Laboratory Engagements: Risky Discourse and Research Decisions

Erik Fisher

efisher1@asu.edu

Arizona State University

Networks, Risk and Knowledge Sharing

University of Massachusetts Amherst

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The Center for Nanotechnology in Society
ARIZONA STATE UNIVERSITY

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Risky Discourse

- Discussions between scientists and “others”…
  - About broader dimensions of research (including risks)
  - That takes place in close proximity to the science and engineering in question (and thus can influence it)

- This can be risky
  - Social capital
  - Cultural taboos
- This can also be valuable
  - Responsibility of research
  - Productivity of research

Risky discourse is not a new idea

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

John Steelman *Science and Public Policy* 1947

A “constitutional moment” in science governance

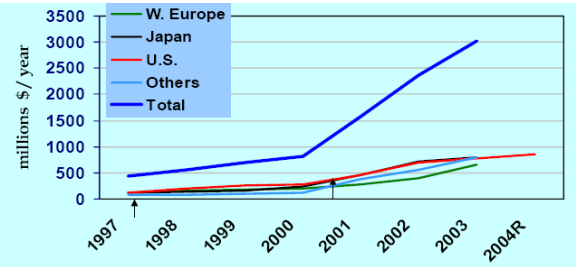
Risky discourse has been mandated in…

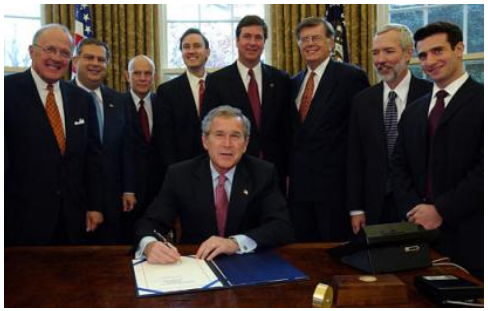
- United Kingdom to build “more reflective capacity into the *practice* of science” (Wilsdon 2005)
- Netherlands to “broaden the scope of strategic choices” (Rip 2005)
- Flanders, Belgium to “stimulate the *reflexivity of scientists*” (Goorden et al. 2008)
- United States to “make different research or application choices” (Guston & Sarewitz 2001)

(cf. Jasanoff forthcoming)

21st Century Nanotechnology R&D Act

- "Ensuring that ethical, legal, environmental, and other appropriate societal concerns…are considered during the development of nanotechnology" by
- "Insofar as possible, **integrating** research on societal, ethical, and environmental concerns with nanotechnology research and development"
- So that societal research "**influences the direction of ongoing** nanotechnology research and development"





(Fisher 2005, Fisher & Mahajan 2006)

Laboratory Engagement Studies

Case 1: *'Dept. of Energy Laboratory',* Los Alamos National Laboratory

Case 2: *Center for Single Molecule Biophysics,* Arizona State University

Case 3: *Thermal and Nanotechnology Laboratory,* University of Colorado, Boulder

Case 1: EHS briefing discussion

Internal risks

Strophe: *We only talk about benefits, not risks of our research*

Antistrophe: *Don't go over to the "dark side" of science*

External risks

Strophe: *I'm uncomfortable saying we just follow the usual practices*

Antistrophe: *No, the answer is we are holding to the most stringent possible standards*

Case 1 Findings

- Discussing negatives is perceived as risky:
  - Ideas from the “dark side” threaten optimism
  - Expressing concerns may trigger unproductive top-down decisions about research
- But also as valuable:
  - Committed to more briefings and discussions
  - Extended invitation to run a session at annual workshop
    - “How should we respond to these issues?”
    - List of recommendations
    - “Thank you for your leadership”

Case 2: Public Value Workshop

“Can public values affect the direction of laboratory research?”

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Socio-Material Layers STEP 1

Please list key challenges and choices available to each of the groups and to the project as a whole.

Physics

Organic Chemistry

Project as a Whole

Electrochemistry

Case 2 Findings

After initial skepticism…

- Graduate students report new perspectives on project and interdisciplinary research
- Faculty and graduate students request “more meetings like this”
- Faculty members have new “breakthrough” and “useful” research ideas
  - “That was actually useful”
  - Scheduled regular workshops
  - Co-authored article

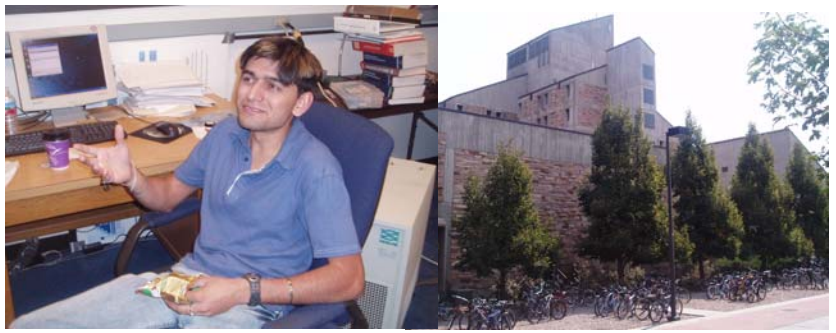
Also: Discussing scientific responsibility stimulated research creativity

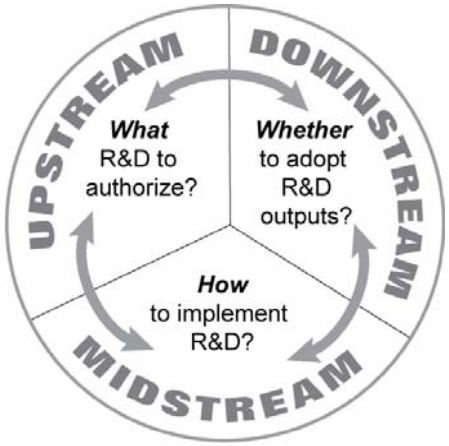
Case 3: Midstream Modulation

- Opportunity
  - Problem framing
- Considerations
  - Constraints and enablers
- Alternatives
  - Perceived available options
- Outcomes
  - Response to opportunity

"Embedded Humanist" in CU-Boulder College of Engineering

(Fisher 2007)





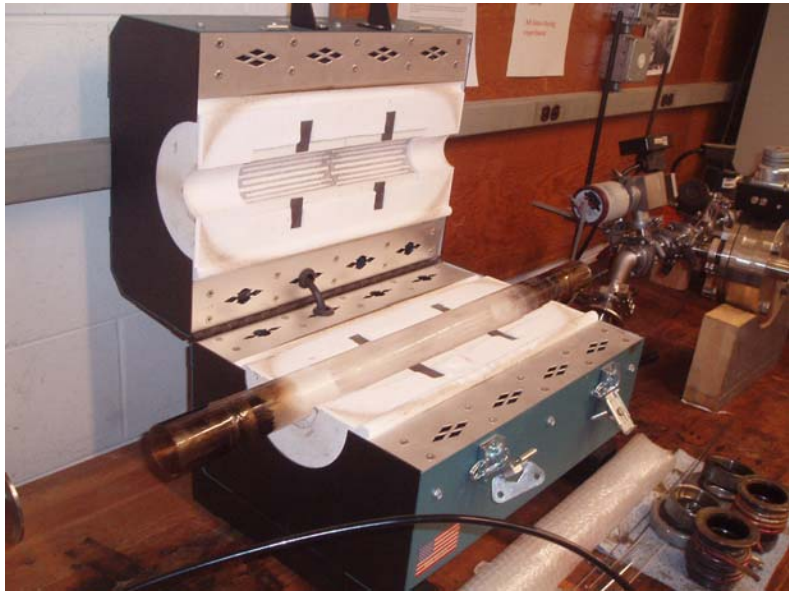
"Can decisions be otherwise?"

Render decisions more transparent

Absence of risky discourse

- Prior to the collaboration, no evidence of it in…
  - Research priority setting, proposal writing, experimental design and conduct, interpretation, paper writing, peer review, research program and PhD assessment, etc.
- During collaboration, some resistance to it
  - “it’s not our job”
  - “Others will decide”
  - “It will only make us safer”

Modulation of Research



- Opportunity
  - “Can we grow tubes in a fiber?”
- Considerations “Ferrocene is messy.”
  - “We didn’t know if it had any potential applications.”
  - “Why not try it and see.”
  - Fiber’s properties, prohibitive size, experimental procedure
- Alternatives
  - “I can only think of Ferrocene”
  - “Maybe ferrofluid” “then we wouldn’t need to use Ferrocene”
- Outcome
  - Ferrocene: “failed experiment”
  - Ferrofluid: “Now it’s actually turning out to be something”

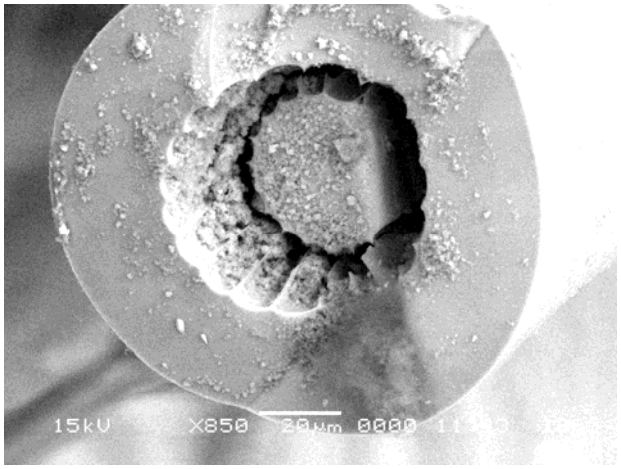
(Fisher 2007)

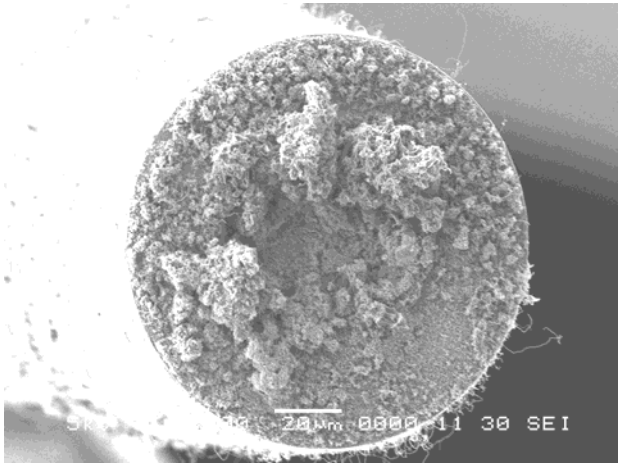
Case 3 Findings

- Initial resistance turned to support (2 subjects)
- EHS-related research practice changes (1 subject)
  - Introduced alternative catalyst
  - Modified disposal method
  - Modified experimental setup
  - Formulated safety rules
- Measured increase in reflexive awareness (3 subjects)
  - Project “could have been a whole different thing”

Also, discussions salvaged a research project

Case 3 extended outcome





PhD DISSERTATION

29 Aug. 2007

The suitability of carbon nanotube growth on three dimensional surfaces and its application as infrared radiation absorbers for thermal detectors, and moldable thermal contact coatings is explored in this work. Carbon nanostructure growth is demonstrated on quartz **using ferrofluid as the catalyst**. Scanning Electron Microscopy (SEM) and Transmission Electron Microscopy (TEM) are employed to study the internal structure of the carbon structures formed. By varying the catalyst deposition technique, nanotube growth with diameters in the range 30-70 nm and lengths up to several microns is achieved. **Growth inside quartz tubes and fibers,** as small as 50 µm is also demonstrated for hydrophobic transport of fluids

Risky discourse, as employed in midstream modulation…

"…can produce research and development options not previously considered. This is of particular value if directors of public research are truly committed to generating beneficial sociotechnical innovation"

Joly & Rip *Nature* 2007

Risky Discourse

Does pose risks:

- Did (temporarily) dampen the outlook of scientists
- Could have (possibly) triggered unproductive policy decisions about research

But also offers value:

- Helped stimulate innovative ideas that promoted
  - Scientific productivity of research
  - Social responsibility of research

= A NET GAIN

for **references** please contact the author at efisher1@asu.edu

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