

# Synthetische Biologie: Ethik und Forschungsförderung in Europa



CI-SYN-BIO

CQSY



SynbioSafety EU-China

国家自然科学基金委员会  
National Natural Science Foundation of China

FWF

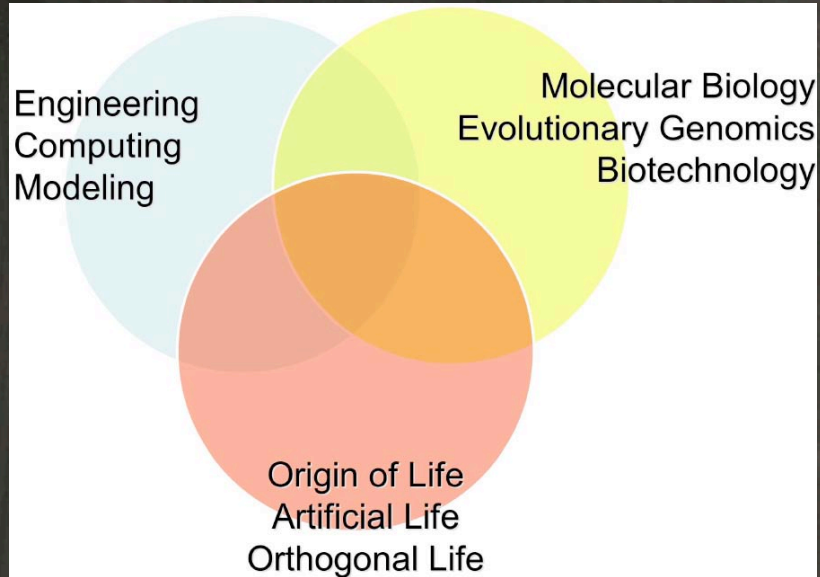
Der Wissenschaftsfonds.

Markus Schmidt, Lei Pei (IDC), Sibylle Gaiser  
Biosafety Working Group  
TA10, Wien  
1. Juni 2010

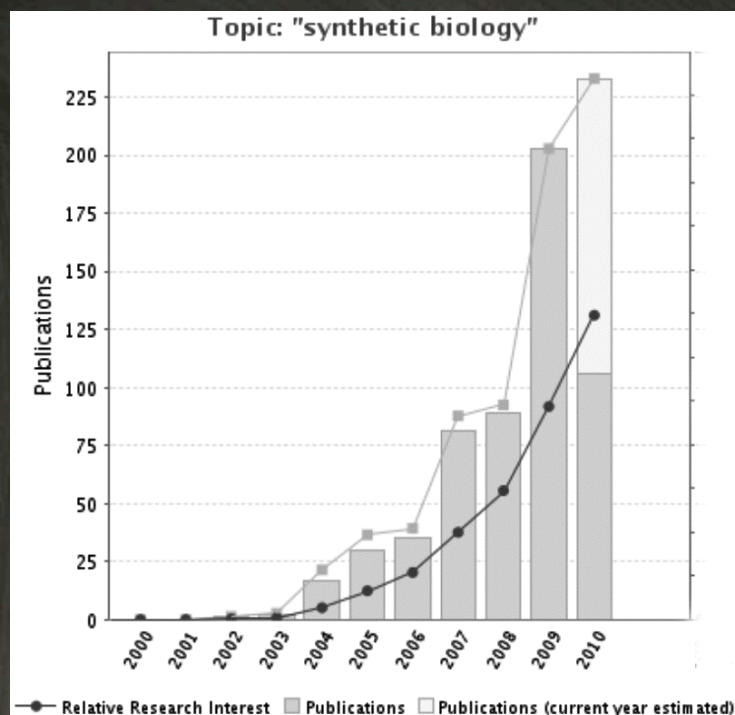
## Was ist synthetische Biologie?

- Viele Definitionen, aber zentral ist die
- Anwendung ingenieurs-wissenschaftlicher Prinzipien in der Biologie.
- Herstellung von neuen und unnatürlichen biologischen Systemen.

# Synthetische Biologie

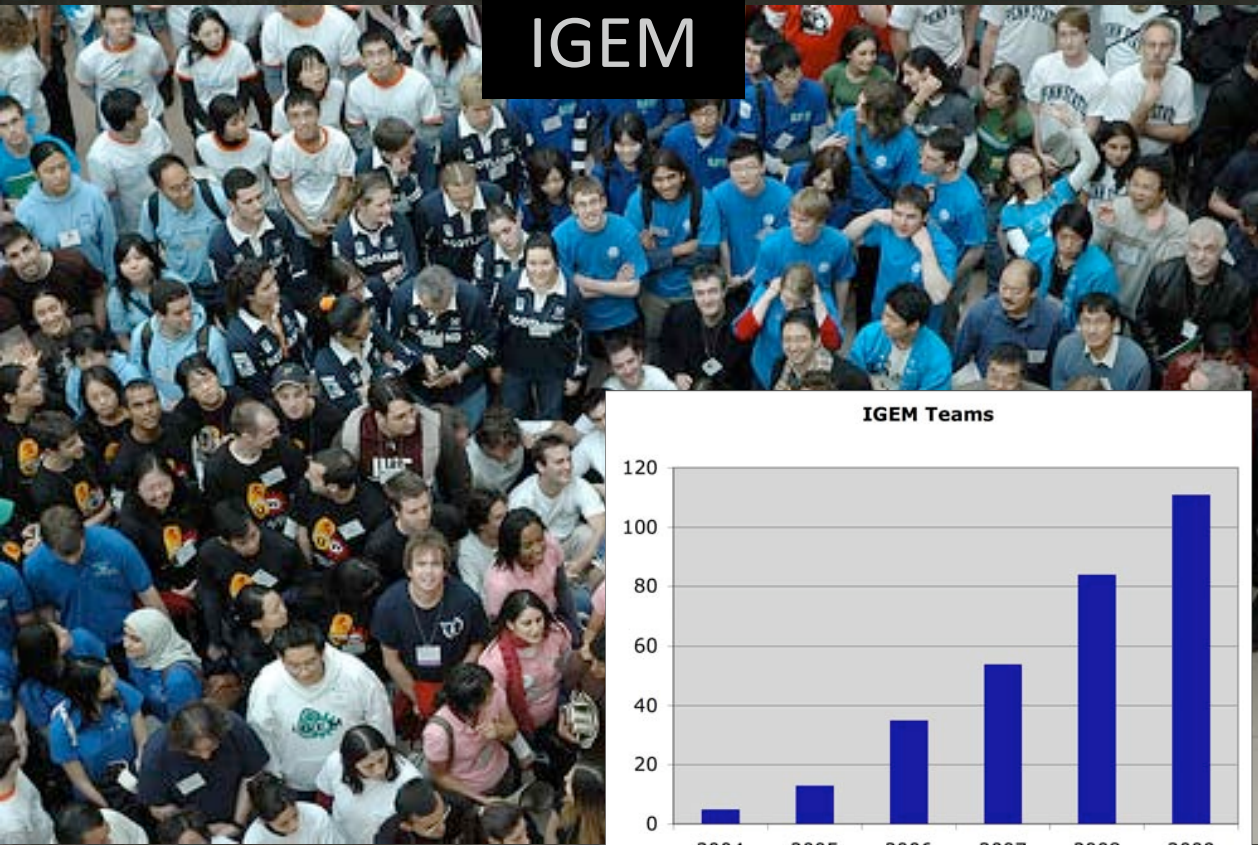


# Forschungsaktivität SB

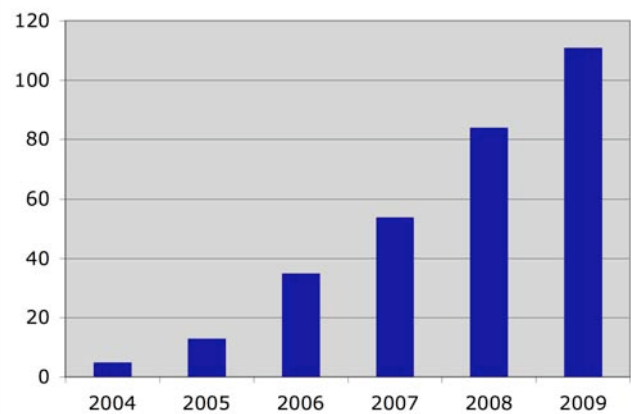




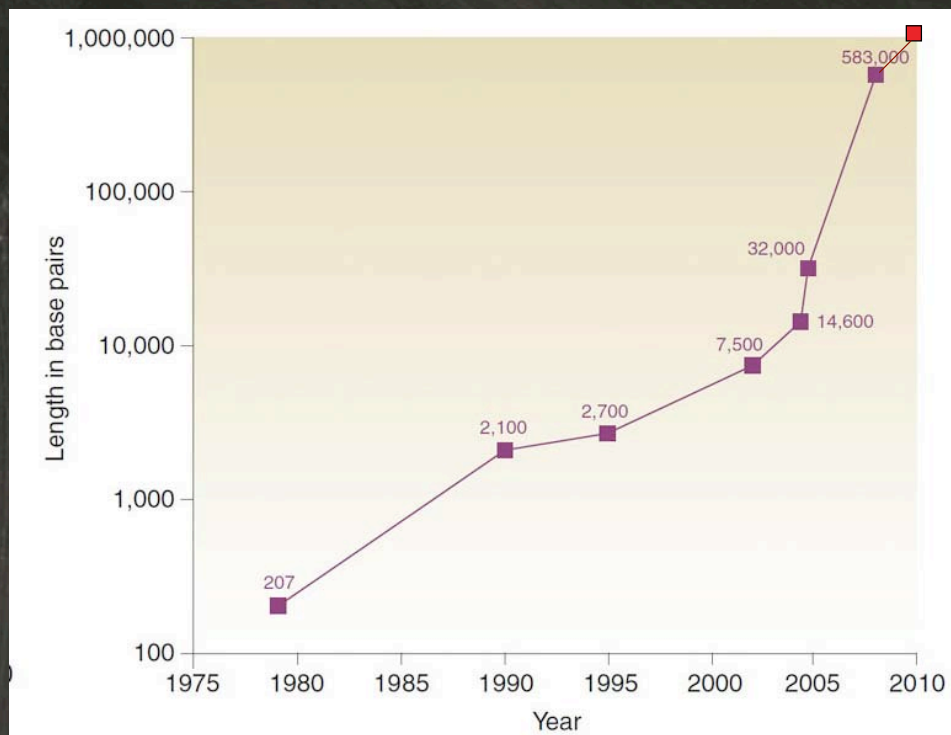
# IGEM



IGEM Teams

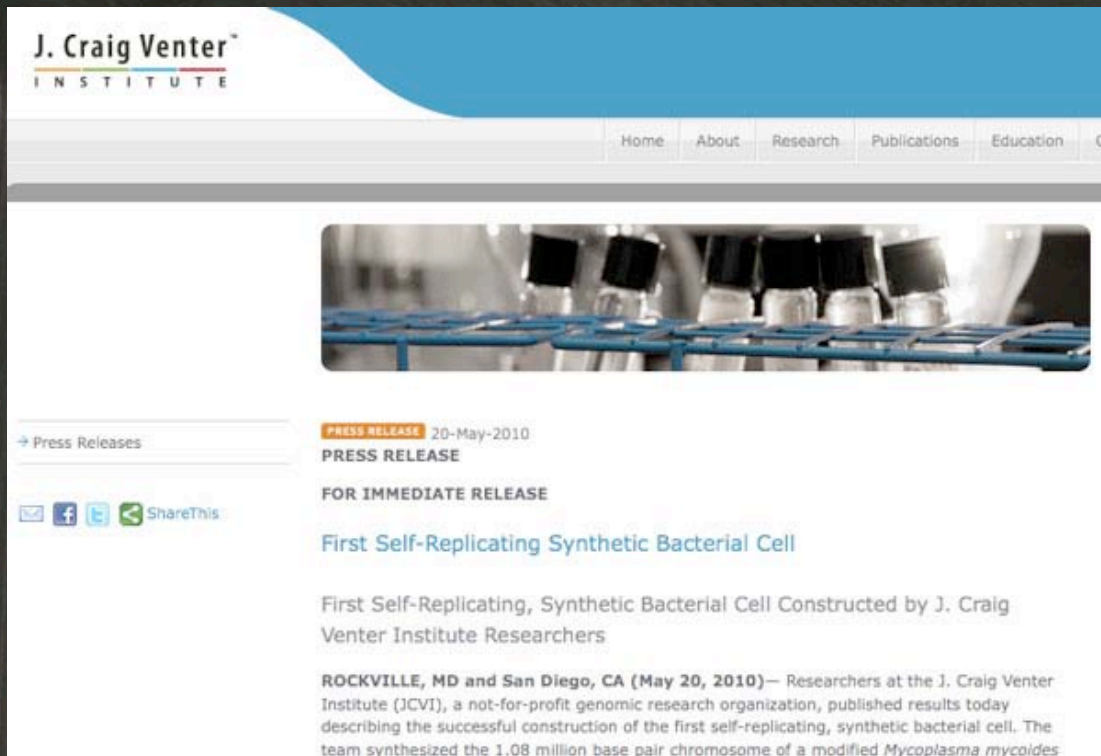


## Moore'sche Gesetz der DNA Synthese



Carlson 2009. Nat Biotech.

# Venter: globales Medieninteresse



**J. Craig Venter<sup>™</sup>**  
INSTITUTE

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**PRESS RELEASE** 20-May-2010  
**PRESS RELEASE**  
**FOR IMMEDIATE RELEASE**

**First Self-Replicating Synthetic Bacterial Cell**

First Self-Replicating, Synthetic Bacterial Cell Constructed by J. Craig Venter Institute Researchers

**ROCKVILLE, MD and San Diego, CA (May 20, 2010)**— Researchers at the J. Craig Venter Institute (JCVI), a not-for-profit genomic research organization, published results today describing the successful construction of the first self-replicating, synthetic bacterial cell. The team synthesized the 1.08 million base pair chromosome of a modified *Mycoplasma mycoides*

THE WHITE HOUSE  
WASHINGTON  
May 20, 2010

Dr. Amy Gutmann  
President and Christopher H. Browne  
Distinguished Professor of Political Science  
University of Pennsylvania  
1 College Hall, Room 100  
Philadelphia, Pennsylvania 19104-6380

Dear Dr. Gutmann,

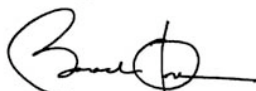
As you know, scientists have announced a milestone in the emerging field of cellular and genetic research known as synthetic biology. While scientists have used DNA to develop genetically modified cells for many years, for the first time, all of the natural genetic material in a bacterial cell has been replaced with a synthetic set of genes. This development raises the prospect of important benefits, such as the ability to accelerate vaccine development. At the same time, it raises genuine concerns, and so we must consider carefully the implications of this research.

I therefore request that the Presidential Commission for the Study of Bioethical Issues undertake, as its first order of business, a study of the implications of this scientific milestone, as well as other advances that may lie ahead in this field of research. In its study, the Commission should consider the potential medical, environmental, security, and other benefits of this field of research, as well as any potential health, security or other risks. Further, the Commission should develop recommendations about any actions the Federal government should take to ensure that America reaps the benefits of this developing field of science while identifying appropriate ethical boundaries and minimizing identified risks. My Science and Technology Advisor, Dr. John P. Holdren, will be in communication with you about the scope and progress of your study.

I ask that the Commission complete its study within six months and provide me with a report with its findings, as well as any recommendations and suggestions for future study that the Commission deems appropriate. Given the importance of this issue, I request that the Commission consult with a range of constituencies, including scientific and medical communities, faith communities, and business and non-profit organizations.

It is vital that we as a society consider, in a thoughtful manner, the significance of this kind of scientific development. With the Commission's collective expertise in the areas of science, policy, and ethical and religious values, I am confident that it will carry out this responsibility with the care and attention it deserves.

Sincerely,



*„I therefore request that the Presidential Commission for the Study of Bioethical issues undertake, as their first order of business, a study of this scientific milestone...”*

Barack Obama on SB

May 20th, 2010



## US Kongress Anhörung zu Nutzen/Risiken der SB



## European Group on Ethics in Science and New Technologies



The European Group  
on Ethics in Science  
and New Technologies  
to the European Commission

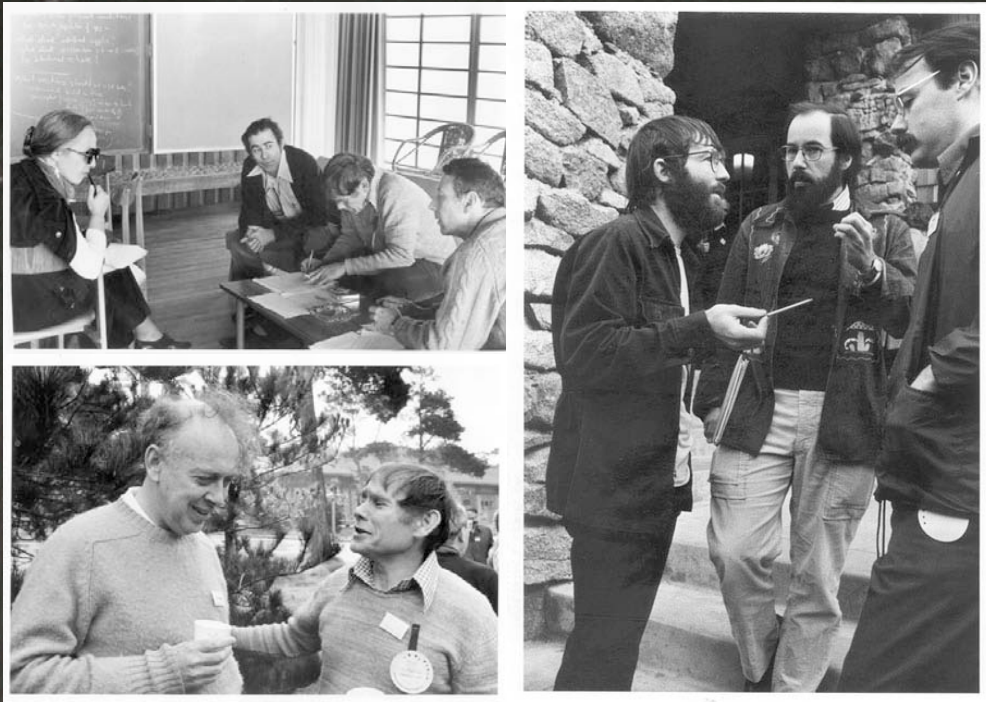
Ethics of  
synthetic biology

Opinion No

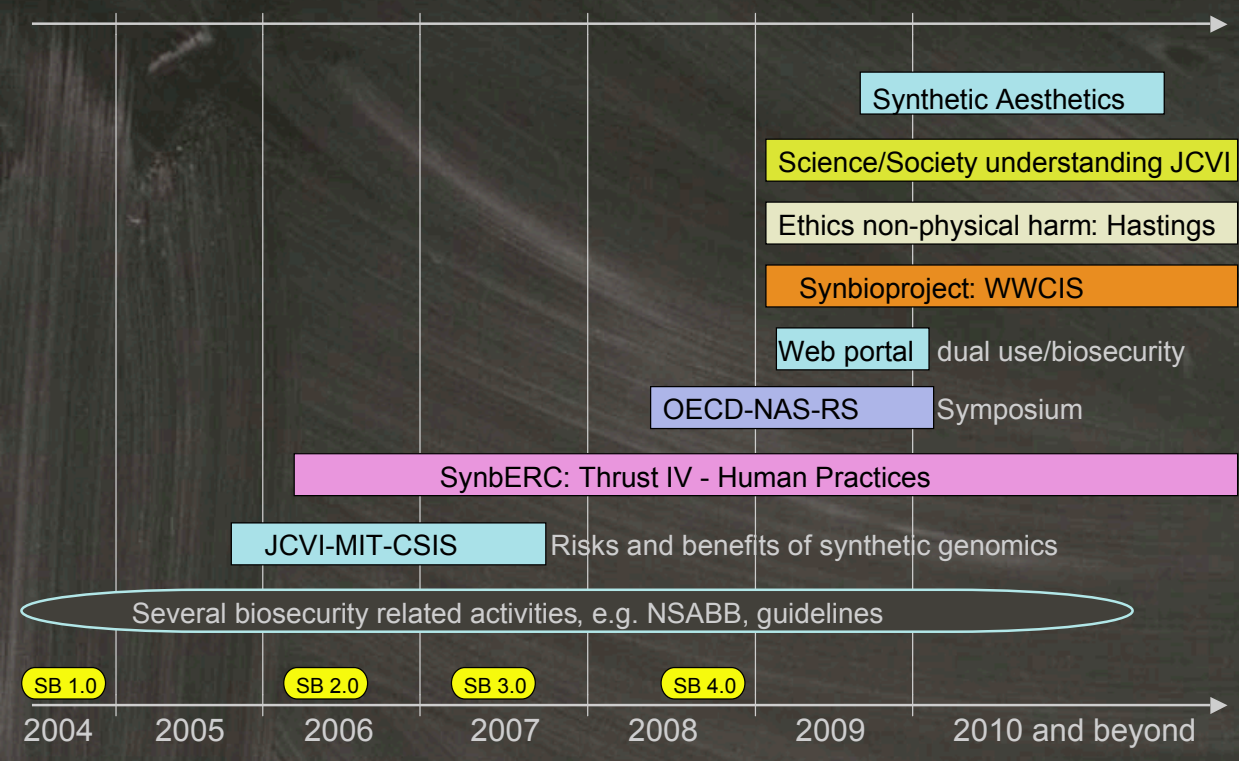
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BRUSSELS, 17 NOVEMBER 2009

# Asilomar Konferenz 1975

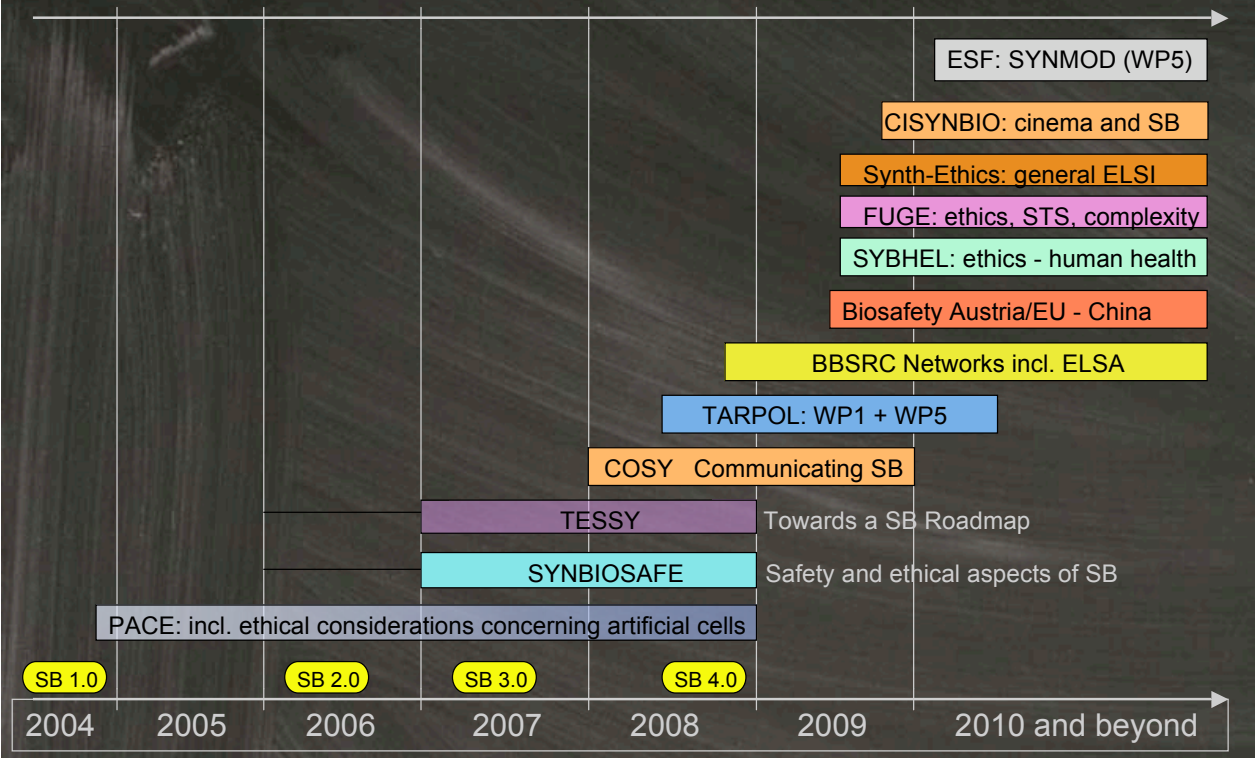


# US Projekte zu SB-ELSA Themen





# Europäische Projekte zu SB-ELSA Themen



## EUROCORES Programme European Collaborative Research

**Synthetic Biology: Engineering  
Complex Biological Systems  
(EuroSYNBIO)**

## Call for Outline Proposals

### What is EUROCORES?

The ESF European Collaborative Research (EUROCORES) Programmes offer a flexible framework for researchers from Europe to work on questions which are best addressed in larger scale collaborative research programmes. The EUROCORES Programmes allow excellent researchers from different participating countries to collaborate in research projects 'at the bench'. They also allow, when appropriate, colleagues from non-European countries, for example the US, to participate. The Programmes encourage and foresee networking and collaboration of researchers to achieve synthesis of scientific

### Synthetic Biology: Engineering Complex Biological Systems (EuroSYNBIO)

Following agreement with funding organisations in *Austria, Belgium, Czech Republic, Finland, Germany, Italy, Luxembourg, The Netherlands, Norway, Romania, Slovakia, Slovenia, Switzerland, United Kingdom*, the European Science Foundation is launching a Call for Outline Proposals for Collaborative Research Projects (CRPs) to be undertaken within the EUROCORES Programme EuroSYNBIO. EuroSYNBIO will run for 4 years and it includes national research funding, as well as support for networking and dissemination activities provided through the ESF<sup>1</sup>. The Programme aims to support high quality multidisciplinary research.

## 4 Themenfelder

- 1) System assembly and molecular and cellular complexity in a context of Darwinian evolution
- 2) Computational design tools
- 3) The biosystems design laboratory
- 4) The social context

## ESF EUROSYNBIO

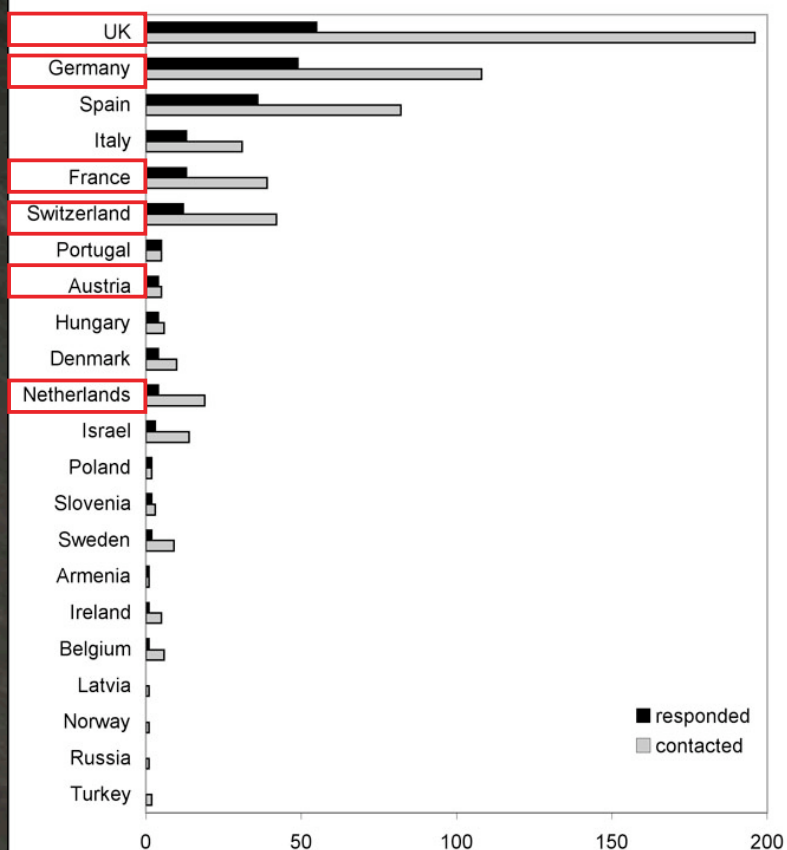
- 24 Proposals Stufe 1
- 18 eingeladen in Stufe 2
- 9 positiv bewertet
- 5 Projekte werden gefördert
- > ca 30 Individual Projects, davon nur 1 ELSA



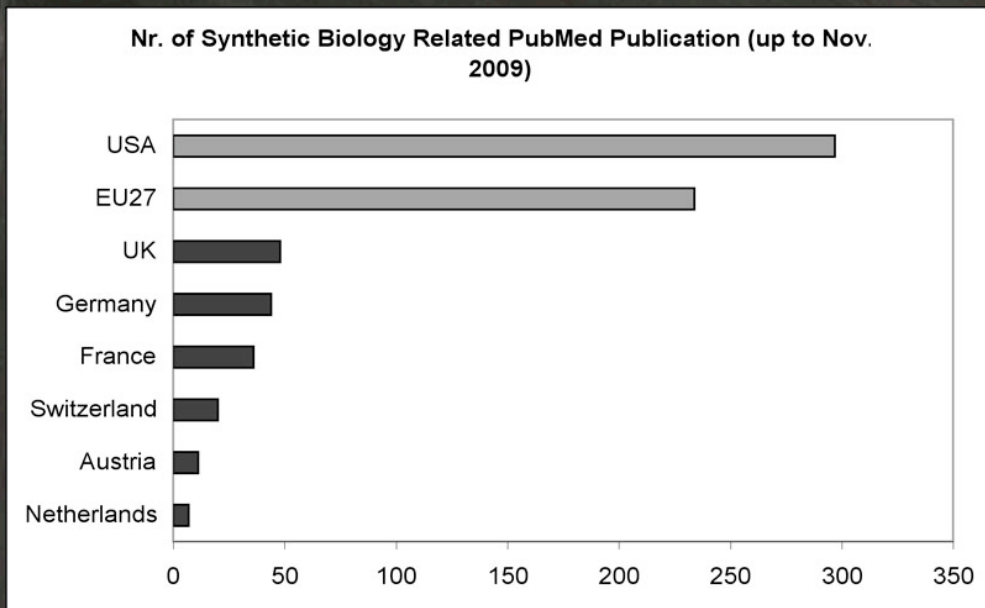
# Ethik und Forschungsförderung in Europa

- Auswahl relevanter/interessanter Länder
- UK, DE, FR, NL, CH, AT
- Interviews mit nationalen  
Forschungsförderern (jeweils 2 pro Land)

Number of identified scientists working on synthetic biology



# Forschungsaktivitäten in Europa



## SB: Eine Definitionsfrage

	AT-1	AT-2	CH-1	DE-1	DE-1	FR-1	FR-2	NL-1	NL-2	UK-1	UK-2
biocircuits using standard biological parts	+	+	+	+	+	+	+	+	?	+	+
biocircuits <u>without</u> standard biological parts?	+	+	+	+	+	+	+	+	?	+	+
engineering cells to produce fine chemicals	+	-	+	+	+	+	+	+	+	+	+
creating artificial life	-	+	+	-	-	+	+	-	?	+	+
computer software for biocircuit design	-	+	+	+	+	+	+	+	-	+	-
artificial ecosystems	-	-	+	?	?	+	+	-	-	+	-
enlarged genetic alphabet	+	+	+	+	+	+	+	+	+	+	+
DNA with chemically different backbone	+	+	+	+	+	+	+	+	+	+	+
minimal genome	-	-	+	+	+	+	+	+	?	+	+
understanding the origin of life	+	-	-	+	+	+	+	-	+	+	+



# Ergebnisse Fördersituation

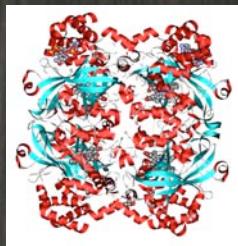
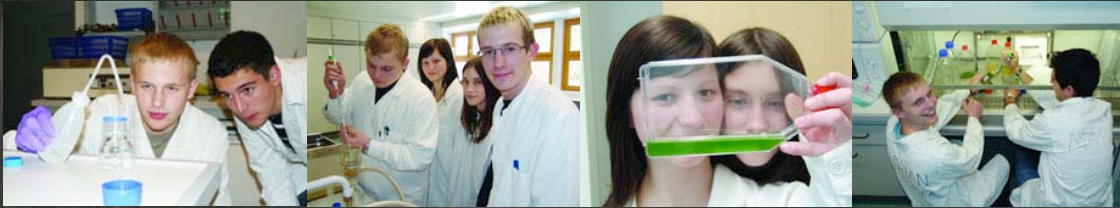
Land	SB community	ELSA community	SB Förderung	ELSA Förderung	Link Förderung / community
Austria	—	+	—	+	+
France	+	+ / —	—	—	—
Germany	+	+	+	+	—
Netherlands	+	+	+	+ / —	+
Switzerland	+	+ / —	+	+ / —	+
UK	+	+	+	+	+

## Ö: HFLS Ursprung, Salzburg

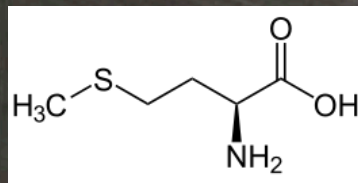


## Proteine 2.0

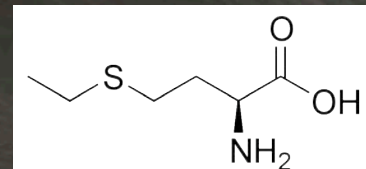
### Amylase/Katalase mit nicht-kanonischen Aminosäuren



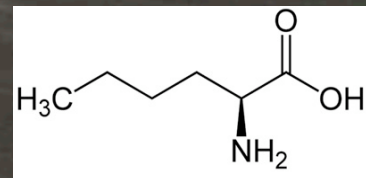
*Catalase*  
*Bacillus subtilis* 1A55



Methionine



Ethionine



Norleucine

## Jugend innovativ: Bundesminister Mitterlehner zeichnete die besten Schüler-Teams aus





# Cinema and Synthetic Biology


**CISYNBIO**  
 CINEMA AND SYNTHETIC BIOLOGY

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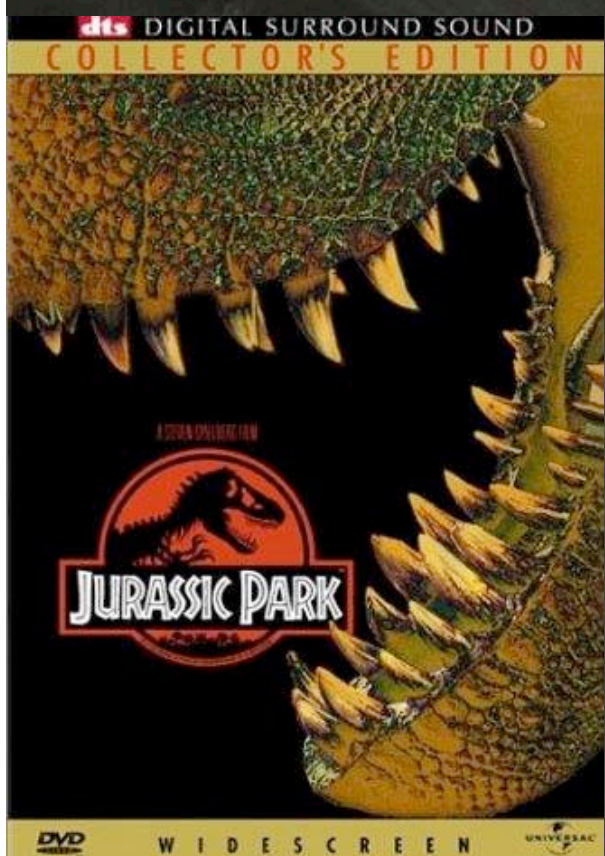
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Project Name: CISYNBIO - Cinema and Synthetic Biology  
 Duration: August 2009 to August 2012  
 Coordinator: Dr. Markus Schmidt (IDC). [More about the team >>](#)  
 Funding: CISYNBIO is funded with 285k€ by the Austrian GEN-AU ELSA III programme

Orthosome Text

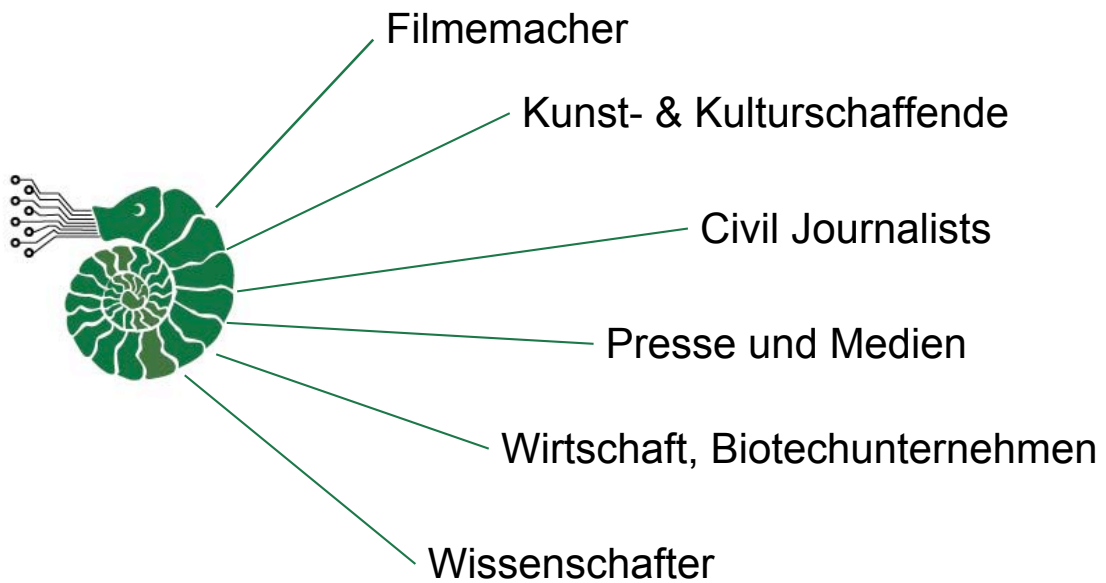
[www.cisynbio.com](http://www.cisynbio.com)



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