

Research & Development Policy 16:833:535 (11675)

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The US federal government spends in excess of \$100 billion annually on scientific research and development (R&D). Although the Department of Defense and the National Institutes of Health dominate R&D spending, there are large R&D programs in almost every federal agency and in pursuit of almost every national goal, from housing to counter-terrorism, education to environment, energy to space.

This class is an advanced introduction to the processes and institutions of R&D policy in the United States. It assumes no prior scientific or technical knowledge, but it does assume some prior understanding of the American political system appropriate to beginning graduate work. The course is organized around the concept that the government pursues R&D for particular purposes. The government thus delegates in regular ways the conduct of R&D to particular performers (agents), and in doing so it faces regular problems, including: the selection of appropriate agents; the assurance of the integrity of the delegation; and the assurance of the productivity of the delegation. The syllabus is organized around these problems and their solutions. The syllabus also includes “hot topics,” which will likely include R&D in New Jersey, the R&D response to terrorism, and other issues.

The class is conducted as a seminar, and students are expected to do all of the reading assigned prior to class. Students have a choice of writing one of three “major assignments” (papers) and of completing five of seven “minor assignments” (homework). The major assignment will be worth 40% of the class grade and is due 18 December. The five minor assignments together will be worth 30% of the grade and are due as indicated on the syllabus (additional minor assignments can be submitted for replacement grades or extra credit). Class participation will be worth the remaining 30%. Students should clear their major assignment with me by 7 October. They do not need to clear their minor assignments. Unexcused late work for the major assignment will result in a penalty of a half-grade per day (e.g., A to B+; B+ to B, etc.). Unexcused late work in minor assignments will not be accepted. Students are expected to follow university policies and guidelines for academic integrity on all assignments.

Students should purchase the following books:

Branscomb, Lewis M. and Keller, James, eds. 1998. *Investing in Innovation: Creating a Research and Innovation Policy That Works*. Cambridge: MIT Press.

Guston, David H. 2000. *Between Politics and Science*. New York: Cambridge U. Press.

There will be additional weekly readings available on reserve in the Public Policy suite. Underscored articles available electronically.

9 Sep (#1): History and Scope of R&D in the US

- James L. Penick, Jr., et al. *The Politics of American Science, 1939 to the Present* (Cambridge: MIT Press, 1972), part one, “A Historical Overview.”
- Bruce L.R. Smith. *American Science Policy Since World War II* (Washington, DC: Brookings Institution, 1990), chap. 5: “The Reagan Era: A New Consensus?”
- Daniel Sarewitz. *Frontiers of Illusion: Science, Technology and the Politics of Progress* (Philadelphia: Temple University Press, 1996), chap. 1: “The End of the Age of Physics.”
- Michael Crow and Barry Bozeman, *Limited by Design* (New York, Columbia U. Press, 1998), chap. 1: “The Sixteen Thousand”

16 Sep: Yom Kippur – No Class

23 Sep (#2): The Public Role in R&D

- Branscomb & Keller, chap. 5: “From Science Policy to Research Policy”
- Ammon J. Salter and Ben R. Martin. “The Economic Benefits of Publicly Funded Basic Research: A Critical Review.” *Research Policy* 30:509-32 (2001).
- G. Steven McMillan, Francis Narin, and David L. Deeds. “An Analysis of the Critical Role of Public Science in Innovation: The Case of Biotechnology.” *Research Policy* 29:1-8 (2000).

30 Sep (#3): The Structure of Science Policy

(minor assignment 1 due)

Guston:

- Intro, “Making Space for Science Policy”
- Chap. 1, “Science Policy: Structure and Boundaries”
- Chap. 2, “Understanding the Social Contract for Science”
- Chap. 3, “Challenging the Social Contract for Science”

7 Oct (#4): Agents, I: Government -- Science for Public Missions

- Lewis M. Branscomb. “National Laboratories: The Search for New Missions and New Structures.” Pp. 103-134 in Lewis M. Branscomb, ed. *Empowering Technology* (Cambridge: MIT Press, 1993).
- Crow & Bozeman:
- Chap. 5, “Federal Laboratories and the NIS”
 - Chap. 6, “Federal Labs and their Performance in the NIS”
 - Chap. 8, “Strategic Analysis & Design Recommendations”

14 Oct (#5): Agents, II: Universities -- A New Kind of Federalism

(minor assignment 2 due)

Jonathan R. Cole, Elinor G. Barber, and Stephen R. Graubard, eds. *The Research University in a Time of Discontent* (Baltimore: The Johns Hopkins University Press, 1994):

Chap. 7, "The Mission of the Research University," by N. O. Keohane

Chap. 13, "Current Criticisms of Research Universities," by H. Brooks

Chap. 19, "The Research University: Notes Toward a New History," by S. Graubard

Michael M. Crow and Christopher Tucker. "The American Research University as America's *de facto* Technology Policy." *Science and Public Policy* 28(1):1-9.

Eugene B. Skolnikoff. "Research in U.S. Universities in a Technologically Competitive World." Pp. 194-223 in David H. Guston and Kenneth Keniston, eds. *The Fragile Contract: University Science and the Federal Government* (Cambridge: MIT Press, 1994).

21 Oct (#6): Agents, III: Industry -- R&D for Profit

Branscomb & Keller:

Chap. 6, "The Advanced Technology Program"

Chap. 7, "Dual Use and Technology Reinvestment"

Chap. 8, "Rethinking the Small Business Innovation Research Program"

Office of Technology Assessment. *The Effectiveness of Research and Experimentation Tax Credits* (Washington, DC: US GPO, 1995).

David M. Hart. "Anti-trust and Technological Innovation in the US: Ideas, Institutions, Decisions, and Impacts, 1890-2000." *Research Policy* 30:923-36 (2001).

28 Oct (#7): The Integrity of Research, I: Peer Review

(minor assignment 3 due)

Daryl E. Chubin and Edward J. Hackett. *Peerless Science: Peer Review and U.S. Science Policy* (Albany: SUNY Press, 1990):

Chap. 1, "The Centrality of Peer Review"

Chap. 2, "Peer Review in Theory and Practice"

Chap. 7, "Peer Review and Unauthorized Science Policy"

James D. Savage, "Where's the Pork?" *Issues in Science and Technology* 10:3 (Spring 1993):21-24.

David H. Guston. In press. 2003. "The Expanding Role of Peer Review Processes in the United States." In P. Shapira and S. Kuhlmann, eds., *Learning from Science and*

Technology Policy Evaluation: Experiences from the United States and Europe.
Northampton, MA: Edward Elgar Publishing.

4 Nov (#8): The Integrity of Research, II: Misconduct and Public Trust

Guston, chap. 4: “Assuring the Integrity of Research”

David Hull, “Scientists Behaving Badly,” *The New York Review of Books* (3 December 1998), pp 24-30.

Patricia Woolf, “Integrity and Accountability in Research.” Pp. 82-100 in David H. Guston and Kenneth Keniston, eds. *The Fragile Contract: University Science and the Federal Government* (Cambridge: MIT Press, 1994).

Daniel S. Greenberg, *Science, Money, and Politics: Political Triumph and Ethical Erosion* (Chicago: University of Chicago Press, 2002):

Chap. 12, “The Sciences’ Way of Politicking”

Chap. 22, “The Ethical Erosion of Science”

11 Nov (#9): The Productivity of Research, I: Technology Transfer

(minor assignment 4 due)

Branscomb & Keller, chap. 9: “Technology Transfer...at NIH”

Guston, chap. 5: “Assuring the Productivity of Science”

David C. Mowery, et al. “The Growth of Patenting and Licensing by US Universities: An Assessment of the Effects of the Bayh-Dole Act of 1980.” *Research Policy* 30:99-119 (2001).

18 Nov (#10): The Productivity of Research, II: Innovation Policy

Branscomb & Keller:

Chap. 1, “Challenges to Technology Policy...”

Chap. 2, “Tech Policy & Economic Growth”

Chap. 18, “Towards a Research and Innovation Policy”

Adam B. Jaffe. “The US Patent System in Transition: Policy Innovation and the Innovation Process.” *Research Policy* 29:531-557 (2000).

(22-23 Nov: Field Trip to DC for Research Symposium With the Next Generation of Leaders in Science and Technology Policy)

25 Nov (#11): Hot Topic, I: R&D and States

(minor assignment 5 due)

- David H. Guston, "New Technology Role for States," *Forum for Applied Research and Public Policy* 11:3 (Fall, 1996), pp. 38-44.
- Donna Fossum et al. "Federal Research and Development in New Jersey." Pp. 359-70 in *Discovery and Innovation: Federal Research and Development Activities in the Fifty States, District of Columbia, and Puerto Rico* (Washington, DC: RAND, 2000).
- Branscomb & Keller
 Chap. 10, "Manufacturing Extension"
 Chap. 16, "State Governments: Partners in Innovation"

2 Dec (#12): Hot Topic, II: University-Industry Relations

(minor assignment 6 due)

- Branscomb & Keller, chap. 14: "University-Industry Relations"
- Henry Etzkowitz, Andrew Webster, Christiane Gebhardt, and Branca Regina Cantisano Terra. "The Future of the University and the University of the Future: Evolution of the Ivory Tower to Entrepreneurial Paradigm." *Research Policy* 29:313-30 (2000).
- Irwin Feller, Catherine P. Ailes, and J. David Roessner. "Impacts of Research Universities on Technological Innovation in Industry: Evidence from Engineering Research Centers." *Research Policy* 31:457-74 (2002).
- David H. Guston. "CRIs in the Wilderness: Toward University-based Centers for Responsible Innovation." To appear in Donald Stein, ed. *The Commercialized Academy*.

9 Dec (#13): Hot Topic, III: R&D and Counter-Terrorism

- John H. Marburger III. 2002. "Science and Technology for Countering Terrorism," National Academy of Sciences Annual Meeting, 30 April, at http://www.ostp.gov/html/02_5_2.html
- Albert H. Teich, Stephen D. Nelson, and Stephen J. Lita, eds. *Science and Technology in a Vulnerable World* (Washington, DC: AAAS, 2002), at <http://www.aaas.org/spp/yearbook/2003/yrbk03.htm>
- Special Analysis of R&D in the Homeland Security Department, at <http://www.aaas.org/spp/rd/dhs0621.htm>
- Ad Hoc Faculty Committee on Access to and Disclosure of Scientific Information. *In the Public Interest* (Cambridge, MIT, 2002).

TBA Dec (#14): Wrap-Up: Research and the Public Good

(minor assignment 7 due)

Guston, chap. 6: “Between Politics and Science”

Susan E. Cozzens, “Quality of Life Returns from Basic Research.” Pp. 184-209 in Bruce L.R. Smith and Claude E. Barfield, eds. *Technology, R&D, and the Economy*

(Washington, DC: Brookings Institution and American Enterprise Institute, 1996).
Sarewitz, chap. 9: “Toward a New Mythology.”

Assignments

Each student will be required to fulfill one major assignment and one minor assignment from the following options.

Major Assignments (choose one of three)

Option 1: R&D Agency Portfolio

Choose a federal agency that supports R&D and write a 15-20 pp paper discussing the following four issues: 1) when and how the agency's R&D programs were created, how have they changed, their budgetary history, and their current priorities, etc.; 2) the intramural and extramural components of your agency's R&D programs and particular kinds of programs for particular kinds of agents (universities, small businesses, non-profits, etc.); 3) how your agency makes use of peer review and how it assures itself (and Congress) that its R&D programs minimize the threat of misconduct; and 4) what kind of technology transfer activities does your agency engage in, and how does it assure itself that its programs are productive?

Option 2: NJ R&D Portfolio

Write a report (15-20 pp) analyzing the status of R&D in the state New Jersey. It should include discussion of the federal support for R&D in NJ, state support of R&D, industrial R&D in NJ, the climate for innovation in the state (e.g., colleges and universities, venture capital, etc.). Part of the paper should update the RAND chapter on NJ using RAND's Radius as well as other data sources.

Option 3: Research Paper

Write a traditional research paper (15-20 pp) on a relevant topic of your choice. You should clear a topic with me by 7 October.

Minor Assignments (choose five of seven)

1. Answer the following questions for the FY03 federal R&D budget:
 - What is the total R&D budget?
 - What is the percent civilian and defense?
 - What percentage of the domestic discretionary budget is civilian R&D?
 - Which six agencies spend the largest shares of civilian R&D?
 - How much was spent for social science research?
 - Identify any complications or challenges you confronted in documenting these answers.

2. ID the following acronyms and write one sentence each on their role in R&D policy: AAAS; AAU; ATP; CSSP; (D)ARPA; EPSCoR; FFRDC; IOM; MEP; NAS; NASULGC; NAE; NASA; NCI; NDRC; NIST; NSB; NSF; NSTC; ONR; OSRD; OSTP; OTA; PCAST; SSTI.
3. Answer the following questions for the most recent year available:
- How much did private industry spend on R&D?
 - How much of what private industry spent was basic research?
 - How much of what private industry spent went to fund research in universities?
 - How much of what the federal government spent in that year was performed by industry?
 - Name and describe three ways in addition to direct funding that the federal government encourages private sector R&D.
 - Which three industries perform the most R&D?
4. Answer the following questions:
- What is the federal definition of research misconduct?
 - Describe the size and scope of research misconduct at either NIH or NSF with respect to the number of allegations, number of investigations, number of findings, and contextualize to the amount of R&D spending, number of grants, expectations of honesty, etc. Do you believe research misconduct is a problem? Why or why not?
 - What is single blind review? What is double blind review?
 - How much R&D spending did Congress earmark in the most recent FY available?
5. Write a one-page (250-400 words) brief on the following topic: What is the role of the research university in research for the economy, and what should it be?
6. Write two pages of substantive observations about the Research Symposium in DC.
7. Write a one-page (250-400 words) brief on an issue that arises from your understanding of one of the hot topics