The Center for Nanotechnology in Society
ARIZONA STATE UNIVERSITY

Anticipatory Governance of Emerging Technologies

UW Biological Futures Colloquium Series

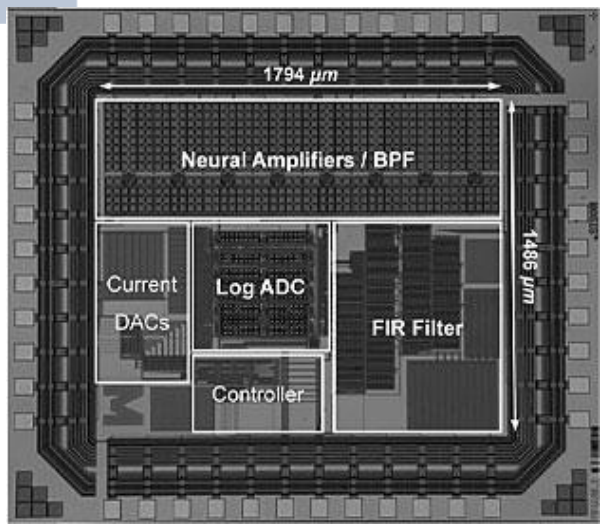
David H. Guston

ARIZONA STATE UNIVERSITY

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

Problem Orientation

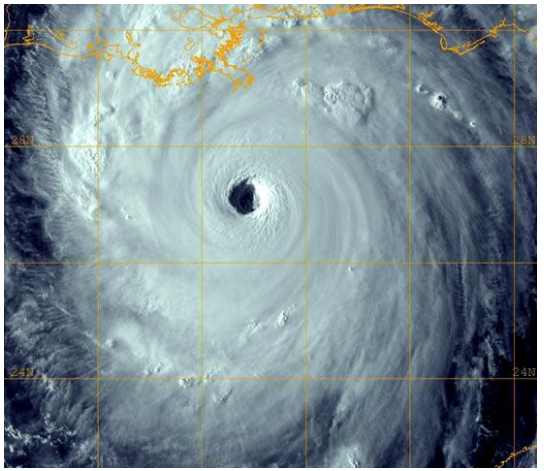


Nano-Bio-Info-Cogno

Eyjafjallajokull

Fukushima

Katrina



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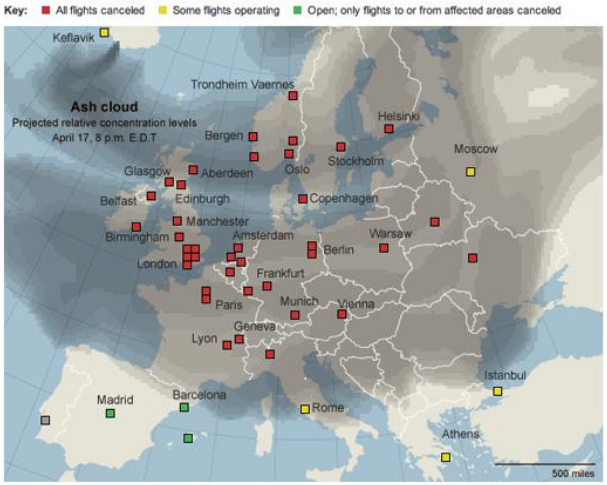

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Anticipatory Governance at CNS-ASU

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"

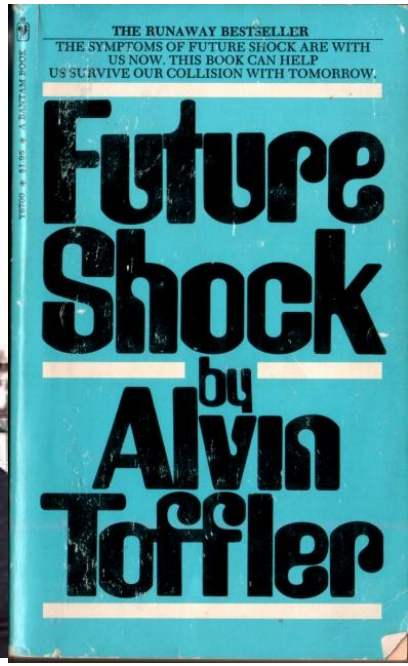
Anticipatory Governance – Not Government

- 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"

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


JUMANJI
A TINY BITE CAN MAKE YOU ITCH, MAKE YOU SNEEZE, MAKE YOU TWITCH
JUMANJI
A GAME FOR THOSE WHO SEEK TO FIND

I.B. Two Answers

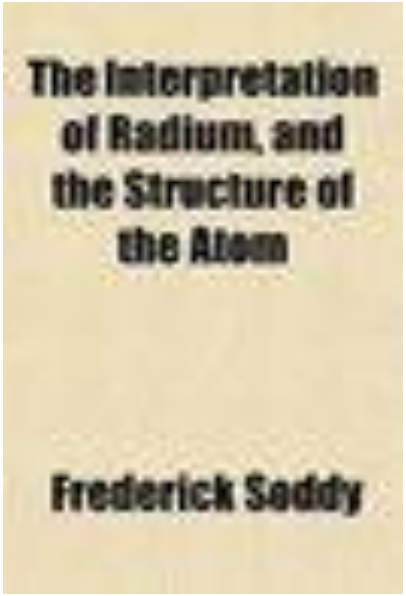
Michael Polanyi
“impossible and nonsensical”

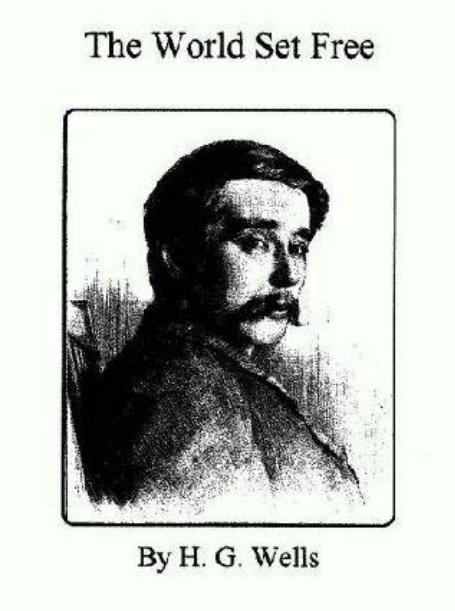
Frederick Soddy
“duty”

II. Polanyi & Prediction

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

III. Soddy & Responsibility





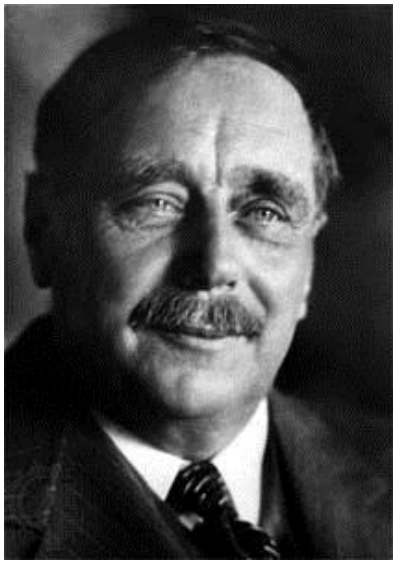
IV. Did the Dog Bark?

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

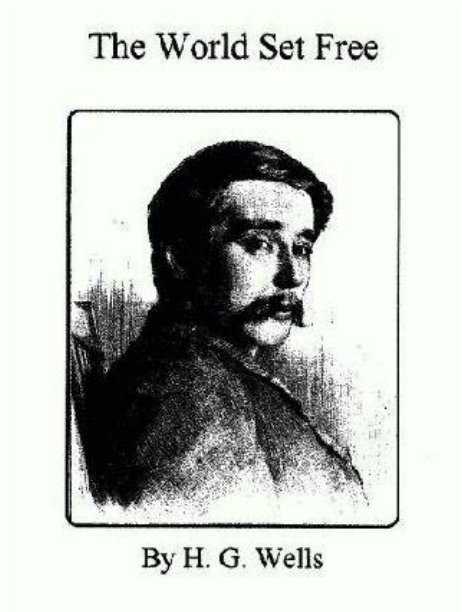


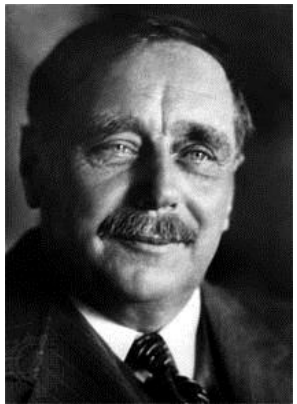
Ernest Rutherford

V. *The World Set Free*

I would become
a philosopher

“his greatest novel”

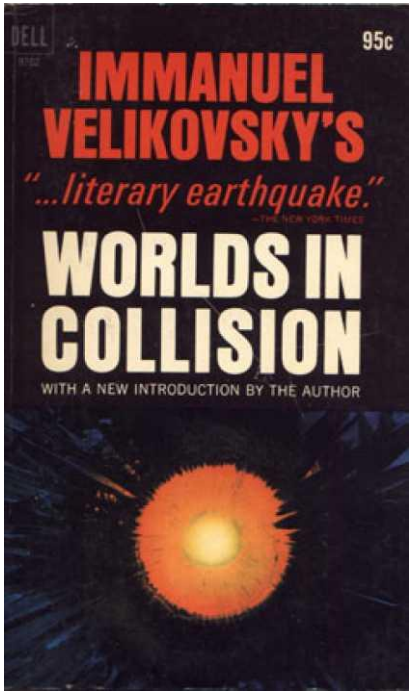




The chain reaction

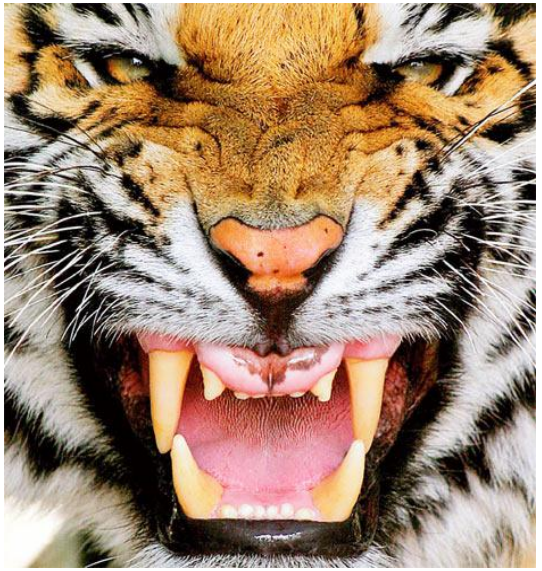
VI. Prediction or Plausibility?

"The assessment of plausibility…is tacit."



Reliability/exactitude
Systematic importance
Intrinsic interest

VI.B. Prediction or Plausibility?

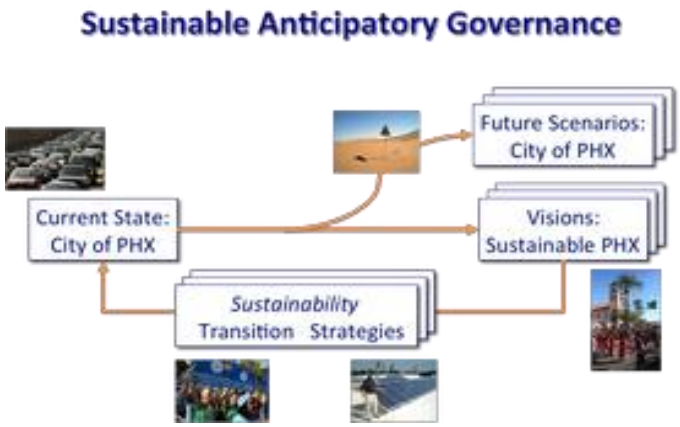


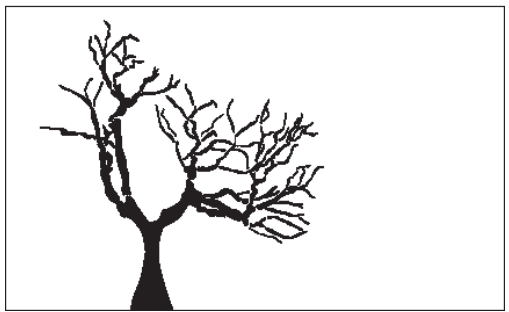
If you are assembling bit of reality, is it not at this point that you want to start asking, “what happens if it is a tiger?

VII. Back in the Booth

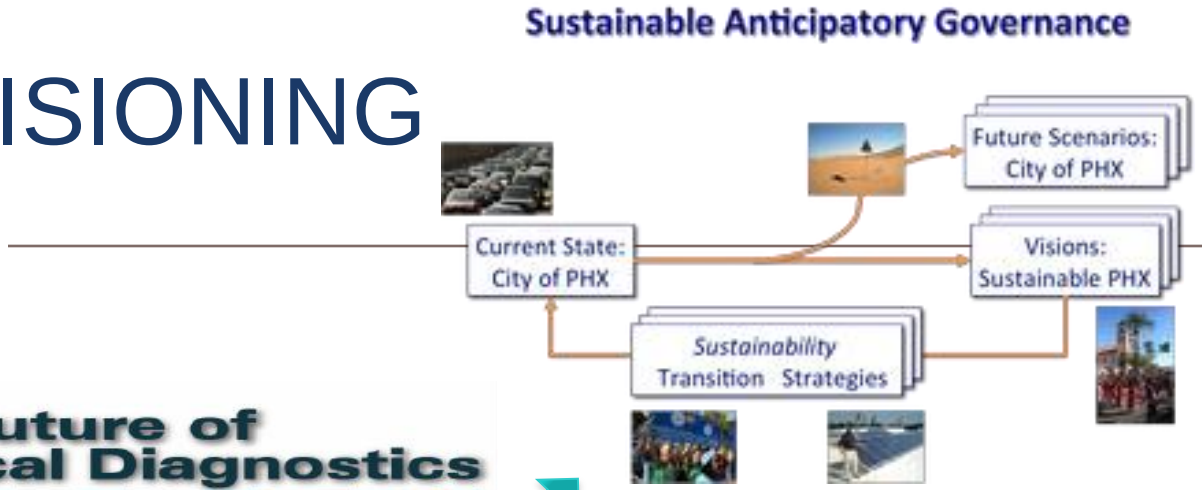
Three Strands of Anticipation Research

- Visioning
- Future Artifacts and Deliberation
- Plausibility





VISIONING



City of St. Paul Climate Adaptation Scenarios

Scenarios Matrix

Responsibility for Health		Value to Society: HIGH	Value to Society: LOW
	Individual	Healthletes vs. Natural Lifers	Docs R Us
	Institutional	Unlimited Hope in a Box	Doc Blue AI

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Solar to Fuels

Report on Interdisciplinary Workshop

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

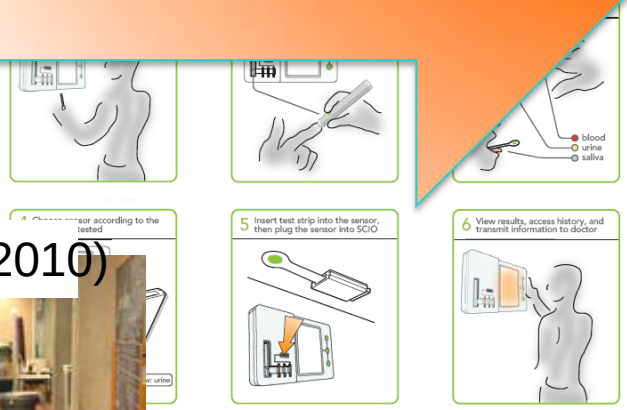
Sarah Davies, Cynthia Selin and Becky Allen

The Center for Nanotechnology in Society, Arizona State University

NISE network
NANOSCALE INFORMAL SCIENCE EDUCATION

FUTURE ARTIFACTS & DELIBERATION

"MATERIAL DELIBERATION"

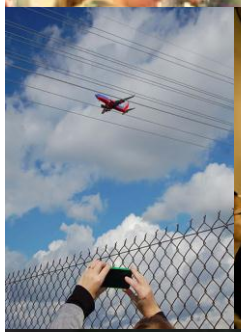


EMERGE: SCIENTISTS AND ARTISTS IMAGINE THE FUTURES

MAKING AND HACKING: EXPLORING DELIBERATIVE PRACTICES

MEDIATING FUTURES

Nano Education article (2010)



FINDING FUTURES

PLAUSIBILITY

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 (2

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

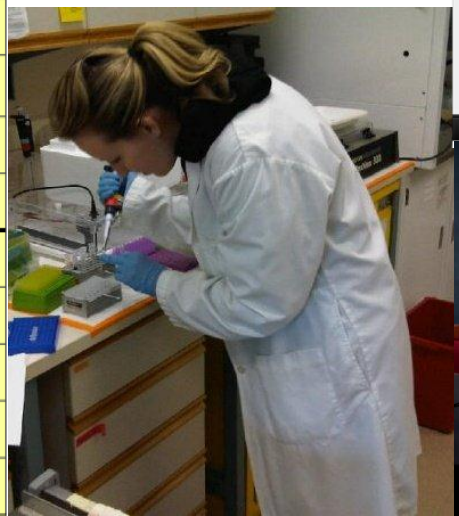
- NISE Net
  - Nano Days
  - Forums
- National Citizens' Technology Forum
  - 2008 Nano and Human Enhancement
- Science Cafes
- FutureScape Tours

NISE network
NANOSCALE INFORMAL SCIENCE EDUCATION

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



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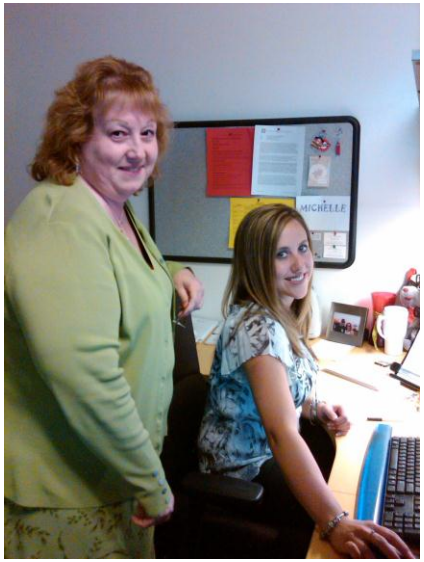
Assistant directors J. Wetmore, C. Selin, E. Fisher

Staff:
R. Sanborn,
M. Iafrat



Thanks

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