Yale University
School of Forestry and Environmental Studies
Fall Term 2008

F&ES 83026a
Technology, Society, and the Environment (Seminar)

Room: Marsh
Time: Tuesday 2.30 - 5.20 pm.

Instructor: Arnulf Grubler (arnulf.grubler@yale.edu)
Teaching Assistant: Daniel Steinberg (daniel.steinberg@yale.edu)

Office hours: Mondays and Tuesdays 9.30-11.30 am
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Synopsis

This 3 credit advanced seminar addresses technology's dual role as both source and remedy of global environmental change. The seminar discusses first conceptual and theoretical aspects of technological change from an interdisciplinary perspective including social science, history, economics, engineering, as well as management theory. Examples of technological change and its environmental impacts in agriculture, industries, and the service economy are addressed through case studies. Questions discussed include: Why are some technological innovations successful (e.g. cell-phones) while others (e.g. fast breeder reactors) are not? What determines rates of change in the adoption of new technologies and how can these be accelerated? How many people can the earth feed? Is dematerialization actually occurring, and why? What are the implications of the Internet's digital North-South divide and what are strategies to overcome it? Active student participation is an essential ingredient of the seminar: students participate in seminar debates, perform case studies in home assignments, and write also a (short) final term paper on a mutually agreed topic.

Seminar Objectives

• Provide a concise "big picture" overview of technology, the drivers of technological change and the social and environmental in- and externalities of technology.
• Introduce key concepts for technology policy, including uncertainty, increasing returns, and technological inertia
• Provide a platform to discuss technology policy opportunities that further social, economic, or environmental objectives.
Organization, Assignments and Evaluation

The seminar consists of a series of lectures by the instructor and/or prepared student presentations on particular topics followed by a general discussion. The first half of the seminar provides basic information on technology and is more in traditional class/lecture mode and includes a mid-term. The second part of the seminar is discursive. It is proposed that during the Fall 2008 semester, discussions revolve around the common theme of "Urban Sustainability" where the technological, institutional, and social dimensions of energy, transport, housing, and climate change protection in a rapidly urbanizing world are discussed.

Active student participation in the seminar is essential. Participants will perform short assignments (reporting on literature reading, preparing short presentations, perform didactical analytical case studies, represent alternative concepts/theories and engage in seminar debates, etc.). The number of sessions for which individual students will prepare discussion materials will depend on numbers of students in class (but will include at least one presentation per student).

All class material is available at the Yale v2 Classes Server.

General reading (an annotated reading list posted on the class server):

W.B. Arthur, 2005, The Logic of Invention, Working Paper 2005-12-045, Santa Fe Institute,


R. Burlingame, 1961, Technology: Neglected Clue to Historical Change, Technology and Culture 2(3):219-229. (To be read in conjunction with the papers by Gilfillan and Mumford).


S.C. Gilfillan, 1962, The Inventive Lag in Classical Mediterranean Society, Technology and Culture 3(1):85-87. (To be read in conjunction with the papers by Burlingame and Mumford).


Intergovernmental Panel on Climate Change (IPCC), 2007, Technology, IPCC WGIII, Chapter 2, pp. 147-160.


L. Mumford, 1961, History: Neglected Clue to Technological Change, Technology and Culture 2(3):230-236. (To be read in conjunction with the papers by Burlingame and Gilfillan).


Additional reading material will be distributed in class.

**Grading**

will be based on the following criteria:

- 40% (active) class participation
- 20% mid-term (Q/A session in class)
- 40% final term paper (max 10 pages)
FES 83026a (802a)
Technology, Society, and the Environment

Seminar Sessions

September 9: Overview (course overview by instructor -- self introduction of students -- sign-up for class presentations of reading list -- presentation of proposed common "urbanization" theme and topics/case studies to be discussed in second half of seminar -- student suggestions)

September 16:
Student report on reading list
What is technology? (definitions of technology - sources of technological change - systems hierarchy of changes - a simple model: technology life cycles - innovation uncertainty - the social construction of technologies)

September 23:
Student report on reading list
Concepts/models of technological change: Diffusion theory (diffusion in time and space - determinants of diffusion - technological substitution - examples - diffusion time constants).
Discussion of diffusion case studies using LSM model (individual homework).

September 30:
Student report on reading list
Explaining change 1 - Growth factors: (R&D - innovation agents - cost reductions [learning phenomena] - joint expectations [Moore’s law] - network externalities; Explaining change 2 - Stagnation/rejection factors: (lack of improvements - erratic R&D - "sailing ship" effects - infrastructure and standardization needs - institutional congruence - social resistance)

October 7:
Student report on reading list
Impacts of technological change 1 - Economy: (output growth - economies of scale and economies of scope - price declines - productivity and efficiency - choice and complexity - division of labor [functionally and spatially] - interdependence);

October 14:
Student report on reading list
Impacts of technological change 2 - Society: (trends in population size, health and life expectancy - income and working time - structural changes [work-pleasure, primary-tertiary, rural-urban])
Progress report and Q/A on individual diffusion case study home assignments.
October 21:
Student report on reading list


October 28:
Wrap-up session of technology impacts (previous classes);
10-min each student presentations on LSM case study.
Diffusion case study report due (2-page write-up plus LSM model files)

November 4:
Mid-term (oral Q/A session in class);
Lead-in into discussion common theme topic “urbanization”
Presentation by instructor – proposed case studies/topics for discussions – student sign-up for topics
(mid-term social event after class)

November 11:
Urbanization past and future
Lecture by instructor – two student commentators – general discussion proposed comments: a) technological and b) social dimensions of urbanization

November 18:
Urban metabolism: theory and practice
Lecture by Helga Weisz – summary of background reading - general discussion
Title and abstract for final seminar paper due.

November 25: Fall Recess (no class)

December 2:
Technology strategies to address urban sustainability
4 student presentations on Housing - Water – Energy – Climate Change – general discussion

December 16: Final term paper due.

Grading will be announced after the Holiday Season.