



Anticipatory Governance of Emerging Technologies

UW Biological Futures Colloquium Series

David H. Guston



NSEC/Center for Nanotechnology in Society at Arizona State University



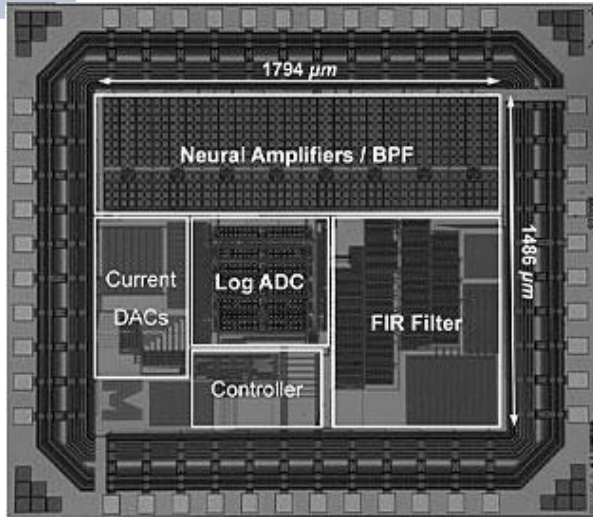
- **Research** the societal implications of nanotechnologies
- **Train** a community of scholars with new insight into the societal dimensions of nanoscale science & engineering (NSE)

- **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

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Problem Orientation



Nano-Bio-Info-Cogno

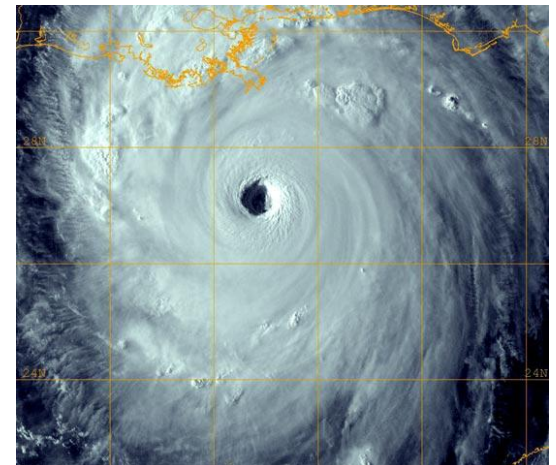
Eyjafjallajokull



Fukushima



Katrina



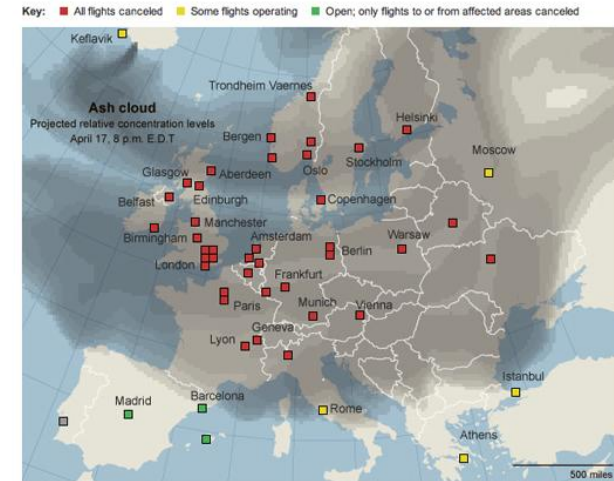
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Anticipatory Governance at CNS-ASU

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

Because none of these works in isolation

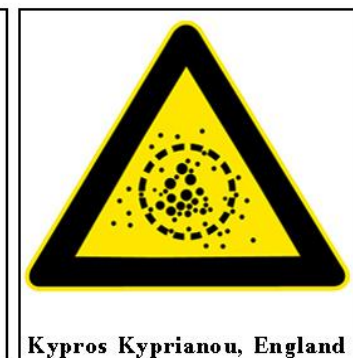
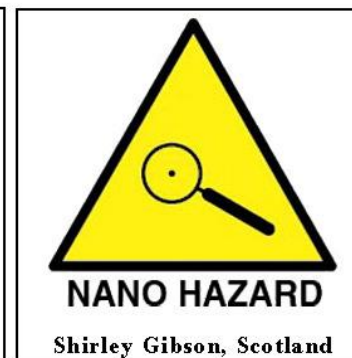
A broad-based capacity extended through society that can act on a variety of inputs to manage emerging knowledge-based technologies while such management is still possible.

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



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
 - R&D funding & tax credits
 - Testing
 - Treaties
 - Public Understanding of Science
 - Informal Science Education
 - Public engagement
 - Public action
 - Priming
 - Routinization
 - Codes of conduct
 - Standards
 - Laboratory decisions

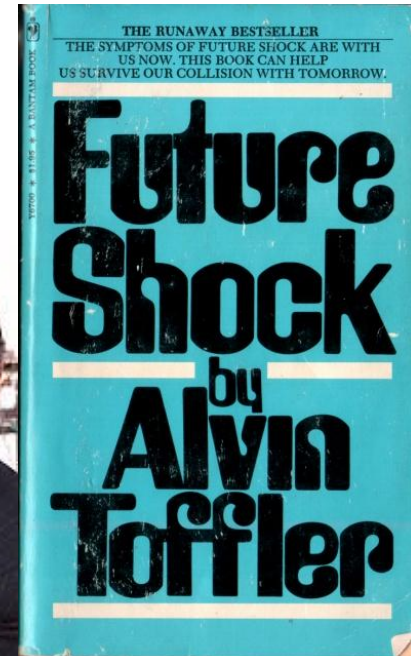


Anticipatory Governance – Not a New Idea, Just a New Capacity



“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.”

Detlev Bronk
Pres., JHU;
Pres., NAS;
Pres., Rockefeller U



“anticipatory democracy”

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Four Warrants for Anticipatory Governance

“if we could use the tenets of psychohistory to guide ourselves we might avoid a great many troubles. But on the other hand, it might create troubles. It's impossible to tell in advance” – Isaac Asimov

1. **Stop-gap**: until we have prediction
2. **Fail-safe**: in case we can't get prediction
3. **Priority-setting**: capacity to predict may not be comprehensive and doesn't tell us how to deploy that capacity
4. **Generality**: prediction in some areas (nano) doesn't imply prediction in other emerging technologies (syn bio)

I. The Puzzle



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I.B. Two Answers



Michael Polanyi
“impossible and
nonsensical”



Frederick Soddy
“duty”

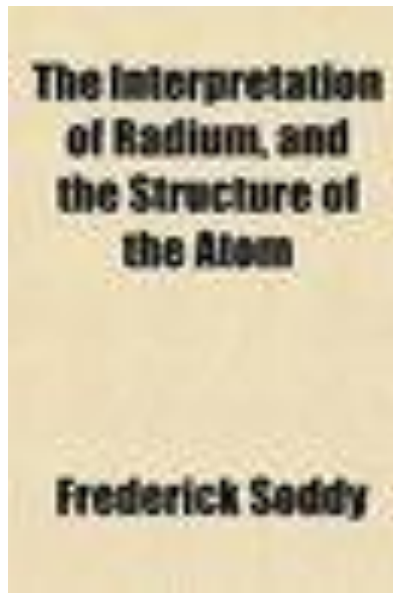
II. Polanyi & Prediction



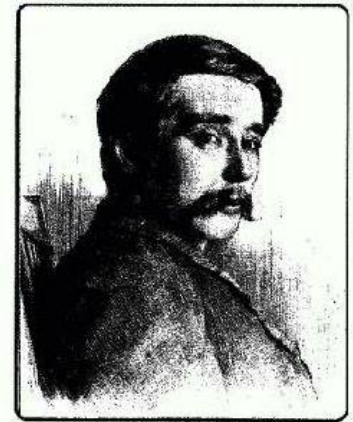
“You can kill or mutilate the advance of science,
you cannot shape it.”

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III. Soddy & Responsibility



The World Set Free



By H. G. Wells



IV. Did the Dog Bark?

PROCEEDINGS OF THE ROYAL SOCIETY A | MATHEMATICAL, PHYSICAL & ENGINEERING SCIENCES

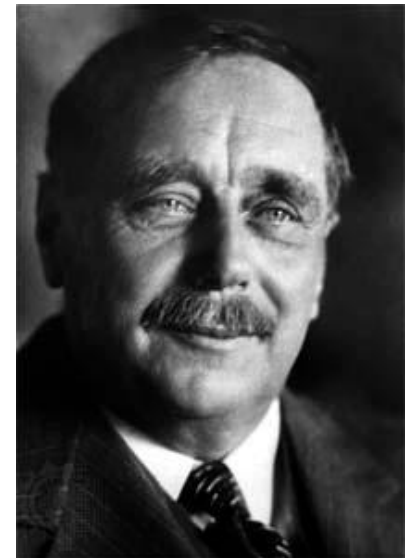
Discussion on Heavy Hydrogen: Opening Address

Lord Rutherford, N. V. Sidgwick, F. W. Aston, P. Harteck, F. Soddy, M. Polanyi, E. K. Rideal, R. H. Fowler, R. P. Bell, J. D. Bernal and W. Jevons

Proc. R. Soc. Lond. A 1934 **144**, 1-28
doi: 10.1098/rspa.1934.0032



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Ernest Rutherford

V. *The World Set Free*



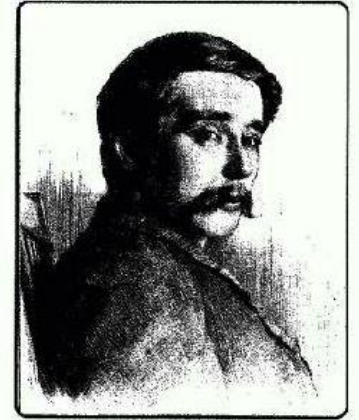
I would become
a philosopher



“his greatest novel”



The World Set Free



By H. G. Wells

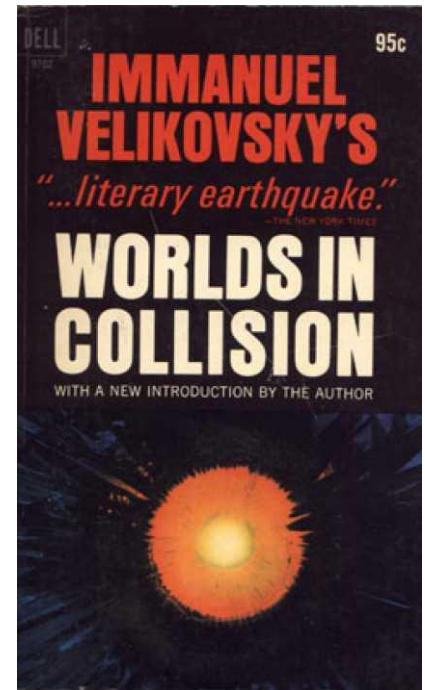


The chain reaction

VI. Prediction or Plausibility?

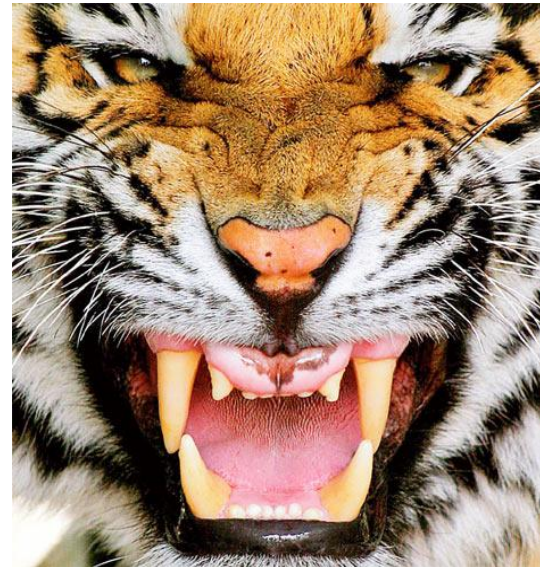


“The assessment of
plausibility...is tacit.”



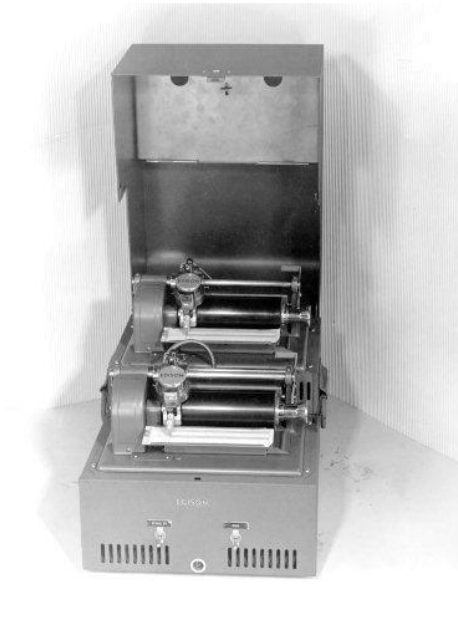
Reliability/exactitude
Systematic importance
Intrinsic interest

VI.B. Prediction or Plausibility?



If you are assembling bit of reality, is it not at this point that you want to start asking, “what happens if it is a tiger?”

VII. Back in the Booth

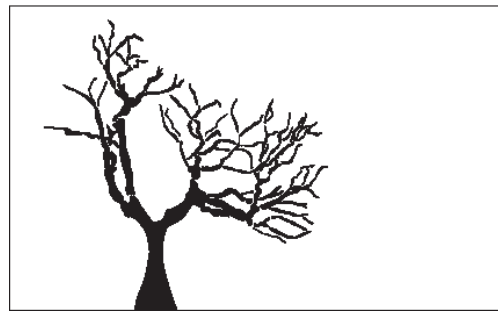
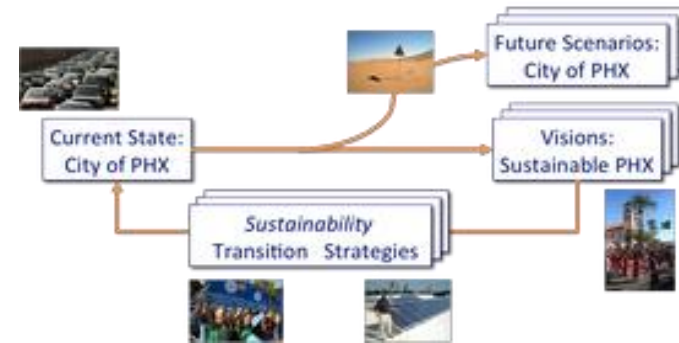


U.S. DEPARTMENT OF THE INTERIOR, NATIONAL PARK SERVICE, EDISON NATIONAL HISTORIC SITE

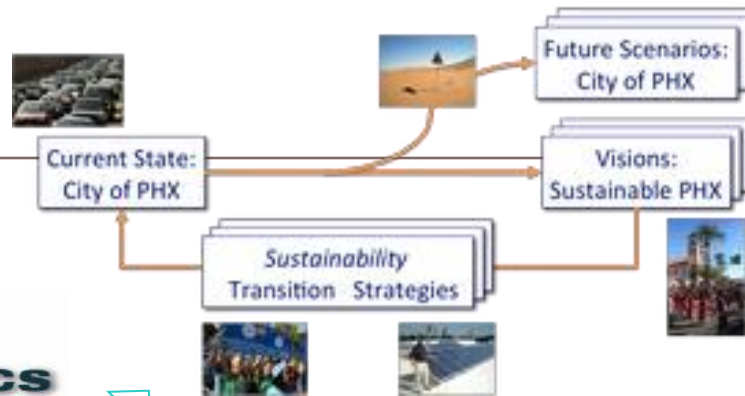
Three Strands of Anticipation Research

- Visioning
- Future Artifacts and Deliberation
- Plausibility

Sustainable Anticipatory Governance



VISIONING



City of St. Paul Climate Adaptation Scenarios

The Future of Medical Diagnostics



Scenarios Matrix

		Value to Society	
		HIGH	LOW
Responsibility for Health	Individual	<p>Healthlites vs. Natural Lifers</p>	<p>Docs R Us</p>
	Institutional	<p>Unlimited Hope in a Box</p>	<p>Doc Blue AI</p>



Solar to Fuels

Report on Interdisciplinary Workshop

Arizona State University, Thursday 4th March 2010, 10am-2pm

Sarah Davies, Cynthia Selin and Becky Allen

The Center for Nanotechnology in Society, Arizona State University

Anticipatory Governance Visioning Workshop



FUTURE ARTIFACTS & DELIBERATION

Does nanotechnology belong in toys?

Nanosilver is found in many consumer products.

Silver is naturally antimicrobial, and tiny nanosilver silver particles are reportedly effective at killing germs. Nanosilver is used in bandages, sporting goods and washing machines—and of one thing we know for sure it's hot stuff.

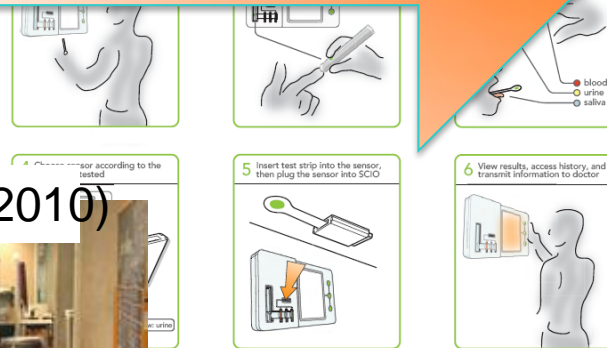
Exposure to nanosilver products probably won't harm you, but widespread use of nanosilver could cause some water supplies, hot tubs or food to "lighten" or "supercharge."

"MATERIAL DELIBERATION"

EMERGE:
 SCIENTISTS AND ARTISTS IMAGINE THE FUTURES

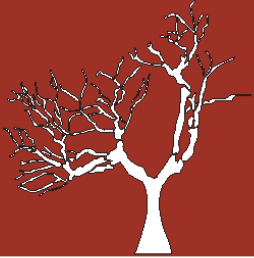
MAKING AND HACKING:
 EXPLORING DELIBERATIVE PRACTICES
MEDIATING FUTURES

Nano Education article (2010)



FINDING FUTURES





International Workshop on Plausibility, Tempe, AZ (2009)
CNS-ASU *vodcast* on Plausibility (2009)

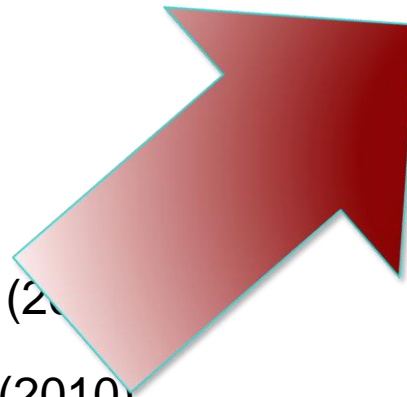


NanoFutures v.2
Survey on Plausibility

Special issue:

*International Journal of
Foresight and Innovation*
(call, 2011)

Writing workshop,
Ispra, Italy with the Joint
Research Centre (2012)



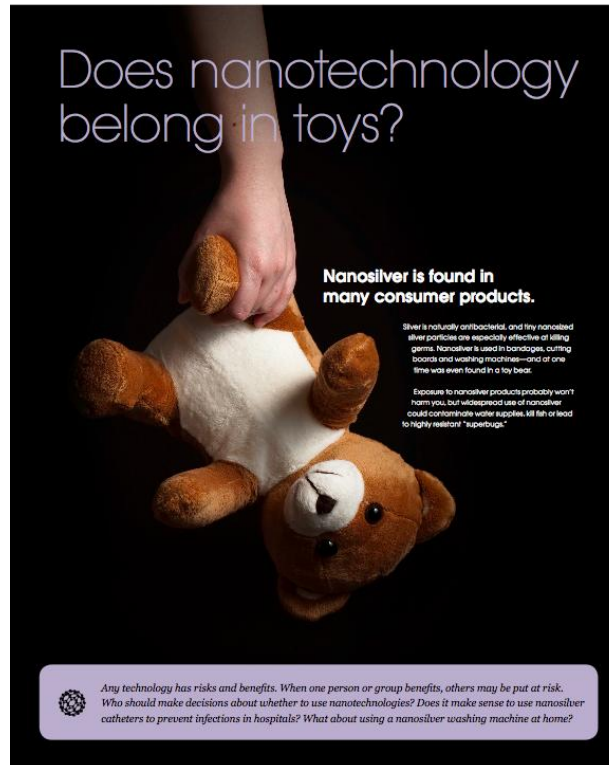
Technology in Society article (2010)
Science and Engineering Ethics article (2010)

Society for the Social Studies of Science (2010)
Society for Risk Analysis panel (2010) <David H. Guston>

Society for the Study of Nanotechnology and Emerging Technologies (2010)

Engagement

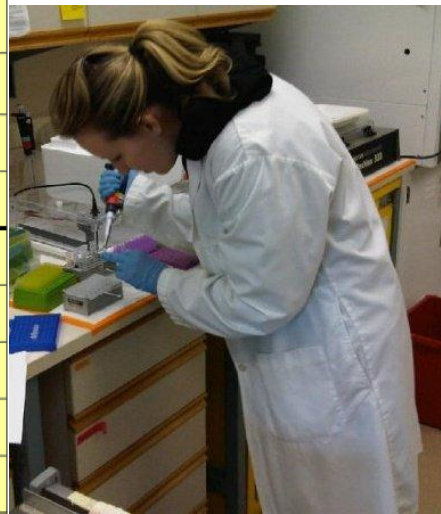
- NISE Net
 - Nano Days
 - Forums
- National Citizens' Technology Forum
 - 2008 Nano and Human Enhancement
- Science Cafes
- FutureScape Tours



Integration

- Socio-Technical Integration Research (STIR)
 - Responsible Innovation
 - Public Value
- Education/Training
 - DC Summer Session
 - PhD +
 - Curricular

STS	Tempe	Beijing	Bio-Physics
Political Science	British Columbia	Oxford	Genetics
Public Affairs	Denver	Belfast	Material Science
Anthropology	Berkeley	Basel	Synthetic Biology
STS	Tempe	Seoul	Bio-Chemistry
Philosophy	Tempe	Madrid	Physics
Business	York	Leeds	Manufacturing
Philosophy	Golden	Dalian	Fuel Cells
Political Science	Walloon	Flanders	Neuroscience
Ethics	Delft	Tempe	Microbiology



CNS-ASU Leadership and Staff

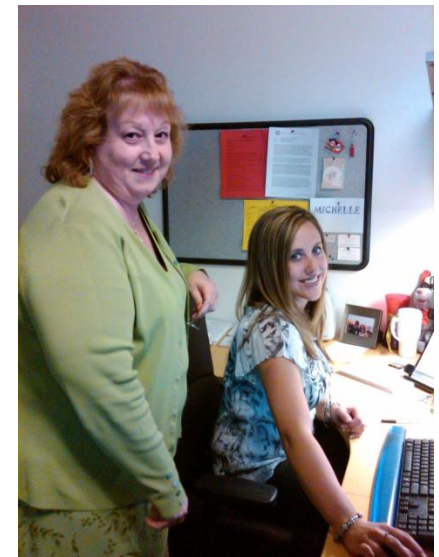


PI: D. Guston; co-PIs C. Miller (assoc dir), D. Meldrum, D. Scheufele, J. Youtie, E. Corley



Assistant directors J. Wetmore, C. Selin, E. Fisher

Staff:
R. Sanborn,
M. Iafrat



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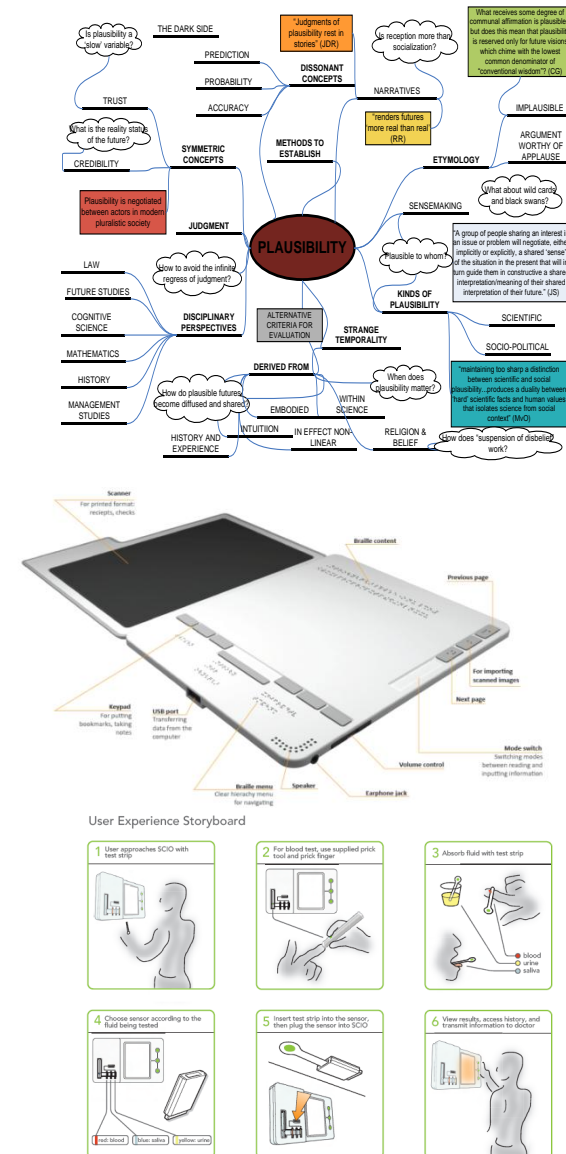


Thanks

- Alison and Gwen for the invitation.
- National Science Foundation cooperative agreement #0531194 and 0937591. Any opinions, findings and conclusions are those of the author and do not necessarily reflect the views of the National Science Foundation.
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- Lee Gutkind, Daniel Sarewitz, Gregg Zachary, Erik Fisher, Peter Collins, and Heather Douglas for comments and assistance.
- Derrick Anderson, Gretchen Gano, and Owen Marshall for research assistance.

Proximity to Nanotechnology

- AG will prime society for NT, whether or not it is real (and to name is to conjure)
- But....
 - We cannot eliminate surprises, so ambiguous priming is favored over unambiguous surprise
 - Less channeling scientific prophecy than in amplifying the still, small voices that don't often get to make the future and
 - Encouraging reflexivity among laboratory researchers (and others)



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Proximity to the Public

- Public engagement has come of age with nanotechnology....
- But does it delegitimize classic democratic institutions?
 - Surge in public engagement is symptom more than cause of delegitimation



Proximity to the Public

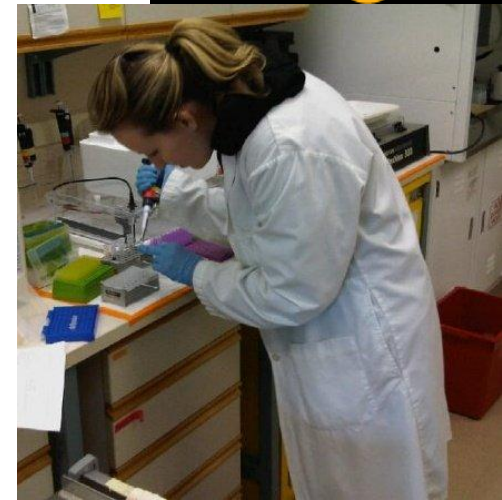
- Is “upstream engagement” fatally flawed with linear thinking? Is it focused on preemptively pacifying publics?
 - More challenge to metaphorical imagination
 - Letting ambiguity serve as dilemma is a soft determinism of its own



Proximity to Technoscience

- Anticipatory governance can't but reproduce the technoscientific world-view
 - Nordmann: "It is the very idea of taking hold of the future that characterizes the transgressive hubris of the technosciences."
 - But Sarewitz: "What lies between an implausible commitment to control and a fatalistic embracing of passivity?"
- "Shaping" technology rather than "controlling"
- STIR
 - Reconfigure responsible development to make it "do-able"
 - Temporal move of anticipation – what we can do now
 - Jurisdictional move – lab as site of governance

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