

#### **Public Perception and Media:**

#### The Case of Synthetic Biology

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#### Introduction: Food for thought...

"Following the Enlightenment, progress in science and technology was considered to be a goal in its own right. But today, science is no longer viewed unquestioningly as the harbinger of better times. Society's view of scientific enquiry has become more sophisticated and nuanced... The gap between the scientific community and society at large has widened... People are not willing just to sit by and let the scientific community and the politicians set the agenda".

EC (2005b), Science and Society Action Portfolio - Today's Science for Tomorrow's Society, Brussels.

"It is important that European governments and scientific bodies think in advance about all the open questions now that the public is unaware of synthetic biology. Learning from the backlash that genetically modified plants created in Europe, we should think well in advance the answers we will offer to society".

Serrano, Luis (2007), "Synthetic Biology: Promises and Challenges", Molecular Systems Biology, 3, Number 158.



#### Food for thought...

# How well have we managed the introduction of other technologies? Have we, as a society, learned anything?

"One lesson of issues such as GM crops is that ordinary people do not always think like philosophers, especially on subject as sensitive as the creation of life. A backlash may be irrational, but it could still threaten a promising field".

Mark Henderson, "Time to Convince the Public", The Times, October 27, 2007.

"If Synbio is to deliver it will need broad public support and that will require much more engagement than has happened to date".

Mark Henderson, "Time to Convince the Public", The Times, October 27, 2007.



### Key questions for today...

1) How the media addressed synthetic biology in Europe and in the US?

2) How members of the **public** perceive the science and its applications?

3) What are the main **societal** concerns on synthetic biology in Europe and the US?



#### But first... is synthetic biology really a big deal?









Ranking of American press articles on synthetic biology, by number of articles during January 2003–January 2008.

New York Times	10
San-Francisco Chronicle	7
Boston Globe	6
Seattle Times	6
Washington Post	5
Houston Chronicle	5
Los-Angeles Times	5
Pittsburgh Post- Gazette	3
Chicago Tribune	2
Buffalo News	2
Other	14





Ranking of European press articles on synthetic biology, by number of articles during January 2003–January 2008.

The Guardian (UK)	18
Le Monde (FR)	8
Le Temps (CH)	7
Die Zeit (DE)	7
de Volkskrant (NL)	6
The Telegraph (UK)	6
The Economist (UK)	6
Frankfurter Allgemeine Zeitung (DE)	5
El Mundo (ES)	5
Telepolis (DE)	5
Other	39





#### How was synthetic biology framed?

"It is life but not as God planned it" (The Guardian, April 1, 2004)

"Playing God: The man who would create artificial life" (The Independent, January 25, 2008)

"As DNA research advances, science plays God ever more; New life forms— The line between biological and artificial is about to blur as life is synthesized in labs with man-made genetic material." (*The Seattle Times*, December 24, 2007)

"The Bacterie van Frankenstein" – "Frankenstein bacteria" (NRC Handelsblad, December 14, 2005)

"Synthetisches Leben – Nano in Gottes Namen" – "Synthetic Life – Nano in the name of God" (*Die Zeit*, September 28, 2006)

"Wunschtraum und Horrorvision – Craig Venter will die erste kunstliche Lebensform geschaffenhaben." – "Great dreams and vision of horror – Craig Venter claims to be the first to have made synthetic life forms." (*Sueddeutsche*, March 16, 2008)

"La vie inventée de toute pièces" – "Life invented from scratch" (Le Monde, January 24, 2008)



#### **Optimistic US versus Precautionary Europe?**

Percentage of news stories regarding synthetic biology that mention potential benefits, potential risks or both (January 2003-January 2008)







Different EU-US research priorities? Emergence of the "Green Agenda"?

Number of news stories mentioning each potential benefit of synthetic biology (January 2003-January 2008)





Different EU-US risk perceptions? Biosecurity versus Biosafety?

Number of news stories mentioning each potential risk of synthetic biology (January 2003-January 2008)





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### Public Perception of Synthetic Biology

"Who is afraid of a synthetic human?" (*The Times*, May 17, 2008)

"Making a brand new DNA code, I think it is dangerous." Male Participant, Focus group 2, Baltimore, August 2008





#### Quantitative Study:

The first representative national phone survey of <u>1,003 US adults</u> nationwide conducted on August 20-25, 2008 by Peter D. Hart Research Associates at the request of the Wilson Center

#### Qualitative Study:



Two focus groups conducted in Baltimore (Maryland) on August 6, 2008 among {18-65} adults – one focus group among women, one among men – from a relatively large diversity of social, political and religious background



#### Public Perception of Synthetic Biology Focus Groups





In both focus groups and phone survey, 70% of participants have heard nothing at all about synthetic biology

How much have you heard about synthetic biology?





Despite their lack of knowledge, 70% of the phone survey participants gave a personal description of synthetic biology and 66% ventured an opinion on the risk-benefit tradeoff.

Will potential benefits of synthetic biology outweigh its potential risks?





What Ideas, Images, Or Words Do You Associate With Synthetic Biology?

"It sounds like we are playing God. Who are we as humans to think we can design or redesign life? It might be nice to be able to do so, but is it right? It seems there are many ethical and moral issues. Perhaps we are getting too arrogant." Male Participant, Focus Group 2

"I feel concerned because, not being perfect, we believe we know what is best in creating life. As in science-fiction movies, when we do—in time—it goes in a direction we didn't think about... I believe when life is created it is meant to be created that way for a purpose we may not even know right now." Female Participant, Focus Group 1

"This 'synthetic biology' involves engineering of genetic codes, requisites to genetic engineering. I mean, it seems like, to me, that with this, you don't even need a base DNA. You just create it. [...] I don't like it"; "Making a brand new code, I think it is dangerous." Male Participant, Focus Group 2



Discomfort toward the "Playing God" aspect of synthetic biology

The Cultural Cognition Project, Yale Law School:

They take at their point of departure the assumption that public attitudes about synthetic biology are likely to be influenced by psychological dynamics associated with cultural cognition (Kahan et al. 2009)

#### Research at the University of Wisconsin-Madison:

"Researchers have found that moral issues and concerns about "unnatural" technologies were important in explaining negative attitudes towards genetically modified (GM) organisms, which were seen as disturbing nature and natural processes, and perceived as risky and immoral. The potential conflict between religiosity and science has been much more salient for nanotechnology, in particular with respect to nano-bio-info (NBIC) technologies that may, in the future, enable us to *create life and intelligence* (our emphasis) at the nanoscale without divine intervention." (Scheufele et al. 2008)



What would you say are some of the major benefits of synthetic biology? Which applications do you think is most promising?

#### **Overall Rankings of Potential Applications of Synthetic Biology**

(Values Reflect Number of Participants in Each Group Who Valued the Given Application the Most)

Potential Applications of Synthetic Biology	Focus Group 1 (Female Participants)	Focus Group 2 (Male Participants)
Biofuels	4	4
Drugs for Treating Diseases	1	3
New Ways to Treat Cancer	3	
Sensing Harmful Contaminants	0	0
Cleaning Up the Environment	3	1



What would you say are some of the major benefits of synthetic biology? Which applications do you think is most promising?(2)

Participants were more ambivalent about the benefits of medical applications developed using synthetic biology...

"My concern, again, would be injecting anything synthetic inside of my body. That's just where it causes concern for me because I understand they want to do the research for it, but, I mean, I wouldn't want to volunteer, do it on me or my family, so that's what concerns me." Female Participant, Focus Group 1

"Biofuels sound promising, but, you know, some of the other stuff, about injecting into the body, in the site of a cancer to attack the tumor. Anybody see...I don't know... what could happen with something like that?" Male Participant, Focus Group 2



Whose job should it be to regulate or manage the risks associated with synthetic biology?

Participants were highly concerned about the "unknowns" and "long-term effects" – concerns for which outcomes and effects cannot be predicted by anyone, including experts in synthetic biology... They propose to have an independent oversight structure to advise the federal government.

"I just want to say that I think the overall goal is good, the quality of life and making things cheaper and easier, and I guess, for me, the biggest concern is the ethics. [...] If we move forward with this, then who sets the boundaries within whatever it is that they are doing?" Female Participant, Focus Group 1

"I was going to add the exact same thing, the moral and ethical boundaries are justwho is going to set them?" Female Participant, Focus Group 1



Whose job should it be to regulate or manage the risks associated with synthetic biology? (2)

**Best Approach to Managing the Risks Associated with Synthetic Biology** (Values Reflect Numbers of Participants in Each Group in Favor of Described Approach)

Best Approach to Manage the Risks Associated with Synthetic Biology	Focus Group 1 Female Participants	Focus Group 2 Male Participants	All Participants	
Require the <b>Federal</b> <b>Government</b> to Regulate Synthetic Biology	4	4	8	
Allow the Scientific Community and Others Involved in Advancements to Regulate Synthetic Biology	6	0	6	
<b>Ban</b> the Further Development and Use of Synthetic Biology	1	4	5	
Allow <b>Companies and Private</b> <b>Funders</b> Investing in Research and Development to Regulate Synthetic Biology	0	1	1	



#### Societal Concerns on Synthetic Biology

Which aspects of synthetic biology may be welcomed by the public? And which concerns may lead to public's potential uneasiness?



# **Societal Concerns on Synthetic Biology**

#### Engineering Life or Engineering for Better Life?

• Engineering ethics is largely a system based on <u>micro-ethics</u> emphasizing the responsibility of the <u>individual practitioner</u>.  $\rightarrow$  ill-equipped in the case of synbio

By "engineering life", synthetic biology may have an unprecedented impact on the <u>human-nature relationships</u>, with special attention on the beliefs and ideas that shape how people understand and value nature.

"Who is afraid of a synthetic human?" (*The Times*, May 17, 2008)

"Making a brand new DNA code, I think it is dangerous." Male Participant, Focus Group 2

"I would say science is great, and advancing the quality of life is great. But just keep in consideration ethics and how some people determine life to be one way, and it could be devastating in the future to alter it." Female Participant, Focus Group 1



## **Societal Concerns on Synthetic Biology**

#### Synthetic Biology as the New "Technological Fix"?

We need a critical (κριτεω/to assess) approach toward synthetic biology promises...

"Just as the first wave of biotechnology revolutionized agriculture and medicine, scientists today herald <u>synthetic biology as a second wave of innovation</u> capable of <u>solving society's most pressing challenges</u>." (*San Jose Mercury News,* December 15, 2008)

However, <u>opposite voices</u> are emerging <u>from the civil society sector</u> to contest this: "Fearing that 'frankencells' will threaten the ecosystem, environmental groups such as Greenpeace and Friends of the Earth have labeled synthetic biology 'genetic engineering on steroids' and condemned it as '<u>a grave biosafety threat to people and the</u> <u>planet</u>'." (*San Jose Mercury News,* December 15, 2008)

"I would say be very careful what you – <u>we only have one earth</u>, and <u>be very careful</u> <u>what you release into the environment</u>, trying to make the <u>environment</u> man's design instead of God's design." Male Participant, Focus Group 2



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#### How to gain and maintain public confidence...





#### **References:**

Hart Research Associates (2008), Awareness of and attitudes toward nanotechnology and synthetic biology. Available at: <u>http://www.synbioproject.org/process/assets/files/6019/hart\_final\_re8706b.pdf</u>

Kahan DM et al. (2009), Risk and Culture: Is Synthetic Biology Different?, in *Harvard Law School Program* on Risk Regulation Research Paper No. 09-2. Available at SSRN: <u>http://ssrn.com/abstract=1347165</u>

Pauwels E, Ifrim I (2008), Trends in American and European press coverage of synthetic biology: Tracking the last five years of coverage, in *Synbio 1* (Synthetic Biology Project, 2008). Available at: <a href="http://www.synbioproject.org/process/assets/files/5999/synbio1final.pdf">http://www.synbioproject.org/process/assets/files/5999/synbio1final.pdf</a>

Scheufele DA et al. (2008), Religious beliefs and public attitudes towards nanotechnology in Europe and the United States. Nature Nanotech. 361, 1-4.

#### Methodology:

#### Media

Pauwels E, Ifrim I (2008), Trends in American and European press coverage of synthetic biology: Tracking the last five years of coverage, in *Synbio 1* (Synthetic Biology Project, 2008), p. 25-26.

Public perception Hart Research Associates (2008), Awareness of and attitudes toward nanotechnology and synthetic biology, p. 1-2. Pauwels E., "Public Perceptions of Synthetic Biology in the United States – A Qualitative Overview", in Systems and Synthetic Biology (June 2009), Journal no. 11693, Springer Netherlands.



# Annex 1: Information about synthetic biology used in the phone survey and the focus groups

Synthetic biology is the use of advanced science and engineering to make or redesign living organisms, such as bacteria, so that they can carry out specific functions. Synthetic biology involves making new genetic code, also known as DNA, that does not already exist in nature.

The potential BENEFITS of synthetic biology include developing new micro-organisms to treat disease, including cancer, more effectively and to create new and less expensive medications. It also could be used to make new organisms that could provide cheaper and cleaner sources of energy than today's oil-based fuels, and to detect and break down environmental pollutants in the soil, air, and water.

While the potential RISKS of synthetic biology are not known, there are concerns that man-made organisms might behave in unexpected and possibly harmful ways and that they could cause harm to the environment. There also are concerns that, if these organisms fall into the wrong hands, they could be used as weapons. Additionally, the ability to create artificial life has raised moral and ethical questions about how life is defined.



# ANNEX 2: Background of the participants in focus group 2 – As an example

40 to 49	Risk engineer	Some college	Over \$100,000	None	None	Married	White
60 to 64	Retired constructio n worker	High school or less	\$30,000 to \$49,999	Catholic	None	Married	White
60 to 64	Landlord	College graduate	\$50,000 to \$74,999	Jewish	Orthodox	Married	White
18 to 24	Student assistant	Some college	\$30,000 to \$49,999	None	None	Single	White
40 to 49	Accountant	College graduate	More than \$100,000	Pentecostal	Born-again	Married	Black
25 to 29	Pre-school teacher	College graduate	\$75,000 to \$100,000	Jewish	None	Single	White
60 to 64	Retired teacher	College graduate	\$30,000 to \$49,999	Methodist	Born-again	Married	White
60 to 64	CEO	College graduate	More than \$100,000	Methodist	None	Married	White
30 to 39	District manager	Some college	\$50,000 to \$74,999	A.M.E	Fundament alist	Married	Black