

**The Promise and Challenges of a New Technology:  
An Integrative Examination of Nanotechnology**

XLA102, Spring 2007, MWF 9:40 – 12:30, 9 Credit Hours

Component Courses and Faculty:

CHM 194: Nanoscience: Concepts and Applications

POS 426: Elements of Public Policy – Science and Technology Policy

ASB/SOC334: Technology and Society

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**Course Texts (available in the ASU bookstore or online):**

Greene, Brian. 2005. *The Fabric of the Cosmos*. Penguin Press.

Kingdon, John. 2002. *Agendas, Alternatives, and Public Policies*. Longman.

Ratner, Mark, and Daniel Ratner. 2002. *Nanotechnology: A Gentle Introduction to the Next Big Idea*. Prentice Hall.

Sismondo, Sergio. 2003. *An Introduction to Science and Technology Studies*. Blackwell Publishing.

Smith, Catherine. 2005. *Writing Public Policy: A Practical Guide to Communicating in the Policy-Making Process*. Oxford University Press.

Volti, Rudi. 2006. *Society and Technological Change, fifth edition*. Worth Publishers.

Roco, Mihail and William Sims Bainbridge, eds. 2004. *Nanotechnology: Societal Implications – Maximizing Benefits for Humanity*. National Science Foundation (available online at [http://www.nano.gov/nni\\_societal\\_implications.pdf](http://www.nano.gov/nni_societal_implications.pdf)).

There will also be a course reader available at The Alternative Copy Shop (cataloged under “XLA102 Guston, Conz, Woodbury”); assignments will be denoted (CR) on the course reading list.

Additional reading assignments will be available online via the myASU course site or distributed in class.

**Overview:** Students participating in this Advanced Learning Community (LC) will develop the analytic and conceptual tools for thinking about the interplay among technology, society, and policy. The course focuses on the issues emerging in the broad field of nano-scale science and engineering (NSE, or nanotechnology), a topic that has attracted great attention in policy circles and among the general public. Students will learn not only the foundations of nanotechnology from a scientific perspective, but how policy and social factors both shape and are shaped by the intersection of these elements. Students will assess the societal implications of NSE and consider the competing benefits and costs of NSE research activities and outcomes through classroom exercises and semester-long projects.

This class examines the development of NSE in relation to society, work, science, the environment, public health, and cultural values related to social change. We will explore the institutions and processes of public policy in the United States, with a focus on how those institutions operate for science and technology policy regarding NSE. The class will cover national legislative, executive, and bureaucratic policy making, state-level policy making, and policy processes like agenda-setting and framing, policy selection and choice, and policy implementation and evaluation. Background in American government is helpful but not required. Students with no familiarity with American government will likely have to perform supplementary reading. Background in science is not required, and introduction to nanotechnology is an integral part of the LC.

The unique, block scheduling of the component courses will allow for a truly integrated learning experience. By design, faculty will periodically team teach from multiple disciplinary perspectives simultaneously, exposing students to a richer, more dynamic classroom experience. Expert guest speakers and panels, in concert with the LC faculty, will address the class and engage students in discussions not possible in traditional lecture settings. Specifically, students will participate in four integrated learning experiences including short-story fiction writing, mock town meetings debating the construction of an NSE research facility in a local neighborhood, mock congressional hearings of a national NSE funding initiative, and an integrative final paper that must incorporate the political, sociological, and scientific elements of NSE.

This LC will be tightly coupled with the Center for Nanotechnology in Society at ASU (CNS-ASU), an NSF-funded center to investigate the societal implications of nano-scale science, engineering, and technology. Students in this LC will participate in the Center's activities, including attending seminars by invited guest lecturers, observing or assisting with outreach to community groups, visiting working NSE laboratories at the Biodesign Institute, and even facing the possibility of paid assistantships with CNS-ASU upon completion of the LC.

**Integrative Activities:** Students will participate in several activities designed to integrate concepts and approaches from multiple perspectives. Each is coupled with a writing assignment or in-class discussion.

*Field Trips:* Students will have the unique opportunity to visit functioning NSE labs at the Biodesign Institute, the Center for Nanotechnology in Society at ASU, and other sites as they become available.

*Town Meeting & Paper:* This in-class discussion of the siting of a new nano fabrication plant will raise questions about whether this plant should be built in our community and, if so, where and with what restrictions; who benefits and who incurs costs; what are the risks and how can they be measured and mitigated? Students will be asked to research and play different roles in the discussions, such as business representatives, university science faculty, elected officials, activists, neighborhood residents of modest means, and the media.

*Short Story Writing and Review:* Students will write a short story about the future of NSE that discusses its capabilities and dangers, their implications for what people can and cannot do (and more deeply, who are and are not people?!), and what has been done, with what effects, to guide or shape the technoscience. Students will post their stories on the myASU course site for others to read. In a coffeehouse format they will hear and discuss each others' visions of the future.

*Peer Review:* On the day the above project is due, students will meet in small groups, exchange papers, and discuss each others' work. They will have the opportunity to share their questions, concerns, and critiques.

*Mock Congressional Hearing & Paper:* This hearing will cover federal regulation of and funding for NSE, addressing what kinds of research should be funded, what might be restricted, what are the potential dangers and how the research might be regulated. Students will play roles such as scientists, business leaders, activists, agency officials, and members of Congress and their staffs.

*Guest Speaker Reviews:* Students will be attending the CSPO Spring Lecture Series as part of the course. We will also have guest speakers come to our class. Students will keep journals in which they will record their thoughts, reactions, and questions based on the talks and the perspectives developed in class.

*Integrative Class Presentation and Discussion:* Students will choose a topic related to nanotechnology, present their ideas to class, and lead class discussions based on the technoscientific, policy, and societal perspectives of their major/home discipline.

*Integrative Final Exam:* The final exam will ask the student to step away from the more strongly positional aspects of the preceding assignments and offer an informed, analytic, measured assessment of the prospects and problems of NSE from multiple perspectives. The Final will include short answer, multiple choice, and essay questions.

## Grading:

Students will receive three separate grades for this learning community.

Town Meeting and Paper	10%
Short Story Writing and Peer Review	10%
Mock Congressional Hearing and Paper	10%
Guest Speaker Series/Field Trip Reviews	10%
Presentation and Discussion	15%
Integrated Final Exam	15%
Participation	30%

**Academic Integrity:** Cheating, plagiarism, or other forms of academic dishonesty will result in a failing grade for the assignment and possible disciplinary action with the dean of academic affairs. There are lots of essays and papers available on the internet and instructors can Google them just as easily as students can. Be sure to properly cite others' words and ideas.

**Class Discussions:** We will be discussing controversial topics in this course. It is imperative that you respect others' perspectives even if you disagree with them. We are here for intellectual debate, not for personal attacks or name calling.

**Disclaimer:** The instructors reserve the right to make changes to the syllabus and alter, add or substitute assignments. Changes will be announced in class and/or on the myASU site. It is the students' responsibility to keep track of these changes. By enrolling and remaining in this course the student agrees to comply with any changes.

## Tentative Semester Schedule and Reading Assignments:

### Week 1: Course Introduction and Overview of the Learning Community

#### Wednesday 1-17

Welcome

Multidisciplinary Foundations and Perspectives on Nanotechnology (Conz interviews Guston and Woodbury)

#### Friday 1-19

CNS-ASU Guest Speaker Ulrich Fiedeler, Biodesign Institute Auditorium

Readings: Richard Feynman. 1959. "There's Plenty of Room at the Bottom."

<http://www.zyvex.com/nanotech/feynman.html>

Eric Drexler. 1986. *Engines of Creation*, Chapter 1

[http://www.e-drexler.com/d/06/00/EOC/EOC\\_Chapter\\_1.html](http://www.e-drexler.com/d/06/00/EOC/EOC_Chapter_1.html)

### Week 2: Size Matters: Why Nanotechnology is Important to Science and Society

#### Monday 1-22

Scale: The really, really big (cosmology)  
Public Policy: Ideas, Process & Institutions  
What is Technology?  
Readings: Volti, Chapters 1 through 4  
Kingdon, Chapters 1 and 4  
Ripley (CR)  
Brian Greene 2004 *The Fabric of the Cosmos*, Chapter 1-3

### **Wednesday 1-24**

Scale: The really, really small (quantum mechanics)  
Laboratory Life – **Erik Fisher** [confirmed]  
Readings: Sismondo, Chapter 9  
Skim the following:  
NSTC. 1999. <http://wtec.org/loyola/nano/IWGN.Public.Brochure/>  
Michael Davey. 2000. <http://www.ncseonline.org/NLE/CRSreports/Science/st-48.cfm?&CFID=3730994&CFTOKEN=90052631>  
William Schultz. 2000.  
<http://pubs.acs.org/cen/nanotechnology/7842/7842government.html>  
Brian Greene 2004 *The Fabric of the Cosmos*, Chapter 4

### **Friday 1-26**

Lab Visit – The Biodesign Institute

## **Week 3: Issues, Agendas, Problems and Frames**

### **Monday 1-29**

Scale: The really, really small (quantum mechanics) cont'd  
Sociology of Science – Weber and Merton  
Framing Public Policy  
Readings: Sismondo, Chapters 1-3  
Smith, Preface & Introduction, Chapters 1 – 3  
Kingdon, Chapter 5  
Cobb and Elder (CR)  
Schon and Rein (CR)  
Brian Greene 2004 *The Fabric of the Cosmos*, Chapter 4

### **Wednesday 1-31**

#### **Professor Guston away**

Scale: The really, really small (quantum mechanics) cont'd  
Framing concepts of STS – controversies  
**Kevin Corley [not confirmed]**  
Readings: Volti, Chapter 17  
Sismondo, Chapters 4, 6, and 10  
Mark Ratner 2002 *Nanotechnology*, Chapters 1-3

## Friday 2-2

Field Trip to Body Worlds 3 Exhibit – AZ Science Center

## **Week 4: Areas of NSE, Budgets and Policy, LC Research Strategies**

### Monday 2-5

When metals start acting like molecules

Performing Research in Politics and Public Policy

Readings: Roco and Bainbridge, Executive Summary and Chapters 1 & 2

William J. Clinton. 2000, 21 January. <http://frwebgate4.access.gpo.gov/cgi-bin/waisgate.cgi?WaisdocID=37659112302+3+0+0&Waisaction=retrieve>

Browse: Matthew Nisbett's Blog. <http://framing-science.blogspot.com>

Sismondo, Chapters 11 and 14

Mark Ratner 2002 *Nanotechnology*, Chapters 4

### Wednesday 2-7

When molecules start acting like devices

Budgets and Policy

Readings: Peters (CR)

Wildavsky (CR)

Rocco. 2005. <http://www.aaas.org/spp/rd/06pch24.htm> |

Browse the AAAS Budget site: <http://www.aaas.org/spp/rd>

Volti, Chapters 8 through 10

Mark Ratner 2002 *Nanotechnology*, Chapters 1-3

Comment [DG1]: I need to update this

### Friday 2-9

GELSS Symposium at Old Main

## **Week 5: The Dynamics of Policy Making, Scenarios and Images of the Future**

### Monday 2-12

LC Librarian Session with Linda Shackle – Hayden Library, C-120

Thesis Statements Due

References Due

### Wednesday 2-14

The tiny machines that run biology

Policy Making

Readings: Ratner, chapters 5&6

Kingdon, chapters 6 & 7

Berube (CR)

Volti, Chapters 15 and 16

### **Friday 2-16**

Readings: Wyatt (CR)  
Geels and Smit (CR)  
Pielke and Sarewitz (CR)  
Schwartz (CR)  
Volti, Chapter 17

### **Week 6: Imagining the Future**

#### **Monday 2-19**

**Guest Speaker, Cynthia Selin, Future(s) Studies and Science Fiction**

#### **Wednesday 2-21**

**Guest Speaker, Ira Bennett – Scenario Development**

#### **Friday 2-23**

**\*Creative Non-Fiction Scenes Due**

**Guest Speaker, Arie Rip**

### **Week 7: Perspectives: Risk, Citizens, and Public Opinion**

**Comment [DG2]:** I wonder about risk here -- i won't talk much about it -- will you?

#### **Monday 2-26**

Tiny sensors powered by blood sugar  
Risk and Public Opinion  
PUS, Expertise, and the Social Shaping of S&T  
Readings: Kingdon, Chapter 3  
Joachim Schummer. <http://scholar.lib.vt.edu/ejournals/SPT/v8n2/schummer.html>.  
Jane Macoubrie. [http://www.pewtrusts.com/pdf/Nanotech\\_0905.pdf](http://www.pewtrusts.com/pdf/Nanotech_0905.pdf)  
Sismondo, Chapter 16

#### **Wednesday 2-28**

Risk and Public Opinion  
Quantum dots  
Readings: Michael D. Cobb. 2005.  
<http://www2.chass.ncsu.edu/cobb/me/past%20articles%20and%20working%20papers/na%20framing%20for%20science%20communication.pdf>  
Ingram Schneider. 1993. (CR)

Guston. 1999. <http://sth.sagepub.com/cgi/content/abstract/24/4/451>.

Roco and Bainbridge, Themes 9 and 10.

Christopher P. Toumey. 2004. [http://nsts.nano.sc.edu/outreach/sccsn\\_s04\\_report.pdf](http://nsts.nano.sc.edu/outreach/sccsn_s04_report.pdf).

Sismondo, Chapter 4

Volti, Chapter 15

### **Friday 3-2**

**Guest Speaker, Lee Gutkind – Creative Non-fiction**

### **Week 8: Medical NSE**

#### **Monday 3-5**

Brain-machine interface

Sociology of Medicine – Socialization of Medical Doctors, Medicalization of Deviance, Technology and Health

Readings: Volti, Chapter 7

**Guest Speaker Ben Lewin, Medicalization of Deviance**

#### **Wednesday 3-7**

**Science Fiction (cont'd)**

**Guest Speaker Clark Miller**

**Read “The Soul of the City”**

#### **Friday 3-9**

**Andrew Jamison Guest Speaker**

### **Week 9: 3-11 to 3-18 SPRING BREAK**

### **Week 10: Governing Consciousness, Artificial Intelligence, and Posthumanism**

#### **Monday 3-19**

Ubiquitous Computing

Artificial Intelligence

The President, Part I

Readings:

Kingdon, Chapter 2

Neustadt. 1976. (CR)

Light. 1984. (CR)

Weingast. 2005. (CR)

#### **Wednesday 3-21**

## **Hispanic Nanotechnology Panel – Biodesign Auditorium**

### **Friday 3-23**

WWC – the World Wide Cognition

Controlling Evolution

The Presidency, Part II

Readings:

Hart. 1998. (CR)

Lambright. 2003. <http://www.businessofgovernment.org/pdfs/LambrightReport3.pdf>.

### **Week 11: Nanoterrorism and Technologies of Destruction**

#### **Monday 3-26**

Revised Floor Statements

Military R&D, Terrorism, and Technologies of Destruction

Readings: Volti, chapters 13 & 14

#### **Wednesday 3-28**

Guns, Violence, and Gun Control

Readings: Explore the following websites: BATFE, Brady Campaign, and NRA

#### **Friday 3-30**

**CNS-ASU Guest Speaker Ahmad Soueid, Biodesign Institute Auditorium**

### **Week 12: The Media and Consumerism**

#### **Monday 4-2**

**\* Guston away**

Redefining Ourselves

Communication, Media, and Consumerism – McLuhan, Merchants of Cool,

Adbusters

Readings: Volti, Chapters 11 and 12

Browse: Adbusters website

#### **Wednesday 4-4**

**\*Guston away**

*Film – Aeon Flux*

Guest Speaker Paul Privateer

**Friday 4-6**

**SHORT STORIES AND READINGS**

**Week 13: Policy, Citizenship, and Nanotechnology**

**Monday 4-9**

Where is nanotechnology going?  
Nanotechnology and the Distribution of Benefits  
Hearings  
    Preparation  
    The Administration  
    The Scientists

**Wednesday 4-11**

Where is nanotechnology going (cont'd)?

**Friday 4-13**

**HEARINGS**

**Week 14: Public/Private Surveillance: How NSE blurs boundaries of behavior**

**Monday 4-16**

Where is nanotechnology going?  
Implementation and Evaluation  
Surveillance – Public Behavior, Privacy Issues, and Public/Government  
and Private/Corporate Interests  
The Privatization of Photo Radar  
Readings: Lyon, <http://www.surveillance-and-society.org/articles1/editorial.pdf>  
<http://www.antipope.org/charlie/rant/panopticon-essay.html>  
Clarke. 2001. <http://www.anu.edu.au/people/Roger.Clarke/DV/AQ2001.html>

**Wednesday 4-18**

Where is nanotechnology going?  
Surveillance and Privacy (cont'd)  
Sousveillance  
Readings: <http://www.wired.com/news/holidays/0,1882,56185,00.html>  
Browse: <http://wearcam.org/>  
Browse: <http://wearcam.org/wsd.htm>

**Friday 4-20**

**ATTEND CNS ALL HANDS MEETING AT ASU**

**Week 15: NSE and Religion; Road Mapping**

**Monday 4-23**

**Jamey Wetmore – NSE and Religion**

**Wednesday 4-25**

**Roadmapping**

**Friday 4-27**

**CLASS PRESENTATIONS**

**Week 16: Wrap Up**

**Monday 4-30**

**Final Exam TBD**