Preliminary Syllabus

ECON E-2888a (12837)
Fall semester 2 credits [meets Mondays 3:30 pm--5 pm on seven dates at 53 Church Street, Lower Level classroom; see course description below]
SCIENCE, ENGINEERING, AND US ECONOMIC PROGRESS

Faculty

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Course Description:

This is a seminar on the economics of science and engineering, with special attention to workforce and career issues. Topics include the effects of globalization on the science and engineering workforce and on innovation; growth of team activities and networks in work; impact of career incentives on productivity; university policies; mobility between academe and industry; links between ideas and economic outputs. The class initially convenes on September 25 for an overview of the field, and then there will be seminar meetings on October 2, October 16, October 23, November 6, November 13, and December 4. The course will also be available through a webcast for distance learners (see below for more information). Students will work with the professors and teaching staff to develop understanding of the issues and ultimately to complete a seminar paper due on January 12, 2007.

Prerequisites: Microeconomics helpful but not required; a course in public policy or political science might be useful for a few topics.

ECON E-2888a is not a prerequisite for ECON E-2888b. Extension and distance learning students must view sample online lectures before they register.

The seminar will continue in the Spring as ECON E-2888b for two additional credits. While students are certainly encouraged to continue the seminar in the Spring for the new

topics on the economics of the scientific workforce, there is no requirement or obligation to do this as a full-year program.

For further background on many issues surrounding the economics of the scientific workforce, please consult the website hosted by the Science and Engineering Workforce Project (SEWP) at the National Bureau of Economic Research:

http://www.nber.org/~sewp/

Distance Education Course

This course is being offered as part of the Harvard Extension School's Distance Education Program. The recorded lectures that you will view online via the Internet are from the Harvard Faculty of Arts and Sciences course Economics 2888a (catalog number 6311). A lecture every two weeks will be made available throughout the term. The recorded version of the lectures for this course will usually be available online 48 hours after the talks are delivered in a Harvard lecture hall.

While the lectures are recorded, the other aspects of the course are "live." This means that you are responsible for completing the two papers and participating in the online discussion.
Please see the Harvard Extension School distance education web site for information on the distance ed program, details on how to view lectures and for technical support. The link is
http://www.extension.harvard.edu/DistanceEd/

Seminar Lecture Schedule:

September 25, 2006 : **Introduction to the economic analysis of the science & engineering work force**

Richard B. Freeman and **Daniel Goroff**

October 2, 2006: Higher Education in India: Student flows and the circulation of the highly skilled workforce

Pawan Agarwal, Fulbright New Century Scholar, Indian Council for Research on International Economic Relations

Recommended reading:

Pawan Agerwal, *Higher Education in India: The Need for Change* (ICRIER Working Paper no. 180, June 2006).

http://www.icrier.org/publication/working_papers_180.html

October 16 Fab Labs, science, and the prospects for development

Neil Gershenfeld, Director, The Center for Bits and Atoms, MIT

Recommended readings

- Recent background on fab labs here:

Apoorva Mandavilli, "Make anything, anywhere: Can everyone use technology creatively?" *Nature*, vol 442, 24 August 2006, 862-864. http://www.nature.com/news/2006/060821/full/442862a.html [requires password from *Nature*-- or Harvard ID and pin under ejournals section of Harvard Libraries networked resources]

October 23, 2006: **The *Gathering Storm* report and its implications for the future of the science & engineering workforce**

Charles Vest, former president of MIT,

Recommended readings:

Committee on Science, Engineering, and Public Policy (COSEPUP), *Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future* (Washington D.C.: National Academies Press, 2006).

November 6, 2006: Public policy and the U.S. scientific enterprise

David Goldston, staff director of the House Committee on Science

November 13, 2006: Allocation of Research Activity within Theoretical Physics

Lee Smolin, Perimeter Institute for Theoretical Physics and author, *The Trouble with Physics*

Recommended readings:

Peter Galison, "Theory bound and unbound: Superstrings and experiment" in Friedel Weinert, ed., *Laws of Nature: Essays on the Philosophical, Scientific, and Historical Dimensions* (Berlin: Walter de Gruyter, 1995), pp. 369-408.

Adrian Cho, "String Theory Gets Real – Sort Of," *Science*, vol. 306, 26 November 2004, pp. 1460-1462.

Lee Smolin, "Why No 'New Einstein'?" *Physics Today*, June 2005, pp. 56-57.

Lee Susskind (interviewed by Amanda Gefter), *New Scientist*, 17 December 2005.

December 4, 2006; The Contribution of the National Postdoc Association to the Careers of Postdocs

Orfeu Buxton, Harvard Medical School

Recommended reading:

Orfeu M. Buxton and Stephen Gasior, "Surveying Postdocs: A Tale from the Trenches, " 4 January 2002 available at:

http://sciencecareers.sciencemag.org/career_development/previous_issues/articles/1330/surveying_postdocs_a_tale_from_the_trenches

Randy Martin, ed., *Chalk Lines: The Politics of Work in the Managed University* (Durham: Duke University Press, 1998).

Assignments

This seminar is designed for students who wish to pursue an individual project in understanding the economics of science and the scientific work force. For the month of October, students will be asked to produce a short report (approximately 1000 words/ 4-6 pages double-spaced) on a book covering issues on science and society. A list of recommended books will be provided. The short paper represents 20 percent of the grade. The short paper is due on October 23.

Participation in the seminar's online discussion forum will be counted for 20 percent of the grade. Students should make at least three contributions to the forum (short commentaries approximately 100-300 words each). Many of the discussions will surround the topics of the lecture series and the optional online forums listed below.

In November and December, students will work with the instructors to sharpen focus on a seminar paper (12-16 pages, double-spaced). Most topics will be selected from the themes of the seminar lecture series. The paper will represent 60 percent of the grade. It will be due on Thursday, January 12, 2007.

I. Recommended Readings for Short Report due October 23 (Choose one book from this list to review; approximately 1000 words)

David Dickson, *The New Politics of Science* (Chicago: University of Chicago Press, 1993).

Richard B. Freeman and Daniel Goroff (editors) forthcoming volume from the National Bureau of Economic Research on the scientific workforce

Daniel S. Greenberg, *Science, money, and politics: political triumph and ethical erosion* (Chicago: University of Chicago Press, 2001).

David H. Guston, *Between politics and science: assuring the integrity and productivity of research* (New York: Cambridge University Press, 2000).

Daniel J. Kevles, *The physicists: the history of a scientific community in modern America* (Cambridge: Harvard University Press, 1987).

Daniel Lee Kleinman, *Politics on the Endless Frontier: postwar research policy in the United States* (Durham: Duke University Press, 1995).

Philip Mirowski and Esther-Miriam Sent, eds., *Science Bought and Sold: Essays in the Economics of Science* (Chicago: University of Chicago Press, 2002).

David C. Mowery and Nathan Rosenberg, *Paths of Innovation: Technological Change in 20th-Century America* (New York: Cambridge University Press, 1999).

Mary Jo Nye, ed., *The Cambridge History of Science: Volume 5, The Modern Physical and Mathematical Sciences* (New York: Cambridge University Press, 2003) [review part VI plus one other section of this very large book].

Anne E. Preston, *Leaving Science: Occupational Exit from Scientific Careers* (New York: Russell Sage Foundation Publications, 2004).

Daniel R. Sarewitz, *Frontiers of Illusion: Science, Technology and Politics of Progress* (Philadelphia: Temple University Press, 1996).

II. Optional Programs that will receive some attention in the online discussion forum (descriptions supplied by the NAS and the NAE)

<u>State Economic Competitiveness</u>

The National Academies will convene leaders of industry, government, research, and education from around the country on September 28, 2006, to share knowledge and discuss ways to advance U.S. competitiveness. They will focus on education, research and innovation -- action areas

identified in the report, "Rising Above the Gathering Storm" (2006). More information on the "Convocation on Rising Above the Gathering Storm: Energizing and Employing Regions, States, and Cities" is available online.
http://www.nationalacademies.org/gatheringstorm

Offshoring of Engineering
The NAE will host a free, public workshop on engineering offshoring on October 24-25, 2006 (Tuesday-Wednesday). The workshop will feature talks by national engineering leaders from industry and academia, a review of trends in engineering offshoring in several key industries, and an examination of implications for the engineering profession, workforce, education, and management. More information on the "Workshop on the Offshoring of Engineering: Facts, Myths, Unknowns, and Implications" is online.
http://www.nae.edu/nae/engecocom.nsf/weblinks/PGIS-6SKKDZ?OpenDocument

III. Some Sample Topics for the Longer Paper (12-16 pages) due January 12, 2007

The Debate over the *Gathering Storm* Report

Congressional Oversight and Science [choose a specific case and study its ramifications; i.e., investigations into scientific misconduct; regulation of science; efforts at deregulation, etc.]

The Crisis in Particle Physics: Is String Theory Tying Up Physicists?

The Marketing of Scientific Agendas: How Support for Science Public Policy is Mobilized [a paper could focus on a single field; i.e., nanotechnology, biotechnology, DARPA and the Strategic Computing Initiative, etc.]

Commercial Pressures on Academic Science

Outsourcing and Offshoring of the Science & Engineering Workforce

Social Science Theory and Patent Productivity

The Under-representation of Women in Science & Engineering

Academic Labor in the Age of the Adjunct and the Postdoc [a paper could focus on an individual university; a specific scientific discipline; or efforts to organize scientific workers]