

Establishing Expertise in Deliberations on Nanotechnology



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Faculty Advisor



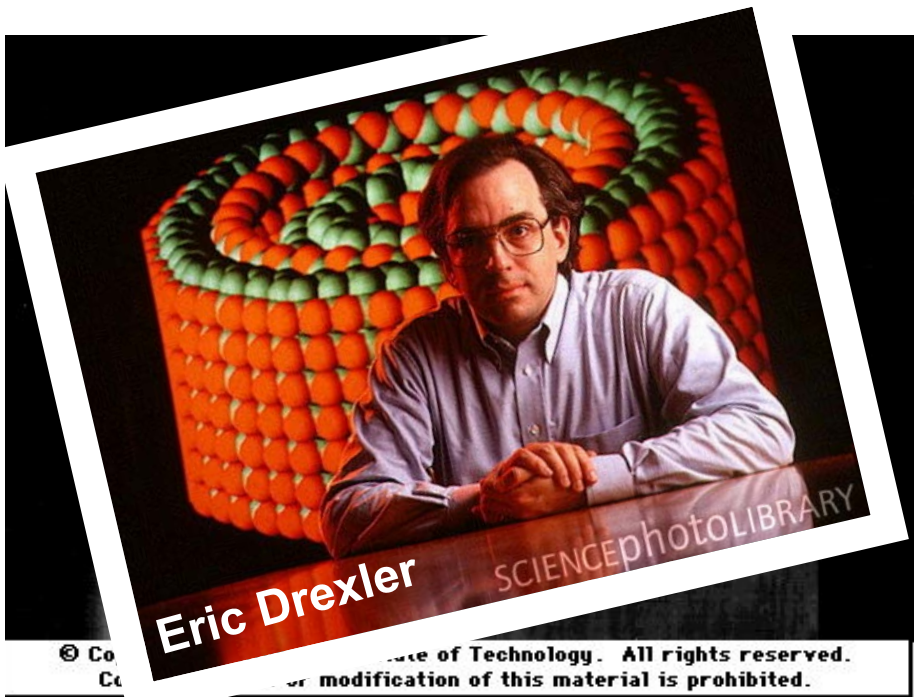
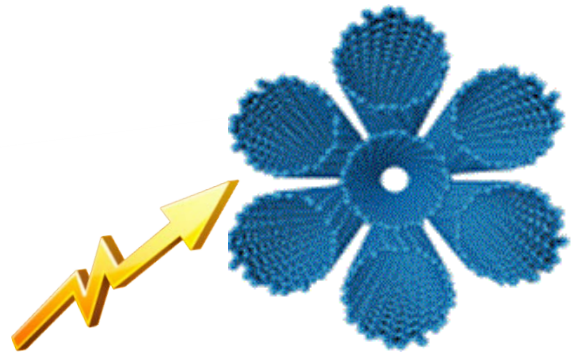
Alexander Lyte
Economics
Santa Barbara City College

Amanda Denes
Mentor



The Story of CNS

National Nanotechnology Initiative



Richard Feynman
There's Plenty of Room at the Bottom

(From Left) Barbara Herr Harthorn, Bruce Bimber, and W. Patrick McCray.
Not Included: Rich Appelbaum and Chris Neufield



We



Photo by: Joe Reign



Upstream



are



How does the public make sense of
nanotechnology?



Many forms of Expertise



Group Deliberations

Read Articles on
Nanotechnology

The Ethics of Nanotechnology
VISION AND VALUES FOR A NEW GENERATION
OF SCIENCE AND ENGINEERING

GEORGE KHUSHF
Center for Bioethics and Department of Philosophy
University of South Carolina

Big, well funded science needs a vision that can grab the public imagination. For the superconducting supercollider the goal was to discover the fundamental building blocks of the universe. For the Human Genome Project it was to read the book of life. Now the metaphor shifts from discovery to creation, from reading nature to rewriting nature. For nanoscale science and technology the vision involves understanding and manipulating matter at the atomic scale. The vision was described in *Nanotechnology: Shaping the World Atom by Atom*, a report by the National Science and Technology Council (NSTC, 1999):

The emerging fields of nanoscience and nanoengineering are leading to unprecedented understanding and control over the fundamental building blocks of all physical things. This is likely to change the way almost everything—from vaccines to computers to automobile tires to objects not yet imagined—is designed and made.

Obviously, any activity with such huge potential raises a host of ethical and social questions. However, before we can explore these issues, or rather, as a first step in exploring them, we must first clarify what we mean by nanotechnology (Keiper, 2003; Stix, 2001). There are several competing meanings of nanotechnology, and the definition we choose will influence the ethical issues that must be addressed. For this reason, the first part of this essay concerns the debate about how nanoscale science and technology should be understood. I then review the ethical issues that should be considered.

Discuss the Issues



Stock image

The Methods

The Sample:

Representative of Santa Barbara's

Various **ethnicities**, **ages**, **education**, and
income

10-15 people per day

6 days of deliberations

2 Topics: **Health & Human
Enhancement** and

Energy & Environment

3 Groups: **Mixed-sex**, **All-Male**,
All-Female

Research subjects gathered by the:

social science survey center
benton survey research lab



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The Methods

Pre-Discussion Survey

Initial Large-Group Discussion

Presentation on Nanotech Risks and Benefits



“Nano” Article Reading

“World Café” Small-group discussion

Final Large-Group Dialogue

Post-Discussion Survey



My Research Goals

- Common Techniques used **For** or **Against** Nanotechnology
- Particular Topics of **Controversy**
- Find **Differences** in How **Women** and **Men** Establish Expertise

Common Techniques of Expertise

Participants' expertise affects perspectives

Personal & Professional Experience

a story from their life that influences their perception

“When I was a biologist...”

Appeals

a request or reference to a certain perspective or value

“Einstein was against regulation...”

Hypothetical Situations

a potential scenario that could occur as a result of nanotechnology

“If we can manipulate DNA...”

Analogies

showing a similarity between the features of two things

“Nanotech is like biotech...”

The Personal & Professional Experience

“...a friend of mine...did have a hip replacement ...She is a very productive artist...we don't know when we are going to go, so let's make the best of it while we are here and be productive if we can”

“I was executive vice-president of the Canadian Primary textile industry...we had many committees that set standards for energy conservation...we always had the bottom line in view but we were very responsible in setting these standards and self-policing...we got the support of various government departments”

The Appeal

“...if we don’t have any more technological advances we’re all gonna die.” – Appeal to Consequences

“We like humans have been here like 3000 years...look at those thousands of years where...people just lived and they did not have all these enhancements. We can go back to that...” – Appeal to Tradition

Hypothetical Situations

“...if we hadn't had nuclear weapons then we would have had another world war”

“if you are photosynthesizing instead of eating what does that do to your digestive system?”

The Analogy

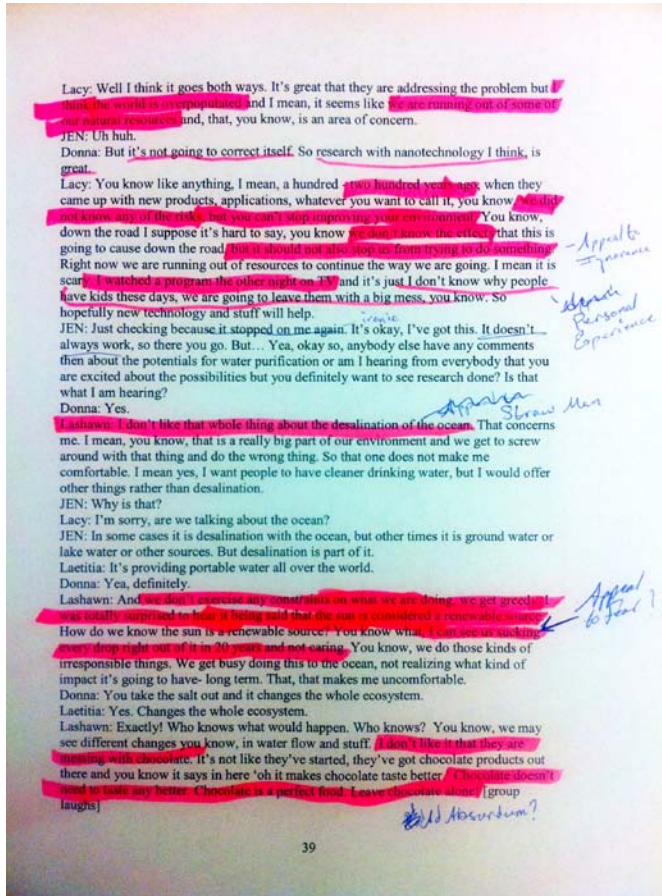
“...it might just be a shell game where you cleaned the water, you cleaned the air, but then it might create new problems”

“...countless stories of people who win the lottery and their life becomes worse.”

The Process

Excel pivot table

Raw transcripts



Direction	Argument	Female	Male	Grand Total
Anti-Tech	Appeal to Consequences	6	3	9
	Appeal to Ethics		3	3
	Appeal to Fear	3		3
	Appeal to Tradition	13	2	15
	Hypothetical	9	6	15
	Personal Experience	3	2	5
Anti-Tech Total		34	16	50
Pro-Tech	Analogy to Smoking	3		3
	Appeal to Consequences	7	1	8
	Appeal to Ethics	8	1	9
	Appeal to Ignorance	1		1
	Appeal to Progress	12	4	16
	Appeal to Tradition	6		6
	Hypothetical	14	9	23
	Personal Experience	29	12	41
	Professional Experience	2	3	5
Pro-Tech Total		82	30	112
Grand Total		116	46	162

Patterns of Expertise: Results

- **For or Against Nanotechnology**
 - Appeal to tradition and hypothetical situations were the most common arguments used against nanotechnology
- **Particular Topics**
 - Human and food enhancement were the most controversial branches of research
- **Women's vs Men's Arguments**
 - Women tend to use more personal experience

Conclusions

- Participants demonstrate expertise in many ways when discussing unknown topics
- Non-experts can make very convincing arguments
- Past perspectives affect current perspectives

Future Research

New Questions

- How do participants' backgrounds affect their perspective?
- Are there common arguments or perceptions among races, classes, and sexes?
- Do some participants' arguments affect others'?
- How does the flow of argument progress?

Summer Goals

Identify it in Deliberations

Enhance the Value of Public Involvement

Define Expertise



- Shaking Senegal

Josephine: Yeah. We cut down on 80% of children's deaths.

BARBARA: That would change- it would be a world changer.

Miles: Sure do not drink the water I mean right or how many places in the world have they told us that?

Ronald: Or using it in desalination form too you know where they can turn salt water into drinking water or bottleable water.

BARBARA: Right and and I mean we have the technology to do that now because we have our black ball desal plant here in Santa Barbara.

Ronald: Right. Well I hear they are very big in in the Mideast though.

BARBARA: Right right.

Josephine: That is who bought it from us right? Saudi Arabia?

BARBARA: Right that is right that is right.

Miles: Are you a golfer perhaps? *point using authority in his game*

BARBARA: No not really. *understanding her authority strategically*

Miles: You know that is as far as everybody else is concerned the sand bar what that is the 11th green.

BARBARA: The 11th green

Miles: The desalination plant.

BARBARA: The desal plant?

Miles: Yeah.

BARBARA: So the question is do you think let us assume I meant they are really pushing on water treatment. Do you think that if the technology is there that it would become widely available in the globe to the world's poor to change the health infrastructure in the developing world to or would it be-

Miles: Just for Richard Branson. *- Virgin?*

BARBARA: -just for just for-

Ronald: Well I think with the changing of the economical picture now with China and India becoming such large players it might have a better distribution than if it was done privately.

Miles: Well I think it is do they still call them iodine pills the ones that you put in your canteens-

BARBARA: Yep.

Miles: -when you go camping.

BARBARA: Yeah only a lot of people now use thing other than iodine.

Josephine: Drops yeah.

Miles: Do they use other stuff instead of just the bottled water that I use now?

BARBARA: Well yeah they use filters, which are small filtration devices that are like little reverse osmosis. So that I molecular but that is very so far that technology is very expensive you wouldn't- you can do it to produce- *run a mountain* but and you can do it to produce small amounts of water but to provide the water for a city it has to be- it has to become more-

Josephine: I think-

BARBARA: -energy efficient really. *- she resolves*

Josephine: Like everything when it first comes out you know it is so it is not as accessible as when other people have developed more and more and more things and then pretty soon it is kind of like over the board like just like in our age remember when calculators



Sorting the Good from the Bad

“You know its like you know
Its Scary” - Mai

VS

“You are addressing what is
 happening without asking why it is”
 - Jay

How?

ex·per·tise: having and demonstrating knowledge of a particular subject, whether acquired by experience or study

Personal Experience
 Group Consensus
 Educated Diction
 Proper Logic

Logical Fallacies
Faulty Generalizations
Red Herrings
Propositional Fallacies

Organizing the Data!

CNS-UCSB

Center for Nanotechnology in Society

From their mouths to our ears

- Shaking Sarah

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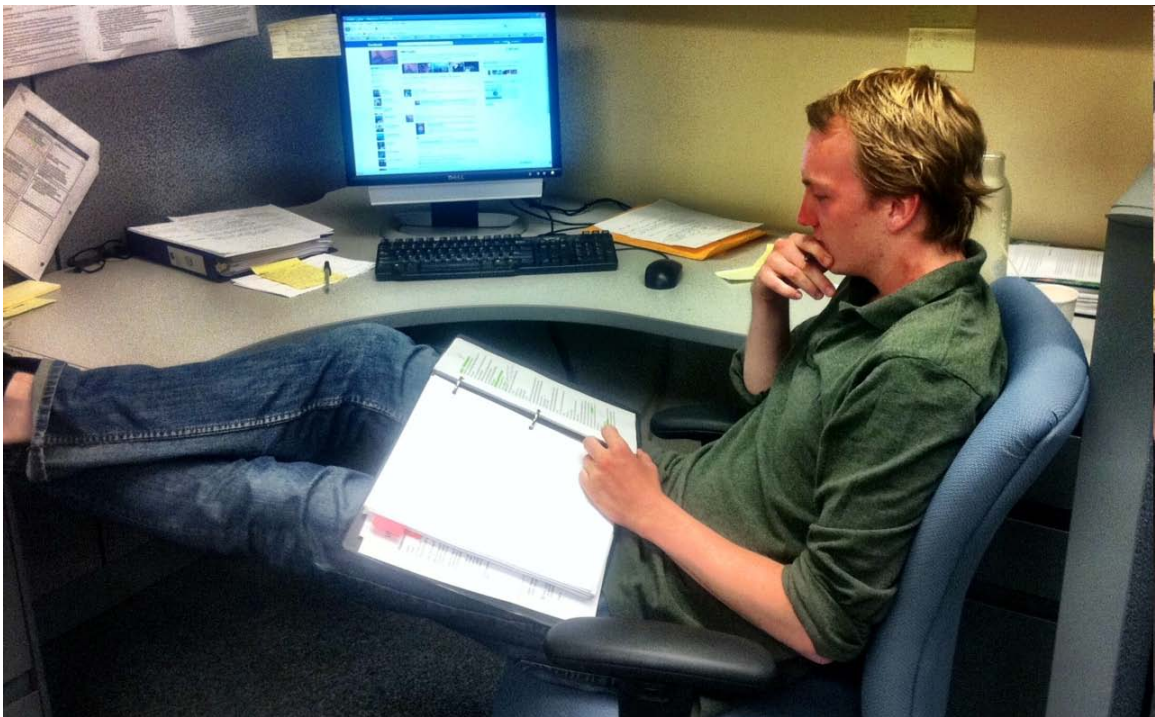
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Alexander Lyte

Photo by: William Reynolds

Name	Technique	Gender	Age	Ethnicity
Jay	Analogy	Male	38	Other
Saul	Experience	Male	56	Asian
Maggie	Sarcasm	Female	34	Asian

