INTRODUCTION TO SCIENCE AND TECHNOLOGY POLICY ANALYSIS
PUBLIC POLICY 650
WINTER 2015

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COURSE DESCRIPTION

Science and technology intersect with multiple areas of public policy. Think of the growing concerns over government surveillance, the debates over policy for climate change mitigation, the challenges of widespread immunization, and the widespread public fear that American research and development competitiveness is eroding in a globalized economy. These issues reflect important questions about the relationship between science, technology, and public policy. Is scientific and technological development governable, and if so, who is responsible for governance? Is more and better science necessary for policymaking? Who is the best judge of the value of scientific research programs and the validity of scientific findings? Is the furtherance of scientific understanding and technological development always socially benign, and who decides?

This course introduces theories and methodologies for science and technology policy analysis. You will learn how science and technology policy is made, with specific attention to the roles of government agencies, expert advisory committees, and the public. You will master tools for science and technology policy analysis, including research funding allocation methods, public value mapping, technology assessment, and innovation theory. This analytic toolkit will be drawn from literature in a range of disciplines, including political science, philosophy, economics, sociology, and history.

This course will provide:
- Background on the science and technology policy environment
- Skills to think critically about how science and technology can be used to solve social and policy problems
- A multidisciplinary toolkit for thinking about science and technology policy
- Multidisciplinary methods for influencing science and technology policy
- An understanding of the "social science" of science and technology policy
- Expertise in conducting and presenting policy analysis

PubPol 650 is a core course in the Science, Technology, and Public Policy (STPP) Graduate Certificate Program, but is not limited to STPP students. It is designed for graduate students from diverse disciplines, including public policy, public health, law, business, engineering and the social, biological, and physical sciences. No scientific or technical background is necessary.

COURSE REQUIREMENTS

Class participation	*20%*
Class Blog	*30%*
Papers:	
Research Funding Memo	*10%*
Controversy Paper Proposal	*5%*
Backgrounder	*15%*
Governance Recommendation	*20%*

A. ***Class participation*.** This is a discussion-intensive course. <u>Preparation, attendance, and active participation are mandatory and will be important parts of your final grade.</u> Each class session will include discussions and other activities for which participation <u>requires</u> that you have read the week's assignment. Your preparation for class should not be a passive process of absorbing facts from readings; rather, while reading, you should actively identify (and write down!) questions you have, possible avenues of discussion, and potential points of application of the readings to current events. Along these lines, you should pay attention to current news in science and technology policy (I'll also provide a list of good sources.) These topics will often come up in class as examples.

B. ***Class Blog!*** To assist you in fulfilling (A), during the course of the semester you will produce entries on the class blog in advance of <u>ten</u> class meetings. At least <u>three</u> should be stand-alone posts based on the readings (300-400 words in length), and at least <u>seven</u> should be comments on/responses to your classmates' posts on the readings (150-200 words in length). Each should be for a separate day of class. You are encouraged to write additional posts or comments, either on the readings, on current events/news related to the class, etc. The blog posts and comments do not need to be elaborate; <u>but they should not simply summarize the reading</u>. They are think pieces, opportunities for you to refine questions and insights from the readings. Your entries should reflect on all of the readings assigned for the day, not just a single article. You can also use your posts to explore the relationship between ideas from the readings and the topics chosen for your class papers, between a particular set of readings and readings from another week, or between the readings and current events. Posts should be up by Tuesdays at 9 am, and comments by Wednesday at 9 am**.** I will draw on them to frame discussion and steer the conversation towards areas of use and concern to you. You should read all of the stand-alone posts in advance of class; I encourage you to read the comments before class as well, but this is not required. The blog will be private and only accessible to students in the class (and will be deleted at the end of the term). Here is the url: http://stpolicyanalysis2015.blogspot.com/

C. ***Class Papers:*** The course emphasizes writing for the policy environment, which may be a new skill for some of you. Unlike academic writing, it encourages persuasiveness, clarity, conciseness, and stating your argument clearly up front (although it still maintains most of the principles of good writing!) We'll discuss the genre, individual paper requirements, and tips throughout the term and in advance of assignments. I'm also available to meet with you regarding this, as are the Ford School's Writing Instructors. All students in the course can meet with them. If you want to make an appointment, you can do so here: https://fordschool.mywconline.com/
Note that you must first register with the site (i.e., create a login and password).

1. ***Research Funding Paper:*** Choose an area of research that you believe deserves more government funding, and a stakeholder (e.g., a scientific/professional organization, patient advocacy organization, civil society group) who is interested in increasing research funding this area. You, on behalf of your organization, have been asked to testify in front of a US Congressional committee (you must find the relevant committee and address your memo accordingly) to make your case. Using <u>no more than 700 words</u>, provide written testimony explaining why Congress should increase funding for your desired area of research. We'll discuss this more in class, but compelling written testimony will include answers to the following questions: Why is this area of research in the public interest? Why and how will it benefit America? What is the return on the investment? As you write this memo, you'll need to think hard about how to explain and justify this area of research (and the need for government research funding in particular) to a "lay" audience which is not expert in the area, and the most powerful way to make your case to these decisionmakers in this venue. (Hint: both the audience and politics matter in terms of how you frame your argument and evidence!)

    Keep in mind that you are purposely being asked to make a complex argument in a very limited space, in order to ensure that your argument, and your writing overall, is crisp and concise. Ingenuity in stretching the word limit will be penalized. (*Due February 13th, 8pm: 10% of grade*)

2. ***Science or Technology Policy Controversy Papers***
    a) **Topic Choice**. Choose an ongoing controversy related to a <u>specific</u> science or technology policy that you might want to focus on for your last two papers. There are a variety of possibilities to choose from, but it is really important that you choose a <u>specific piece of legislation or policy proposal</u>. Controversies are likely to focus on one of two specific questions: 1) should an area of science or technology move forward (e.g., proposals for developments pertaining to synthetic biology, geoengineering, natural resource development, etc.); or 2) should we regulate a particular area of science and technology (e.g., greenhouse gases/fossil fuels; genetically modified organisms, genetic testing). Choose a particular state or national context in which <u>an actual</u> controversy is taking place. Answer the following questions: What are the main topic(s) of controversy, and what is the history and context of the issue? What is the specific policy or legislation being debated? What is the evidence of a live, ongoing controversy? Who are the stakeholders involved? Who are the decisionmakers involved? Who are the experts involved? Why is this controversy of interest to you in the context of this course? This assignment should be no more than 500 words in length. (*Due February 27th, 8pm, 5% of your grade*)

    b) **Backgrounder**. This paper should provide an assessment of the controversy you are analyzing. It should be addressed to a decisionmaker in the controversy, from you as a science and technology policy analyst. It should include a brief history of the controversy, an assessment of the stakeholders involved (including who they are, their interests, values, and positions on the issue), the main issues of controversy, and previous efforts at resolution. In evaluating the main issues of controversy, be sure to

discuss the disputes over values, knowledge, and expertise (and how they are linked together). Also make sure to be specific about the history, the policy, who the stakeholders are, and what the stakeholders are arguing. An argument should guide this paper. This paper should be no more than 1000 words. Be sure to use concepts from class discussion and the readings in your analysis. Ingenuity in stretching the word limit will be penalized. *(Due March 27th, 8pm)*

c) **Governance Recommendation.** Choose one of the approaches we have discussed in class that is designed to resolve science and technology policy controversies. In a memo to a decisionmaker involved in your controversy (i.e. someone who would be in a position to implement your proposal), explain why this approach should be implemented in the context of your policy. Why is this approach appropriate for dealing with this controversy? How will you implement it? Be specific: who will be involved, how will the process work? Why is your approach the best way to implement the policy? More specifically, how will you ensure that the mechanism makes a difference in the controversy? Why is this a better approach than previous approaches in this or similar policy controversies? How will you design the mechanism to promote democratic objectives (again, be specific: what democratic objectives are you promoting, and which are being sacrificed, and why)? Will you make any improvements to the proposal and approach, how and why? What kinds of concerns might the decisionmaker have about your proposal, and how will you respond (counterargument)? Be specific! This paper should provide a blueprint for putting your chosen approach into action in your specific policy area. This paper should be no more than 1000 words. Be sure to use concepts from class discussion and the readings in your analysis. You do not need to revisit the background discussed in the "Backgrounder" memo. Ingenuity in stretching the word limit will be penalized. *(Due April 24th, 8pm)*

COURSE POLICIES
1. Attendance: Because this course depends heavily upon participation, I expect students to make every effort to attend all class sessions. Please notify me in advance if you will miss class. Repeated and unexcused absences will negatively affect your grade.
2. Late assignments: Extensions require prior arrangements with the instructor. Late assignments will lose **ten points for each day, or fraction thereof**, that they are late.
3. Academic honesty: All students are expected to abide by the University's standards of academic honesty, integrity, and professionalism. For details, see http://www.rackham.umich.edu/policies/academic_and_professional_integrity/.
4. Electronic devices: **Laptops and other devices are NOT allowed in class.** While I recognize that this may cause some consternation, such technologies negatively impact the character and quality of class discussion.
5. Disabilities: If you believe you need an accommodation for a disability, please let me know at your earliest convenience. Some aspects of this course may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, I can work with the Office of Services for Students with Disabilities to help us determine appropriate accommodations. We will treat any information you provide as private and confidential.

Texts available for purchase and on reserve in Weill Hall's library:
Daniel Sarewitz (1996). *Frontiers of Illusion: Science, Technology, and the Politics of Progress*. New Brunswick, NJ: Rutgers University Press.
Ann Campbell Keller (2009). *Science in Environmental Policy: The Politics of Objective Advice*. Cambridge, MA: MIT Press.
Melissa Leach and James Fairhead (2007). *Vaccine Anxieties: Global Science, Child Health, and Society*. Sterling, VA: Earthscan Press.

Other readings are available on CTools.

Course Schedule:
January 7: Themes, Mechanics, and Introductory Discussion

January 14: Thinking Critically about Science and Technology Policy
Wenda K. Bauchspies, Jennifer Croissant, and Sal Restivo, *Science, Technology, and Society: A Sociological Approach* (Malden, Mass., 2006), selections.
Martin, Emily (1991). "The Egg and the Sperm: How Science Has Constructed a Romance Based on Stereotypical Male-Female Roles." *Signs*. 16(3): 485-501.
Daniel Sarewitz (1996). *Frontiers of Illusion: Science, Technology, and the Politics of Progress*. New Brunswick, NJ: Rutgers University Press. Chapters 1, 3.

I.   Rethinking Science Funding to Solve Social Problems

January 21: National Research Policy in Historical and Comparative Perspective
Daniel Sarewitz, *Frontiers of Illusion: Science, Technology, and the Politics of Progress* (New Brunswick, NJ: Rutgers University Press, 1996), Chapter 2
Daniel Kleinman, *Politics on the Endless Frontier: Postwar Research Policy in the United States* (Durham, 1995), Chapters 3-6.
Celeste Amorim Varum, Can Huang, and Joaquim Borges Gouveia, "The Reform of the Chinese Innovation Policy Framework," First International Seminar on Regional Innovation Policies, Feb. 2007.
RECOMMENDED: Vannevar Bush (1945). *Science: The Endless Frontier. A Report to the President*. (Washington, D.C., 1945). (Chapter 6)

January 28: Rethinking the "Social Contract" for Government Research Funding
Daniel Sarewitz, "Institutional Ecology and the Social Outcomes of Scientific Research." In *The Science of Science Policy: A Handbook* (2011) Edited by Kaye Husbands Fealing, Julia I. Lane, John H. Marburger III, and Stephanie S. Shipp. Stanford, CA: Stanford University Press.
Barry Bozeman and Daniel Sarewitz, "Public Value Mapping and Science Policy Evaluation" *Minerva* 32 (2005), 119-136.
Monica Gaugan, "Public Value Mapping Breast Cancer Case Studies," in *Knowledge Flows and Knowledge Collectives: Understanding the Role of Science and Technology Policies in Development* (Consortium for Science, Policy & Outcomes, 2003), Vol. 2, 49-86.

Julia Lane, "Assessing the Impact of Federal Science Funding," *Science* 24 (5 June 2009), 1273-1275.

David Guston, "Retiring the Social Contract for Science." *Issues in Science and Technology* (2000).

February 4: Private Science and the Growing Intellectual Property Controversy

Philip Mirowski (2011). *Science-Mart: Privatizing American Science*. Cambridge, MA: Harvard University Press. Selections.

Padmanabhan, Swathi et al (2010). "Intellectual property, technology transfer, and manufacture of low-cost HPV vaccines in India." *Nature Biotechnology*. 28 (7): 671-678.

Biotechnology Industry Organization (2013). Amicus Brief in *AMP et al. v. Myriad*.

Medicins sans Frontieres, (2014) "Overcoming Barriers to Access: The Issues".

RECOMMENDED:

Heller, Michael and Rebecca Eisenberg (1998). "Can Patents Deter Research? The Anticommons in Biomedical Research." *Science*. 280: 698-701.

Richter, Jurith (2004). "Public-private partnerships for health: A trend with no alternatives?" *Development*. 47(2): 43-48.

February 11: DEBATE: Who Should Pay for Research, and Why?

Hegde, Deepak and Bhaven Sampat. "Interest Groups, Congress, and Federal Funding for Science."

Margaret E. Blume-Kohout (2012). "Does Targeted, Disease-Specific Public Research Funding Influence Pharmaceutical Innovation?" *Journal of Policy Analysis and Management*. 31.3: 641-660.

David Goldston (2011). "Science Policy and the Congress." In *The Science of Science Policy: A Handbook*. Edited by Kaye Husbands Fealing, Julia I. Lane, John H. Marburger III, and Stephanie S. Shipp. Stanford, CA: Stanford University Press.

Terence Kealey et al (2013). *Who Pays for Science?* CATO Institute.

February 13, 8pm: Research Funding Paper Due!

II.   The Politics of Knowledge and Expertise

February 18: Understanding the Political Environment of Science and Technology Policy

Stephen Hilgartner (1990). "The Dominant View of Popularization: Conceptual Problems, Political Uses." *Social Studies of Science*. 20.3: 519-539.

Daniel Carpenter (2004). "The Political Economy of FDA Drug Review: Processing, Politics, and Lessons for Policy." *Health Affairs*. 23.1: 52-63.

Sheila Jasanoff (2000). "Technological Risk and Cultures of Rationality." In *Incorporating Science, Economics, and Sociology in Developing Sanitary and Phytosanitary Standards in International Trade*. National Research Council. Washington, DC: National Academy Press: 65-84.

William B. Bonvillian. "The Problem of Political Design in Federal Innovation Organization." In *The Science of Science Policy: A Handbook* (2011) Edited by Kaye Husbands Fealing,

Julia I. Lane, John H. Marburger III, and Stephanie S. Shipp. Stanford, CA: Stanford University Press.

February 25: Understanding the Role of Science and Scientists in Policy Controversies
Ann Campbell Keller (2009). *Science in Environmental Policy: The Politics of Objective Advice*. Cambridge, MA: MIT Press. Introduction, Chapters 1-3.
Daniel Sarewitz, "How Science Makes Environmental Controversies Worse," *Environmental Science and Policy* 7 (2004), 385-403.

February 27th, 8pm: Controversy Papers Topic Choice due!

March 4: No class, Winter Recess

March 11: Complicating the Idea of Expertise
FILM: *How to Survive a Plague*
Brian Wynne, "Misunderstood Misunderstandings: Social Identities and Public Uptake of Science," in *Misunderstanding Science?* ed. Alan Irwin and Brian Wynne (Cambridge, 1996), 19-46.
Melissa Leach and James Fairhead (2007). *Vaccine Anxieties: Global Science, Child Health, and Society*. Sterling, VA: Earthscan Press. selections.

March 18: Risk, Uncertainty, and Trust in Policymaking
Daniel Sarewitz, Roger A. Pielke, and Radford Byerly, Jr., *Prediction: Science, Decision Making, and the Future of Nature* (Washington, DC, 2000), Chapter 1.
California Ocean Science Trust (2014). *Putting the Pieces Together*.
S. O. Funtowicz and J. R. Ravetz, "Three Types of Risk Assessment and the Emergence of Post-Normal Science" in Krimsky and Golding, eds., *Social Theories of Risk* (Westport, Conn., 1992), 251-74.
Les Levidow (2001). "Precautionary Uncertainty: Regulating GM Crops in Europe." *Social Studies of Science*. 31(6): 842-874.
Jasanoff, Sheila (2003). "Technologies of Humility: Citizen Participation in Governing Science." *Minerva*. 41: 223-244.

III.   Rethinking Innovation to Solve Social Problems

March 25: Understanding Innovation
Thomas P. Hughes, "The Evolution of Large Technological Systems," in *The Social Construction of Technological Systems*, ed. Wiebe Bijker et. al. (Cambridge, Mass., 1987), 51-82.
Jameson Wetmore, "Redefining Risks and Redistributing Responsibilities: Building Networks to Increase Automobile Safety," *Science, Technology, and Human Values*. 29 (2004), 377-405.
Langdon Winner, "Do Artefacts Have Politics?" in *The Whale and the Reactor: A Search for Limits in an Age of High Technology*, ed. L. Winner (Chicago, 1986), 19-39.
Daniel Sarewitz (1996). *Frontiers of Illusion: Science, Technology, and the Politics of Progress*. New Brunswick, NJ: Rutgers University Press. Chapters 7.

Kass, Jason (2013). "Bill Gates Can't Build a Toilet." *The New York Times*. November 18.
Hazeltine, Barrett and Christopher Bull (2003). *Field Guide to Appropriate Technology*. pp. 1-11.

==March 27th, 8pm: Controversy Backgrounder Due!==

April 1: Techniques for Technology Assessment
Lin, Albert C (2010). "Technology Assessment 2.0: Revamping our Approach to Emerging Technologies." *Brooklyn Law Review*. 1309-1370.
Selin, Cynthia (2008). "The Future of Medical Diagnostics." *Scenario Development Workshop Report*.
Buck, Holly Jean, Andrea R. Gammon, and Christopher J. Preston (2013). "Gender and Geoengineering." *Hypatia*.
Daniel Sarewitz (1996). *Frontiers of Illusion: Science, Technology, and the Politics of Progress*. New Brunswick, NJ: Rutgers University Press. Chapter 8.
Miller, Clark A and Ira Bennett (2008). "Thinking longer term about technology: Is there value in science fiction-inspired approaches to constructing futures?" *Science and Public Policy*. 35(8): 597-606.

April 8: Strategies For Democratizing Science And Technology
Bell, Larry. "Engaging the Public in Technology Policy A New Role for Science Museums." *Science Communication* 29.3 (2008): 386-398.
Sclove, Richard (2000). "Town Meetings on Technology: Consensus Conferences as Democratic Participation." In Daniel Lee Kleinman, ed., *Science, Technology, and Democracy* (Albany: SUNY Press), Chapter 2.
Brown, Mark (2006). "Citizen Panels and the Concept of Political Representation." *The Journal of Political Philosophy*. 14.2: 203-225.
Stilgoe, Jack, Matthew Watson, and Kirsty Kuo (2013). "Public Engagement with Biotechnologies Offers Lessons for the Governance of Geoengineering Research and Beyond." *PLOS Biology*. 11.11: 1-7.
Macnaghten, Phil and Bronislaw Szerszynski (2013). "Living the global social experiment: An analysis of public discourse on solar radiation management and its implications for governance." *Global Environmental Change*. 23: 465-474.
RECOMMENDED:
Daniel Sarewitz (1996). *Frontiers of Illusion: Science, Technology, and the Politics of Progress*. New Brunswick, NJ: Rutgers University Press. Chapter 9.

April 15: Sociotechnical Breakdowns
Charles Perrow, *Normal Accidents* (New York, 1984), Introduction and Chapter 1.
Diane Vaughan, "Organizational Rituals of Risk and Error," in *Organizational Encounters with Risk*, ed. Bridget Hutter and Michael Power (New York, 2004).
Hindmarsh, Richard ed. (2013). *Nuclear Disaster at Fukushima Daiichi: Social, Political, and Environmental Issues*. Pages 1-11 (to remind you of the Fukushima disaster chronology), Chapters 3 and 6.
Tabuchi, Hiroko (2014). "Unskilled and destitute are hiring targets for Fukushima cleanup." *The New York Times*. March 16.

RECOMMENDED:
Evan Osnos (2011). "Letter from Fukushima: The Fallout." *The New Yorker.*

April 24, 8pm: Final Paper Due!