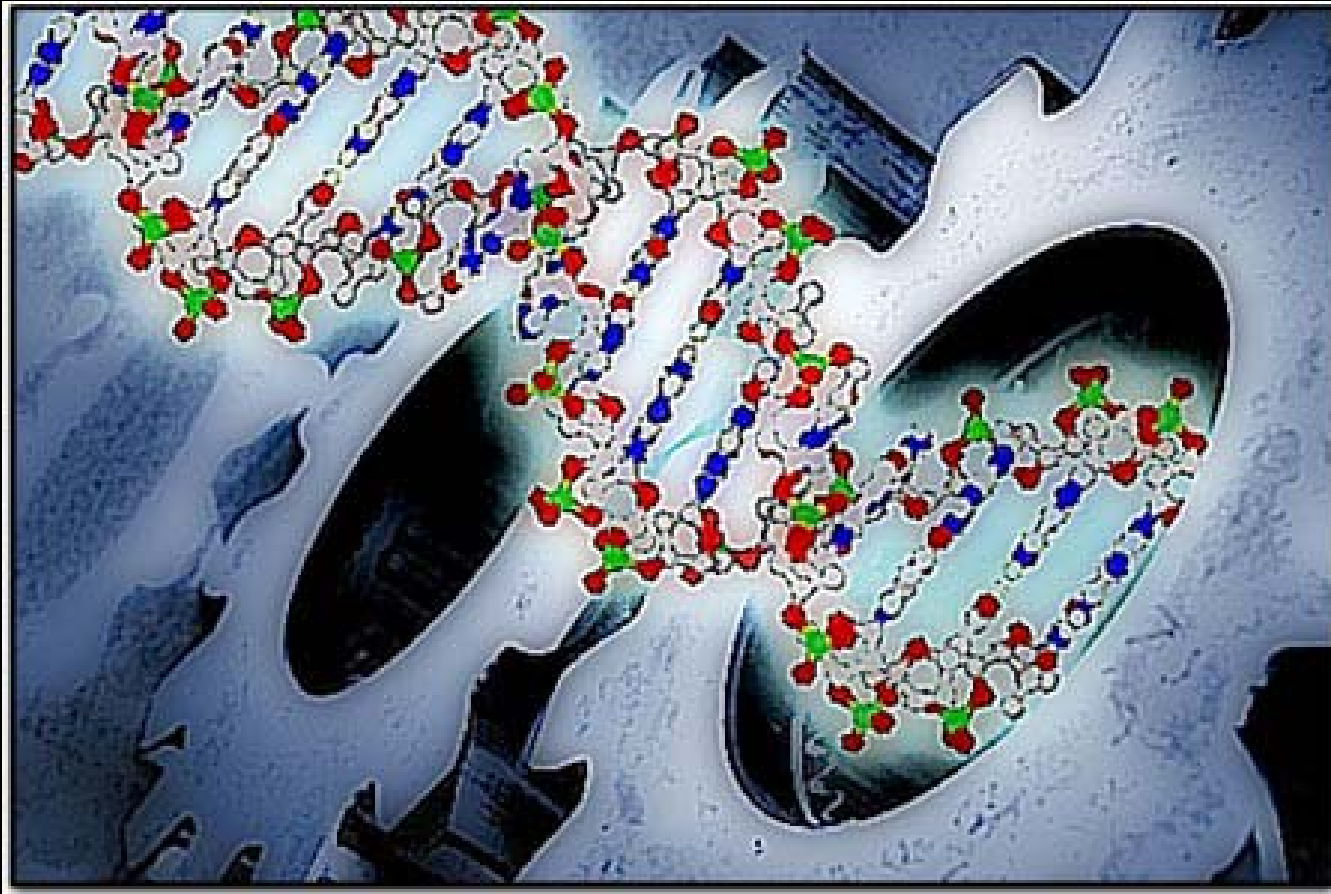
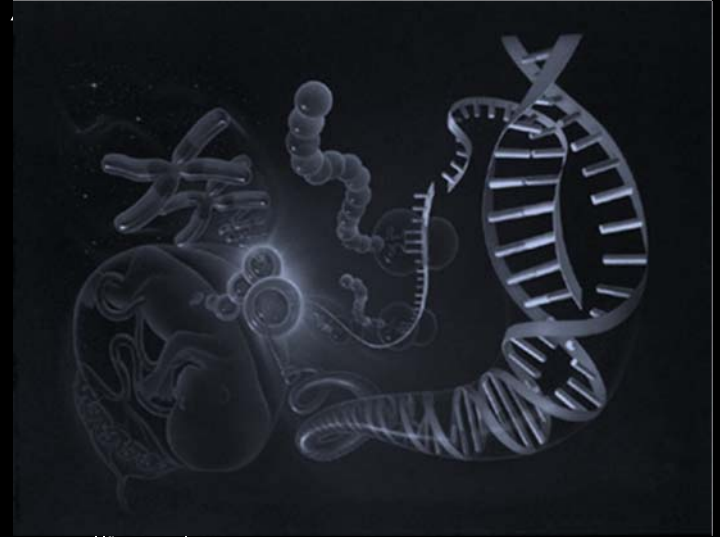


# Synthetic Biology

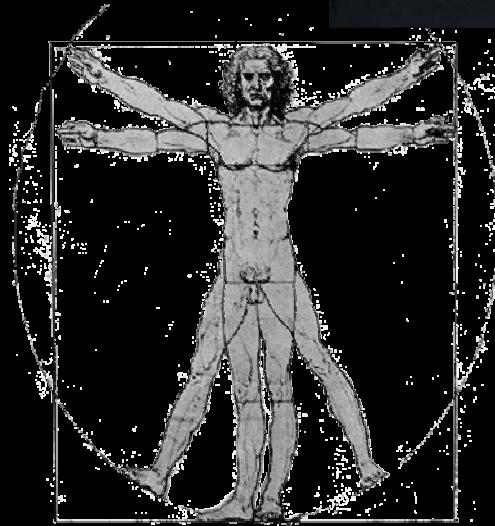


Niklas Bobrovitz, Sibat Khwaja, Daniela Navia, Andrew Wu  
Supervisor: Dr. Gregor Wolbring  
Presentation for Shad Valley , Calgary, July 2<sup>nd</sup> 2008

# What is synthetic Biology? (synbio)



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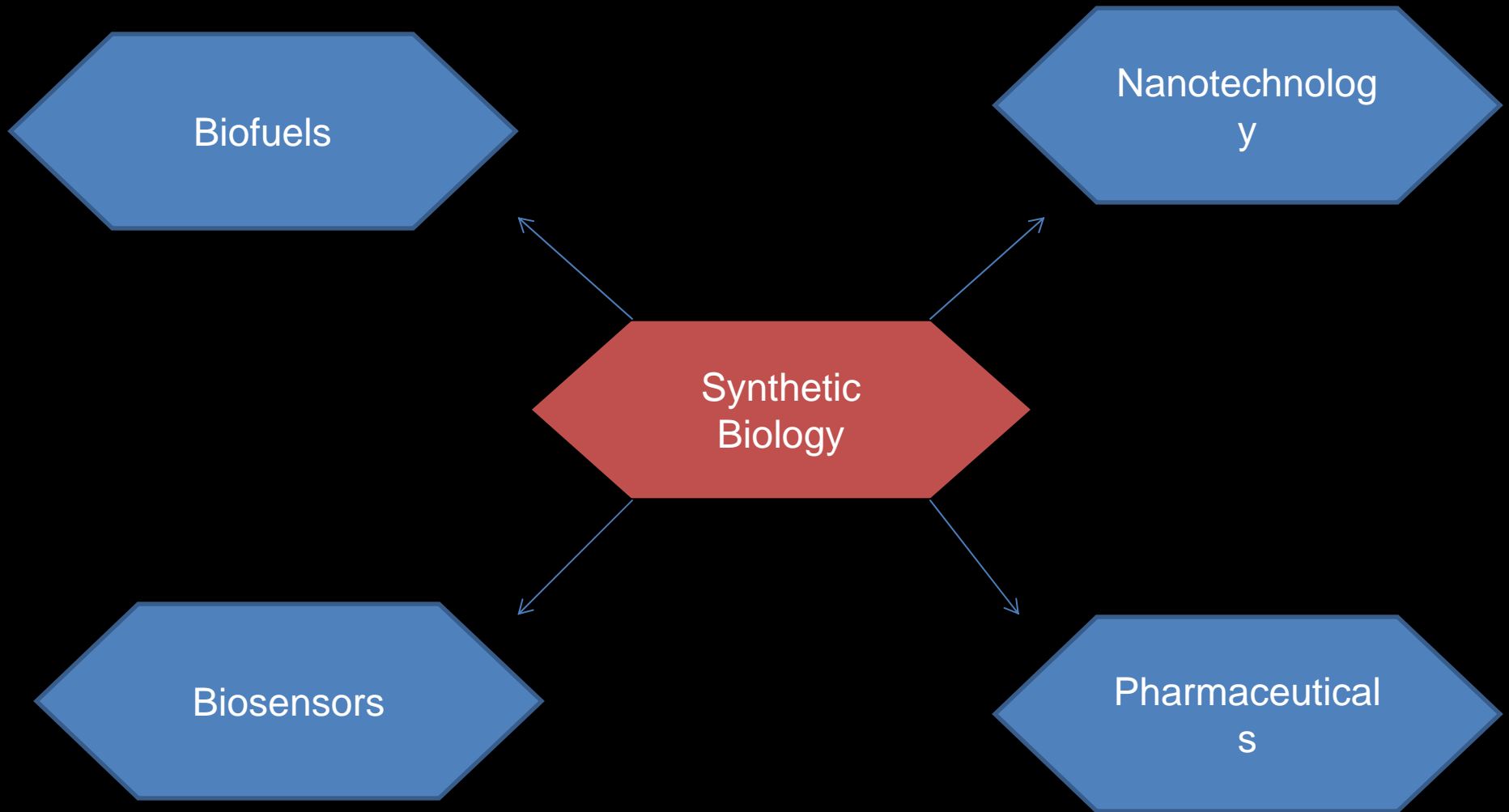
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- There are many definitions of synthetic biology and each have varying ethical, legal, social and economic implications
- One general definition of synthetic biology is; the design and construction of new biological parts, devices, and systems and the re-design of existing, natural biological systems for useful purposes

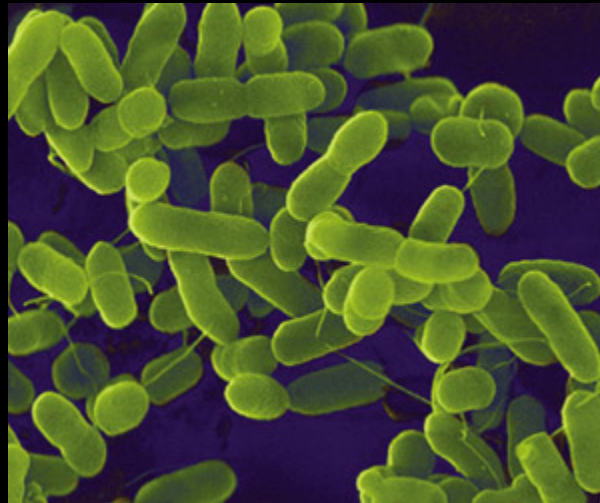
- Synthetic biology contains elements of nanotechnology and biotechnology
- Synthetic biology can be a technology based on the traditional genetic code
- Or it can be based on artificial genetic code, artificial amino acids and proteins.
- It can also be the creation of biological system with non-biological material or making of non-biological system with biological material.

# Applications of synthetic biology in the real world



# Biosensors

- Bacteria can be engineered to detect whether water is safe to drink by determining its pH and the levels of heavy metals or other potentially hazardous substances it may contain



# Nanotechnology



Insects with modified body structures and embedded micro-electromechanical systems (MEMS) have survived to adulthood in a US Defense Advanced Research Projects Agency (DARPA) programme (Wolbrink, 2008)

# Drug Development

Synthetic biology may be the next step in drug development by synthesizing a gene network that produces context depended bio-chemicals and potentially inserting them into a human.

One possibility may be engineering bacteria in the human gut which would detect vitamin insufficiencies and synthesize more as required.



# Biofuels

- Scientists in the field of synthetic biology are working on engineering bacteria that will produce renewable and sustainable liquid fuels.



# iGEM

The International Genetically Engineered Machine (iGEM) competition is a worldwide competition between teams of undergraduate, graduate and PhD students from different universities who are interested in the field of synthetic biology. When creating their projects, the teams use the BioBricks (standardized biological parts) from the iGEM registry to make new, functional biological systems. The teams come from Asia , Europe, United States and Canada to the Massachusetts Institute of Technology (MIT) in Boston to present their project.

# Examples from iGEM

- The Slovenian team won the grand prize in the iGEM 2007 for "engineering a cell that reacted with the body's excessive response to infection, which could lead to the fatal condition known as sepsis" This could have a potential to work in human body!



- Bactoblood is a cost-effective red blood cell substitute constructed from engineered *E. coli* bacteria being developed by the UC Berkley IGEM team.

MIT team made "eau d'ecoli", an engineered E. coli bacteria that would smell like mint while it is growing and smell like banana once it is done growing.



A possible use of this bacteria could be ensuring bathrooms always smell lovely

# The Registry for Standard Biological Parts

The goal behind iGEM is to allow people around the world to work and compete to develop new biological systems and parts.

The iGEM registry is an online database that stores all the new systems and parts created and used in the competition. The individual parts in the registry are referred to as biobricks because competing teams use the parts to build their systems.

# Our Survey and Goals

We created our survey as part of our goal to understand and communicate the level of ethical, legal, social and economic awareness of synthetic biology among different groups of people. We are going to present our findings at aGEM and iGEM as the first ethics team in the history of the competition.



# The Future of Synthetic Biology?



# Pictures

- <http://www.greentechmedia.com/assets/images/ecoli-article.jpg>
- [http://www.bbc.co.uk/health/images/300/ecoli\\_bacteria.jpg](http://www.bbc.co.uk/health/images/300/ecoli_bacteria.jpg)
- [http://www.xconomy.com/wordpress/wp-content/images/2007/08/istock\\_00000402589\\_3xsmall.jpg](http://www.xconomy.com/wordpress/wp-content/images/2007/08/istock_00000402589_3xsmall.jpg)
- [http://content.answers.com/main/content/wp/en-commons/thumb/2/22/310px-Leaf\\_1\\_web.jpg](http://content.answers.com/main/content/wp/en-commons/thumb/2/22/310px-Leaf_1_web.jpg)

- <http://innovech.files.wordpress.com/2007/11/genome3.jpg>
- <http://www.blog83.net/2008/06/09/animali-transgenici-creati-al-photoshop/>

# Questions

