

# “Reflections on Anticipatory Governance of Nanotechnologies: Meanings for the Regulatory Environment”

*Toward Regulation of Nanomaterials:*

*Conversation between Academia, Industry, Law and Government*

University of Notre Dame

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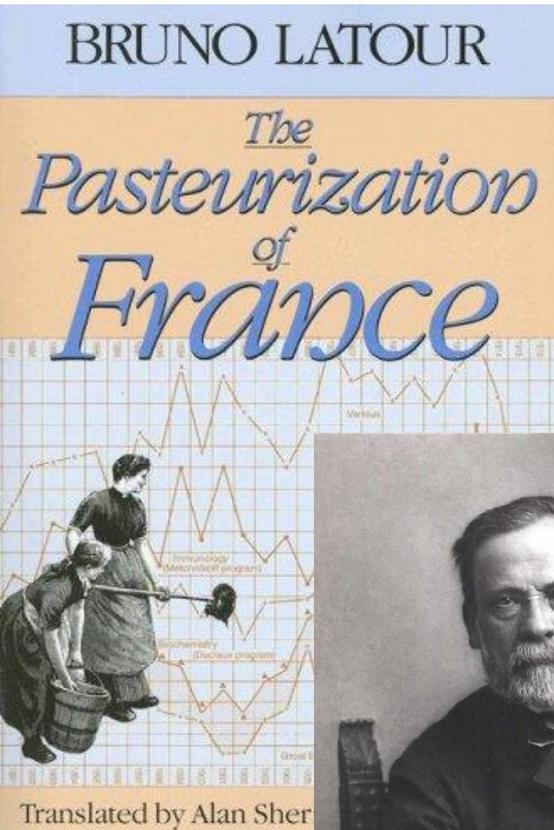
Arizona State University



# Plan of Talk

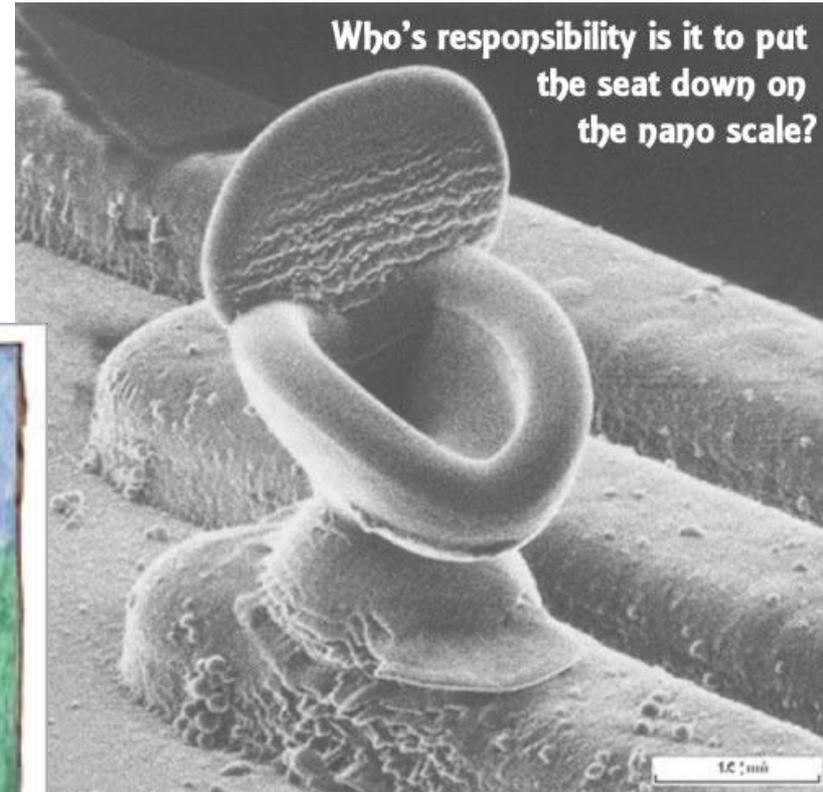
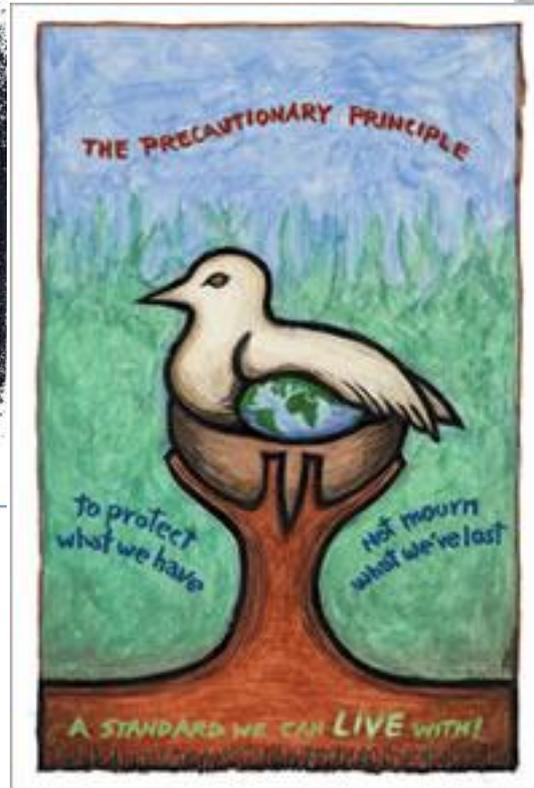
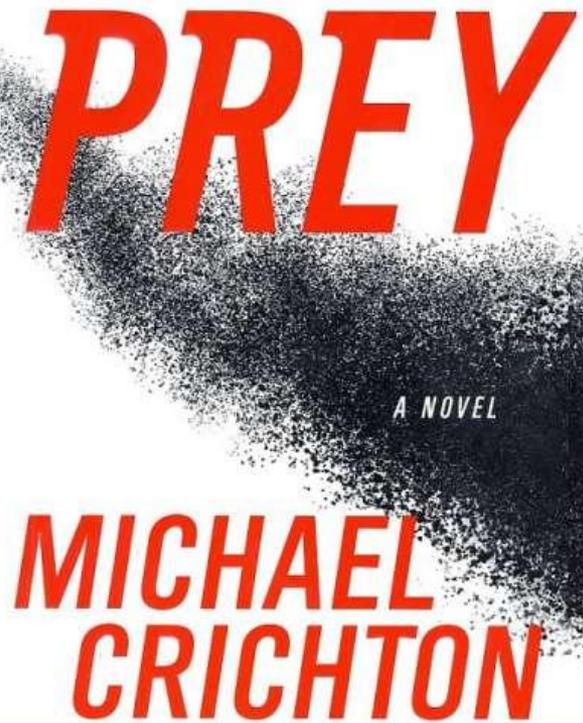
1. Anecdote, Part 1
  - a. Pasteurization
  - b. Fear and Precaution
2. Introduction to CNS-ASU
3. Anticipatory Governance
4. Regulatory Meaning
  - a. Foresight
  - b. Engagement
  - c. Integration
  - d. Evaluation
5. Anecdote, Part II

# Anecdote 1.a.: Pasteurization



Successful innovation requires the extension of the laboratory into society

# Anecdote 1.b.: Fear and Precaution



# Introduction to CNS-ASU

21<sup>st</sup> Century Nanotechnology R&D Act of 2003

(PL 108-153)

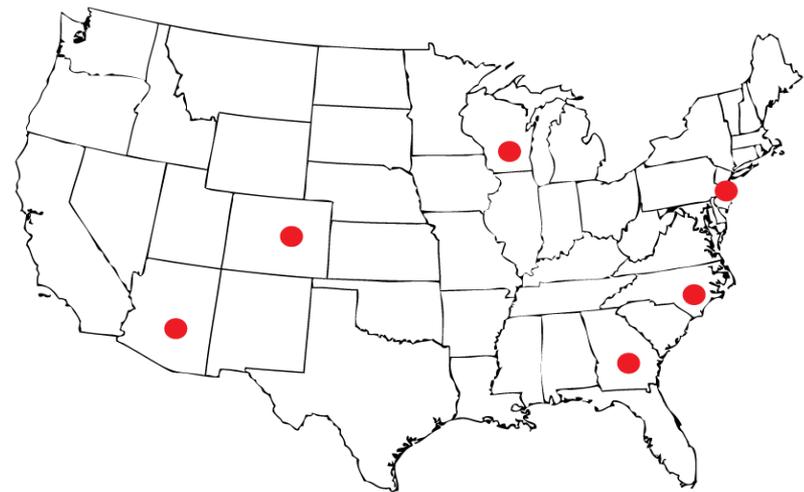
Sec 2(b)(10):

- Establish societal implications research program
- Require NSECs address societal implications
- Integrate societal concerns with nano R&D for benefit of all Americans
- Provide for regular public input



# NSF's Network for Nanotechnology in Society

- **NSEC/Center for Nanotechnology in Society at Arizona State University**
  - \$6.2 million (Oct 2005 – Sept 2010)
  - Renewed (\$6.5M Oct 2010-Sept 2015)
  - Partner institutions across the country
- **NCEC/Center for Nanotechnology in Society at UC Santa Barbara**
  - \$5 million (renewed \$6.1M)
- **Projects (2005-10):**
  - Harvard/UCLA (\$1.7 million)
  - University of South Carolina (\$1.4 million)



# NSEC/CNS-ASU Mission



- **Research** the societal implications of nanotechnologies
- **Train** a community of scholars with new insight into the societal dimensions of nanoscale science & engineering (NSE)
- **Engage** the public, policy makers, business leaders, and NSE researchers in dialogues about the goals and implications of NSE
- **Partner** with NSE laboratories to introduce greater reflexiveness in the R&D process



# NSEC/CNS-ASU Research Programs

## Anticipatory Governance

Provides strategic vision

1. Foresight

All governance requires a disposition toward future

2. Engagement

Crucial normatively, strategically, pragmatically

3. Integration

Scientists know things we don't, and vice versa

4. Ensemble-ization

None of these works in isolation



## Real-Time Technology Assessment

Provides methodological orientation

1. Research and Innovation Systems Analysis
2. Public Opinion and Values
3. Anticipation and Deliberation
4. Reflexivity and Integration

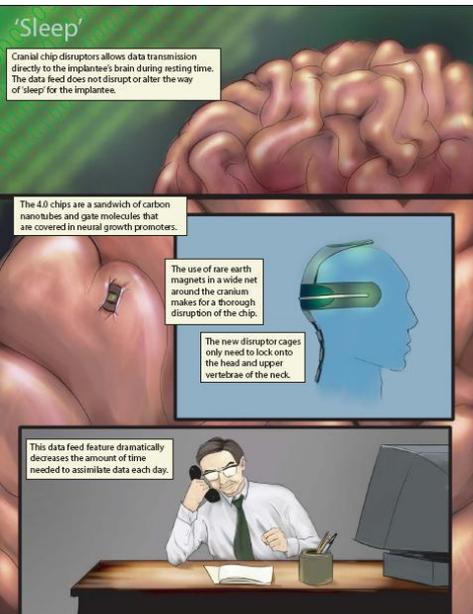
## Thematic Research Clusters

Provides thematic focus

1. Equity, Equality and Responsibility
2. Urban Design, Materials & the Built Environment (Nano & the City)



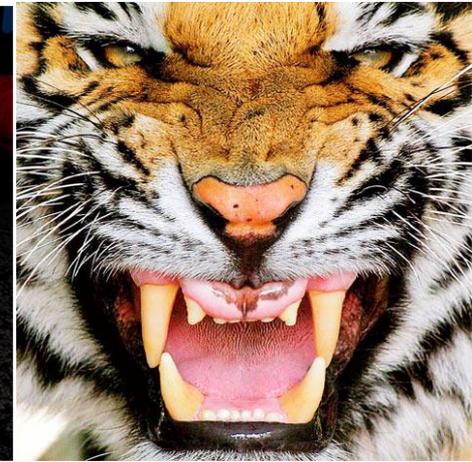
# Anticipatory Governance as Strategic Vision



Anticipate: from *ante-* and *capere*, “to take [into possession]” “beforehand”; related to capable and capacity and not a synonym for “expect,” “predict,” or “foresee”

A broad-based capacity extended through society that can act on a variety of inputs to manage emerging knowledge-based technologies while such management is still possible.

The pumpkin or the tiger? If science is puzzle-solving, when do we begin to pay attention?



# Anticipatory Governance -- Genealogy

(Karinen and Guston 2010)



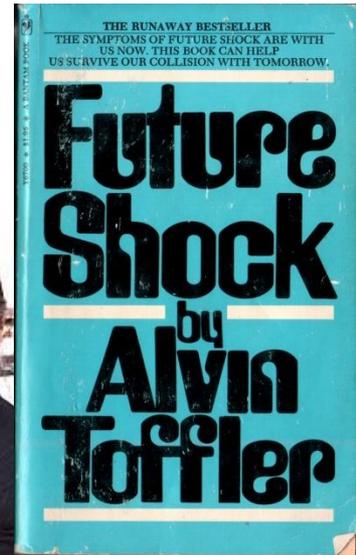
Detlev Bronk

Pres., JHU

Pres., NAS

Pres., Rockefeller U

“Competent social scientists should work hand-in-hand with natural scientists, so that problems may be solved as they arise, and so that many of them may not arise in the first instance.”

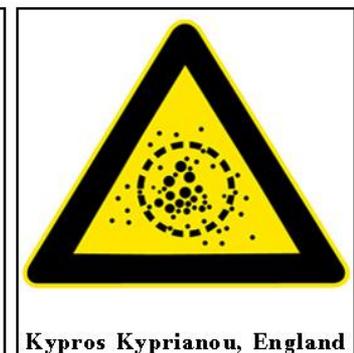
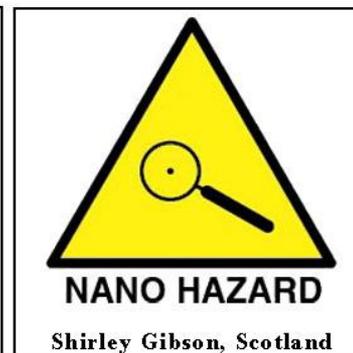
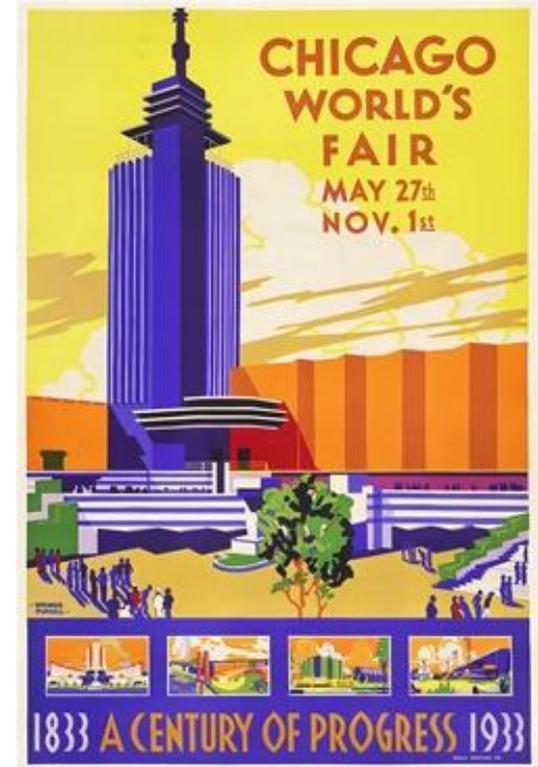


“anticipatory democracy”

- Three familial strands
  - Environmental Studies: Gupta (2001) doctoral thesis
  - Public Administration: Baechler (2001) chapter in *Berghof Handbook for Conflict Transformation*
  - Emerging Technologies: Guston and Sarewitz (2002)
- “A distributed form of emerging political order with an emphasis on long-term thinking”
  - PA scholars (some) reject it because they reject prediction (and see anticipation as similar)
  - ES and ET scholars embrace it because they reject prediction (and see anticipation as different)
    - “[not] foretelling the future [but still] preparing for it”

# Anticipatory Governance – Not Government

- Not “do” or “ban”
  - “Science finds, genius invents, industry applies, man adapts”
  - Moratoriums proposed by ETC Group and Friends of the Earth
- Wide array of mechanisms
  - Regulation
  - Licensing/restrictions
  - Liability/indemnification
  - Intellectual property
  - Testing
  - Treaties
  - Public Understanding of Science
  - Informal Science Education
  - Public engagement
  - Public action
  - Codes of conduct
  - Standards
  - Laboratory decisions



# Anticipatory Governance – Scholarship and Other Outreach

## Scholarly publications and presentations:

- Barben et al (2008; 25 citations)
- Guston (2008; 9 citations)
- Karinen and Guston (2010)
- Politicization of Science (Bielefeld 2009)
- U Wash 2009 NanoEthics Symposium
- 4S 2009 Chair's plenary STS & Policy
- 4S 2009 meeting – double session combined audience ~150
- special issue for *Social Studies of Science* (~2011)
- special issue of *Science and Engineering Ethics* (2010)

## Policy audience and public actors taking up term:

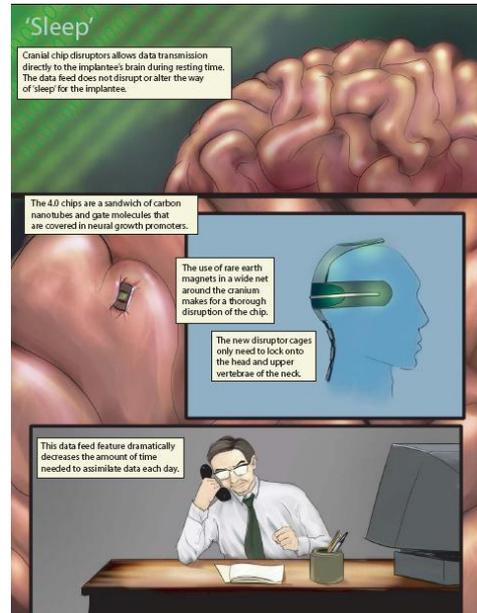
- Mike Roco (NSF) in nano governance
- Kevin Hurst (OSTP) in energy and climate
- Jeff Morris (EPA) in nano and EHS
- Carol Johnson (city of Phoenix) in city planning
- International uptake including:
  - Flanders
  - Japan
  - Australia
  - New Zealand
- AAAS S&T Policy Forum 2009
- CRS Briefing
- GAO Meetings (ECAST)
- STPI Meetings

## Other interactions:

- Fisher and Selin on a large grant from the Norwegian Research Council (R. Strand)
- Workshop with SynBERC Human Practices group (P. Rabinow)
- WWIC meeting on STS, Sus Sci & Syn Bio
- Inaugural S.NET meeting training session (30 colleagues)
- 50+ international visitors from 15 countries
- NISE Net interaction
- Consultative Group for Biodiversity
- Asilomar for Geo-engineering
- Ant Gov, RTTA, PVM “handbooks” co-produced with CSPO

# Foresight

- <http://cns.asu.edu/nanofutures/>
  - Literature-based
  - Vetted
  - Web-disseminated
- Scenario development workshops
- Product design
- Plausibility Project



## The Future of Medical Diagnostics



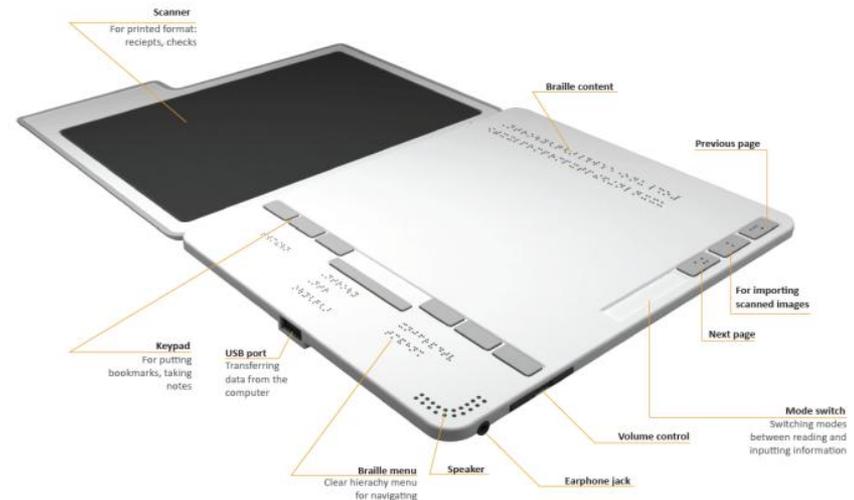
November 14-15, 2007  
Arizona State University  
Tempe, AZ

Sponsored By:

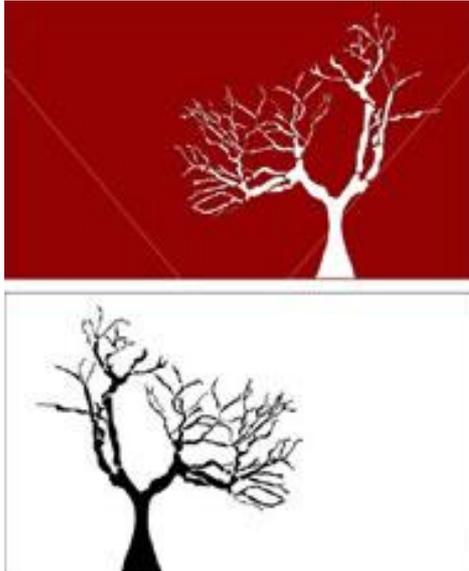
THE BIODESIGN INSTITUTE  
ARIZONA STATE UNIVERSITY



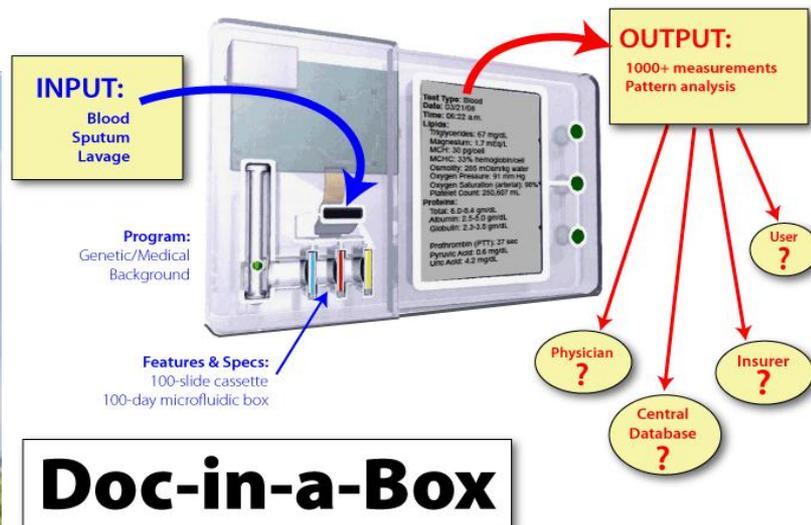
The Center for Nanotechnology in Society at Arizona State University research, education and outreach activities are supported by the National Science Foundation under cooperative agreement #0531194



# Regulatory Meaning of Foresight

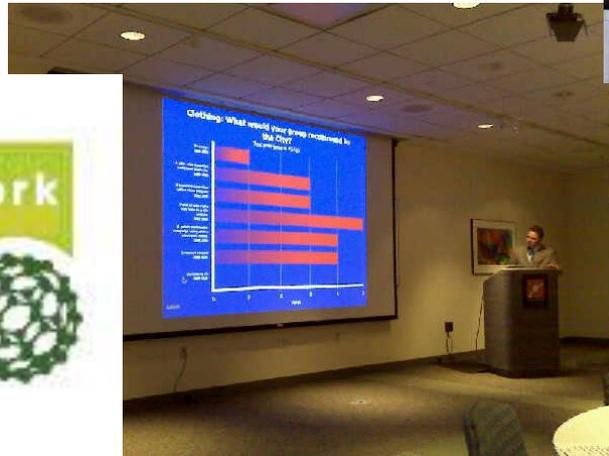


Scenario development helps address what kinds of plausible responses, uses, contexts, etc., may be important for emerging technologies.



# Engagement

- National Citizens' Technology Forum
  - 2008 Nano and Human Enhancement
- Science Cafes
- NISE Net
  - Informal Science Education
  - Forums



# Regulatory Meaning of Engagement

## Process-related findings:

- Increased opinion holding
- Increased knowledge
- Congruence between individuals and groups
- Congruence among regional groups
- No direct evidence for polarization cascades

## Substance-related findings:

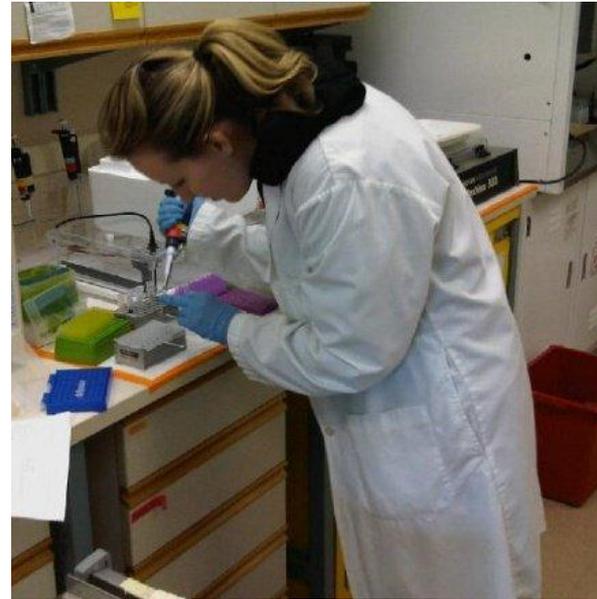
- Deliberation reduces support for enhancement applications
- ...reduces support for non-therapeutic interventions
- ...does not dilute general optimism about nano
- ...increases feelings of internal efficacy
- ... decreases feelings of external efficacy



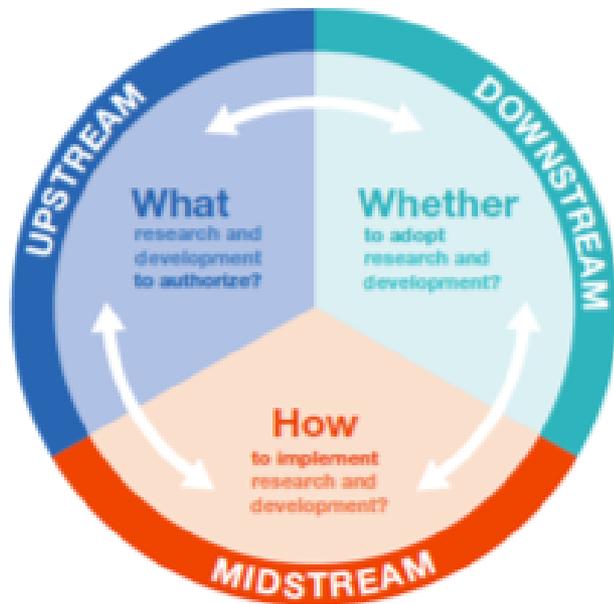
2003 Act authorized it.  
Methods are ready.  
Are agencies?

# Integration

- Socio-Technical Integration Research (STIR)
- Education/Training
  - PhD+
  - DC Summer Session
  - Curricular
    - Undergraduate
    - Graduate



# Regulatory Meaning of Integration



Laboratories are sites of governance as well

Midstream modulation can occur through increased reflexive awareness

# Urban Design, Materials, and the Built Environment

To what extent could nano-technologies foster sustainable urban development (potentials/limitations) in the future?

Graduate studio course:

“Sustainable Anticipatory Governance: The Future of Phoenix



## Four Phases of Research

- Stakeholder analysis for Nano and the City topics
- Participatory scenario construction with stakeholders
- Sustainability appraisals of scenarios
- Exploration of governance arrangements for sustainable scenarios

# Anticipatory Governance in Action: Strategic & Evaluative Guidance for Another Asilomar?

- **Foresight**: What vision of future did scientists at Asilomar have?
  - **Determinist** (“these things are coming, like it or not”)
  - **Distancing** (“we don’t have the ability to do this now so we don’t have to consider this stuff”)
- **Engagement**: To what extent was the public involved in the discussions?
  - **Not at all** (by invitation GRC)
  - **Contrast**: Cambridge city council hearings
- **Integration**: To what extent were social science and humanistic expertise represented in collaboration with natural science and engineering expertise?
  - **Attorneys and journalists** played crucial role
  - **Ad hoc** decision-making processes



(Left to right) Maxine Singer, Norton Zinder, Sydney Brenner, and Paul Berg were among the participants at the Asilomar Conference.

# Anecdote 2.a. Precaution in the Lab



# Anecdote 2.b. Back to Pasteur and Latour

Laboratories are sites of governance, too.

Laboratories are social and precautionary.



What if we expand the social and precautionary elements of the lab?

Let citizens have anticipatory, engaged, and integrated experience with emerging technologies and protect them as we do scientists.

# Thanks!

- Conference Organizers
- National Science Foundation cooperative agreement #0531194. Any opinions, findings and conclusions are those of the author and do not necessarily reflect the views of the National Science Foundation.