

## New forms of collaboration? Synthetic biology, social science, art and design

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Synbio in Society: Toward New Forms of Collaboration?  
Woodrow Wilson International Center for Scholars, Washington  
DC, USA, 12<sup>th</sup> May 2010

# Social science and synthetic biology

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# Precedents

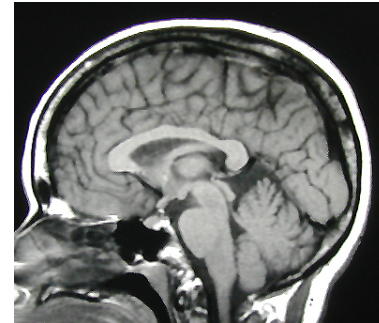
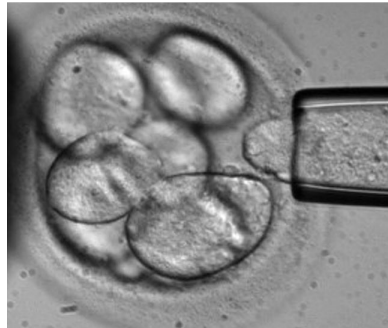
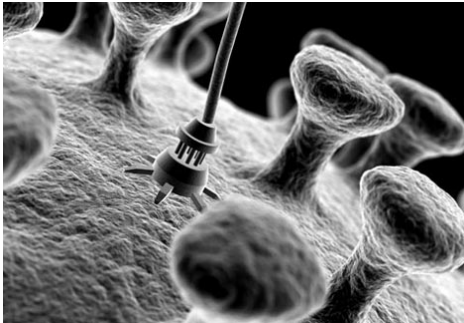
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Ethical, Legal and Social Issues (ELSI)

# A widespread trend

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- A growing concern for the social dimensions of innovation
- An increasingly distributed network influencing the governance of science (also including policy makers, lawyers, bioethicists and publics)

# New collaborative arrangements: US

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# New collaborative arrangements: Europe

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# New collaborative arrangements: UK

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Arts & Humanities  
Research Council



**EPSRC**

Engineering and  
Physical Sciences  
Research Council



synthetic  
biology  
standards  
network :

**CSYNBI**

Centre for **S**ynthetic **B**iology and **I**nnovation

# Synthetic Biology and Science and Technology Studies (STS)

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- STS: the consequences science and technology have for society  
But also how social context influences scientific knowledge
- “Things could be otherwise”
- Scientific and technological developments are the result of choices, such as funding decisions
- Synthetic biology as a topic for STS
- Creating a new field requires technical, social, economic and political resources





# 2009



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## iGEM 2009 Jamboree

October 31 to November 2, 2009

Massachusetts Institute of Technology

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## iGEM 2009 is officially over!



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# Possible roles

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- Wait for the scientists and engineers to do the work, and then deal with the social and ethical consequences?  
(Assumes that technical and social issues can easily be separated)

# Opening up

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- Exploring the assumptions that lie behind the choices that are made
- Attempting to articulate implicit visions of the future and alternatives
- May involve discussing the aims of scientific research
- Not just studying the 'implications' of a technology on society

# Art and design in synthetic biology

# Synthetic Aesthetics

Bringing together synthetic biology, design & art

Pablo Schyfter, Alexandra Daisy Ginsberg,  
Jane Calvert, Alistair Elfick, Drew Endy



STANFORD  
UNIVERSITY

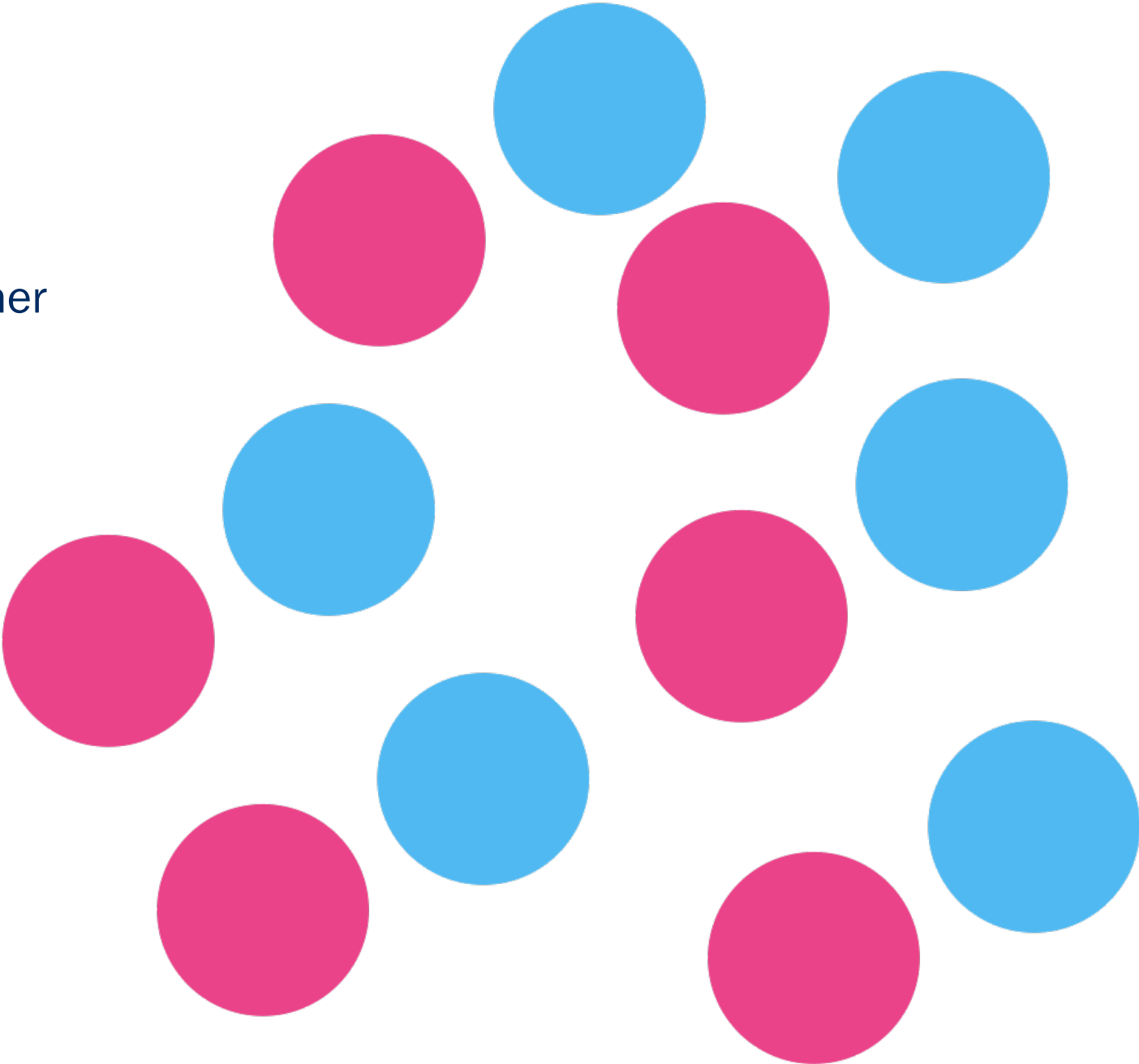


EPSRC  
Engineering and Physical Sciences  
Research Council

[www.syntheticaesthetics.org](http://www.syntheticaesthetics.org)

12 residencies

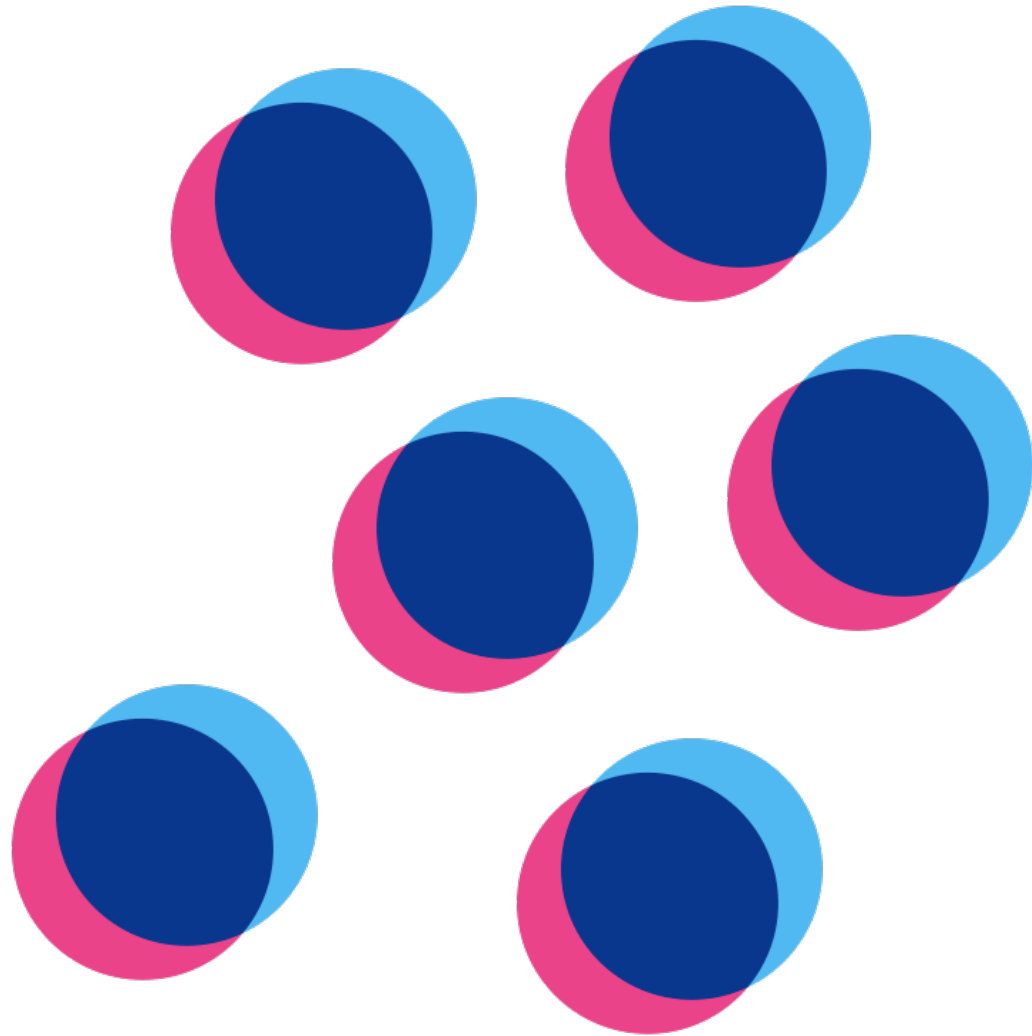
4 weeks together



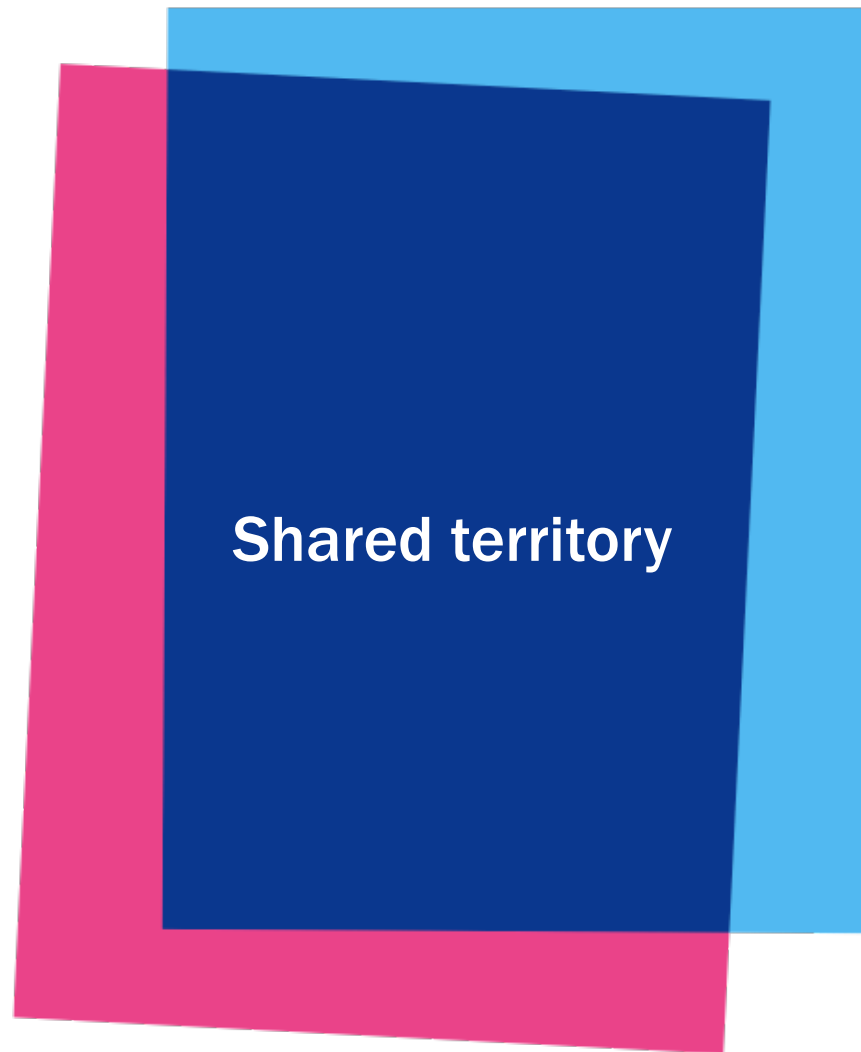
12 residencies

4 weeks together

New kinds of  
collaboration



6 scientists  
& engineers



6 designers &  
artists

[www.syntheticaesthetics.org](http://www.syntheticaesthetics.org)



# Design in synthetic biology

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- Decoupling
- Biology becomes a product of design choices, rather than evolutionary pressures
- Could include industrial and political imperatives (e.g. safety)
- Is it designed well or not? For what purpose is it designed?
- Brings in values and politics
- Opens up synthetic biology to broader discussion

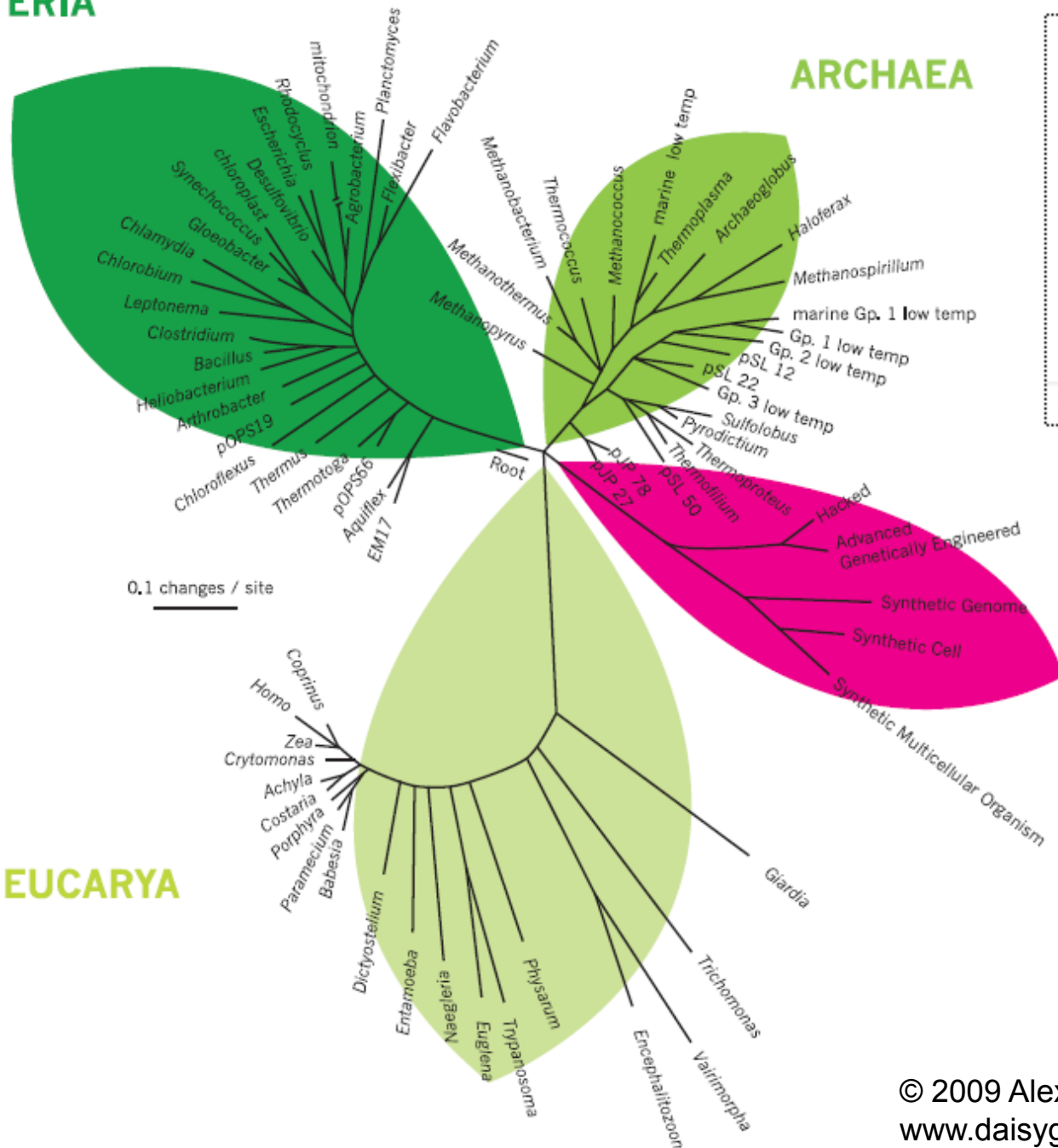
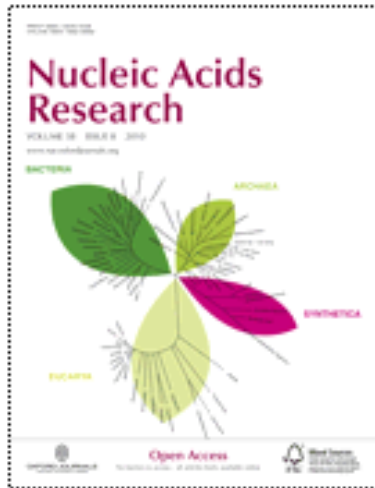
# Art and design in synthetic biology

- Critical design: exploring possible futures through imaginary objects
- Can provoke debate by making abstract concepts tangible



# BACTERIA

# ARCHAEA







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## Project :

Overview

Sensitivity Tuner

--- Characterisation

--- Modelling

Colour Generators

--- Carotenoids (Orange/Red)

--- Melanin (Brown)

--- Viocaine (Purple/Green)

The Future

Safety

## Notebook :

Week 1

Week 2

Week 3

Week 4

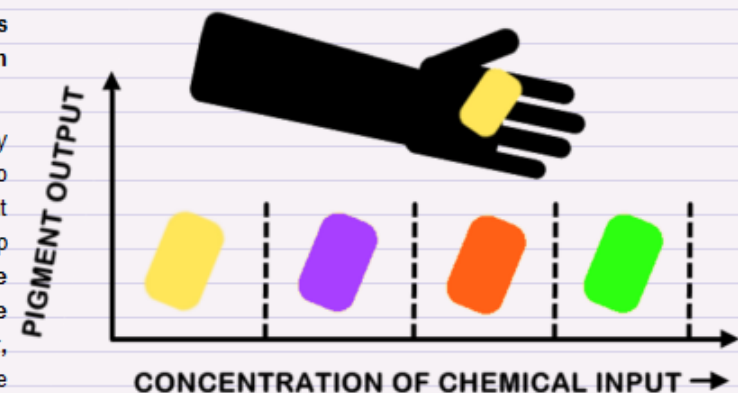
Week 5

## E. Chromi

The Cambridge 2009 iGEM team has created two kits of parts that will facilitate the design and construction of biosensors in the the future.

Previous iGEM teams have focused on genetically engineering bacterial biosensors by enabling bacteria to respond to novel inputs, especially biologically significant compounds. There is an unmistakable need to also develop devices that can 1) **manipulate input** by changing the **behaviour of the response** of the input-sensitive promoter, and that can 2) **report a response** using clear, **user-friendly outputs**. The most popular output is the expression of a fluorescent protein, detectable using fluorescence microscopy. But, what if we could simply see the output with our own eyes?

We successfully characterised a set of transcriptional systems for calibrated output - [Sensitivity Tuners](#). We also successfully expressed a spectrum of pigments in *E. coli*, designing a set of [Colour Generators](#).



[1]

[2]

[3]

Learn

Sensitivity

fun







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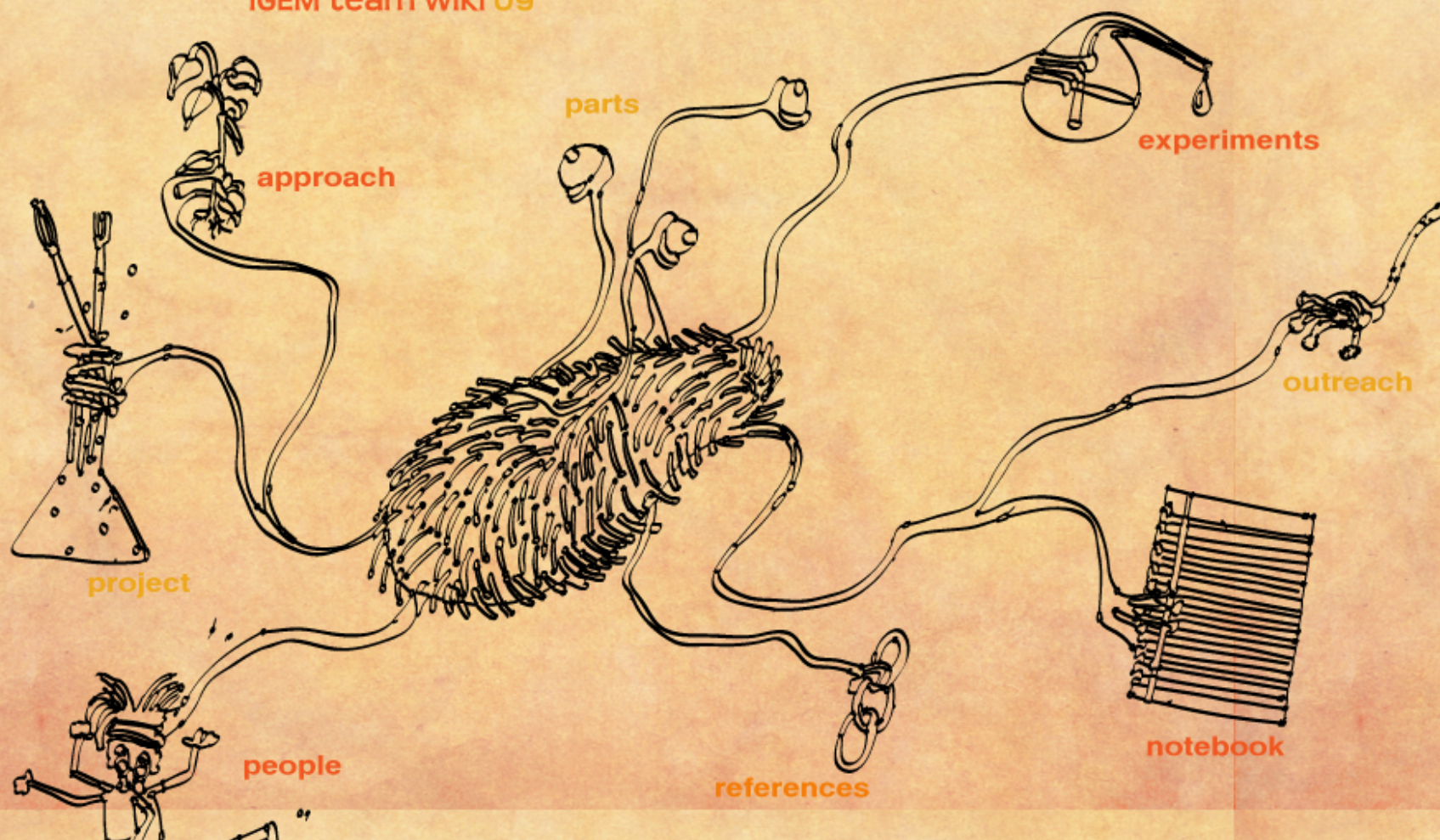
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Team:ArtScienceBangalore

artsciencebangalore

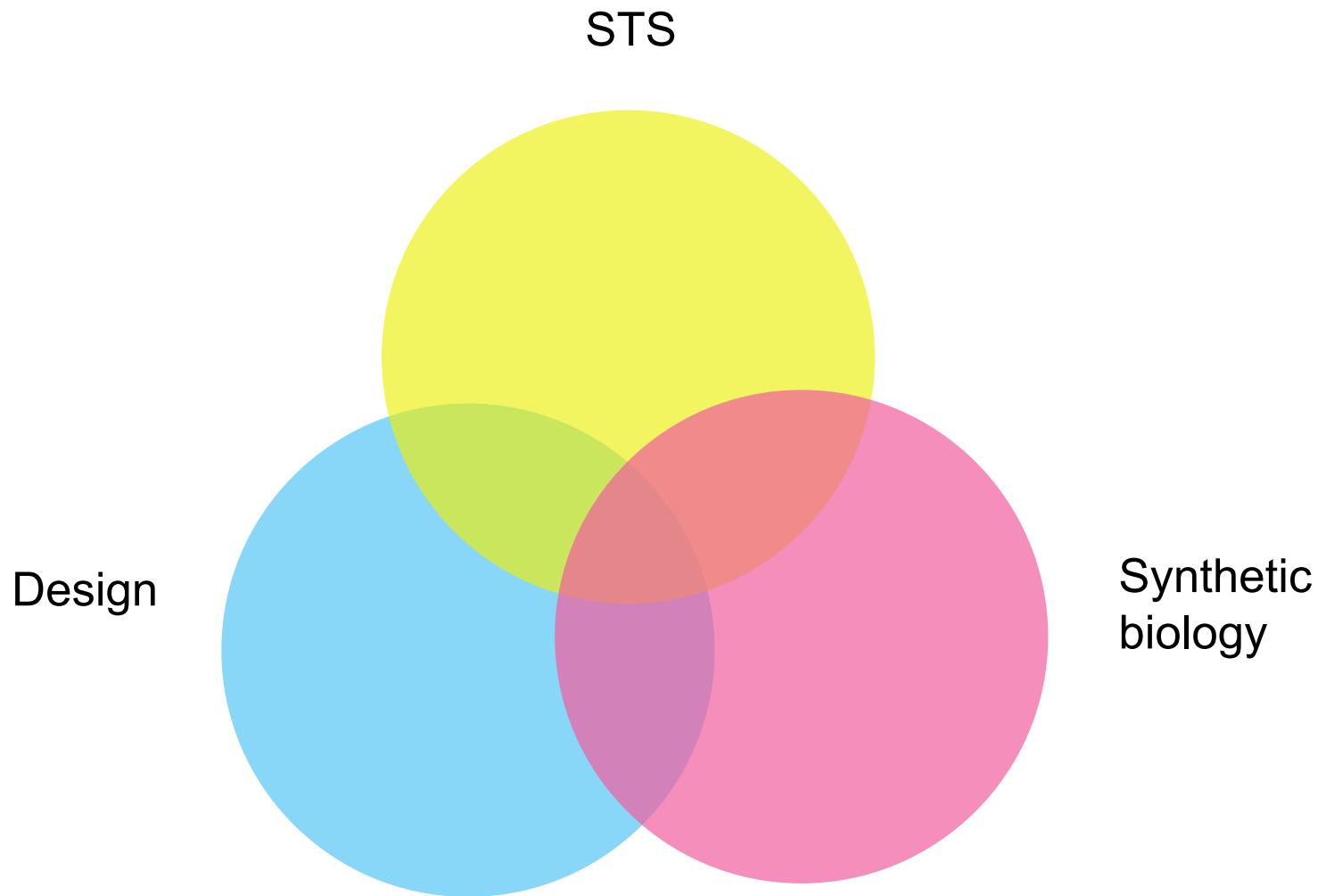
IGEM team wiki 09





Art Science  
Bangalore  
iGEM 2009

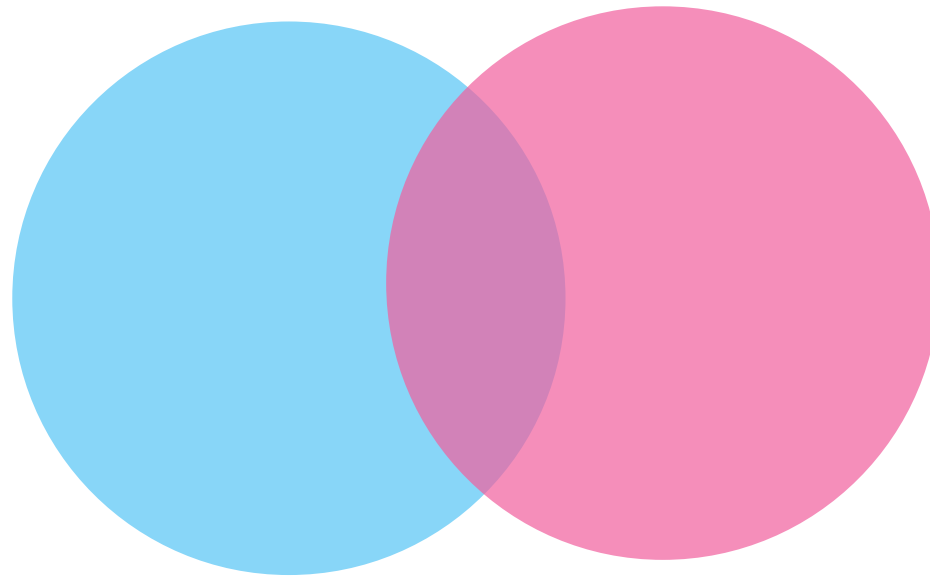






Biology is a new material for design  
Synthetic biologists are designers  
Both want to produce new things

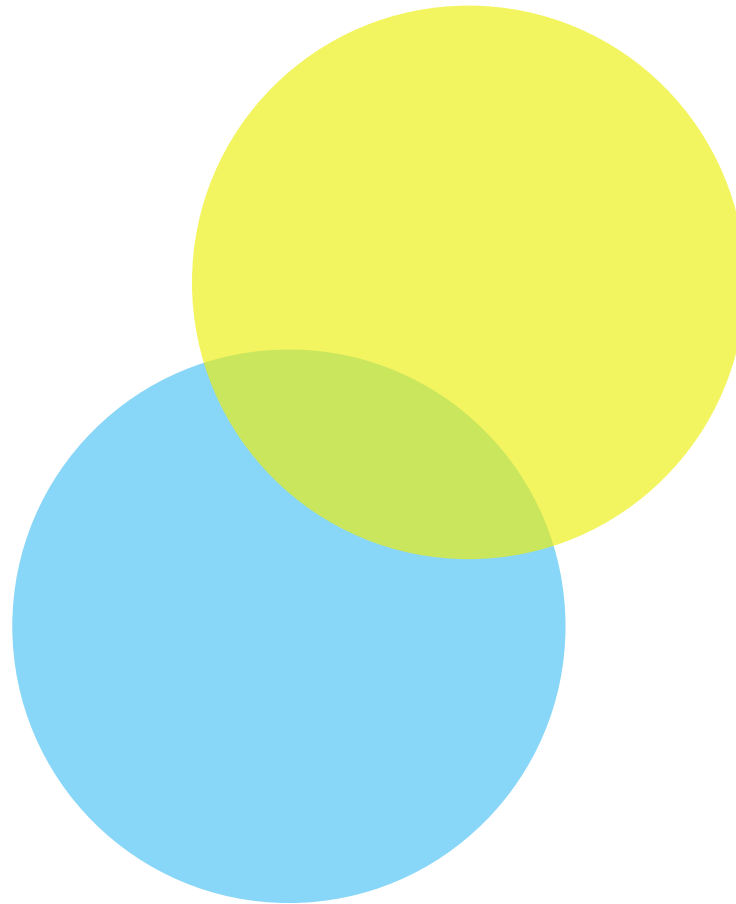
Design



Synthetic  
biology

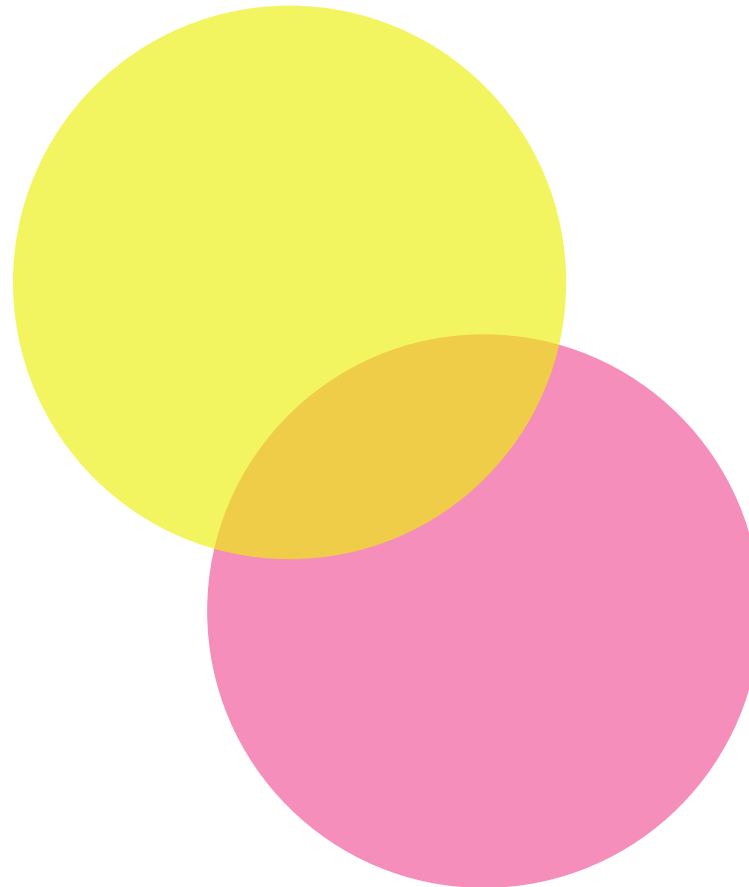
STS

Design



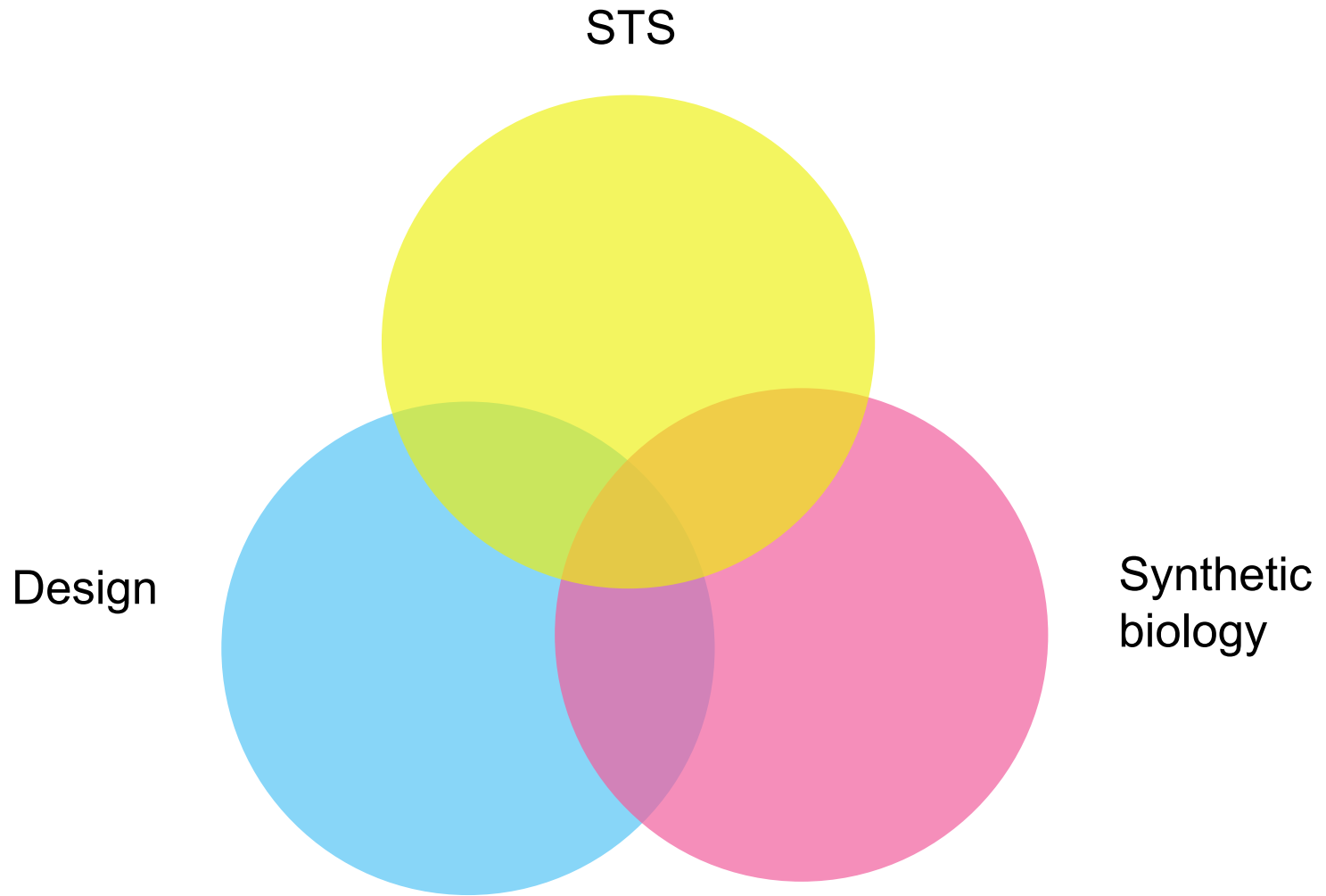
Forging new  
collaborations with  
synthetic biology  
Critical interrogation  
of the science  
Exploring implicit  
assumptions and  
alternatives

STS



Gathering data  
Generating  
knowledge  
Disseminating  
research

Synthetic  
biology



Generate new ways of thinking  
Promote critical reflection on all sides

# Barriers

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- Institutional barriers
- Asymmetric expectations
- Can highlight the differences between the different groups (e.g. what counts as good knowledge and appropriate methods)

# New collaborations

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- Can these new kinds of collaboration make synthetic biology better?
- Can they make social science and art and design better?
- What does 'better' mean?
  - More sustainable?
  - More beautiful?
  - More useful?
  - More democratic?

The support of the Economic and Social Research Council (ESRC) is gratefully acknowledged. The work presented forms part of the programme of the ESRC Genomics Network at Innogen.