HISTORY OF SCIENCE 305
(same as HISTORY 292)

Technology and Culture

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Fall 2002
T-Th, 9:55-11:10

Aims and Methods

The purpose of this seminar is to acquire an understanding of the nature, development, role, and significance of technology as a dynamic element in human society. In other words, we will be studying the social history of technology, a vast subject area, both in time, and in conceptual approaches. To give us a path through this area, we will use a few "texts" to provide focus, continuity, and a point of departure for looking at the subject in different ways.

For example, at a very basic level, one can approach the history of technology either as a study in the humanities, illuminating human nature, or as one in the social sciences, yielding causal relations and predictive power. In fact, we will try the social sciences viewpoint in considering technology assessment, but, at the same time, our focus on the "unexpected" consequences of technology will involve us in a study of human nature.

In recent years historians of technology have stressed ideology, complexity, and system as important factors in the development of technology and in the characterization of its nature. They have also broadened their concerns to provide context from the point of view of the environment, of "consumers," and of women. These and similar factors are significant for understanding and reconstructing the technological past. They are also important for analysing and evaluating what are taken to be the salient features of the interrelationships of technology and society.

Course Requirements

Class discussion (30% of final grade)
evaluation based on attendance, plus frequency and quality of participation.
Paper (6-10pp) (20%)
Term Project (30%)
Comprehensive final examination (20%)

Term Project

The purpose of the term project is to study specific areas of personal interest, and to apply newly acquired knowledge critically where appropriate, while following a method and narrative discipline relatively unusual for an academic exercise. Conventional history of technology is rather linear straightforward narrative, chronological, and causally relatively simple. Such histories oversimplify the complex interrelations of humans and technologies, which form a rich and interwoven historical tapestry. It is extraordinarily difficult to try to write history unconventionally, but the attempt to do so is well worth the effort it takes to acquire a novel comparative perspective.

To that end, we begin by viewing James Burke's videotape series CONNECTIONS. Each of the ten one-hour episodes about technology and culture is to be viewed (group watching, when possible, is strongly recommended); we discuss them briefly in class, approximately one episode each week.

For the term project, each student [or group of students] is to prepare an additional episode. To the extent felt possible, the narrative should indicate visual and audio context [scenes, pictures, models, music]. A shooting script is acceptable, as would be a filmed episode or even a dramatic Power Point presentation. Most people feel more comfortable with the conventional format of a term paper.

Students present their new episodes in class, beginning the week before Thanksgiving week to ensure everyone has a chance to perform. Presentations are limited to 15 minutes [the equivalent of about 6 double spaced typed pages], so that a 10 minute question and discussion period may follow each one.

Students should clear topics and provide a rough outline (~1pp) by Thursday, October 17, the first class after Fall Reading Period. Final written drafts or scripts/tapes of the episodes are due by 5:00 p.m. on Friday, Dec. 6, the last day of fall semester classes.

Critical Paper

George Basalla's The Evolution of Technology presents an unusual and provocative theory of technology: an evolutionary model for understanding technology's history and development. Students are to read Basalla's book and write a critical evaluation of it. Papers (6-10 pp) should be handed in by Thursday, Oct. 31.

Because students will have already become familiar with the different approaches and interpretive stances of Mumford, Gimpel, Cardwell, Pacey, and White, the evaluation should ideally also be comparative.

TEXTS

Lewis Mumford Technics and Human Development (THD)

Volume I of the Myth of the Machine presents a humanistic, holistic, organic, complex, and symbolic vision of technology's development from prehistory to the middle ages. An alternative to conventional history.

Jean Gimpel Medieval Machine (MM)

A broad and useful introduction to the revolution in medieval technology. The best brief yet comprehensive text on the subject.

DSL Cardwell Technology (T)

Arnold Pacey The Maze of Ingenuity (MI)

These 2 texts begin with medieval technology, and bring the historical account to the twentieth century. Cardwell gives some of the internal history that is not Mumford's purpose to recount; his book is a more conventional historiography, yet still interpretive. Pacey's work covers similar ground, but from a complementary viewpoint.

James Burke Connections

A lively, eclectic, and journalistic work, the book has much more detail than its TV version or its successor versions. It should be read at the rate of one chapter per week. Although the material usually will not match the current reading, either chronologically or topically, we will briefly discuss its salient features (themes, interpretations, historiography) each Thursday.

George Basalla The Evolution of Technology (ET)

Develops an evolutionary model of technology's growth and change, from nature-facts to artifacts. Innovation-mutation, selection pressures.

A few extra articles supplement the texts, available as a course packet from Ms. Kate Fletcher, Administrative Assistant, Bronfman 189, at cost:

1.	L. White, jr.	The Life of the Silent Majority	(LSM)
2.	L. White, jr.	Technology in the Middle Ages	(TMA)
3.	L. White, jr.	Technology Assessment from the Stance of a Medieval Historian	(TA)
4.	L. White, jr.	The Act of Invention	(AI)
5.	L. White, jr.	Historical Roots of Ecological Crisis	(HRE)
6.	M. R. Smith	Technological Determinism	(TD)
7.	L. Marx	Postmodern Pessimism	(PP)
8.	L. Mumford	Pentagon of Power	(POP)

Class Meetings

Classes will be in seminar format, consisting of discussion of the salient viewpoints, arguments, weaknesses, metaphysics, etc. presented in the assigned reading, plus any other critical, analytical, or contextual remarks thought relevant.

READING ASSIGNMENTS

Date	Topics and Reading
Thu., 9/5 (1)	Introduction, orientation. Evolution. Complexity. System. Determinism. Internal-External. Social Construction. Revolutions. Dynamics.
Tues., 9/10 (2)	**Mind, Consciousness, Language, Naturfacts. Paleotechnics.** Prologue (THD 2-13) The Mindfulness of Man (THD 14-47) In the Dreamtime Long Ago (THD 48-71) The Gift of Tongues (THD 72-97)
Thu., 9/12 (3)	**Paleotechnics. Neolithic and Agricultural Revolutions. Kings and States.** Finders and Makers (THD 98-125) Fore-Stages of Domestication (THD 126-141) Garden, Home, and Mother (THD 142-162) Kings as Prime Movers (THD 163-187) The Trigger Effect (Connections Ch. 1, 1-13)
Tues., 9/17 (4)	**The Megamachine, and Civilization, Invention, Arts.** The Design of the Megamachine (THD 188-211) The Burden of 'Civilization' (THD 212-233) Invention and the Arts (THD 234-262) Introduction (T 3-19)
Thu., 9/19 (5)	**The Third Industrial Revolution: Energy, Agriculture; Technology and Life in the Middle Ages** Energy Resources of Europe and their Development (MM1-28) The Agricultural Revolution (MM 29-58) Life of the Silent Majority (Packet, LSM 133-144; 15 pp) The Middle Ages (Packet, MA 66-79; 14 pp) The Road from Alexandria (Connections Ch. 2, 14-43)
Tues., 9/24 (6)	**Medieval Inventiveness and Technological Change** Technology Assessment from the Stance of a Medieval Historian (Packet, TA 1-13; 13 pp) The Act of Invention (Packet, AI 107-131; 25 pp)

Thu., 9/26 (7) **Mines, the Environment, and Ecological Crisis**

Mining the Mineral Wealth of Europe (MM 59-74)
Environment and Pollution (MM 75-92)
Historical Roots .. Ecological Crisis(Packet, HRE 75-94;20 pp)
Distant Voices (Connections, Ch. 3, 45-79)

Tues.,10/01 (8) **Cathedrals, Monasteries, Engineers, and Medieval Pioneers**

Labor Conditions in Three Medieval Industries (MM 93-113)
Villard de Honnecourt: Architect and Engineer (MM 114-147)
The Cathedral Builders…(MI 1-28)
Pioneers in Mechanization (THD 263-296)

Thu.,10/03 (9) **Medieval Technology: Another View**
Clock and Press. Two kinds of solution.

The Mechanical Clock: the Key Machine (MM 148-170)
A Century of Invention: 1250-1350 (MI 29-55)
Gears from the Greeks (T 20-48)
New Worlds and an Information Revolution (T 49-74)
Faith in Numbers (Connections Ch. 4, 80-113)

Tues.,10/08 (10) **Medieval Science**

Reason, Mathematics, and Experimental Science (MM178-198)
Mathematics and the Arts: 1450 - 1600 (MI 56-79)

Thu.,10/10 (11) **The End of Medieval Technics**
The Scientific Revolution

The Practical Arts and the Scientific Revolution (MI 80-102)
The Scientific Revolution (T 75-101)
The Wheel of Fortune (Connections Ch. 5, 114-151)

---------- FALL READING PERIOD ----------

Thu., 10/17 (12) **The Scientific to the Industrial Revolution: Social and Political Factors**

Project Drafts Due

Social Ideals in Technical Change…(MI 103-132)
The State and Technical Progress: 1660-1770 (MI 133-158)
Fuel to the Flame (Connections Ch. 6, 152-183)

Tues.,10/22 **The Industrial Revolution: the Eighteenth Century**
(13)

Technology in the Industrial Revolution (MI 159-189)
Reason and Improvement (T 105-128)
Progress in Practice (T 129-152)
The Birth of the Factory (T 153-177)

Thu., 10/24 **The Revolutionary Years, 1790-1825**
(14)

Technology becomes Autonomous… (T 178-202)
Napoleonic Europe (T 203-227)
The Long Chain (Connections Ch. 7, 184-213)

Tues.,10/29 **The 19th Century: Railroads, Power, and Engineering**
(15)

Conflicting Ideals in Engineering: America and
Britain, 1790-1870 (MI 190-215)
Roads, Railroads, and a New Philosophy of Power (T 228-252)
The Public Face of Technology: Artistry and
and Intelligence (T 253-277)

Thu., 10/31 **1840-1870: Exhibitions, Thermodynamics, Electricity** (16)

Basalla Paper Due

Progress at the Flood (T 281-305)
Three Decades of Innovation (T 306-333)
A Second Industrial Revolution (T 334-363)
Eat, Drink and Be Merry (Connections Ch. 8, 214-247)

Tues.,11/05 **Ideals and Technology; Wars and New Technologies**
(17)

Institutionalizing Technical Ideals, 1820-1920 (MI 216-241)
A Century of Wars, (T 363-394)
Paradigm Cases (T 395-424)

Thu., 11/07 **From Little Technology to Big Technology**
(18)

Foreshadowing the Future (T 425-456)
Technology and the Individual: Little Technology (T 457-484)
Lighting the Way (Connections Ch. 9, 248-286)

Tues.,11/12 **Philosophy of Technology - 1**
(19)

Idealistic Trends in Twentieth-Century Technology (MI 242-266)
Conclusion: Evolution and Progress (ET 207-218)
Notes towards a Philosophy of Technology (T 485-513)

Thu., 11/14 **Philosophy of Technology - 2**
(20)

"Technological Determinism" (Packet, TD 1-35; 35 pp)
"Postmodern Pessimism" (Packet, PP 237-257; 21 pp)
"Pentagon of Power" (Packet, POP 4-21; 18 pp)
Inventing the Future (Connections Ch. 10, 287-295)

Tues.,11/19 Student Presentations - 1
Thu., 11/21 " " - 2
Tues.,11/26 " " - 3

----------THANKSGIVING----------

Tues.,12/01 **Comprehensive Hour Exam**

Thu., 12/05 Student Presentations - 4 (if needed) SCES
Course review and evaluation

Fri., 12/06 5:00 p.m. ***Term Projects are due.***

A VERY BRIEF BIBLIOGRAPHY

M. Kranzberg and C. Pursell, eds. — Technology in Western Civilization (2 vols.) (this and the next two texts are classics for the study of the history of technology)

C. Singer, A.R. Hall, E. J. Holmyard, T. I. Williams, eds. — A History of Technology (7 vols.) an excellent reference work.

M. Daumas, ed. — A History of Technology and Invention (3 vols.)

A. Wolf — A History of Science, Technology and Philosophy in the: 16th and 17th Century (2 vols)
18th Century (2 vols)

D. S. L. Cardwell — Turning Points in Western Technology

L. Mumford — Technics and Civilization

L. White, jr.	Medieval Technology and Social Change Dynamo and Virgin Reconsidered Medieval Religion and Technology
D. Boorstin	The Americans: The Democratic Experience (social history of technology in American life)
R.S. Cowan	A Social History of American Technology
A. Pacey	The Culture of Technology
L. Winner	Autonomous Technology The Whale and the Reactor

SHOT (Society for the History of Technology) publishes a journal, Technology and Culture, that contains many excellent articles covering a variety of topics. One issue each year contains a bibliographical update.

The list above may prove useful in forming ideas about how to start your Connections episode, and what events you might like to include in it. As you move to refine and expand the structure and character of your episode, you will find there are many fine and interesting books on more specific topics, such as on industry (electrical, chemical, automotive, computer), on engineering, on categories (power, communications, transport, military, textiles, metallurgy, materials, domestic technologies), etc.

If you start early enough, you may be able to identify useful articles you would like to have, which, if not held at Williams, could be ordered on inter-library loan. If you haven't ordered such articles before Fall Reading Period, however, you can't count on their arriving in time for your presentation.

Internet

Under “Resources” on the History of Science webpage whose address is [http://www.williams.edu/acad-depts/HistSci/home.html], are helpful materials for the history of technology, including some useful links to sources and other reputable links.