

Technology, Science, and Innovation: Institutions and Governance
PUBP820-001
Fall, 2012

Professor David M. Hart
School of Public Policy
George Mason University

Times, Places, and Contact Information

Class meetings: Wednesdays, 4:30-7:10 p.m., Founders Hall TBA

Office hours: Wednesdays, 2-4 pm or by appointment

Office location: Founders Hall 527

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Learning Outcomes

New technologies present extraordinary opportunities for achieving major public policy objectives, such as economic growth, environmental sustainability, public health, military security, and the advancement of knowledge. Yet, they may also place the very same objectives in jeopardy. Whether the public benefits from technological change depends on how well the processes of research, innovation, and diffusion are governed.

This course provides an understanding of the workings of the technical and scientific communities and their interactions with the cultural, economic, and political institutions that shape what they do. (Please note that these institutions “shape,” rather than determine, the outcomes of research, innovation, and diffusion; technology and science have substantial “internal” momentum as well.) Students will acquire knowledge of the main theoretical frameworks that seek to explain these complex governance processes over time and across geographical and jurisdictional levels (regional, national, supranational, and global). The course places particular emphasis on the globalization of technological innovation and its implications for contemporary policy-makers.

Participants

PUBP820 welcomes all SPP doctoral students and aims to support their progress toward field exams and dissertation proposals. The course is open to students enrolled in other programs as well, if they have a deep interest in and appropriate background for it, space permitting and subject to the instructor’s approval.

Course Texts and Materials

Course readings will be made available through e-reserves or the course website.

Format

Each class meeting (excluding the first three and the last one) will have two distinct components. The first half of the class will revolve around short papers prepared by the students, as described below, that focus on concepts introduced in the previous week. The second half will be composed primarily of a lecture that lays out core concepts, building on the readings and augmented by clarifying and critical discussion among all participants.

Assignments and Grading

Each student will prepare five essays of approximately 1500 words each. The class will be divided into two groups, each writing an essay every other week on a staggered basis, so that approximately half of the students will have an essay to share each week. The essays will not require research, but rather will be critical assessments of course concepts and related scholarly and policy questions. Detailed guidance for these essays will be provided in the first class. The essays will be weighed equally in the semester grade.

Participation

This class depends vitally on preparation and active participation. No formal weight in the semester grade will be assigned to participation, but failure to participate adequately will result in lowering of assignment grades. Students in risk of this penalty will be given adequate notice and generous opportunity to avoid it.

Students with Special Needs

If you are a student with a disability and you need academic accommodation, please see the instructor and contact the Disability Resource Center (DRC) at 993-2474. All academic accommodations must be arranged through the DRC.

Please read the plagiarism policy attached to the end of this syllabus. Ignorance of or failure to understand the policy will not lead to lenience in case of violation.

Reading List

I. Technology, Science, and Innovation: The Inner Workings

1. Technology, Science, and Innovation: Autonomy, Momentum, and Control

August 29

- Bill Joy, “Why the Future Doesn’t Need Us,” *Wired*, April 2000.
- Freeman Dyson, “Our Biotech Future,” *New York Review of Books*, July 19, 2007.
- Alvin M. Weinberg, “Can Technology Replace Social Engineering?,” *Bulletin of the Atomic Scientists* 22:12 (December 1966): 4-8.
- Alex Roland, “Was the Nuclear Arms Race Deterministic?,” *Technology and Culture* 51:444-461 (2010)..
- Edward Constant, “The Evolution of War and Technology,” in John M. Ziman, ed., *Technological Innovation as an Evolutionary Process* (Cambridge University Press, 2000), 281-298.
- Ithiel de Sola Pool, “Foresight and Hindsight: The Case of the Telephone,” in Pool, *The Social Impact of the Telephone* (MIT Press, 1977).

2. Science: Norms and Other Incentives

September 5

- Robert K. Merton, “The Normative Structure of Science,” (1942) in Merton, *Sociology of Science* (University of Chicago Press, 1973).
- Michael Mulkay, “The Mediating Role of the Scientific Elite,” *Social Studies of Science* 6(3-4):445-470 (September 1976).
- Henry Etzkowitz, “The Norms of Entrepreneurial Science: Cognitive Effects of the New University–Industry Linkages,” *Research Policy* 27(8):823-833 (December 1998).
- Diana Rhoten and Walter W. Powell, “The Frontiers of Intellectual Property: Expanded Protection versus New Models of Open Science,” *Annual Review of Law and Social Science* 3: 345-373 (2007).

3. Technology and Innovation: From Invention to Use

September 12

- Stephen J. Kline, “Innovation Is Not a Linear Process,” *Research Management*, July/August 1985, 36-45.
- W. Brian Arthur, “Engineering and Its Solutions,” ch. 5 (pp. 87-106) in *The Nature of Technology* (Free Press, 2009)
- Anderson, Philip, and Michael Tushman, “Technological Discontinuities and Dominant Designs: A Cyclical Model of Technological Change,” *Administrative Science Quarterly* 35:604-633 (December 1990).
- David, Paul, “The Dynamo and the Computer: An Historical Perspective on the Modern Productivity Paradox,” *American Economic Review* 80(2):355-361 (May 1990).
- Bronwyn Hall, “Innovation and Diffusion,” National Bureau of Economic Research, working paper 10212, January 2004.

II. “Background” Governance Institutions

4. Firms and Markets

September 19

- Joseph A. Schumpeter, “Plausible Capitalism” and “The Process of Creative Destruction,” chapters 6-7 in *Capitalism, Socialism, and Democracy* (Harper, 1942), 72-86.
- David C. Mowery, “Alfred Chandler and Knowledge Management within the Firm,” *Industrial and Corporate Change* 19:483-507 (2010).
- Gary P. Pisano, “The Evolution of Science-Based Business: Innovating How We Innovate,” *Industrial and Corporate Change* 19:465-482 (2010).
- AnnaLee Saxenian, “The Origins and Dynamics of Production Networks in Silicon Valley,” *Research Policy* 20:423-437 (1991).
- Linus Dahlander and Martin W. Wallin, “A Man on the Inside: Unlocking Communities as Complementary Assets,” *Research Policy* 35:1243-1259 (2006).

5. Law and Finance

September 26

- Naomi R. Lamoreaux and Kenneth L. Sokoloff, “Intermediaries in the U.S. Market for Technology, 1870-1920,” NBER Working Paper No. 9017, June 2002.
- Ashish Arora and Alfonso Gambardella, “Ideas for Rent: An Overview of Markets for Technology,” *Industrial and Corporate Change* 19:775-803 (2010).
- Paul Gompers and Josh Lerner, “The Venture Capital Revolution,” *Journal of Economic Perspectives* 15(2):145-168 (2001).
- James Brander, Qianqian Du, and Thomas Hellmann, “The Effects of Government-Sponsored Venture Capital,” draft of June 2010.
- Martin Kenney, “Venture Capital Investment in the Greentech Industries: A Provocative Essay,” BRIE Working Paper 185, July 18, 2009.

6. Culture and Education

October 3

- Douglass C. North, “Economic Performance Through Time,” *American Economic Review* 84(3):359-368 (1994).
- Jared Diamond, “Why Did the Vikings Vanish?,” *New York Review of Books*, April 11, 2002.
- David S. Landes, “Britain and the Others,” ch. 15 in *The Wealth and Poverty of Nations* (Norton, 1999), 213-230.
- Fareed Zakaria, “Culture Is Destiny - A Conversation with Lee Kuan Yew,” *Foreign Affairs*, Mar/Apr 1994, 109- 126.
- G. Pascal Zachary, “Mongrelize or Die!,” chapter 3 in *The Diversity Advantage* (Westview, 2003), 56-81.

III. Public Policy: Regional and National

7. Regional (Provincial, State, and Local) Policies

October 10

- Lynne G. Zucker, Michael R. Darby, and Marilyn B. Brewer, "Intellectual Human Capital and the Birth of U.S. Biotechnology Enterprises," *American Economic Review* 88(1):290-306 (1998).
- Michael E. Porter, "Clusters and the New Economics of Competition," *Harvard Business Review* November/December, 1998.
- Steven Klepper, "Disagreements, Spinoffs, and the Evolution of Detroit as the Capital of the U.S. Automobile Industry," *Management Science* 53:616-631 (2007).
- Stuart Leslie, "Regional Disadvantage: Replicating Silicon Valley in New York's Capital Region," *Technology and Culture* 42(2):236-264 (2001).
- European Commission, "Innovative Strategies and Actions: Results from 15 Years of Regional Experimentation," November 2007.

8. R&D Spending and Tax Incentives

October 17

- Stephen Toulmin, "The Complexity of Scientific Choice: A Stock-Taking," *Minerva* 2:343-359 (1964).
- David M. Hart, "Governmental Organization and Implications for Science and Technology Policy," in John de la Mothe, ed., *Science, Technology, and Governance* (London: Continuum, 2001), pp. 88-103.
- Gary Guenther, "Research and Experimentation Tax Credit: Current Status and Selected Issues for Congress," Congressional Research Service, February 5, 2010.
- Bérubé, Charles, and Pierre Mohnen, "Are Firms that Received R&D Subsidies More Innovative?," *Canadian Journal of Economics*, 42:206-225 (2009).
- Robert D. Atkinson, "Effective Corporate Tax Reform in the Global Innovation Economy," Information Technology and Innovation Foundation, July 2009.

9. Public Procurement and Regulation

October 24

- William P. Rogerson, "Economic Incentives and the Defense Procurement Process," *Journal of Economic Perspectives* 8(4):65-90 (Fall, 1994).
- Arman Avadikyan and Patrick Cohendet, "Between Market Forces and Knowledge Based Motives: The Governance of Defence Innovation in the UK," *Journal of Technology Transfer* 34:490-504 (2009).
- Vicki Norberg-Bohm, "Stimulating Green Technological Innovation: An Analysis of Alternative Policy Mechanisms," *Policy Sciences* 32(1):13-38 (1999).
- Margaret R. Taylor, Edward S. Rubin, and David A. Hounshell, "Regulation as the Mother of Innovation," *Law & Policy* 27(2): 348-378 (2005).
- Edward Barbier, "How Is the Global Green New Deal Going?," *Nature* 464:832-833 (8 April 2010).

10. Measuring Technology, Science, and Innovation

October 31

- Adam B. Jaffe, "Measurement Issues," in James Keller and Lewis M. Branscomb, eds., *Investing in Innovation* (MIT Press, 1998), 64-84.
- National Science Board, *Science and Engineering Indicators 2010* (Washington: NSB, 2010), "Overview," pp. O-1 to O-21.
- Organization for Economic Cooperation and Development, *Measuring Innovation: A New Perspective* (Paris: OECD, 2010), "Innovation Today," ch. 1 (19-42)
- Jane Calvert, "What's Special about Basic Research?," *Science, Technology & Human Values* 31: 199-220 (2006).
- Hariolf Grupp and Torben Schubert, "Review and New Evidence on Composite Innovation Indicators for Evaluating National Performance," *Research Policy* 39:67-78 (2010).

IV. International Competition and Global Governance

11. International Competition: Catching Up (Or Not)

November 7

- Moses Abramovitz, "Catching Up, Forging Ahead, and Falling Behind," *Journal of Economic History* 46:385-406 (1986).
- Jan Fagerberg and Martin Srholec, "National Innovation Systems, Capabilities, and Economic Development," *Research Policy* 37:1417-1435 (2008).
- Manuel Castells and Pekka Himanen, "Innovation About Innovating," chapter 3 in *The Information Society and the Welfare State - the Finnish Model* (Oxford University Press 2002), 45-63,71-73.
- John A. Matthews, "National Systems of Economic Learning: The Case of Technology Diffusion Management in East Asia," *International Journal of Technology Management* 22(5/6):455-479 (2001).
- OECD, *Reviews of Innovation Policy, CHINA, Synthesis Report* (Paris: OECD, 2007).

12. Multinational Firms and the Emerging Global Innovation System

November 14

- Raymond Vernon, "International Investment and International Trade in the Product Cycle," *Quarterly Journal of Economics* 80:190-207 (1966).
- Antonello Zanfei, "Transnational Firms and the Changing Organization of Innovation," *Cambridge Journal of Economics* 24:515-542 (2000).
- Iain Cockburn, "Pharmaceuticals," in Jeffrey T. Macher and David C. Mowery, eds., *Innovation in Global Industries* (Washington: National Academies Press, 2008), 207-230.
- Kenneth L. Kraemer and Jason Dedrick, "Personal Computing," in Jeffrey T. Macher and David C. Mowery, eds., *Innovation in Global Industries* (Washington: National Academies Press, 2008), 19-52.
- Annalee Saxenian, "Transnational Communities and the Evolution of Global Production Networks: The Cases of Taiwan, China and India," *Industry and Innovation* 9:183-202 (2002).

NO CLASS ON WEDNESDAY, NOVEMBER 21 – THANKSGIVING RECESS

13. Global Governance

November 28

- Richard D. Smith, Carlos Correa, and Cecilia Oh, "Trade, TRIPS, and Pharmaceuticals," *The Lancet* 373:684-691 (21 February 2009).
- David M. Hart, "Managing the Global Talent Pool: Sovereignty, Treaty, and Intergovernmental Networks," *Technology in Society* 28(4):421-434 (2006).
- Kimberley Ann Elliott, "Pulling Agricultural Innovation and the Market Together," Center for Global Development, Working Paper 215, July 2010.
- Michele S. Garfinkel, *et al.*, "Synthetic Biology: Options for Governance," J. Craig Venter Institute, October 2007.

14. Wrap Up

December 5

- European Patent Office, *Scenarios for the Future* (Munich: EPO, 2007).

SPP Policy on Plagiarism

The profession of scholarship and the intellectual life of a university as well as the field of public policy inquiry depend fundamentally on a foundation of trust. Thus any act of plagiarism strikes at the heart of the meaning of the university and the purpose of the School of Public Policy. It constitutes a serious breach of professional ethics and it is unacceptable.

Plagiarism is the use of another's words or ideas presented as one's own. It includes, among other things, the use of specific words, ideas, or frameworks that are the product of another's work. Honesty and thoroughness in citing sources is essential to professional accountability and personal responsibility. Appropriate citation is necessary so that arguments, evidence, and claims can be critically examined.

Plagiarism is wrong because of the injustice it does to the person whose ideas are stolen. But it is also wrong because it constitutes lying to one's professional colleagues. From a prudential perspective, it is shortsighted and self-defeating, and it can ruin a professional career.

The faculty of the School of Public Policy takes plagiarism seriously and has adopted a zero tolerance policy. Any plagiarized assignment will receive an automatic grade of "F." This may lead to failure for the course, resulting in dismissal from the University. This dismissal will be noted on the student's transcript. For foreign students who are on a university-sponsored visa (eg. F-1, J-1 or J-2), dismissal also results in the revocation of their visa.

To help enforce the SPP policy on plagiarism, all written work submitted in partial fulfillment of course or degree requirements must be available in electronic form so that it can be compared with electronic databases, as well as submitted to commercial services to which the School subscribes. Faculty may at any time submit student's work without prior permission from the student. Individual instructors may require that written work be submitted in electronic as well as printed form. The SPP policy on plagiarism is supplementary to the George Mason University Honor Code; it is not intended to replace it or substitute for it.

<http://www.gmu.edu/facstaff/handbook/aD.html>

Professor Hart's Addendum

I believe deeply that intellectual integrity is a fundamental element of learning. I firmly support the School's zero tolerance policy on plagiarism and will enforce it stringently. Ignorance is not an excuse. To avoid plagiarism, a simple rule of thumb may be of help: when in doubt, include a citation. Citations, including those to web sources, should include sufficient information to allow a reader to verify the source. Further details on when and how to cite sources will be discussed in class. However, providing a citation to a block of text taken with minimal change from a source is not sufficient to avoid plagiarism. You must put the block in quotation marks, thereby acknowledging the source's contribution of specific words as well as ideas in the block.