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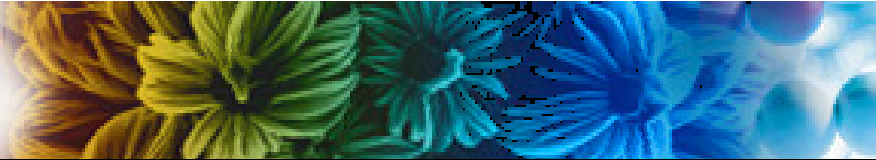
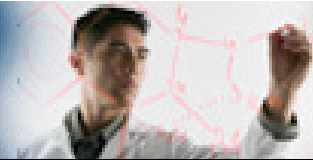
Synthetic
BIOLOGY
PROJECT

Public Perceptions On the Technological Frontier: The Case of Synthetic Biology (“Synbio”)

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Science, Technology and Innovation Program
Woodrow Wilson International Center for Scholars

Synthetic Biology Workshop: From Science to Governance
DG SANCO, March 19, 2010, Brussels



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”.*

*“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.

Which Messengers?

SYNTHETIC BIOLOGY

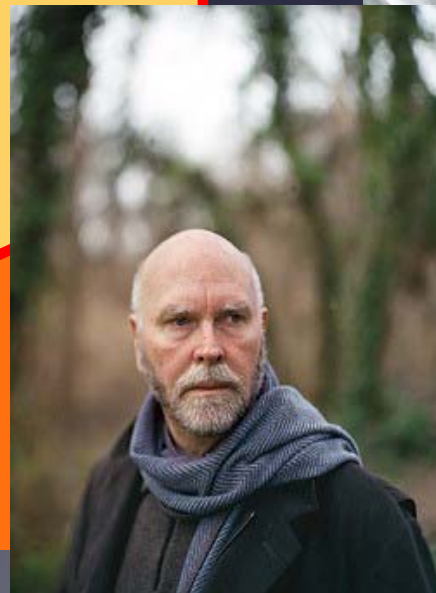
INFLUENCING DEVELOPMENT

Which aspects of synthetic biology may be welcomed by the public?

And which concerns may lead to public's potential uneasiness?

LLOYD'S EMERGING RISKS TEAM REPORT

Lloyds

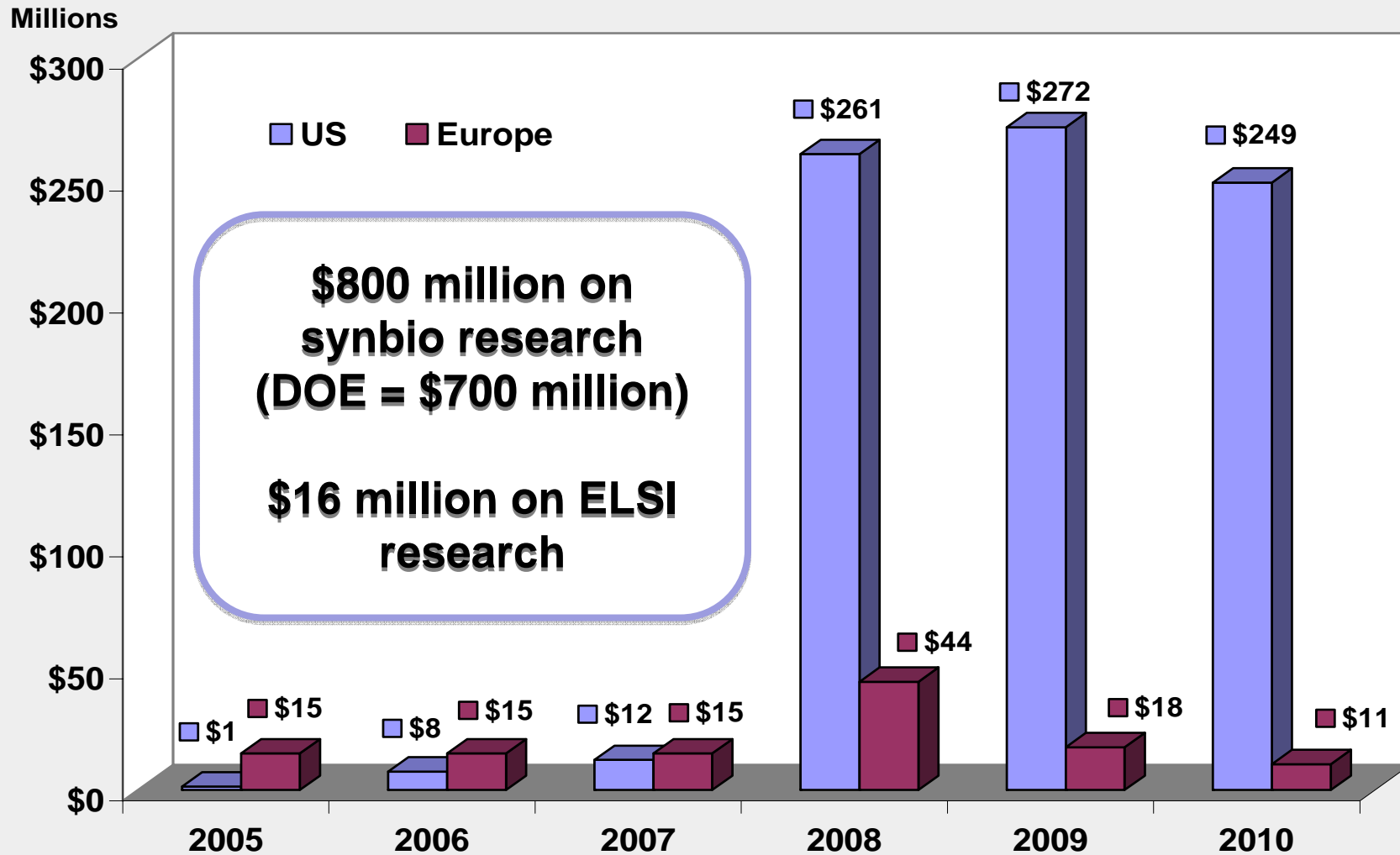


Key steps for today...

- 1) Review some of the initial **research findings** on public perceptions of synthetic biology
- 2) Share some observations about the **communication challenges** as synthetic biology further develops
- 3) Identify some **short-term needs** in understanding the “complexity” of public attitudes

Is synthetic biology really a big deal?

Total U.S. and European Funding



Methodology - US Public Perceptions Study

■ **Quantitative Study:**

Two representative **national phone surveys** of 1,001 US adults nationwide conducted in September 2008 and 2009 by Peter D. Hart Research Associates at the request of the Wilson Center

■ **Qualitative Study:**

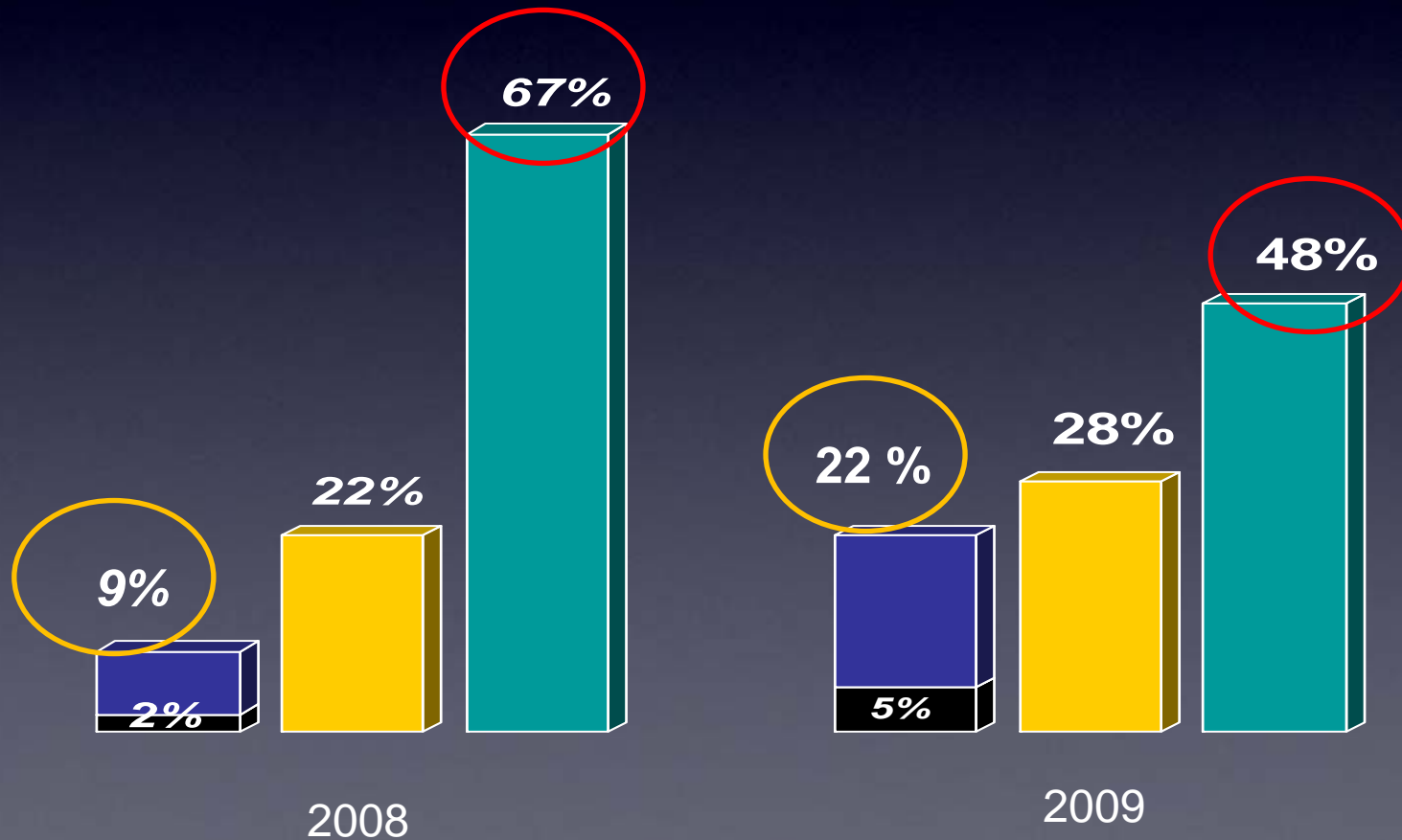
Four **focus groups** conducted in Baltimore (Maryland) in August 2008 and 2009 among {18-65} adults from a relatively large diversity of social, political and religious background



Public awareness of synthetic biology has more than doubled...

How much have you heard about synthetic biology?

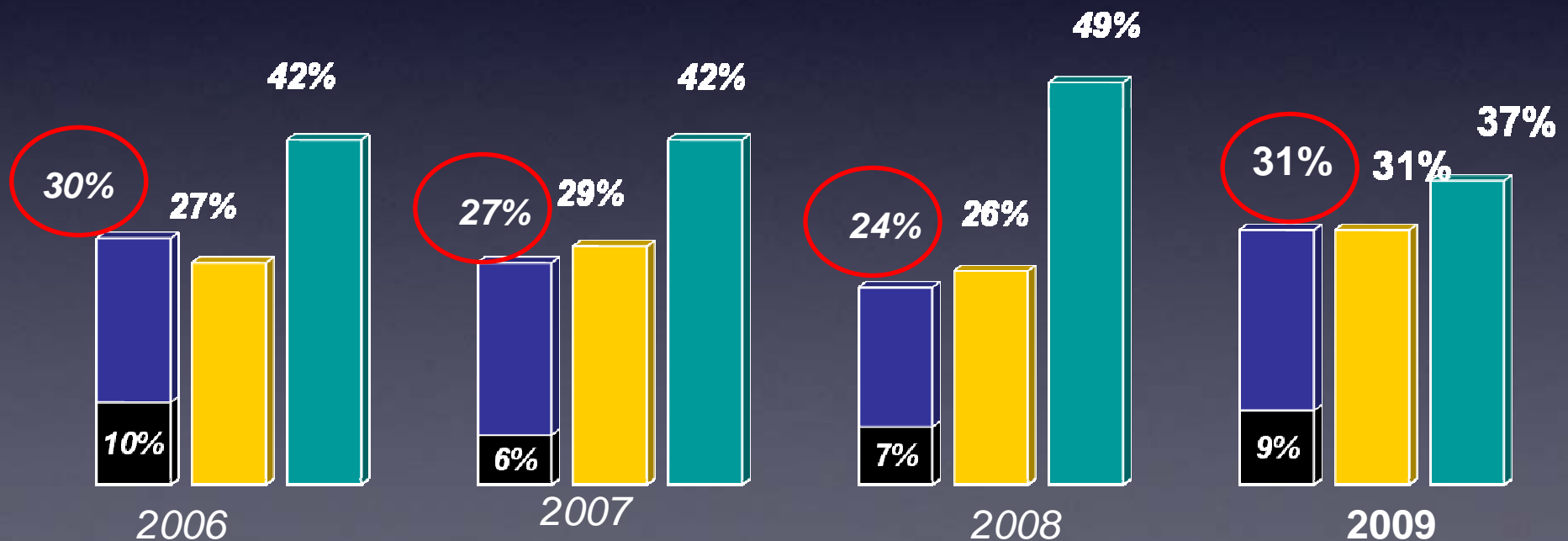
■ Heard a lot ■ Heard some ■ Heard just a little ■ Heard nothing at all



Little change in public awareness of nanotechnology

How much have you heard about nanotechnology?

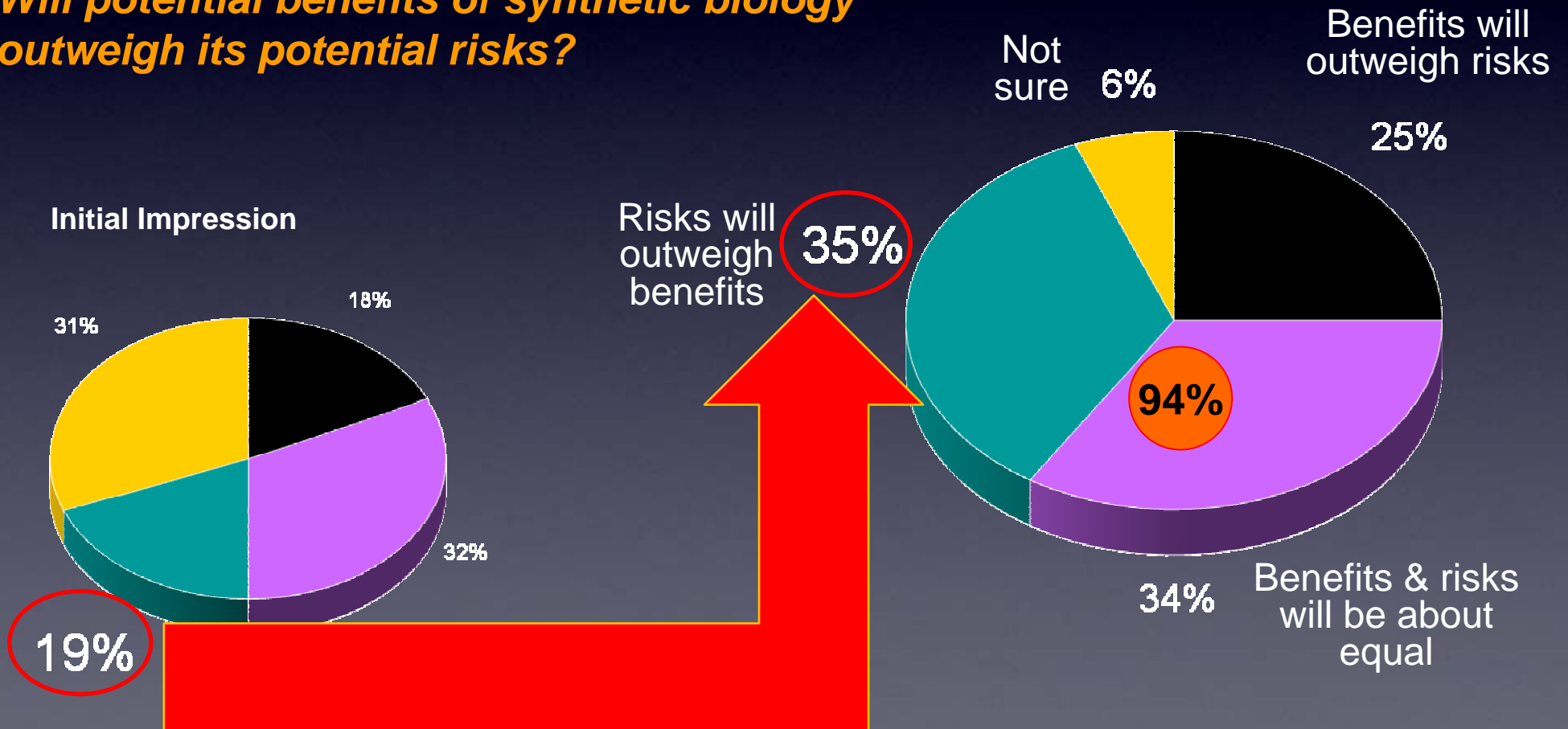
■ Heard a lot ■ Heard some ■ Heard just a little ■ Heard nothing at all



From initial to informed impression of risks and benefits of synthetic biology

- Slight move toward “Risks will outweigh benefits”...

Will potential benefits of synthetic biology outweigh its potential risks?



Framing of Synthetic Biology

Persistent use of analogs to cloning, stem cells and genetic engineering

Something man-made, artificial, fake, not natural, not real	29%
Has to do with cloning, genetic manipulation	13%
Has to do with biology, altering the biological makeup	7%
Used in medical research to develop new medicines, treatments	6%
Used to develop better, safer plants, sources of food	6%
Attempt to create life, artificial life	5%
Some kind of material, synthetic material	5%
Don't know; no response	28%

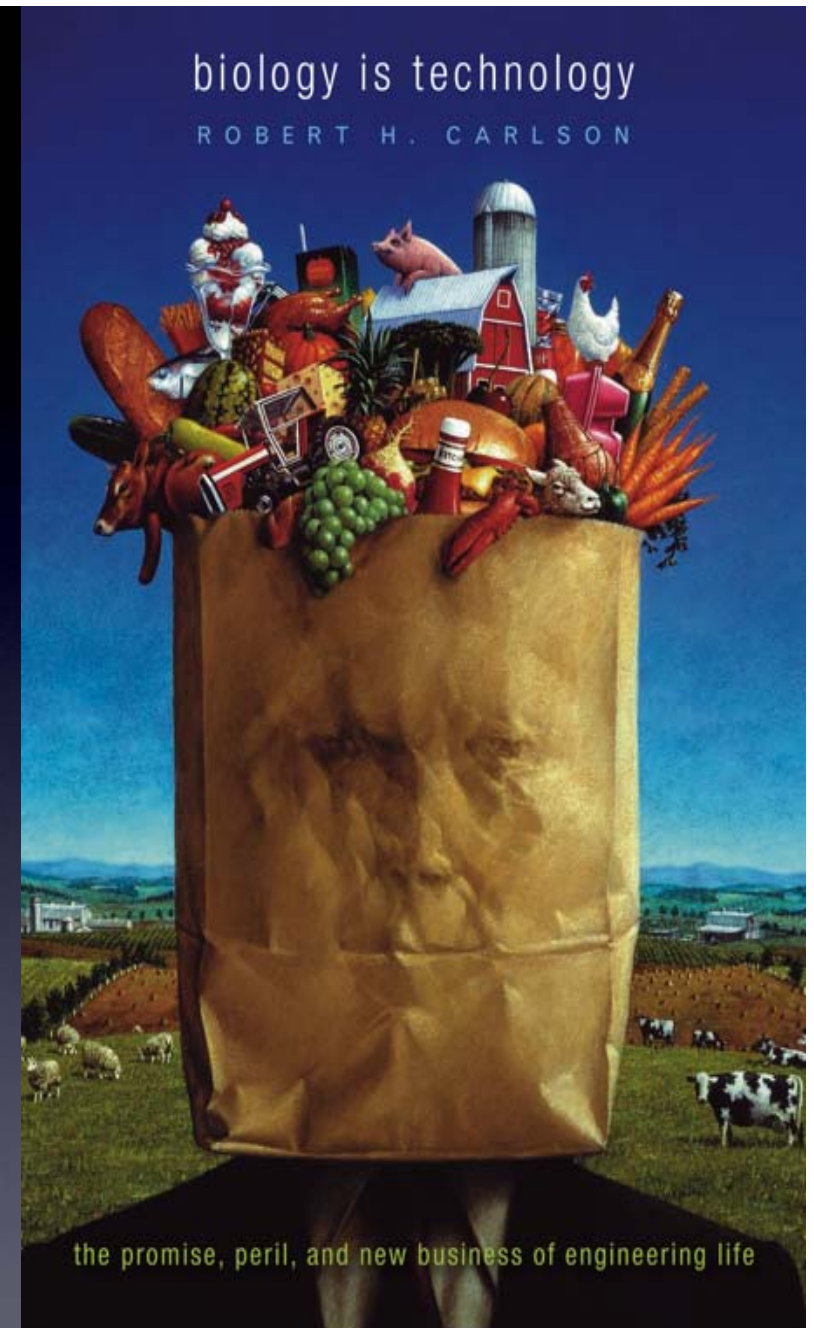
Framing of Synthetic Biology

Excerpts from focus groups...

“Do you actually engineer that type of cell, like a brain cell, **instead of using a stem cell?**”

“But this seems like you just clone. But, well, **we’re not cloning. We’re just creating our own DNA.**”

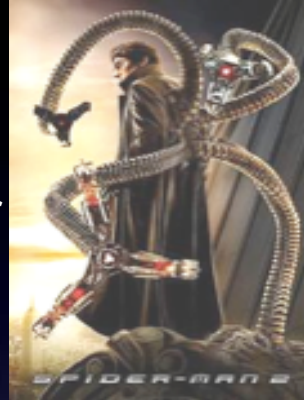
SYNBIO BOOK!



Cultural Narratives: Will Synbio be Like Nano?

1. *Opening Pandora's box or Dr. Strangelove:*

The corruption or manipulation of science for evil purposes.



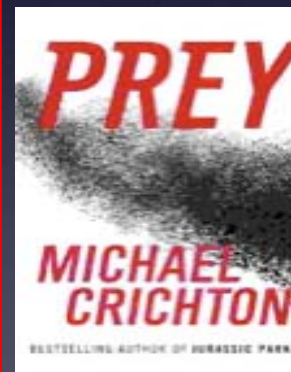
2. *Trojan Horse, "It's Out":*

We accept innovations into our lives and learn later that we made a mistake. Bhopal Disaster...



3. *Messing with Nature:*

Technology's potential to shake up boundaries like the living and the non-living... "Playing God"

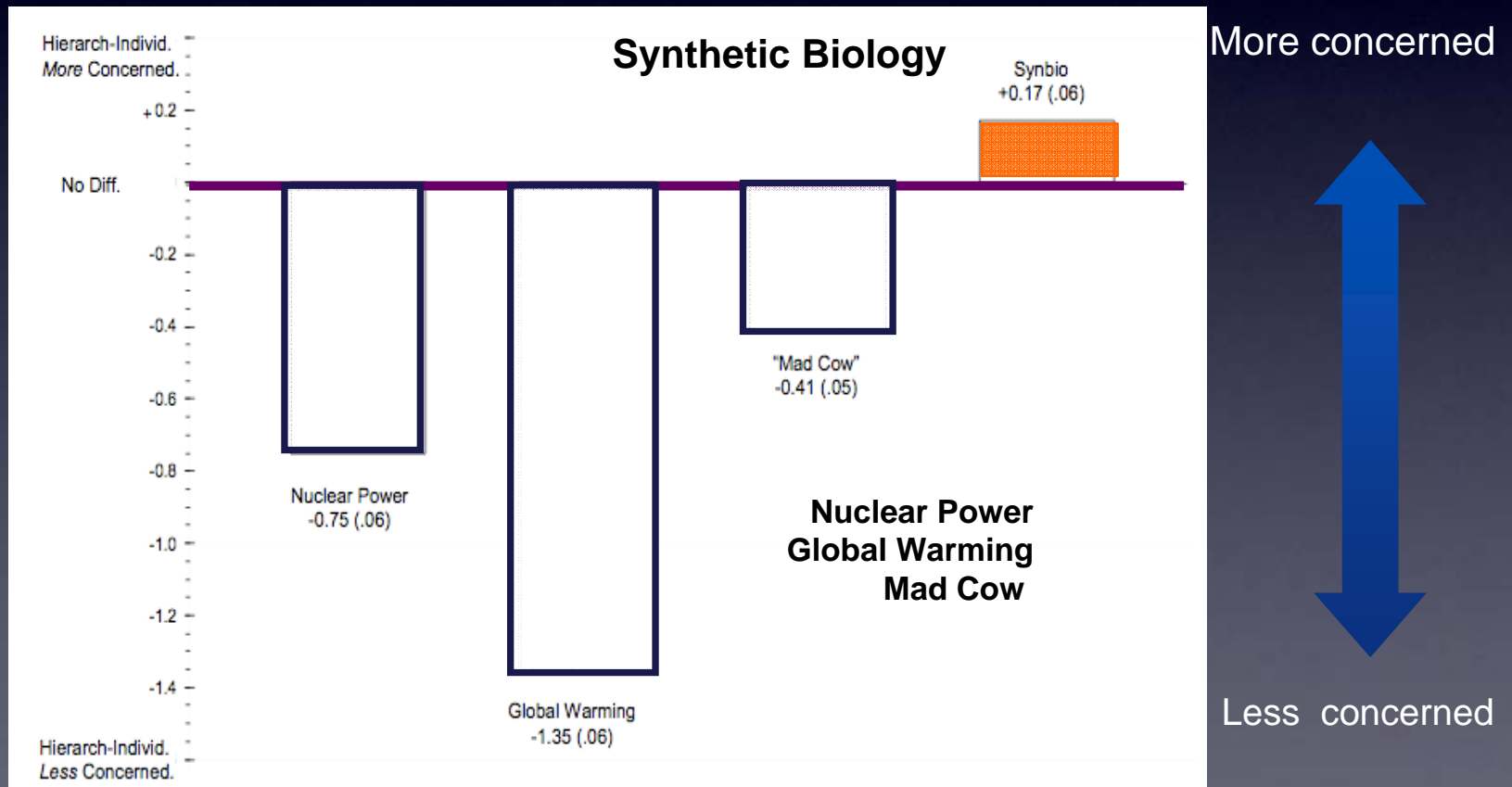


Focus Groups: "It sounds like we are **playing God**. Who are we as humans to think we can design or redesign life?"

New Opponents?

Inversion of the Leiserowitz effect (Kahan et al, Yale University)

Anthony Leiserowitz labeled as “environmental risk naysayers” a segment of U.S. society whose members are disproportionately white and male, politically conservative, and highly religious.²



Perceived Risks – Bioweapons... Messing with Nature/Life...

Which ONE of these concerns you most?

It could be used to create harmful things such as **biological weapons**



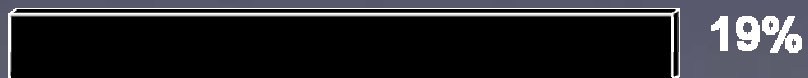
It is morally wrong to create **artificial life**



It could damage the environment



None of these is a concern



Some Communication Challenges

-The name “synthetic biology” can be a liability.

“When the name is bad, things tend to get worse. When the name is good, things tend to get better.”

Al Ries and Jack Trout
Positioning: The Battle for Your Mind, 1981

-Potential for Risk Amplification

The **global H1N1** pandemic raises public anxiety of biological threats.

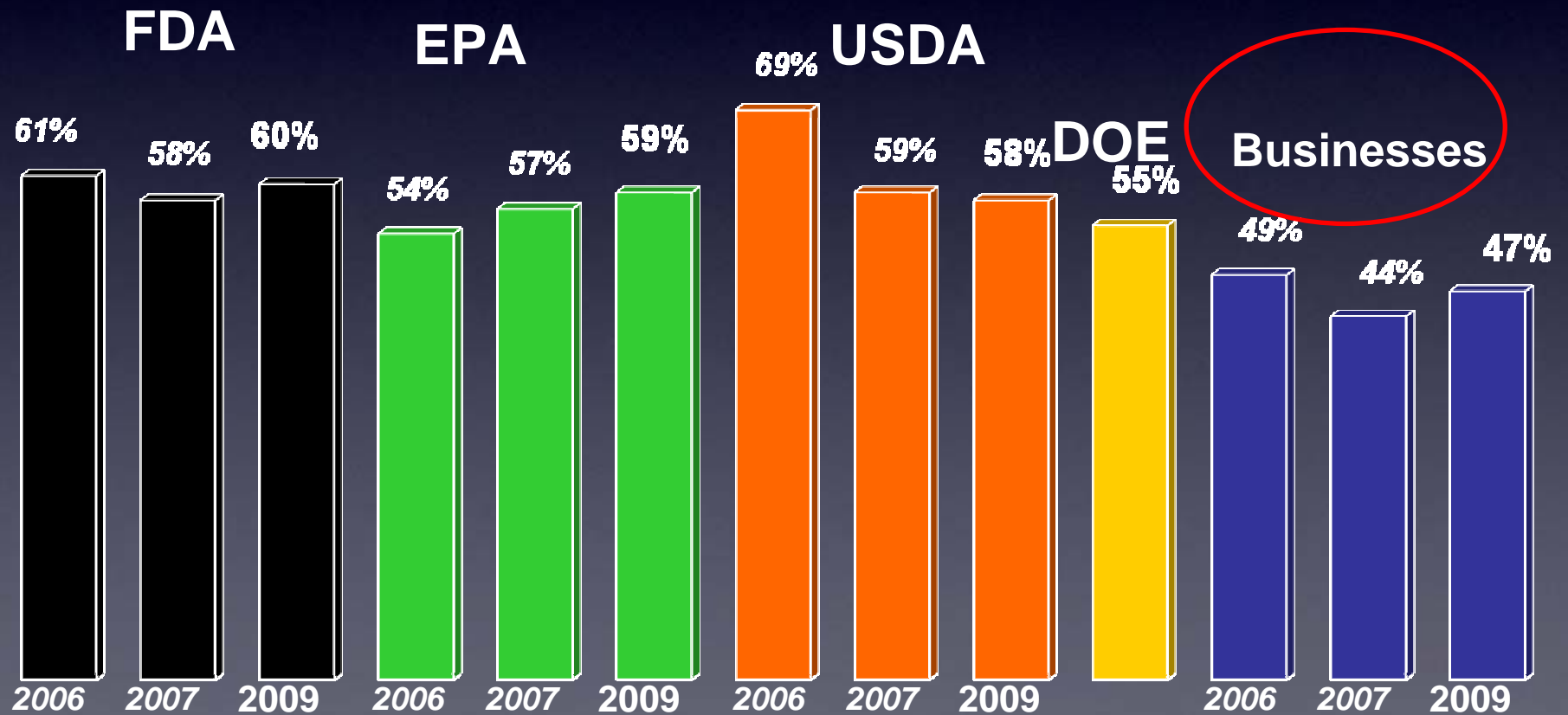
Good science journalists are becoming an extinct species = greater potential for ill-informed

The American public has experienced **repeated failures of government** regulation and oversight.

Filling the trust gap

No Obama Miracle... How do we communicate on the technological frontier?

Little change in public confidence in federal agencies and businesses



Applications Matter...

Cautious enthusiasm for synthetic biofuels

Which comes closer to your point of view?

ENCOURAGE the development of synthetic biofuels because they would be a renewable energy source that could cost less, be better for the environment, and help address global warming. Synthetic biofuels could help ensure America's energy independence far into the future.



DISCOURAGE the development of synthetic biofuels because there will be no way to ensure that the new technologies are not used to create harmful things such as biological weapons. Even with the right intentions, the man-made organisms could behave in unpredictable and harmful ways, potentially causing damage to our environment. There are also moral questions about whether we should be creating artificial life.



Governance – What does the public want?

Public wants more information and federal regulation...

“While the issues we have been discussing may seem hypothetical and far in the future, the creation of synthetic life forms may be very close. Recently, researchers announced that within a few months they will be able to create artificial life in the form of a synthetic organism made from scratch.”

With that in mind, do you agree or disagree that:

■ Agree ■ Neither agree nor disagree/not sure ■ Disagree

More should be done to inform the public about this research



Federal gov't should regulate this research



This research worries me



I am excited about the promise of this research



0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

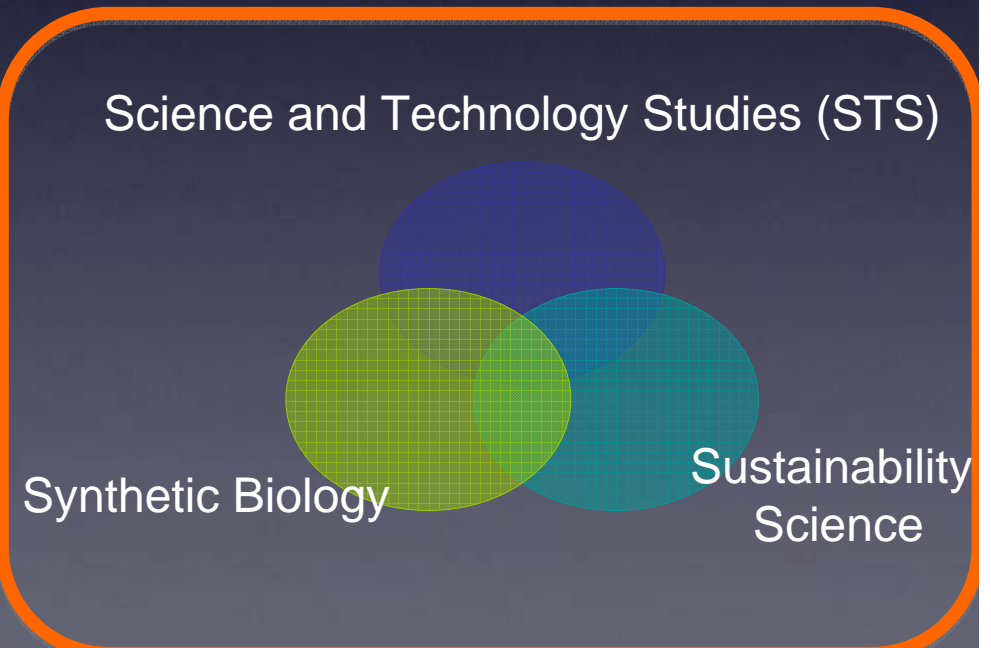
Short-Term Needs

- Need more applied research on **public attitudes** and **perceptions**, including international **comparisons** (and we need it soon)
- Based on research, need a **public engagement strategy**; one that scales
- **Risk research** and analyses of regulatory adequacy
- More **international cooperation**

WWICS RESEARCH PROJECTS

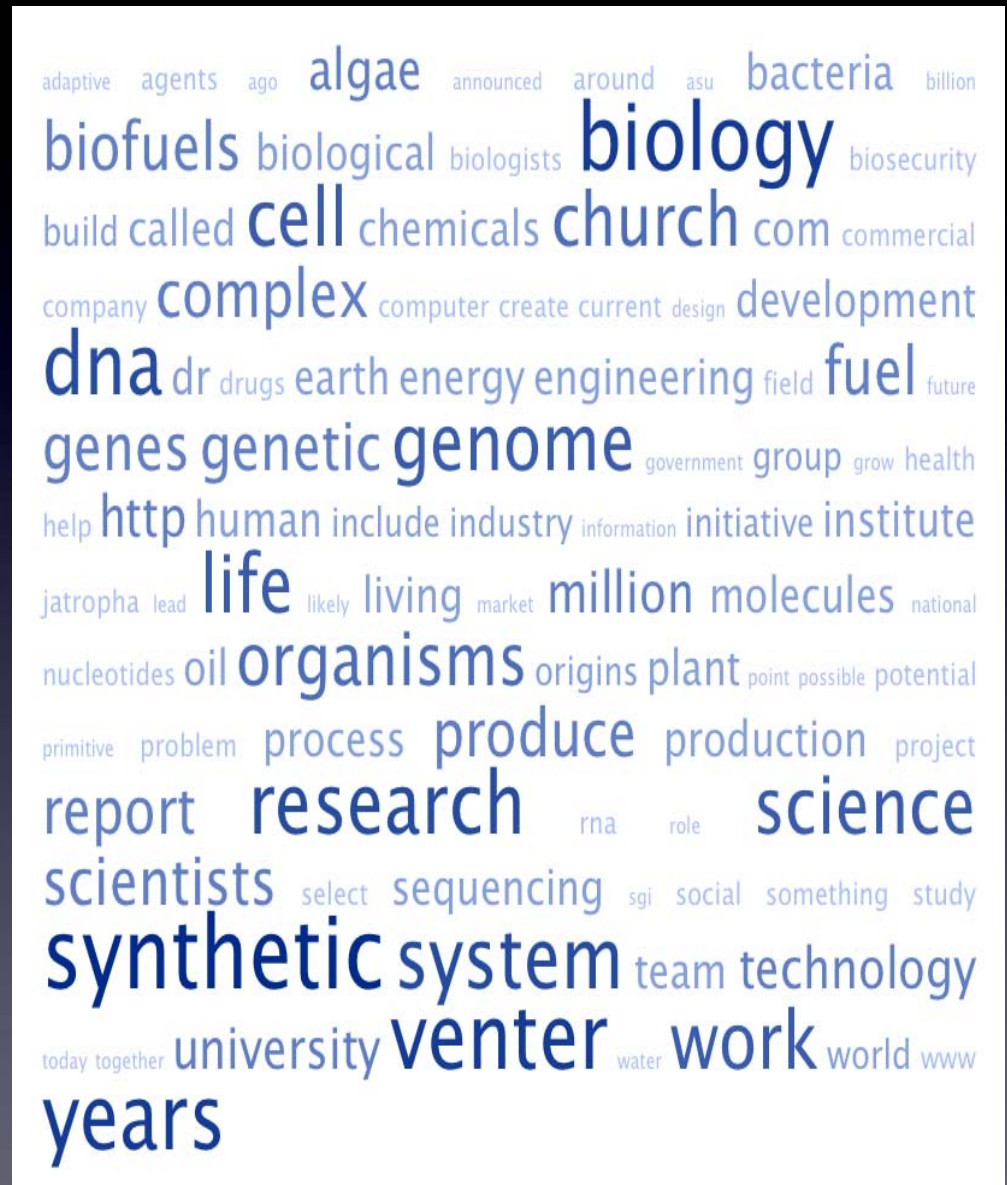


- Comparative analysis of US and EU **Public Funding**
- Further work on **Media analysis** with a focus on quick feedback to scientists and journalists
- The application of **prediction markets**
- NSF project on the **sustainability implications** of synthetic biology



How to gain and maintain public confidence...

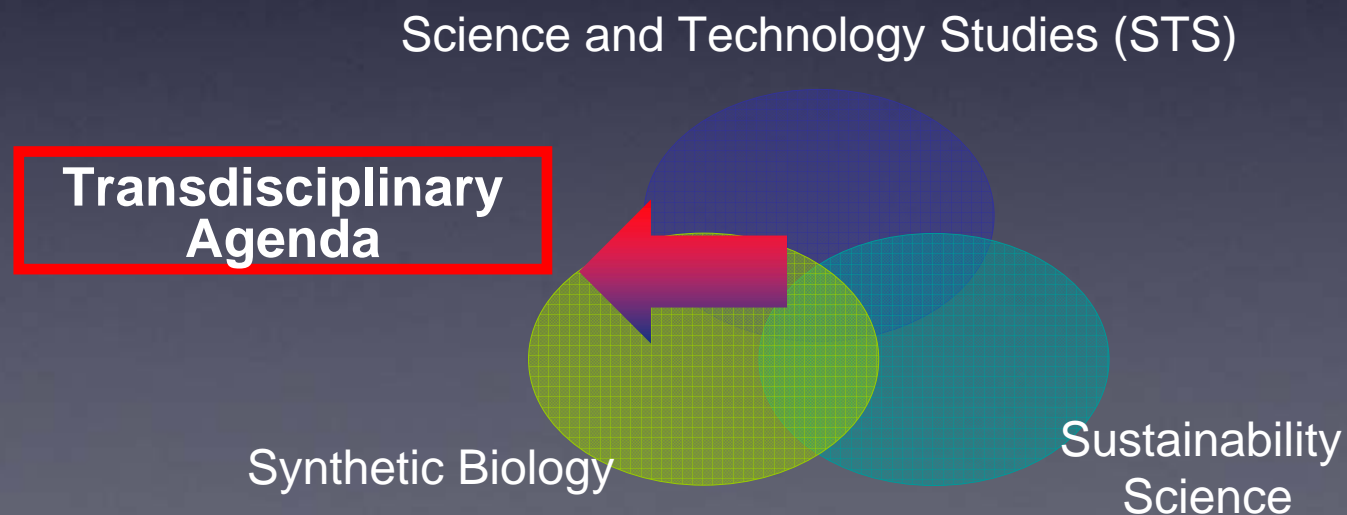
- “The term ‘synthetic biology’ makes me think of **genetic engineering** and something lab-grown.”
- “**Cloning** is the image I think of. I think of something man-made and artificial”
- “What the term makes me think of is something human-made to mimic nature. It is about molecular compounds and **playing God.**”
- “I think of taking a drug that comes from a plant and making it without having to use the plant anymore.”
- “I think of things being created, chemical reactions, and scientists in a lab **playing God.**”



NSF-sponsored workshop on the implications of synthetic biology for Sustainability Science & Policy

Goals: The workshop will develop a EU-US trans-disciplinary research agenda for synthetic biology with a special focus on sustainability.

This research agenda will go beyond the disciplinary boundaries of synthetic biology, to examine the broader questions of how synthetic biology can contribute to sustainable development, and to what extent synthetic biology poses challenges to sustainability itself.



Research on the use of on-line prediction markets to explore emerging issues in synthetic biology

Examples of questions/bets on the market...

Public Perceptions

- Will there be a public backlash to synthetic biology?
- When might this happen? In response to what event?

Risks

- What is the most important near-term risk from synthetic biology?
- What is the most important long-term risk?

Annex 1: Information about synthetic biology used in the U.S. 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.

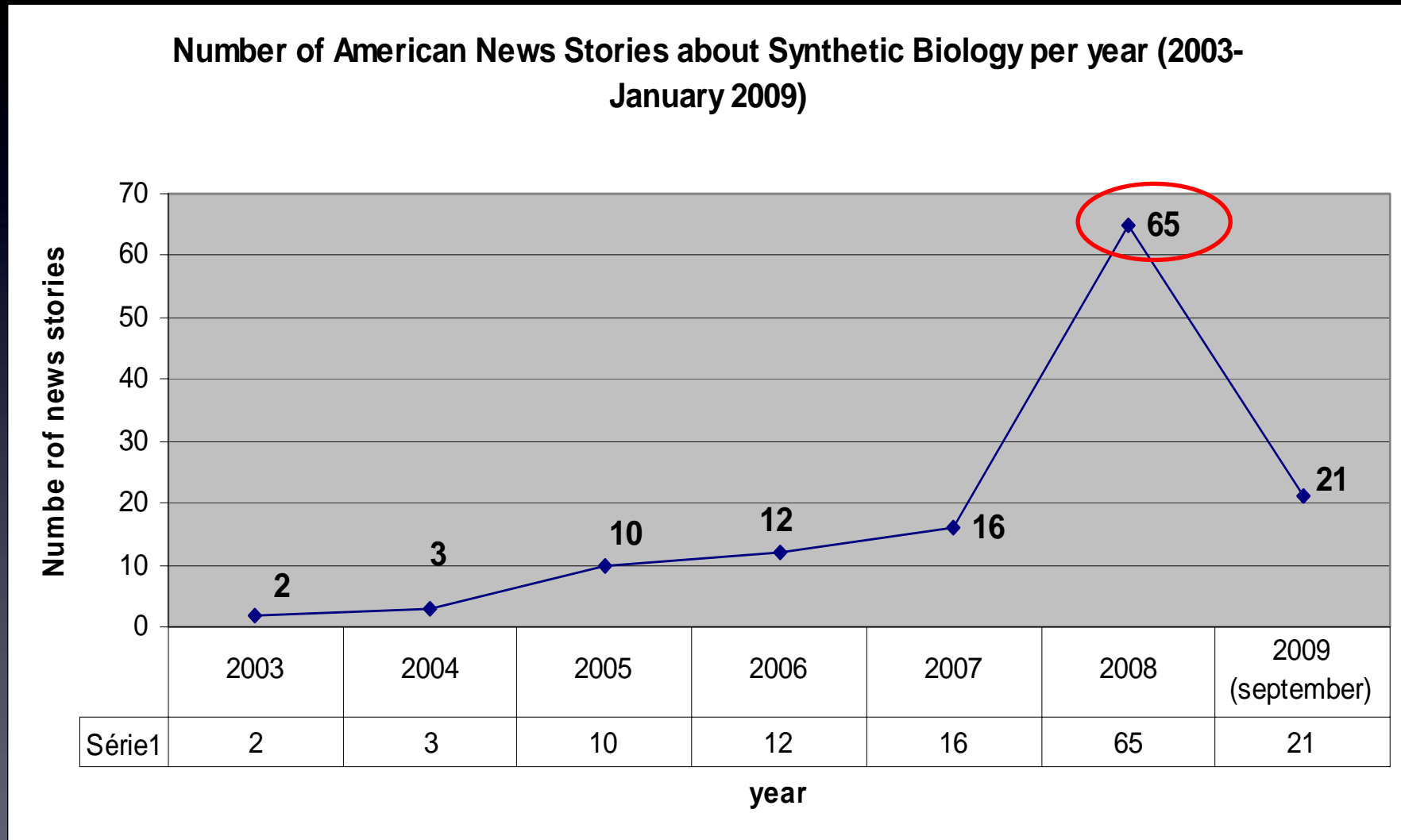
The potential **BENEFITS** of synthetic biology include developing new micro-organisms to treat disease, including cancer, more effectively and to create new and less expensive medications. It also could be used to make new organisms that could provide cheaper and cleaner sources of energy than today's 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 (U.S. Data)

40 to 49	Risk engineer	Some college	Over \$100,000	None	None	Married	White
60 to 64	Retired construction 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	Fundamenta list	Married	Black

Annex 3: Synthetic biology is also increasingly reported in the US Press!



Annex 4: Green Gold? Enthusiasm for biofuels Focus Groups

“Sounds great, good deal, **biofuels**, I love that.”

“I really like the idea of generating, constructing a **bacteria to generate hydrogen**.”

“I like, about the biofuels, how they said it produces **cleaner fuels**... That could be good as far as **going greener for the environment**.”

“**We picked biofuels**, basically because we felt it would have the **biggest world impact** of the four, because of the global concern about fuels in general and the CO2 emissions that it would actually save.”

“It will have the **biggest impact on individual users**. I know the anti-malarial drug is fantastic but it only will hit three or four million people, whereas there’s millions and millions of car drivers.”

Annex 5: Public awareness of synthetic biology among key subgroups

	Heard a lot/some about synthetic biology	Heard a little/nothing about synthetic biology
All adults	22%	76%
Men age 18 to 49	25%	75%
Men age 50/over	28%	70%
Women age 18 to 49	17%	80%
Women age 50/over	20%	78%
High school/less education	11%	88%
Some college/technical ed	19%	79%
College graduate/more ed	35%	64%
Income under \$30K	17%	82%
Income \$30K to \$50K	15%	83%
Income \$50K to \$75K	24%	76%
Income over \$75K	33%	64%
Whites	23%	75%
African Americans	16%	79%
Hispanics	21%	78%

Annex 6: Initial/Informed impression of risks/benefits of synthetic biology

	Initial Impression			Informed Impression		
	Benefits outweigh	Equal	Risks outweigh	Benefits outweigh	Equal	Risks outweigh
All adults	18%	32%	19%	25%	34%	35%
Men	25%	33%	16%	31%	34%	31%
Women	13%	31%	21%	20%	33%	40%
Men age 18 to 49	25%	31%	20%	28%	38%	32%
Men age 50/over	25%	36%	12%	33%	31%	30%
Women age 18 to 49	16%	33%	19%	20%	37%	39%
Women age 50/over	9%	29%	23%	19%	29%	42%
High school/less ed	9%	33%	18%	15%	38%	39%
Some college/tech ed	17%	33%	22%	25%	33%	37%
College graduate/more	27%	30%	18%	33%	31%	32%
Income under \$30K	13%	36%	17%	18%	36%	40%
Income \$30K to \$50K	16%	31%	19%	21%	41%	35%
Income \$50K to \$75K	18%	32%	21%	27%	31%	38%
Income over \$75K	29%	32%	16%	36%	30%	29%

Annex 7: Initial/Informed impression of risks/benefits of synthetic biology

	Initial Impression			Informed Impression		
	Benefits outweigh	Equal	Risks outweigh	Benefits outweigh	Equal	Risks outweigh
All adults	18%	32%	19%	25%	34%	35%
Whites	21%	31%	19%	26%	33%	36%
African Americans	11%	32%	20%	17%	33%	39%
Hispanics	11%	47%	15%	22%	40%	33%
Attend religious services:						
Weekly	14%	30%	25%	19%	31%	44%
Monthly	24%	35%	15%	29%	39%	28%
Less often/never	20%	36%	17%	27%	34%	34%
Evangelicals	17%	27%	24%	18%	30%	46%
Initial familiarity:						
Heard a lot/some	34%	33%	23%	39%	29%	28%
Heard just a little	20%	38%	17%	26%	39%	29%
Heard nothing	10%	29%	18%	18%	32%	43%

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