

**Department of Humanities 2010–11**

**A GLOBAL HISTORY OF TWENTIETH CENTURY THINGS  
COURSENOTES**

**Prof. David Edgerton**  
**Centre for the History of Science, Technology and Medicine**

**E-mail: [d.edgerton@imperial.ac.uk](mailto:d.edgerton@imperial.ac.uk)**

This course is a history of technology which focuses on technologies, things, in use. Why things? Because the history of things, if one wants to be pejorative, the history of stuff, provides an insight into the history of technology, that is not, indeed cannot, be provided by what are usually called 'histories of technology'. Such histories are not usually histories of *technology* at all, but rather histories of *invention* and *innovation*. Such histories cannot tell us as much as we might think. In order to address the issue of the changing relation of technology and society in the history of the twentieth century we need to look at what has been in use. This course does so at a global level, since while invention has been highly concentrated in particular parts of the world, use of technology is much more widely diffused. Furthermore, there are many technologies in use around the world, which are indeed still being developed, which we hardly think of as technologies – think of the bicycle.

In the last decade a number of interesting works have looked at the histories of particular things over long periods, by academic historians of technology, engineers, and some more popular writers too. This course will use some of this work, but will put the history of things very firmly in their particular historical contexts, asking many of the key questions one needs to ask in order to think about the place of technology in society, in the past, and in our day.

**Objectives of the Course**

By taking this course students will be better able to:

- distinguish between the history of invention and innovation, and the history of technology, and understand the significance of so doing;
- understand the significance of technological alternatives in history;
- assess the role of technology as a causal agency of historical change in the twentieth century;
- discuss the gender implications of technology in the workplace and the home;
- recognise and understand different kinds of historical explanation;
- appreciate the roles of skill, machines and the division of labour in the processes of production in industry, agriculture and the home;
- give informed and critical comment on historical writing (both scholarly and popular) about the development of technology. You will be able to read a complex historical text; to write a good historical essay; and to acknowledge the work of historians by citing existing work clearly, accurately, and appropriately. You will learn to challenge, criticise and evaluate historical arguments; to formulate arguments clearly; to choose and judge between competing arguments; to understand that different people in different times and places interpret events differently.

## Lectures and Tutorials

The course consists of lectures and seminars. The lectures take place on **Fridays** at 12.00 (starting on 8 October), seminars at times to be arranged.

Every class has a reading that *must be done before class*. All readings are available in electronic (.pdf) form. Please go to:

<http://www3.imperial.ac.uk/ict/services/teachingandresearchservices/elearning/webct/>

and log in accordingly.

## Essays and Assessment

You are required to write **two** essays, each of around 2,000 words. The first assignment must be handed in at the Humanities Reception desk (Level 3, Sherfield Building) by 2 pm, Thursday **13 January 2011**. The second must be handed in by 2 pm, Thursday **5 May 2011**.

The essay will not be accepted without a Humanities Department cover sheet (included in the Humanities Student Handbook or available from the Humanities website). This provides evidence that you have handed in your essay on time and includes a declaration that it is your own work.

The two-hour written final **examination** will be on Friday **25 March 2011**, at 12:00.

## Extensions

Students needing to request an extension for reasons of illness or a serious personal problem (**no other reason is valid**) need to arrange this through the Humanities administration. A 'Coursework Extension Request Form' is appended to the Humanities Student Handbook or available for download from the Humanities website. Complete and sign the form and return it to Christian Jacobi, Humanities Administrator (Level 3, Sherfield Building), or by e-mail to [humanities@imperial.ac.uk](mailto:humanities@imperial.ac.uk), along with any supporting documentation such as a medical certificate. The Humanities Department administration will, if necessary, liaise with the home department to ascertain the seriousness of the circumstances.

Apart from in very exceptional circumstances, the maximum extension period will be two weeks. **Students submitting late assignments without arranging an extension in advance will be subject to a mark penalty of 5% per day, including weekends.**

The first essay will account for 20% of the total mark, the second essay for 30%. The exam accounts for 30%, while the remaining 20% shall be awarded throughout the term on your participation in class.

This course is externally examined.

**Problems or Queries:** If you have any difficulties please feel free to contact Prof. Edgerton, Centre for the History of Science, Technology, and Medicine. Room 222A, Central Library (Level 2). Email: [d.edgerton@imperial.ac.uk](mailto:d.edgerton@imperial.ac.uk).

## How to succeed on this course

The course emphasizes reading, debating, and writing skills that are often foreign, but essential, to scientists and engineers. There are no notes available nor lecture handouts: you are expected to take notes and then share and compile notes with your fellows. Practice in note-taking is like practice in differential equations: you only learn by doing. Essays and exams can be considered similarly. You should write, and then re-write your essays. For

exams, you should practice exam questions within perhaps a study group: say there are four of you compiling notes in your group, for four days each of you takes turns to write out a question and then together you explore the answers. The readings are, in reality, only the beginning. They will be focused in on, and used as a springboard for the class as a whole. You need to take notes on the readings, and should be ideally deepening your knowledge of the historical issues through more reading. The best way to test your knowledge is via discussion in the tutorials.

## Lecture Schedule

### AUTUMN TERM

8 October **Introduction – How to think about the history of technology?**

15 October **Disappearing Things I: elephants and horses.** R. L. DiNardo and A. Bay, 'Horse-Drawn Transport in the German Army', *Journal of Contemporary History* (1988), pp. 129-41.

22 October **Disappearing Things II:** Svante Lindqvist, 'Changes in the Technological Landscape: the temporal dimension in the growth and decline of large technological systems', in Ove Granstrand (ed.), *Economics of Technology*, (Amsterdam: North Holland, 1994), pp. 271-288.

29 October *No Lecture.* **Visit to Science Museum: Making the Modern World Gallery.** <http://www.ingenious.org.uk/> and <http://www.makingthemodernworld.org.uk/>

5 November **Emergence of 'old' technologies: bicycles, rickshaws and long-tailed boats in modern Asia.** Tony Wheeler and Richard l'Anson, *Chasing Rickshaws* (London: Lonely Planet, 1998). On Mahatma Gandhi and technology, see <http://web.mahatma.org.in/books/showbook.jsp?link=bg&lang=en&book=bg0059&id=1&cat=books>

12 November **Maintenance and Repair:** the anvil and car maintenance in Ghana. Birgit Meyer and Jojada Verrips, 'Kwaku's Car. The Struggles and Stories of a Ghanaian Long-Distance Taxi Driver' in: Daniel Miller (ed.), *Car Cultures* (Oxford: Berg Publishers, 2001).

19 November (lecturer TBA) **The emergence of the New. The Atomic Bomb and the Second World World:** Thomas Hughes (1989), 'Tennessee Valley and Manhattan Engineer District,' in *American Genesis: A century of invention and technological enthusiasm*, London, Penguin, Chapter 8, pp.353–428.

26 November **Assessing the significance of technologies and alternatives I: strategic bombing in the second world war.** United States Strategic Bombing Survey: Summary Report (Pacific War) 1 July 1946. Washington, D.C.: United States Government Printing Office, 1946. See, [http://life.csu.edu.au/marshall/html/WWII/USSBS\\_Summary.html](http://life.csu.edu.au/marshall/html/WWII/USSBS_Summary.html).

3 December **Assessing the significance of technologies and alternatives II: nuclear power.** P.D. Henderson, 'Two British Errors: their probable size and some possible lessons', *Oxford Economic Papers* (July 1977), pp. 159-94. (JSTOR)

10 December **Death, Preservation and killing: slaughterhouses and refrigeration.** William Boyd, 'Making Meat: Science, Technology, and American Poultry Production', *Technology and Culture* Vol. 42, No. 4 (2001), pp. 631–664.

## **SPRING TERM**

14 January **The ownership of things: radio and television sets – purchase and hire purchase.** S. Bowden and A. Offer, 'Household appliances and the use of time: the United States and Britain since the 1920s', *Economic History Review* Vol. 47 (1994), pp. 725-48. (JSTOR)

21 January **Making things I: Technologies of domestic production.** Ruth Schwartz Cowan, 'The 'Industrial Revolution' in the Home: Household Technology and Social Change in the 20th Century', *Technology & Culture* Vol. 17, No. 1 (January 1976), pp. 1-23.

28 January **Making things II: high speed tool steel and scientific management.** Frederick W. Taylor, *Scientific Management* Chapter 2, <http://www.eldritchpress.org/fwt/t2.html>

4 February **Men, women and technology: condoms and the Pill.** Andrea Tone, 'Making Room for Rubbers: Gender, Technology and Birth Control before the Pill: *History and Technology* Vol. 18 (2002), pp. 51-76. Andrea Tone, *Device and Desires: a history of contraception in the United States* (New York: Hill and Wang, 2001).

11 February **Nations, empires and the control of technology I: oil-from-coal processes.** A. Krammer, 'Fuelling the Third Reich', *Technology and Culture*, Vol. 19 (1978), pp. 394 - 422;

18 February **Nations, empires and the control of technology II: Making Jet aeroplanes in unlikely places, 1945-1970.**

25 February **War: Small arms and artillery in war in the twentieth century: from the .303 to the Kalashnikov.** 'Killing,' in *Shock of the Old: technology and global history since 1900*, pp.160–83. [www.smallarmssurvey.org](http://www.smallarmssurvey.org)

4 March **The Sources of Invention.** D.E.H. Edgerton (ed.), *Industrial Research and Innovation in Business* (Cheltenham: E. Elgar, 1996).

11 March **Genocide.** <http://www.holocaustdenialontrial.com/ieindex.html> See in particular the report by Robert Jan van Pelt. See also the Nizkor project website: <http://www.nizkor.org>.

18 March Revision

**25 March EXAM**

### **General Readings:**

For the overall argument distinguishing the study of technology from that of use see David Edgerton, *The Shock of the Old: technology and Global History since 1900* (Profile Books – available from Amazon, £6.99). See also Edgerton, 'From Innovation to Use: ten (eclectic) theses on the history of technology', *History and Technology* Vol. 16 (1999), pp. 1-26. The article first appeared in French as 'De l'innovation aux usages. Dix thèses éclectiques sur l'histoire des techniques' *Annales HSS* juillet-octobre 1998, Nos 4-5, pp. 815-837.

There are also Spanish and Mandarin translations available in the library.

<http://earthtrends.wri.org/> is useful key source of data since 1960.

Arnulf Grübler, *Technology and Social Change* (Cambridge: Cambridge University Press, 1998).

Vaclav Smil, *Transforming the Twentieth Century Technical Innovations and Their Consequences* (Oxford University Press, 2006)

Vaclav Smil, *Energy in World History* (Oxford: Westview, 1994).

John R. MacNeill, *Something New Under the Sun: an environmental history of the twentieth century* (London: Penguin, 2000).

T.P. Hughes, *Networks of Power: Electrification in Western Society, 1880-1930* (Baltimore: Johns Hopkins University Press, 1983).

David F. Noble, *Forces of Production: a social history of automation* (New York: Oxford University Press, 1985).

S. Brand, *How Buildings Learn: What Happens after they're Built* (London: Penguin, 1994).

Brian Winston, *Media, Technology and Society, A History: From the telegraph to the internet* (London: Routledge, 1998).

Paul R. Josephson, *Industrialised Nature: Brute force technology and the transformation of the natural world* (Washington: Island Press, 2002).

Siegfried Giedion, *Mechanization takes Command: a contribution to anonymous history* (New York: Oxford University Press, 1948).

Ruth Schwartz Cowan, *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave* (New York: Basic Books, 1985).

See also the Science Museum websites <http://www.ingenious.org.uk/> and <http://www.makingthemodernworld.org.uk/>

Some histories of particular things:

Alan Macfarlane & Gerry Martin, *Glass: A World History* (Chicago: University of Chicago Press, 2002).

Henry Petroski, *The Pencil: A History of Design and Circumstance* (New York: Alfred A. Knopf, 1990).

Mark Kurlansky *Salt: A World History*, (London: Jonathan Cape, 2001).

Witold Rybczynski, *One Good Turn: A Natural History of the Screwdriver and the Screw*, (New York: Scribner, 2000.)

Alison J. Clarke, *Tupperware: the Promise of Plastic in 1950s America* (Washington, 1999).

Robert Friedel, *Zipper: An Exploration in Novelty*, (New York: W. W. Norton and Company, 1994).

Henry Petroski, *The Evolution of Useful Things: How Everyday Artifacts-From Forks and Pins to Paper Clips and Zippers-Came to Be As They Are* (New York: Alfred A. Knopf, 1992).

Some studies of things in use:

Christina Hardyment, *From mangle to microwave: the mechanization of household work* (Cambridge: Polity, 1988).

Ronald R. Kline, *Consumers in the Country: Technology and Social Change in Rural America* (London: John Hopkins University Press, 2000).

David Nye, *Electrifying America: Social Meanings of the New Technology, 1880-1940* (Cambridge, Mass.; London: MIT Press, 1990).

Jeffrey L. Meikle, *American Plastic: A Cultural History* (New Brunswick, N.J.: Rutgers University Press, 1995).

Cluade S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992).

K. Jellison, *Entitled to Power: Farm Women and American Technology* (Chapel Hill: University of North Carolina Press, 1993).

Cynthia Cockburn and Susan Ormrod, *Gender and Technology in the Making* (London: Sage, 1993).

C. Chant (ed.), *Sources for the Study of science, technology and everyday life, 1870-1950* (London: Hodder and Stoughton, 1989).

Histories of Invention/Technology:

Robert Bud et al., *Inventing the modern world: Technology since 1750* (Science Museum: London, 2000).

Donald S. L. Cardwell, *The Fontana History of Technology* (London: Fontana, 1994).

R. A. Buchanan, *The Power of the Machine: the impact of technology from 1700 to the present* (Harmondsworth: Penguin, 1992).

Some histories of US technology:

Ruth Schwartz Cowan, *A Social History of American Technology* (New York: Oxford University Press, 1997).

Carroll Pursell, *The Machine in America: A social history of technology* (Baltimore: John Hopkins University Press, 1995).

David Hounshell, *From the American System to Mass Production, 1800-1932: the development of manufacturing technology in the United States* (Baltimore: John Hopkins University Press, 1984).

## ESSAY TOPICS

### FIRST ESSAY

1. Give an account of a disappearing technology of the twentieth century. Why has its use decreased?

Svante Lindqvist, 'Changes in the Technological Landscape: the temporal dimension in the growth and decline of large technological systems', in Ove Granstrand (ed.), *Economics of Technology*, (Amsterdam: North Holland, 1994), pp. 271-288.

John Singleton, 'Britain's Military Use of Horses 1914-1918', *Past and Present* No. 139 (May, 1993), pp. 178 – 203.

R. L. DiNardo and A. Bay, 'Horse-Drawn Transport in the German Army', *Journal of Contemporary History* No. 23 (1988), pp. 129 – 43.

Gary R. Saxonhouse and Gavin Wright. 'Stubborn Mules and Vertical Integration: The Disappearing Constraint' *Economic History Review* Vol. 40 (1987), pp. 87-94; Gary R. Saxonhouse, and Gavin Wright. 'New Evidence on the Stubborn English Mule and Cotton Industry, 1878-1920', *Economic History Review* Vol. 37 (1984), pp. 507-19.

2. How successful was the strategic bombing of Germany in the Second World War? On what criteria do you base your assessment?

Richard Overy, 'The Means to Victory: Bombers and Bombing', in *Why the Allies Won* (London: Cape, 1995), chapter 4.

Michael S Sherry, *The Rise of American Air Power: The Creation of Armageddon* (New Haven, CT: Yale University Press, 1987)

Tami Davis Biddle, *Rhetoric and Reality in Air Warfare: The Evolution of British and American Ideas about Strategic Bombing, 1914-1945* (Princeton Studies in International History and Politics) Princeton: 2002.

Stephen A. Garrett, *Ethics and Airpower in World War II: British Bombing of German Cities* (New York: St. Martin's, 1993).

United States Strategic Bombing Survey: Summary Report (Pacific War) 1 July 1946.  
Washington, D.C.: United States Government Printing Office, 1946.  
URL: [http://life.csu.edu.au/marshall/html/WWII/USSBS\\_Summary.html](http://life.csu.edu.au/marshall/html/WWII/USSBS_Summary.html)

3. How might the history of maintenance and repair illuminate the history of technology?

Film: Terry Gilliam, *Brazil* (1984).

Birgit Meyer and Jojada Verrips, 'Kwaku's Car. The Struggles and Stories of a Ghanaian Long-Distance Taxi Driver' in Daniel Miller (ed.), *Car Cultures* (Oxford: Berg, 2001).

S. Brand, *How Buildings Learn: What Happens after they're Built* (London: Viking, 1994).

John Powell, *The Survival of the Fitter: Lives of some African engineers* (London: Intermediate Technology Publications, 1995).

Svante Lindqvist, 'Changes in the Technological Landscape: the temporal dimension in the growth and decline of large technological systems', in Ove Granstrand (ed.), *Economics of Technology*, (Amsterdam: North Holland, 1994), pp. 271-288.

Kevin L. Borg, *Auto Mechanics: Technology and Expertise in Twentieth-century America* – (Baltimore: Johns Hopkins UP, 2007)

Nathan Rosenberg, 'Learning by Using' in Nathan Rosenberg, *Inside the Black Box: Technology and economics* (Cambridge: Cambridge University Press, 1982), pp. 120-40.

4. What is meant by 'technological determinism'? How good an account of twentieth century history could such a theory produce?

D. F. Noble, *Forces of Production: a social history of automation* (New York: Knopf, 1984), Preface.

M.R. Smith and L. Marx (eds.) *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge MA: MIT Press, 1994).

B. Bimber, 'Karl Marx and the Three Faces of Technological Determinism', *Social Studies of Science*, Vol. 20 (1990), pp. 333-51, reprinted in M.R. Smith and L. Marx (eds.), *Does Technology Drive History? The Dilemma of Technological Determinism* (Cambridge MA, 1994).

R. Heilbroner, 'Do Machines make history', *Technology and Culture* Vol. 8, No. 3 (July, 1967), pp. 335-45.

D. MacKenzie, *Inventing Accuracy: An historical sociology of nuclear missile guidance* (Cambridge, Mass.; London: MIT Press, 1990), Introduction.

W. Bijker, *Of Bicycles, Bakelites and Bulbs: Toward a theory of sociotechnical change* (Cambridge Mass.; London: MIT Press, 1995).

David Edgerton, 'Tilting at Paper Tigers', *British Journal for the History of Science* Vol. 26 (1993), pp. 67-75. David Edgerton, 'From Innovation to Use: ten (eclectic) theses on the history of technology', *History and Technology* Vol. 16 (1999), pp. 1-26.

## SECOND ESSAY

1. What technologies have been used to kill people, and why?

T.S. Reynolds and T. Bernstein, 'Edison and "the chair"', *IEEE Technology and Society*, 8 (March, 1989).

R. J. Evans, *Rituals of Retribution: Capital Punishment in Germany 1600-1987* (Oxford: Oxford University Press, 1996).

T. Metzger, *Blood and Volts: Edison, Tesla and the Electric Chair* (Brooklyn, N.Y.: Autonomedia, 1996).

D. Gerould, *Guillotine: its legend and lore* (New York: Blast Books, 1992).

Michael Thad Allen, *The Business of Genocide: The SS, Slave Labor and the Concentration Camps* (Chapel Hill: University of North Carolina Press, 2002).

Z. Bauman, *Modernity and the Holocaust* (Cambridge: Polity Press, 1989).

Jean-Claude Pressac & Robert-Jan van Pelt, 'The Machinery of Mass Murder at Auschwitz', in Gutman & Berenbaum, (eds.), *Anatomy of the Auschwitz Death Camp* (Washington D.C.: Indiana University Press, 1994), pp. 183-245.

P. Weindling, 'The uses and abuses of biological technologies: Zyklon B and Gas disinfection between the First World War and the Holocaust', *History and Technology* 11 (1994), pp. 291-8.

R. Horowitz, 'Where Men will not work': Gender, Power, Space and the Sexual Division of Labour in America's Meatpacking Industry, 1890-1990', *Technology and Culture*, Vol. 38, No. 1 (January 1997), pp. 187-213

2. What in your view is the most significant technology of the twentieth century and why?

P.D. Henderson, 'Two British Errors: their probable size and some possible lessons', *Oxford Economic Papers* (July 1977), pp. 159-94.

Robert Bud et al., *Inventing the modern world: Technology since 1750* (London: Science Museum, 2000).

Donald Cardwell, *The Fontana History of Technology* (London: Fontana, 1994).

R.A. Buchanan, *The Power of the Machine: the impact of technology from 1700 to the present* (Harmondsworth: Penguin, 1992)

Henry Petroski, *The Pencil: A History of Design and Circumstance* (New York: Alfred A. Knopf, 1989).

Alison J. Clarke *Tupperware: the Promise of Plastic in 1950s America*, (Washington, 1999).

Robert Friedel, *Zipper: An Exploration in Novelty*, (New York: W. W. Norton and Company, 1994)

Henry Petroski, *The Evolution of Useful Things: How Everyday Artifacts-From Forks and Pins to Paper Clips and Zippers-Came to Be As They Are* (New York: Alfred A. Knopf, 1992).

3. Has technology affected the relations between men and women?

Claude S. Fischer, *America Calling: A Social History of the Telephone to 1940* (Berkeley: University of California Press, 1992).

K. Jellison, *Entitled to Power: Farm Women and American Technology* (Chapel Hill: University of North Carolina Press, 1993).

Cynthia Cockburn and Susan Ormrod, *Gender and Technology in the Making* (London: Sage, 1993).

Alison J. Clarke *Tupperware: the Promise of Plastic in 1950s America* (Washington: Smithsonian Inst., 1999).

Delphine Gardey, 'Mechanizing writing and photographing the word: utopias, office work and histories of gender and technology', *History and Technology* Vol. 17 (2001), pp. 319-52.

Andrea Tone, *Device and Desires: a history of contraception in the United States* (New York: Hill and Wang, 2001).

Nina Lerman, Ruth Oldenziel and Arwen Mohun eds *Gender and Technology. A Reader*, (Baltimore: Johns Hopkins University, 2003).

Ruth Oldenziel, *Making Technology Masculine: Women, Men, and the Machine in America, 1880-1945* (Amsterdam/Ann Arbor: Amsterdam University Press/Chicago University Press, 1999).

Nelly Oudshoorn, *The Male Pill A Biography of Technology in the making* (Duke University Press, 2003).

4. Do nations have technologies?

A. Krammer, 'Fueling the Third Reich', *Technology and Culture* Vol. 19 (1978), pp. 394-422.

A Stranges, 'From Birmingham to Billingham: high-pressure coal hydrogenation in Great Britain', *Technology and Culture* Vol. 26 (1985), pp. 726-57.

Anthony Stranges, 'Friedrich Bergius and the Rise of the German Synthetic Fuel Industry', *ISIS* (1984), pp. 643-667.

D. Edgerton, *England and the Aeroplane* (Basingstoke: Macmillan, 1991)  
Gabrielle Hecht, *The Radiance of France: Nuclear Power and National Identity after World War II* (Cambridge Mass.; London: MIT Press, 1998)