

**Theories of Technological Change: History, Culture, Techniques**  
**Preliminary syllabus for fall 2016**

**HSci 8421**

**Program in History of Science, Technology, and Medicine**

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**Overview:** This seminar examines prominent theories of technological change, against the backdrop of three historical, empirical examples and one emerging example: the printing revolution and the contemporary revolution in electronic communications; industrial revolutions in the context of industrial globalization; and technology's role in historical/ongoing debates about the meaning and value of human work; and, right now, the emergence of biotechnology as a potent new realm of human activity. Topics include technological determinism, social construction of technology, actor-network theory, and activity theory; communications, orality, literacy, and electracy; semiotics and post-modernity; work, economics, and self; and democracy and the user's critique of technology.

**Format:** The seminar is a readings and discussion course, and includes both weekly in-person discussion meetings (Mondays, 4:35-5:30) and weekly contributions to the on-line discussion forum. Students are expected to attend and participate in the weekly discussions in person and on-line. In-class discussion is worth 50% of the course grade, and on-line participation is worth 50% of the course grade (30% for on-going weekly forum posts, 20% for assigned reading evaluation posts).

**Reading evaluations:** Each student will prepare and post two readings evaluations during the course. A readings evaluation should give an overview of the readings for the week, pose possible discussion questions, and take an evaluative position on the readings. We will assign weeks at the first seminar meeting. Readings evaluations are worth 20% of the course grade.

**Forum posts:** In addition to posting two readings evaluations during the course, students must post a substantial response to the readings evaluation for each week that they do not post a readings evaluation. This post must respond to the readings evaluation. It should also respond to other comments already posted, and in fact a good forum response may require two more more additional postings. The response can be critical. It can also open a new avenue for discussion, connect the readings or postings to other issues and readings, etc. We will determine a timeline for postings at the first seminar meeting. Forum posts are worth 30% of the course grade. You will be asked to collect and submit them as a single document at the end of the term.

**Discussion:** Students are required to attend weekly seminar meetings, and to participate in discussion. Discussion participation is worth 50% of the course grade.

**Grading:** Grading will be based on participation in in-person discussion (50%), on-line forum posts (30%), and readings evaluations (20%). Please note that students may not pass the course

without completing all assignments, and that a grade of incomplete (I) will be given only if a student has already satisfactorily completed the majority of the coursework and if there is a compelling and emergency reason.

### **Books:**

Most of the books we are using will be placed on reserve in Wilson Library. Almost all of the journal articles are available on-line; those that are not will be scanned and made available digitally. You may wish to purchase some of these books, which are available at a substantial discount from on-line sources. Please note that we will not read all of these books in their entirety.

Andrew Feenberg, *Questioning Technology* (London: Routledge, 1999).

Useful throughout, for descriptions of theories and concepts, such as agency and rationality, and remarkable for its sustained commitment to finding democratic possibilities within technological society.

Carl Mitcham, *Thinking Through Technology: The Path Between Engineering and Philosophy* (Chicago, University of Chicago Press, 1994)

Very helpful overview of the principle philosophies of technology, and their development and paths of intersection. Useful reference.

Val Dusek, *Philosophy of Technology: An Introduction* (Malden, Mass: Blackwell Publishing, 2006)

Good summary of major issues and theories; a good reference throughout the course.

Jacques Ellul, *Technological Society* (Vintage Books, 1967)

Repays careful reading over time, full of fascinating observations and moral/philosophical reflections.

Herbert Marcuse, *One-Dimensional Man* (Boston: Beacon Press, 1991), try to get the edition with the introduction by Douglas Kellner

A classic that you will most likely annotate heavily.

Andrew Feenberg, *The Philosophy of Praxis* (Verso: London, 2014)

Feenberg is a student of Marcuse's. You will want to dip in and out of this when it is assigned, rather than reading it straight through.

Walter Ong, *Orality and Literacy* (Routledge, 2012, 3rd ed)

Another classic, and seminal in communication studies.

Brian Rotman, *Becoming Beside Ourselves: The Alphabet, Ghosts, and Distributed Human Beings* (Durham, NC: Duke University Press, 2008)

This is a slender and exciting volume, about speech and human gestures, and the possibilities that digital technologies may foreclose.

Jose van Dijck, *The Culture of Connectivity: A Critical History of Social Media* (Oxford University Press, 2013)

Very empirical, compelling detail.

David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, 2<sup>nd</sup> ed. (Cambridge: Cambridge University Press, 2003).

Stuffed with statistics and data, makes a good economic reference itself.

Karl Polanyi, *The Great Transformation* (Boston: Beacon Press, 2001).

A great classic, about the context in which industrial civilization developed.

Richard White, *The Organic Machine* (New York: Hill and Wang, 1996).

A slim volume, a lovely and compelling story. How environmental history should be done.

Martin Reuss and Stephen Cutcliffe, eds., *The Illusory Boundary: Environment and Technology in History* (Charlottesville: University of Virginia Press, 2010)

An edited volume, with a variety of authors and loads of interesting citations.

Richard J. Evans, *In Defense of History* (New York: W.W. Norton, 1999).

An argument for the significance of the study of history from one of its most distinguished practitioners.

Frank Ankersmit, *Meaning, Truth, and Reference in Historical Representation* (Ithaca, NY: Cornell University Press, 2012).

An attempt to introduce an intellectually respectable form of realism into theories of history, through an analysis of Ranke's views on objectivity. A response to postmodern theories of history.

Keith Jenkins, ed., *The Postmodern History Reader* (London and New York: Routledge, 1997).

You may want to have this around. Selections from it will be available electronically, but it is an excellent survey of the major positions of postmodernism.

### **Schedule of discussions and readings:**

**Sept. 8            Technology and history: an introduction**

**Sept. 15          Constructing the history of humans and machines**

**Theories: the Social Construction of Technology and Actor Network Theory**

Read:

Trevor J. Pinch and Wiebe E. Bijker, “The Social Construction of Facts and Artifacts: Or How the Sociology of Science and the Sociology of Technology Might Benefit Each Other,” in Bijker, et al, *The Social Construction of Technological Systems* (Cambridge, Mass: MIT Press, 1990), pp. 17-50.

Michel Callon, “Society in the Making: The Study of Technology as a Tool for Sociological Analysis,” in Bijker et al, *The Social Construction of Technology*, pp. 83-103.

John Law, “Technology and Heterogeneous Engineering: The Case of Portuguese Expansion,” in Bijker et al, *The Social Construction of Technology*, pp. 111-134.

Bruno Latour, “Machines,” in Latour, *Science in Action: How to follow scientists and engineers through society* (Cambridge, Mass: Harvard University Press, 1987), pp. 103-144.

These two collections are worth examining, if this subject interests you:

Wiebe Bijker, *Of Bicycles, Bakelites, and Bulbs: Toward a Theory of Sociotechnical Change*

Wiebe Bijker, Thomas P. Hughes, Trevor Pinch (eds.), *The Social Construction of Technological Systems: New Directions in the Sociology and History of Technology*

See also this well-known critique:

Langdon Winner, “On Opening the Black Box and Finding It Empty: Social Constructivism and the Philosophy of Technology,” *Science, Technology, and Human Values* 18 (1993): 362-378

And the classic example of social construction in operation:

Thomas P. Hughes, *Networks of Power*

These two pieces offer a taxonomy of approaches within social construction:

Philip Brey, “The Philosophy of Technology Meets Social Constructionism” [http://scholar.lib.vt.edu/ejournals/SPT/v2\\_n3n4html/brey.html](http://scholar.lib.vt.edu/ejournals/SPT/v2_n3n4html/brey.html) *Society for Philosophy and Technology*, spr/sum 97, v. 2

S. Sismondo, “Some Social Constructions.” *Social Studies of Science* 23 (1993): 515-553.

Note also that there is a more moderate approach, the social shaping (rather than construction) of technology. Here are some readings that take this approach:

Langdon Winner, *The Whale and the Reactor: A Search for Limits in an Age of High Technology*

Donald MacKenzie, *Knowing Machines: Essays on Technical Change*

Trevor Pinch, *How Users Matter: The Co-Construction of Users and Technology* (Cambridge: MIT Press, 2005)

And this controversial classic, of what has become called Actor Network Theory:

Bruno Latour, *Science in Action: How to Follow Scientists and Engineers Through Society* (Cambridge, Mass: Harvard University Press, 1988)

You can familiarize yourself with Latour's terminology in:

Bruno Latour, *Reassembling the Social: An Introduction to Actor-Network-Theory* (Oxford: Oxford University Press, 2007)

Be aware of these contributions considering Actor Network Theory in studies of information systems; perhaps choose one to read:

Antonio Cordella and Maha Shaikh, "From Epistemology to Ontology: Challenging the Constructed 'truth' of ANT," London School of Economics and Political Science, Department of Information Systems, Working Paper Series #143.

Andrea Whittle and André Spicer, "Is Actor Network Theory Critique?" *Organization Studies* 29 (2008): 611-629.

## **Sept. 22      Classic theories about technology, social change, and human work**

### **Theory: varieties of Marxism**

#### Read:

Karl Marx, preface to *A Contribution to the Critique of Political Economy* (Chicago: Charles H. Kerr and Company, 1904), pp. 9-15

E.P. Thompson, "Time, Work-Discipline, and Industrial Capitalism," *Past and Present* 38 (Dec. 1967): 56-97.

and a selection from Merritt Roe Smith, *Harper's Ferry Armory and the New Technology: The Challenge of Change* (Ithaca, NY: Cornell University Press, 1980)

See Giddens's study for the larger reach of social theory:

Anthony Giddens, *Capitalism & Modern Social Theory: An Analysis of the Writings of Marx, Durkheim, and Weber* (Cambridge: Cambridge University Press, 1971).

Chapter 11 is especially helpful, "Fundamental Concepts of Sociology" (pp. 145-168). It concentrates on Weber but also discusses the historical and contextual development of important categories within social thought.

And these classics:

Emile Durkheim, *Division of Labor in Society* (1893); *Rules of Sociological Method* (1895); *Suicide* (in *L'année sociologique*, 1897), *Elementary Forms of Religious Life* (1912).

Max Weber, *Protestant Ethic and the Spirit of Capitalism* (1930); *Theory of Social and Economic Organization* (1947); *Essays in Economic Sociology* (1999); *Religion of China: Confucianism and Taoism* (1951); *Ancient Judaism* (1952); *Types of Legitimate Rule* (1958).

## Sept. 29 **Industrial revolutions and technological change: economic theories of change**

**Theory: economics as the driver of technological change**

Read selections from:

David S. Landes, *The Unbound Prometheus: Technological Change and Industrial Development in Western Europe from 1750 to the Present*, 2<sup>nd</sup> ed. (Cambridge: Cambridge University Press, 2003).

Karl Polanyi, *The Great Transformation* (Boston: Beacon Press, 2001)

These are some well-known considerations of industrialization and change:

David F. Noble, *Forces of Production: A social history of industrial automation* (New York: Oxford University Press, 1984).

Michael Adas, *Machines as the Measure of Men*. Adas criticizes the use of industrial ideas of progress for critiquing the non-European world.

Joel Mokyr, *The Gifts of Athena*. A study complimentary to capitalism.

Joel Mokyr, "The Intellectual Origins of Modern Economic Growth," *Journal of Economic History* 65 (2005): 285-351

Rondo Cameron, Joel Mokyr, "The Industrial Revolution: Fact or Fiction?" *Contention: Debates in Society, Culture, and Science* 4(1994): 163-188

Larry Stewart, "Assistants to Enlightenment: William Lewis, Alexander Chisholm and Invisible Technicians in the Industrial Revolution," *Notes and Records of the Royal Society* 62, (2008), 17—29. Stewart argues for the importance of other kinds of labor than industrial.

**Oct. 6            Industry and innovation: theory and empirical example**

**Theory: entrepreneurial activity as the root of technological change**

Read selections from:

Scott Berkun, *The Myths of Innovation* (Sebastopol, CA: O'Reilly Media, 2010)

Thomas P. Hughes, *Elmer Sperry: Inventor and Engineer* (Baltimore, MD: Johns Hopkins University Press, 1971)

**Oct. 13          The discipline of history: studying change over time**

Read:

Frank Ankersmit, *Meaning, Truth, and Reference in Historical Representation* (Ithaca, NY: Cornell University Press, 2012)

Richard J. Evans, *In Defense of History* (New York: W.W. Norton & Co., 1999)

*and selections from* Keith Jenkins, ed., *The Postmodern History Reader* (London: Routledge, 1997) (we will read selections from Jenkins throughout the course)

There are many good studies of history as a practice and a field, and my favorites include:

Paul Veyne, *Writing History*

Thomas Haskell, *Objectivity is not Neutrality: Explanatory Schemes in History*

Peter Novick, *That Noble Dream: The Objectivity Question and the American Historical Profession*

David Harlan, *The Degradation of American History*

**Oct. 20      Biotechnology, environment and change, I**

**Theory: nature and technology are known through activity**

Read:

Joan H. Fujimura, "Technobiological Imaginaries: How Do Systems Biologists Know Nature?" in Mara J. Goldman et al, eds., *Knowing Nature: Conversations at the Intersection of Political Ecology and Science Studies* (Chicago: University of Chicago Press, 2011), pp. 65-80

*and selections from Martin Reuss and Stephen Cutcliffe, eds., The Illusory Boundary: Environment and Technology in History* (Charlottesville: University of Virginia Press, 2010).

Other provocative studies of technology, biology, and environment:

Helen Tilley, *Africa as a living laboratory: Empire, development, and the problem of scientific knowledge, 1870-1950* (Chicago: University of Chicago Press, 2011), especially chapter III, "An Environmental Laboratory: "Native" Agriculture, Tropical Infertility, and Ecological Models of Development".

Edmund Russell, et al, "The Nature of Power: Synthesizing the History of Technology and Environmental History," *Technology and Culture* 52 (2011): 246-259.

Andrew Feenberg, *Between Reason and Experience: Essays in Technology and Modernity* (Cambridge, MA: MIT Press, 2010), esp. chap 3: "Incommensurable Paradigms: Values and the Environment"

**Oct. 27      Biotechnology, environment and change, II**

**Theory: nature speaks to technology**

Read:

Richard White, *The Organic Machine* (New York: Hill and Wang, 1996).

See also this recent cheerleading effort on behalf of biotechnology:

Emily Anthes, *Frankenstein's Cat: Cuddling up to biotech's brave new beasts* (New York: Farrar, Straus, Giroux, 2013)



That people knowing nature through practice is a cornerstone of Activity Theory, which focuses on cognition and tool use. We will not read these contributions, but you may want to be aware of them, especially if you are interested in neurology, activity, and change. Activity theory is rooted in work by Russian psychologists, and American Bonnie Nardi has been influential in extending the theory here:

Bonnie Nardi, *Context and Consciousness: Activity Theory and Human-computer Interaction* (Cambridge, Mass: MIT Press, 1996)

Bonnie Nardi, *Information Ecologies: Using Technology with Heart* (Cambridge, Mass: MIT Press, 1999)

Bonnie Nardi and Victor Kaptelinin, *Acting with Technology: Activity Theory and Interaction Design* (Cambridge, Mass: MIT Press, 2006)

Lev Vygotsky, *Mind in society: the development of higher psychological processes* (Cambridge, Mass: Harvard University Press, 1978).

### **Nov. 3                    Communications I: printing and the digital revolution**

**Theory: society is defined by how its members interact**

Read:

José van Dijck, *The Culture of Connectivity: A Critical History of Social Media* (Oxford: Oxford University Press, 2013)

*and selections from Elizabeth L. Eisenstein, The Printing Revolution in Early Modern Europe* (New York: Cambridge University Press, 1983).

And be aware of larger ramifications of cultural theory:

Clifford Geertz, “Thick Description ... Toward an interpretive theory of culture,” in *The Interpretation of Cultures: Selected Essays* (New York: Basic Books, 1973), pp. 3-30. Often cited as offering a model for historians to follow.

Robert Darnton, *The Great Cat Massacre*

Pierre Bourdieu, *Outline of a Theory of Practice* (Cambridge: Cambridge University Press, 1977). Critical of cultural theory.

Raymond Williams, *Marxism and Literature* (Oxford: Oxford University Press, 1977). Also critical, and looking outside cultural theory for models.

### **Nov. 10                    Communications II: The transition from speech to writing**

**Theory: the shift to text made rationality possible**Read:

Walter Ong, *Orality and Literacy* (Routledge, 2012, 3rd ed)

Be aware of the seminal study to which Ong responded:

Eric Havelock, *Preface to Plato* (Cambridge, Mass: Harvard University Press, 1963)

And of this early collection exploring the varieties of non-literate society:

Jack Goody, ed., *Literacy in Traditional Societies* (Cambridge: Cambridge University Press, 1968)

And of this brilliant study of how orality and literacy meet in biblical interpretation:

Northrop Frye, *The Great Code: the Bible and Literature* (University of Toronto, 2006)

Nov. 17

**Communications III:****Theory: alphabet and text limit human cognition**Read:

Brian Rotman, *Becoming Beside Ourselves: The Alphabet, Ghosts, and Distributed Human Beings* (Durham and London: Duke University Press, 2008)

Nov. 24

**Technological determinism and critics of technology****Theory: that technology has limited human freedoms**Read:

Jacques Ellul, *The Technological Society* (Vintage Books, 1967).

This is a frustrating but widely influential study from a jurist and lay theologian. Dip into parts of it, and read those carefully; do not feel compelled to read through the whole thing.

Herbert Marcuse, *One-Dimensional Man* (Boston: Beacon Press, 1991)

See also the famous but impossible to read essay by Heidegger:

Martin Heidegger, “The Question Concerning Technology”, 1954, 1977. There are a couple of versions available on-line. Heidegger would object to being called a technological determinist.

And be aware of these interesting contributions:

Merritt Roe Smith, “Technological Determinism in American Culture,” in Smith and Leo Marx, eds., *Does Technology Drive History?* (Cambridge, Mass.: MIT Press, 1994): 2-37

David Chandler, *Technological or Media Determinism* (pdf [www.aber.ac.uk/media/Documents/tecdet/tdet.html](http://www.aber.ac.uk/media/Documents/tecdet/tdet.html))

And these classic contributions:

Lewis Mumford, *Technology and Civilization*

Siegfried Geidion, *Mechanization Takes Command*

## **Dec. 1            Ways out of technological determinism: diagnosis and response**

**Theory: critical theory and empirical history**

Read:

Jennifer Karns Alexander, *Mantra of Efficiency: From Waterwheel to Social Control* (Baltimore: Johns Hopkins University Press, 2008)

Andrew Feenberg, *The Philosophy of Praxis: Marx, Lukács and the Frankfurt School* (London: Verso, 2013)

And be aware of this significant treatise, a classic of what is called the Frankfurt School approach:

Theodor Adorno and Max Horkheimer, *Dialectic of Enlightenment*

You might also find these of interest:

Richard Bernstein, “Heidegger’s Silence? Ethos and Technology,” in Bernstein, *The New Constellation: Ethical-Political Horizons of Modernity/Post-modernity* (Cambridge, Mass.: MIT Press, 1994), 79-141.

Hayden White, “Postmodernism and Textual Anxieties,” in *The Fiction of Narrative* (Baltimore: Johns Hopkins University Press, 2010), pp. 304-317.

Feenberg, chaps. 4 & 8: “Critical Theory of Technology: An Overview,” and “From Critical Theory of Technology to the Rational Critique of Rationality”.

*Familiarize yourself with one of these, asking “what is under criticism?”:*

Michel Foucault, *Discipline and Punish*

Henry Jenkins, “The Work of Theory in the Age of Digital Transformation,” *BrainTrustdv*, <http://www.braintrustdv.com/essays/work-of-theory.html>

*And if you are of a philosophical bent, look up Herbert Dreyfus’s papers on Heidegger and Foucault:*

<http://socrates.berkeley.edu/~hdreyfus/index.html>

**Dec. 8      Technology, change, and the future: final discussion**

Please collect all your postings from the term, and submit them as a single document.