Engineering Life: What is Synthetic Biology?

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Content

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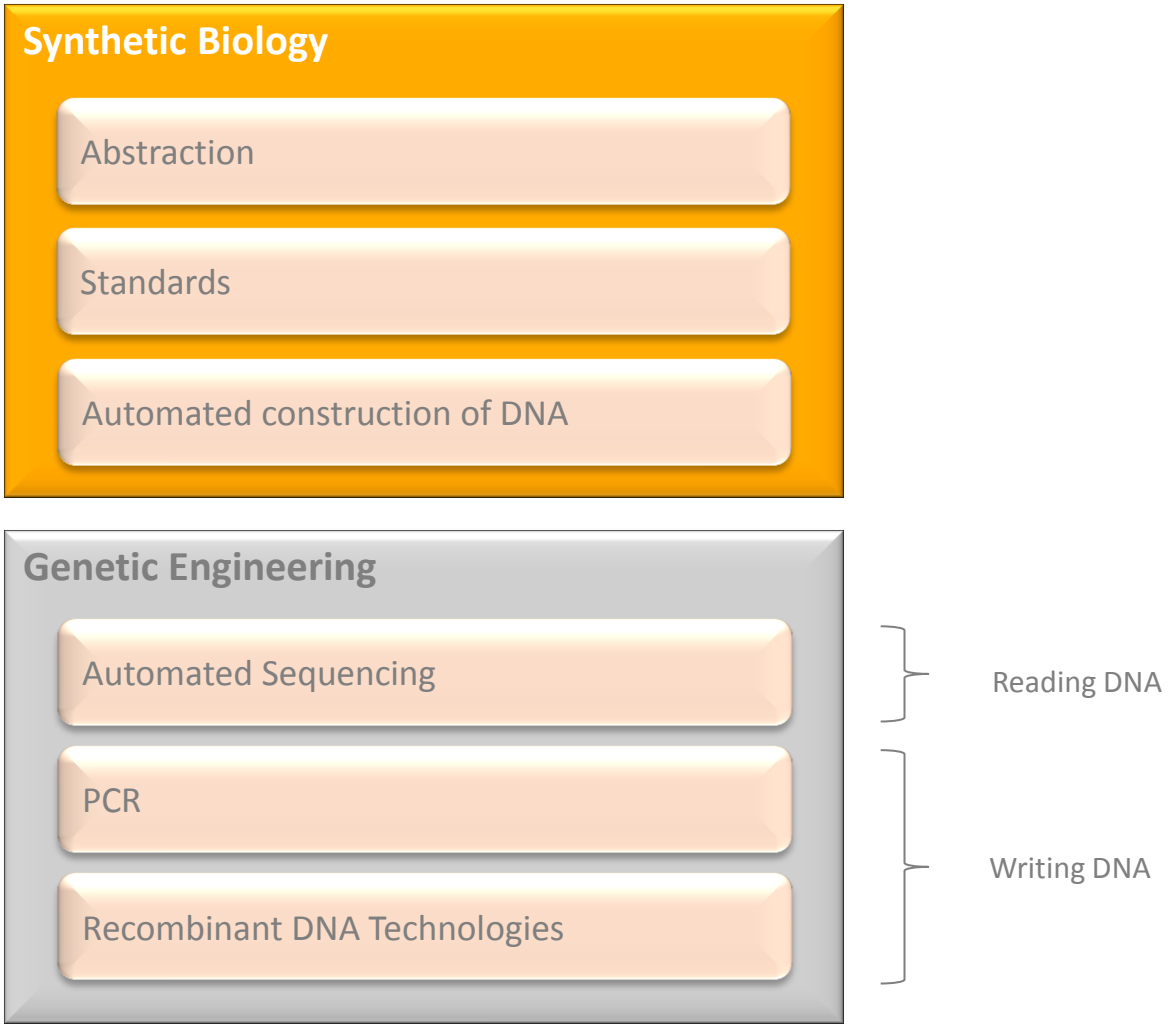
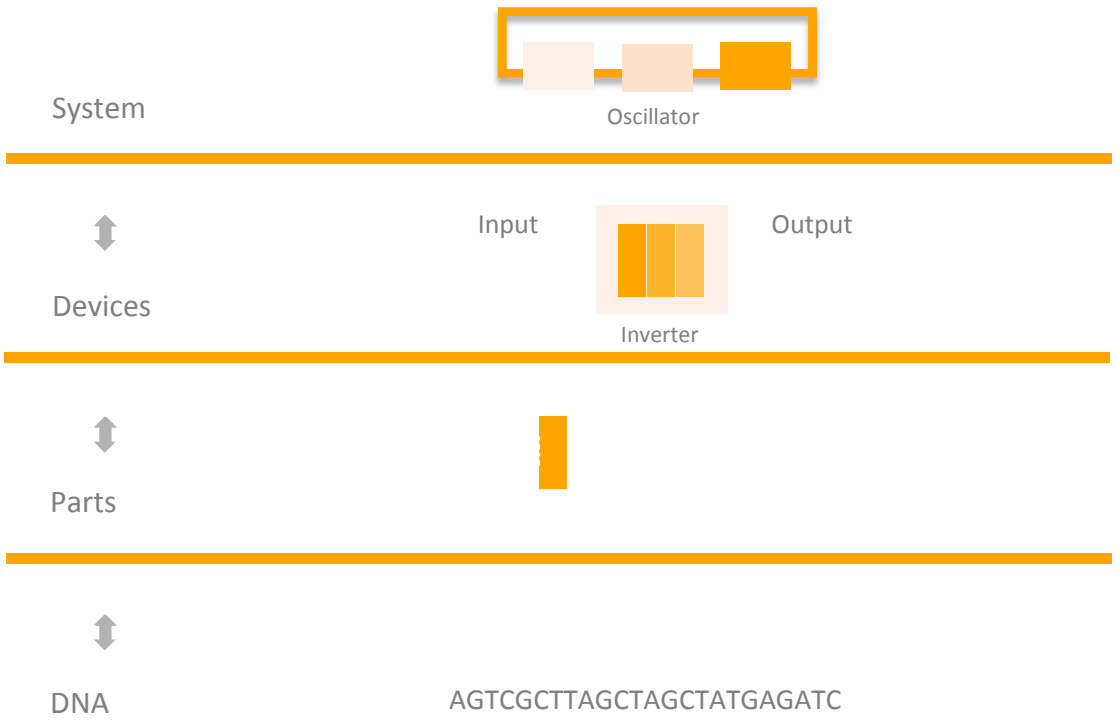
„Synthetic Biology is an approach to engineering biology." - Drew Endy

→ **Rational Design** and **Synthesis** of predictable and robust biological systems with novel functionalities not found in nature

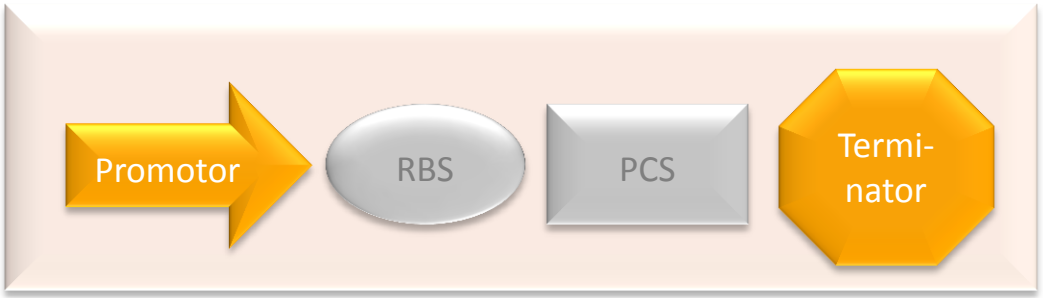
→ **Creation** of novel organisms for practical purposes


Synthetic Biology
Abstraction
Standards
Automated construction of DNA
Genetic Engineering
Automated Sequencing
PCR
Recombinant DNA Technologies
Reading DNA
Writing DNA

Abstraction



Devices: Protein Generator



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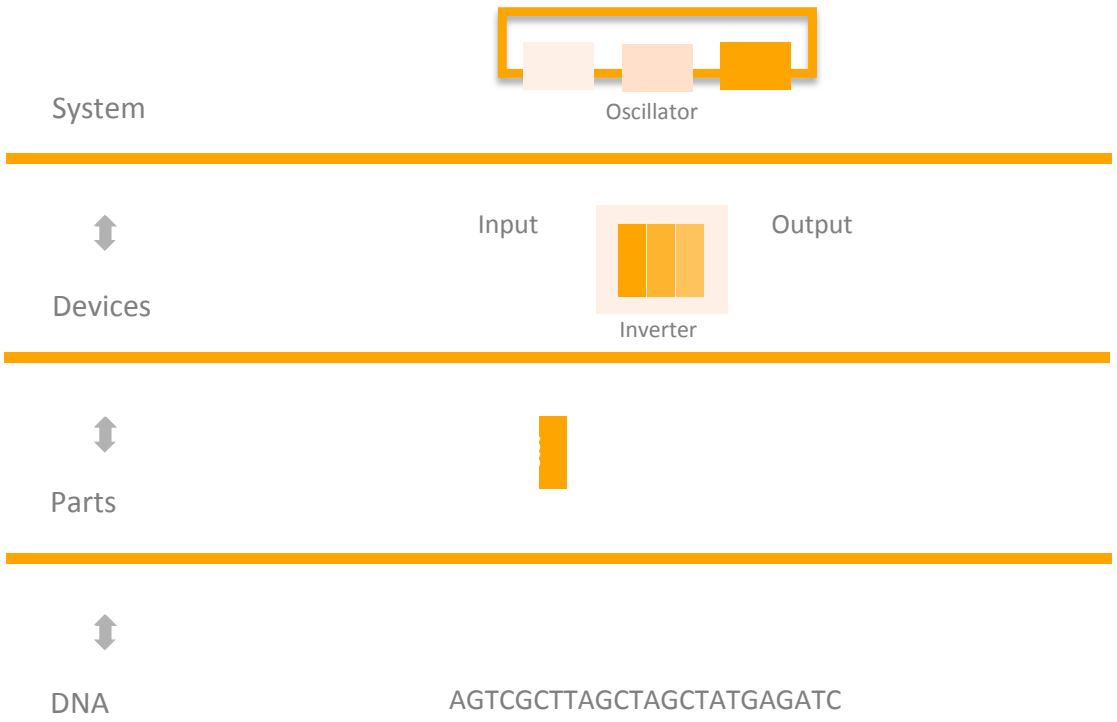
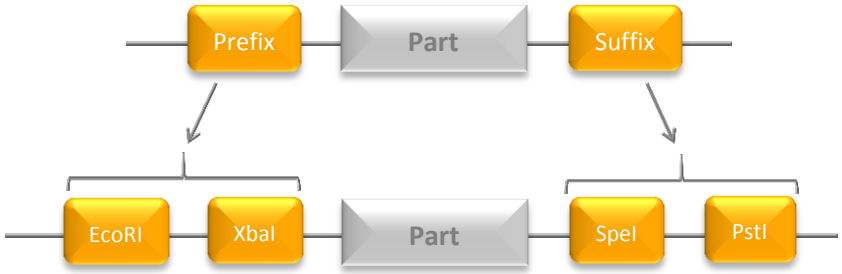
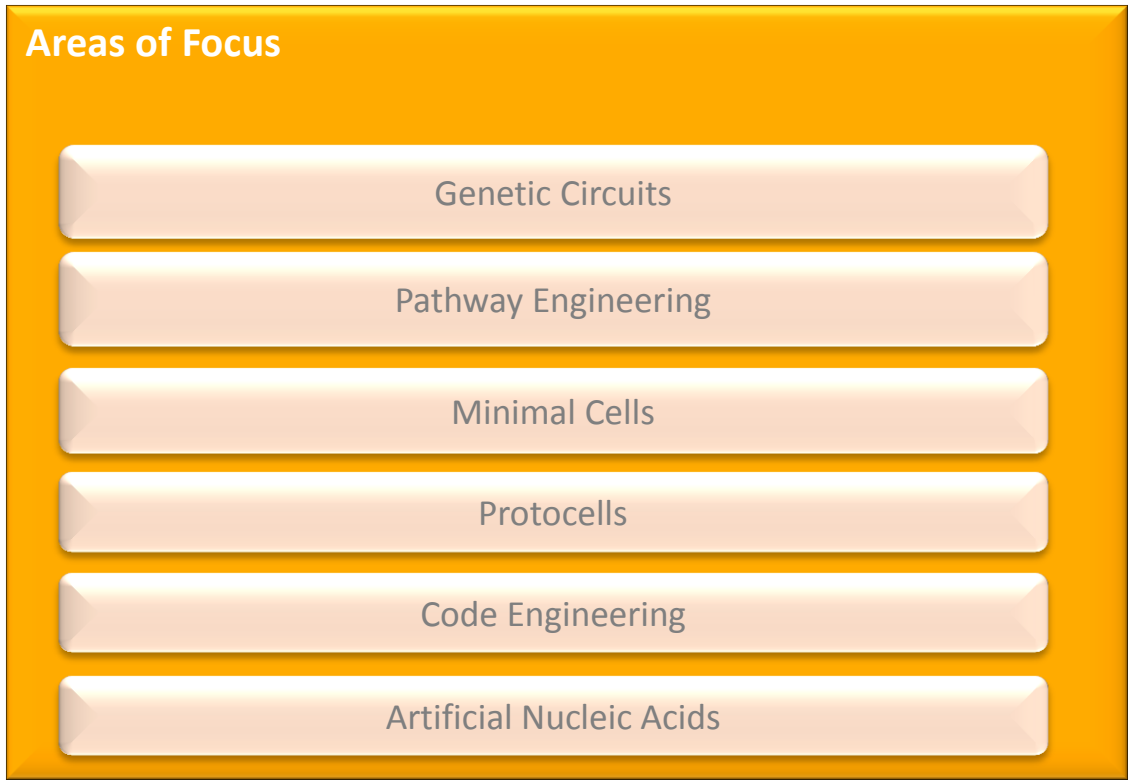


Standard Biological Parts – BioBricks



gca	GAATTC	gcggccgc	t	TCTAGA	g	**PART**	t	ACTAGT	a	GCGGCCG	CTGCAG	gct
cgt	CTTAAG	cgccggcg	a	AGATCT	c		a	TGATCA	t	cgccggc	GACGTC	gca
	EcoRI			**XbaI**				**SpeI**			**PstI**	


Areas of Focus
Genetic Circuits
Pathway Engineering
Minimal Cells
Protocells
Code Engineering
Artificial Nucleic Acids

Areas of Focus	Applications
Genetic Circuits	Self-sufficient control of urate homeostasis in mice by a synthetic circuit
Pathway Engineering	Artemisinin
Minimalcell	JCVI-syn1.0
Protocell	Cell-sized Lipid Vesicles as models of primitive life forms
Code Engineering	Bio-adhesive mussel proteins designed by modified prolines
Artificial Nucleic Acids	Nucleic Acids with artificial bases

iGEM = international genetically engineered machine competition

Goals

- Design and construction of biological systems with novel funtionalitites via standardized biological parts
- Enabling the systematic engineering of biology
- Promoting the open and transparent development of relevant SynBio-tools

Cooperation with the iGEM Team TU Munich

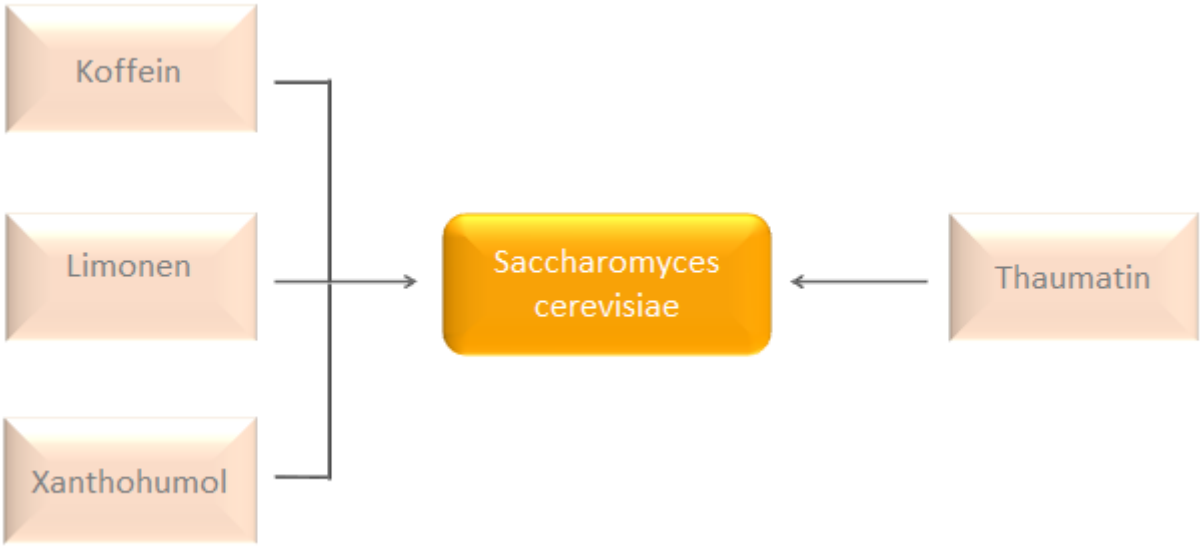
Project Description

→Design and Production of BioBricks

→Adaption of a yeast shuttle vector (pYES2)

→Use of a yeast integration vector for stable transfection

→Creation and characterization of different promotor systems


Koffein
Limonen
Xanthohumol
Saccharomyces cerevisiae
Thaumatin

TUM Brew – the first SynBio Beer

→ Synthetic Biology is the engineering of biology

→ The Engineering perspective may be applied at all levels of the hierarchy of biological structures

→ Synthetic Biology enables the design of biological sytems in a rational and systematic way

→ The construction of biological systems relies on standardized biological parts (BioBricks)

→ Synthetic Biology benefits from the knowledge drawn from a wide spectrum of scientific disciplines

→ Synthetic Biology can be regarded as a further development of these disciplines and their respective objectives

→ Synthetic Biology opens new avenues for biotech applications

→ BUT: most of the current work is still at the basic research level