
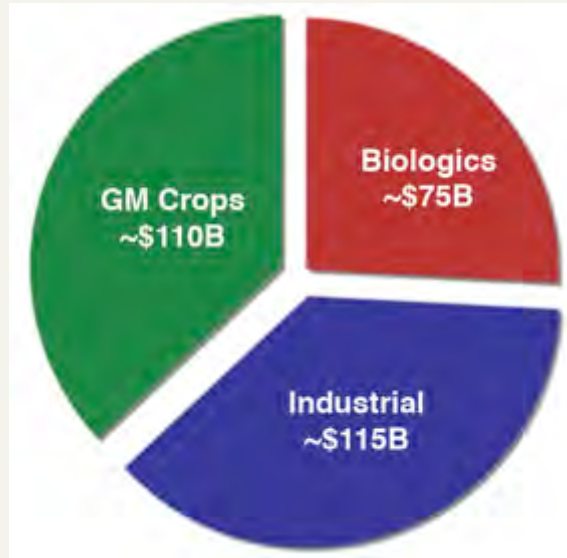
**Multiple
Pathways:
Genomes**



**Multiple
Genomes:
Tissues**



2011 US Revenue: Genetically Engineered 'Stuff'

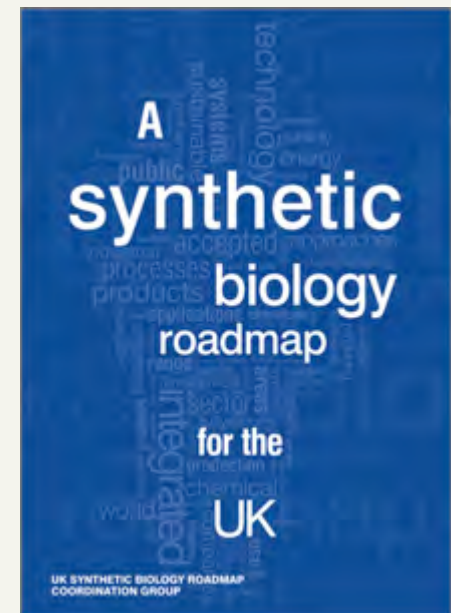
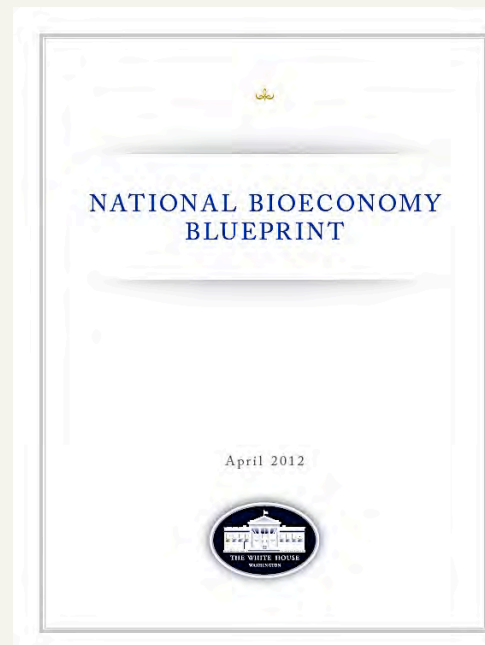


>2% GDP
>10% Growth



Building 
with Biology





nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE



GMOs

The promise. The reality.

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OPICS

LOOK AROUND YOU

Digital cameras with
an insect-eye view

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TECH ANALYSIS

RECIPE FOR DISASTER

Today's global networks
are programmed to fail

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MONEY FROM THE MASSES

How to make the most
of crowdfunding

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Building
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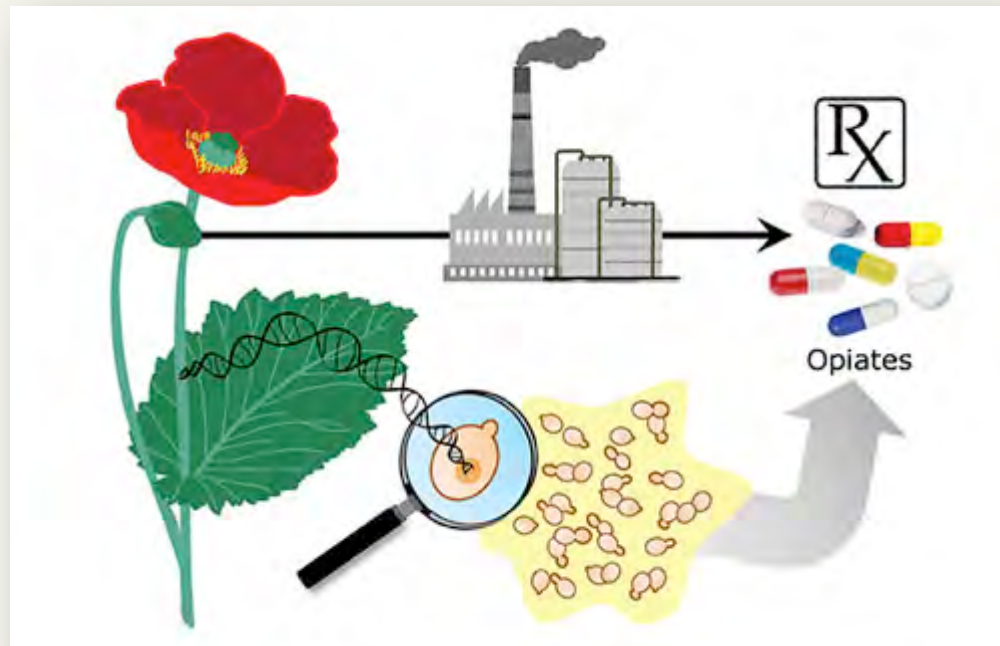




BIOTECHNOLOGY

Regulating gene drives

Regulatory gaps must be filled before gene drives could be used in the wild



THE PANDORA'S BOX CONGRESS

By Michael Rogers

**140 Scientists Ask: Now that We Can Rewrite
the Genetic Code, What Are We Going To Say?**

THE PANDORA'S BOX CONGRESS

By Michael Rogers

**140 Scientists Ask: Now that We Can Rewrite
the Genetic Code, What Are We Going To Say?**

**CONCLUSION: HUMAN SEX AS
MODERATE-RISK EXPERIMENT**



8,433

backers

\$484,013

pledged of \$65,000 goal

0

seconds to go

Building 
with **Biology**

