

the information age

HSTM 20282 (10 credits)

HSTM 20782 (20 credits)

Semester 2, 2014-2015

Course lecturer: **Dr James Sumner**

Classes: Thursdays 16.00–18:00, Simon Building 2.60 (Theatre 2A)



Introduction, aims, intended learning outcomes

Teaching and assessment • Contacting us and course communications

A note about plagiarism • Disability support • What to do each week

General course readings • Where to find the readings and other texts

Date	16.00–17.00	17.00–18.00
29 Jan	01. Introduction	
5 Feb	02. Does information need machines? Nineteenth-century industry and the Babbage engines	
12 Feb	03A. Source analysis exercise: the changing computer	03B. Getting bigger, getting smaller: hardware comes of age
19 Feb	04A. Essay skills	04B. Software in crisis?
26 Feb	05. Alan Turing: man and myth	
5 Mar	06. Machines that think: hopes, dreams, failures and nightmares	
12 Mar	07. The Manchester dimension	
19 Mar	08. Computers for the people! Home micros, hackers and hyperspace	
<i>Easter break: no classes 23 Mar – 10 Apr</i>		
16 Apr	09. Geek mythology: skills and identities, women and men	
23 Apr	10. Internet connections	
30 Apr	11. Living in the information age: identity, privacy and power	
7 May	12A. Exam skills	12B. Conclusion: memory expansion

Introduction

How did information-processing equipment come to dominate, by the beginning of the twenty-first century, so many areas of human life? Who are the winners and losers in a computerised, automated, data-driven world? Is “information technology” applied computer science, or applied bureaucracy? And what about those who use it? Even now that computerised technology is a familiar household convenience, there are still identifiable kinds of ‘computer people’. They are sometimes viewed as wizards, sometimes as dullards — but rarely as just ‘ordinary.’ Why is this? Have the ‘boffins,’ ‘nerds’ or ‘code junkies’ always been a breed apart?

To answer these questions, this course traces the histories of a range of technological developments, from the mechanical calculating machines of the nineteenth century to the global networked systems of today. Equally importantly, it focuses on the hopes and fears attached to information. In popular culture, information technologies have appeared as secret weapons that win wars, infernal machines that destroy jobs, vehicles for journeys of personal discovery, badges of industrial success, and irritants that don’t work properly and need to be kicked. Their users, meanwhile, have been pictured as Victorian capitalists, wartime boffins, 1970s techno-radicals, 1980s whizzkids, hackers, crackers, geeks, cybernauts and perfectly ordinary wage-slaves who drink too much coffee. Factual or fictional, these images also have the power to change the world.

The course is equally suitable for computer science students and those who have never studied the field, but are interested in learning more about the background of one of the dominant technologies of our time.

Aims

This course uses historical case studies to show how and why digital information-processing occupies a crucial role in present-day human life. Combining strands from technical, social, cultural and economic history, it will describe the development of mass-produced computer technology and mass public access to information systems, and their consequences for society. It will also show the role of hopes, fears and other visions in informing public ideas, using examples ranging from employment forecasting to science-fiction dreams.

Intended learning outcomes

By the end of this unit, it is expected that all students will

- have a good working knowledge of major developments in the history of information technology, particularly from the Second World War onwards
- have developed skills in critical reasoning and analysis, understanding the different motivations of historical characters in the history of information technology, and the differences in the ways they interpret and describe events

- be able to appreciate, and display the ability to analyse and discuss, the different factors — social, technical, sometimes accidental — which shape the history of computing, and the definition of the computer and its users

In addition, a student taking the 20-credit version will

- have defined (in consultation with the lecturer) a research project in the history of computing
- be able to find, and assess critically, relevant primary and secondary sources
- have produced, with full scholarly apparatus, a report (or alternative piece of work, subject to the lecturer's approval) based on this research.

Teaching

This course unit will be taught in a single weekly two-hour slot. Each class will consist of a mixture of lecture and group discussion, with occasional short video screenings and other activities. **You may ask questions at any time** in a lecture or discussion. Feel free to (politely) interrupt if there's anything you need to clarify, or if you think I have made a mistake.

Attendance at classes is expected. Anyone who is repeatedly absent without a good explanation may receive penalties up to and including **exclusion from the course**. Study on this kind of course is based on a combination of lecture content, seminar discussion, and reading around the subject. The classes are partly there to help to direct and structure your reading, but will also include important information about course content and assessment. You should **take notes** during the lectures to guide future work.

Each class has one or more **required readings**. You need to read these in advance of the class. There will also be something specific to prepare in writing, listed under the heading "Exercise for this class": this will usually be a response to one of the readings, based on questions supplied.

There are also **background readings**, which are usually the sources I used in writing the lecture content. You should read as much background material as you have time for, in the parts of the course which interest you most. This will be useful for exam preparation, and essential for essays.

Blackboard

You should **check Blackboard regularly** for new course materials, updates, and suggested reading for research. Any **corrections** to the course outline (this document) will also be announced on the Blackboard site.

If you have any questions about **course content**, please **don't** report them through Blackboard. Email the course lecturer directly.

If you want to report **technical problems** with the Blackboard site, please contact eLearning support using the link provided.

Assessment

Assessment is by examination, and by essay (or alternative kinds of project work if agreed beforehand with the lecturer). A range of permitted essay titles will be distributed early in the course.

Students taking the **10-credit version, HSTM 20282**, will normally be assessed on

- **one essay** of about 1500 words (1350-1650 words acceptable, including all notes and references), to be submitted by **15.00, Thursday 23 April**, counting for 50% of the total
- **one examination** of two hours' duration, in the Semester 2 exam period (date to be announced), counting for 50% of the total

Students taking the **20-credit version, HSTM 20782**, will be assessed on

- **one essay** as above, counting for 25% of the total
- **one examination** as above, counting for 25% of the total
- **one project** or extended critical essay, to be submitted by 15.00, **Thursday 14 May** and counting for 50% of the total

All work should be submitted in accordance with the **essay guidelines** supplied for this unit. Arrangements for handing in will be announced during the course. **Late essays** will be penalised according to Faculty of Life Sciences guidelines.

Project (HSTM 20782 only)

The project on the 20-credit version of the course is intended to introduce you to specialist literature on a topic that you want to study in more depth. The project may take the form of an extended research piece (3000-3500 words), and could address one of the themes from the essay list just given, or a theme of your own. You should take care that your essay and project themes are not too similar, and **must consult the lecturer to get your title approved**. You need to allow considerable time for reading around the subject. Start looking for the readings you will need as soon as possible in the library, and if they are already on loan, put in reservations.

You might also like to consider other formats for a project. Possibilities include oral history interview work; a short dramatisation or documentary presentation (either recorded or presented before the group, time permitting); web-based presentation, or work on documents or artefacts held by the School of Computer Science, National Archive for the History of Computing or Museum of Science and Industry (if you know of, or can find, staff who are willing to help you out.) If you are thinking of one of these alternative formats, you should discuss it as early as possible with the lecturer to make sure your work will meet the requirements of the course.

Contacting us

This course is organised by the **Centre for the History of Science, Technology and Medicine (CHSTM)** — **not** by Computer Science or SALC. CHSTM is part of the Faculty of Life Sciences and is based in the Simon Building on Brunswick Street. See [www.manchester.ac.uk/chstm] for full details.

The unit co-ordinator, and sole lecturer on this course, is **Dr James Sumner**. I can most easily be contacted by **email**, at [james.sumner@manchester.ac.uk].

You can phone me or leave voicemail on 0161 275 5845: however, I'm often away from my desk, so email usually finds me more quickly. My office is 2.34 Simon Building.

I do not have a regular tutorial hour this semester, but I encourage you to meet me if you have any problems or need advice. Just email me for an appointment, suggesting times when you're available.

Course communications

You need to check your University e-mail account regularly. I will routinely use email (not Blackboard) for course announcements, and it's your responsibility to make sure you're up to date with them. If you prefer to use a private address, you should arrange to forward e-mails from your University address to it.

A note about plagiarism

Plagiarism is a very serious offence, comparable to cheating in exams. It consists of passing off others' work as though it were your own (eg lifting passages – either word-for-word or closely paraphrased – from books, articles, online sources, etc.). Even 'recycling' parts of your **own** work, which has previously been submitted for assessment at this University or elsewhere, is defined as plagiarism under the University's guidelines.

It is not difficult for staff, who are all professional academic writers, to recognise instances of plagiarism. Likewise, software for detecting material lifted from internet sources is regularly employed in this regard.

Ignorance of the rules on plagiarism will not be accepted as a defence. It is your responsibility to familiarise yourself with the University's policy on plagiarism before you prepare and submit any coursework so that you do not inadvertently commit this offence. All students should read, and make sure they understand, the University's regulations on plagiarism:

[documents.manchester.ac.uk/display.aspx?DocID=2870]

Since academic writing typically draws on the work and specific language of other writers, it is vital that you understand the (often subtle) distinctions between ethical use of others' texts and unethical appropriations of the work of others. The penalties for plagiarism range

from being required to resubmit the piece of work in question (possibly for a mark of zero), for minor instances, to **expulsion from the University** in serious ones.

Disability support

The University of Manchester is committed to providing all students access to learning in the way most beneficial to them. It is important to tell us about any additional support that you need. If you have a disability, a learning difficulty or any condition that **you feel** may affect your work, then you might want to tell us about it. Please feel free to approach us to discuss any additional needs that you have. You may wish to email us, or we can arrange a meeting. Any discussion we have will be confidential. If you wish, you can also inform the Disability Support Office. It is based on the lower ground floor of the John Owens Building. You can drop in, but for appointments/enquiries telephone 0161 275 7512, or email [disability@manchester.ac.uk].

What to do each week

- Attend the lecture and seminar and **make notes**.
- In advance of the next class, read the “Required reading” listed for it and **make notes on this too**. Think how it relates to the lecture and to the rest of the course so far. Look at the exam past papers provided for this course: which questions are relevant to the reading? How would you use the reading to help you answer it?
- At the same time, do the task listed under “Exercise for this class”, which is usually (but not always) tied to part of the reading.
- For most weeks there are plenty of “Background readings”. The annotations will help you to choose which ones are most likely to be useful to you. Use them to learn more about the parts of the course you are most interested in, when you are planning an essay, and when you need more coverage for exam preparation.

General course readings

Core text: Campbell-Kelly et al, *Computer*

This is the text we’ll be using most widely in this course. It contains several of the required readings, and most of the other chapters are useful background reading. The current edition is

- Campbell-Kelly, Martin, William Aspray, Nathan Ensmenger and Jeffrey R Yost, *Computer: a history of the information machine*, 3rd edition. Boulder: Westview 2014.

There are two earlier editions:

- Campbell-Kelly, Martin, and William Aspray, *Computer: a history of the information machine*, 2nd edition. Boulder: Westview 2004.
- Campbell-Kelly, Martin, and William Aspray, *Computer: a history of the information machine*, 1st edition. New York: Basic Books 1997.

Throughout the rest of this outline, the book is just referred to as **Campbell-Kelly et al** (“et al”, meaning “and others”, is a standard abbreviation used when a text has a lot of co-authors).

We recommend using the third edition, which is obviously the most up-to-date (particularly for internet technologies) and has more coverage of skills and professionalization, and a better bibliography. However, the earlier editions are still reliable and usable. Chapters 1 to 8 are very similar in all three editions.

As we’ll be using this book quite widely across the course, you may find it useful to buy a copy – in which case, note that the older editions can sometimes be picked up for a few pounds second-hand (try, for instance, [abebooks](#) or [Amazon](#) New & Used). The University Library has copies available for short loan in the High Demand Collection, for standard loan in both the Main Library and Joule Library, and as an ebook (the ebook edition listed as a 2009 publication in the catalogue is actually the 2004 edition).

If you have trouble getting access to the book – or any books on this course – please contact the course lecturer AS SOON AS POSSIBLE. We often hear of problems only at the end of the course, when it’s too late to do anything about them.

Other useful general histories

- Ceruzzi, Paul E, *A History of Modern Computing*, 2nd edition. Cambridge, Mass: MIT Press 2003.
The main alternative to Campbell-Kelly et al. Covers a narrower time period (roughly 1945-1990) in more detail. Where Campbell-Kelly et al write business history, focusing on commercial applications and software, Ceruzzi writes technical history, focusing on hardware producers and information technology concepts.
- Swedin, Eric, and David L Ferro, *Computers: the life story of a technology*. Westport, Conn: Greenwood 2005.
The whole history of computing in 150 pages. Try this first if you want a quick and readable overview, to get things into perspective before tackling more complex studies. Not detailed enough to substitute for Campbell-Kelly et al. Mostly covers traditional ‘standard’ stories you will find in other texts, but Chapter 7 is a fresh attempt to address convergent tech, open-source and security.
- Ceruzzi, Paul E, *Computing: a concise history*. Cambridge, Mass.: MIT Press 2012.
Ceruzzi’s newer book is also short, but not so simple. Try this if you prefer a quick overview with more technical and analytical depth to it. The book is partly an experiment in putting together a more ‘future-proof’ history of computing, so it moves away from traditional stories to focus on analytical concepts such as the stored-program principle.
- Williams, Michael R, *A History of Computing Technology*, 2nd edition. London: Wiley 1997.
Broad history from the ancient world to the 1960s. Very good on mathematical and technical perspectives, very little on users.

There are many general histories of computing aimed at a more popular audience. While not always good essay sources, these can be useful in helping you to pick up the historical background. Some of the most interesting are:

- Palfreman, John, and Doron Swade, *The Dream Machine*. London: BBC Books 1993.
Accompanies the TV documentary series used in this course.

- Augarten, Stan, *Bit by Bit: an illustrated history of computers*. London: Unwin 1985.
Light, accessible survey.
- Hally, Mike, *Electronic Brains: stories from the dawn of the computer age*. London: Granta 2005.
Another readable popular survey. More attention to British cases than the others.
- Lohr, Steve, *Go To: the story of the math majors, bridge players, engineers, chess wizards, maverick scientists and iconoclasts*. London: Profile 2002.
Anecdotal long-range overview of the development of computer languages, 1950s-90s. Based on many interviews with influential coders.
- Lubar, Steven D, *Infoculture: the Smithsonian book of Information Age inventions*. Boston: Houghton Mifflin 1993.
Looks at computing technologies amongst other information/communications developments.

Some more specialised texts

The most appropriate background readings are listed for individual lectures and seminars in this handbook. You will often find these useful in essay preparation, or as background for exam revision.

The following is a list of useful texts which, though specialised, are relevant to more than one week's material, or give a different perspective which may be useful for writing essays or (especially) projects.

- Abbate, Janet, *Inventing the Internet*. Cambridge, Mass.: MIT Press 1999.
First serious book-length Internet history, mainly covering the ARPAnet years.
- Abbate, Janet, *Recoding Gender: women's changing participation in computing*. Cambridge, Mass.: MIT Press 2012.
Best recent introduction to gender themes, running quite quickly and readably through the literature on quite a wide range of situations and problems, backed up with new research based on interviews with women computing professionals. Focuses on the UK and USA.
- Agar, Jon, *The Government Machine: a revolutionary history of the computer*. Cambridge, Mass: MIT Press 2003.
Detailed British-focused survey which sees the rise of computing technology as a part of the general growth of the large information organisation, as typified by the Civil Service "machine."
- Aspray, William, ed, *Computing Before Computers*. Ames: Iowa State University Press 1990.
Multi-author survey of early computing machinery, including an account of analogue computing.
- Brock, Gerald W, *The Second Information Revolution*. Cambridge, Mass: Harvard University Press 2003.
Computers in the context of the postwar explosion in communications technology.
- Campbell-Kelly, Martin, *From Airline Reservations to Sonic the Hedgehog: a history of the software industry*. Cambridge, Mass: MIT Press 2003.
First book-length treatment of the software industry. Focuses mainly on US cases and on the commercial dimension.
- Cortada, James, *The Digital Hand: how computers changed the work of American manufacturing, transportation, and retail industries*. Oxford: Oxford University Press, 2003.
Volume 1 of an enormous industry-by-industry survey (mainly US-focused) of the difference computers made. See also Volume 2 (2005) on finance, telecomms, entertainment and the media; and Volume 3 (2007) on education and government.

- Croarken, Mary, *Early Scientific Computing in Britain*, Oxford: Clarendon Press, 1990.
The development of automated calculation in scientific research facilities. Covers the mechanical and early electronic periods, including some material on analogue computers.
- Edwards, Paul, *The Closed World: computers and the politics of discourse in Cold War America*. Cambridge, Mass: MIT Press 1996.
Engages the politics so often lacking from accounts of computer history, and introduces ideas from cultural theory, to address how military and civil policymakers' ideas about control, surveillance and territory changed in the Cold War, and the role played by cybernetics, computers and AI.
- Ensmenger, Nathan, *The Computer Boys Take Over*. Cambridge, Mass: MIT Press 2010.
How industry hired and managed – or mismanaged – software specialists from the 1950s to the 1990s. Themes include professional identity, mistrust of subcultures, and reasons why the “computer boys” remain mostly “boys”.
- Hendry, John, *Innovating for Failure: government policy and the early British computer industry*. Cambridge, Mass: MIT Press 1989.
The shift from consensus to competition and its effect on a nation's technological profile.
- Ifrah, Georges, *The Universal History of Computing: from the abacus to the quantum computer*. London: Wiley 2002.
Very wide-ranging general-interest text on techniques of computation, translated from a French source: its arrangement and interpretations are often interestingly different from comparable English-language studies.
- Kidder, Tracy. *The Soul of a New Machine*. Boston: Little, Brown, 1981.
Classic journalistic study of one company's project to develop a minicomputer and “make a lot of money.”
- Lavington, Simon, *Early British Computers*. Manchester: Manchester University Press 1980. Online transcript at [ed-thelen.org/comp-hist/EarlyBritish.html].
Overview focusing on the development of the technologies involved.
- Metropolis, Nicholas, Jack Howlett and Gian-Carlo Rota, eds, *A History of Computing in the Twentieth Century*. New York: Academic Press 1980.
Among the most technical/mathematical of overview studies. Coverage mostly 1940s-60s. Includes first-hand recollections by Backus, Dijkstra, Eckert, Good, Mauchly, Wilkes, Zuse and others.
- Norberg, Arthur, and Judy O'Neill, *Transforming Computer Technology: Information Processing for the Pentagon, 1962-1986*. Baltimore: Johns Hopkins, 1996.
The role of the US Advanced Research Projects Agency in sponsoring computer science research for (possible) military application, much of which eventually became part of ‘everyday’ computing. Includes AI work and ARPAnet.
- Rochlin, Gene, *Trapped in the Net: the unanticipated consequences of computerization*. Princeton University Press 1997.
Not (necessarily) the Internet, but the ‘net’ of commitments and dependencies we sign up for when we transfer tasks to automated digital information structures. From supermarket checkouts to banking to airline safety, Rochlin considers the risks of trusting the technology.
- Turkle, Sherry, *The Second Self: computers and the human spirit*. New York: Simon and Schuster 1984.
Classic study, one of the first seriously to address the involvement of computers in the social and psychological lives of experts and non-experts. Includes studies of the first generation of children growing up with digital equipment as ‘everyday’ familiar objects.
- Wardrip-Fruin, Noah, and Nick Montfort, *The New Media Reader*. Cambridge, Mass: MIT Press 2003.
Valuable collection of primary sources written to promote or describe new methods of information distribution, often involving computers. Includes work by Alan Turing, Norbert Wiener, Ted Nelson, Richard Stallman and the originators of the World Wide Web.

- Yates, JoAnne, *Control through Communication: the rise of system in American management*. Baltimore: Johns Hopkins University Press 1989.
Includes coverage of early information processing.
- Yates, JoAnne, *Structuring the Information Age: life insurance and technology in the twentieth century*. Baltimore: Johns Hopkins University Press 2005.
Case study of the consequences of data-processing, mechanical and electronic, in the insurance industry.

If there's a book which you find helpful but which isn't on this list, let me know!

Where can I look for more history of computing?

If you want to look further, an excellent annotated bibliography is

- Thomas Haigh, "History Resources" at [www.sigcis.org/resources]
Maintained for the Society for the History of Technology Special Interest Group on Computers, Information and Society (SHOT SIGCIS). Lists books and articles, museums and archives, oral history resources, recommended texts for beginners, texts *about* the history of computing, and more.

And see also my contribution:

- James Sumner, "History of computing in the UK: a resource guide" at [www.sigcis.org/britain]
More detailed guide focusing on Britain, mainly covering published books and articles.

You may also find relevant scholarly articles by journal searching. There is one journal devoted to the field, *IEEE Annals of History of Computing*. Journals which regularly publish history of computing content include *Technology and Culture*, *Information and Culture*, *History and Technology* and *Business History Review*.

Where to find the readings and other texts

Required readings

- **Campbell-Kelly et al's *Computer*** is widely used on this course. For copyright reasons we can't provide PDFs, but we have an eBook edition and several paper copies: see above, "General course readings", for details.
- All the other required readings will be available electronically, either in electronic full text or as PDF images of scanned photocopies. We are trying to make all of these available **through Blackboard**. If there are any exceptions to this, you'll be notified.

In this course, you will also be expected to undertake **independent reading** for essay and exam preparation (and, for HSTM20782, the project). Various background readings are recommended for each week of this course. You should also read as widely in and beyond these as time allows.

An increasing volume of the material you might need to look at is available **online**, either on the open web, or through services subscribed to by the University of Manchester Library (UML). This is particularly true for journal articles. Bear in mind, however, that **many of the most important sources are still only available on paper** — particularly books. You **will** need to visit libraries to access paper sources.

Finding paper materials in the University Library

The University Library search catalogue at [www.library.manchester.ac.uk/searchresources/librarysearch/] is a bit idiosyncratic and not always helpful. When searching for books, you may need to select the “Library catalogue only” tab to prevent your results being clogged with irrelevant journal articles and reviews. The default approach is a roughly Google-like phrase search: if you go to “Advanced search” instead you can search specifically by author and title. Unfortunately there is no date search.

There should be at least one copy of everything recommended on this course on the **main UML site**, either in the main collection or in the **High Demand Collection** on the ground floor. You may find extra copies in the **Joule Library** in the Sackville Street building, or the **Precinct Library** next to the shopping precinct on Oxford Road.

If you find that a text you need to use has been borrowed by another reader, you can **reserve it** through the online catalogue. This means that anyone who has taken out a popular book will usually find it is recalled quickly.

Don't hog books. Beside the other students on this course, there are many other readers in the University who may be waiting to access books. You should therefore return all materials to the Library as soon as you have finished with them. You may wish to make your own copies of anything you need to use regularly.

Material outside the University

The main non-University library in Manchester is the **Central Library** on St Peter's Square. This holds many local collections and archives (potentially useful if you are writing an essay on a Manchester topic.) More information is available at [www.manchester.gov.uk/centrallibrary/].

COPAC, accessed at [www.copac.ac.uk/], is a union catalogue allowing you to search the collections of the British Library and over 20 major university research libraries at the same time. If you find useful material via COPAC, you may be able to borrow it through **Inter-Library Loans and Document Supply** at Manchester: see [www.library.manchester.ac.uk/ourservices/servicesweprovide/documentsupply/].

If you find that a text you need to use has been borrowed by another reader, you can reserve it through the online catalogue. This means that anyone who has taken out a popular book will usually find it is recalled quickly.

Don't hog books or photocopies. Other students on this course unit, and other

WorldCat, accessed at [www.worldcat.org/], is another powerful union catalogue: as the name suggests, it's international. You probably won't be able to borrow material from abroad, but WorldCat sometimes finds things in the UK which COPAC misses. (The reverse is also true.)

01. Introduction

Attempts to automate calculation and other kinds of information-processing can be found as far back as human history can be recorded. The history of this endeavour is not only long but complex and controversial. This lecture sets out the aims, scope and themes of the course.

Also, in this week's session, we will be looking at excerpts of some of the **video material** recommended to view during the course. Since the idea of the electronic computing machines first reached general audiences in the late 1940s, computers and computer operators have been represented in various ways on film and television. In the 1970s and 80s, television was also used to encourage mass audiences to get involved in computer use themselves. Today, shows about computers and IT are much rarer. Is this simply because audiences now are so much more familiar with the concepts? Or do we live in a less IT-aware society than the earlier programme-makers expected?

Required reading

- If you receive this handbook before the course starts, please read, in preparation for next week, **chapter 1** of the required text, Campbell-Kelly et al's *Computer*. See "Course readings" for details.

Background reading

- Williams, Michael R, *A History of Computing Technology*, 2nd edition. London: Wiley 1997, pp 191-198.
Brief background on the astrolabe and Antikythera device.
- Freeth, Tony, et al, "Letter: Calendars with Olympiad display and eclipse prediction on the Antikythera Mechanism", *Nature* 454 (2008), 614-617.
Recent research on the Antikythera mechanism. *Nature* is one of the most high-profile scientific journals in the world, so we can assume there's widespread interest in the idea of (very) early computers.

02. Does information need machines? Nineteenth-century industry and the Babbage engines

New information technologies obviously make a lot of activities faster, cheaper and easier. People sometimes argue that it's "impossible to imagine" anything like the modern world without digital data storage or the microprocessor. But it's important not to get carried away. Centuries ago, people were building transport networks, financial systems and military empires that spanned the world, using handwriting, ledger-books, and large numbers of unskilled, poorly paid human workers.

One person who *did* believe information needed machines was the mathematician and manufacturing theorist Charles Babbage (1791-1871), who developed grand plans for cog-

driven, programmable brass calculating devices. We will look at Babbage's achievements, dreams and disappointments in the context of their time.

We will also look at the controversy over Babbage's influence and importance: while some see him as the "father of the modern computer", others emphasise that his plans had little or no influence on twentieth-century developments. Alongside this, we will examine the role of Ada, Countess of Lovelace (1815-1852), whose popular account of Babbage's work has led her to be described as the "first programmer" – again, not without considerable controversy.

Required reading (to be done in advance)

- **Campbell-Kelly et al**, chapters 1 and 2: "When Computers Were People" and "The Mechanical Office".
- Martin Campbell-Kelly, "Data processing and technological change: the Post Office Savings Bank, 1861-1930", *Technology and Culture* 39:1 (1998), 1-32

Exercise for this class

Make notes on the "Data processing" reading – about two sides of A4 – and **bring them to the class** to discuss. Use these questions to guide your reading, and be prepared to answer them:

- How do you process data cheaply if you haven't got a machine to do it?
- What challenges did the Post Office Savings Bank depend on? What pre-existing systems did it rely on to overcome them?
- What do you make of the "lesson in exactness" for "Mary Ann" (page 11): is it reasonable to treat this as a case of a user making a mistake? Can you see connections to the way modern-day systems deal with users?
- What decides whether an information-processing industry will mechanise?
- Does this help to explain why Charles Babbage's engines weren't more successful?

Background reading on information processing before computers

- Campbell-Kelly, Martin, "The Railway Clearing House and Victorian Data Processing" in Lisa Bud-Frierman, ed, *Information Acumen*, London: Routledge 1994, 51-74.
A useful companion-piece by the same author, looking at another classic nineteenth-century activity which needed heavy and centralised information processing.
- Perry, Charles, *The Victorian Post Office*, Woodbridge: Royal Historical Society, 1992.
Background on the institution which made the Savings Bank system possible.
- Marsden, Ben, and Crosbie Smith, *Engineering Empires: a cultural history of technology in nineteenth-century Britain*, Basingstoke: Palgrave Macmillan 2005, chapter 5: "The most gigantic electrical experiment", 178-225.
Global communication technologies in the nineteenth century.
- Cortada, James, *Before the Computer: IBM, Burroughs and Remington Rand and the Industry they Created, 1865-1956*, Princeton: Princeton University Press, 1993.
Broader study of the general area of data-processing automation technologies Campbell-Kelly discusses towards the end of the paper.

- Yates, JoAnne, *Control through Communication: the rise of system in American management*. Baltimore: Johns Hopkins University Press 1989.
More on data-processing systems, showing particularly how they related to US white-collar work. See particularly Chapter 2 on the main pre-digital technologies: letterpress, ledgers, vertical filing etc.
- Agar, Jon, *The Government Machine*, Cambridge, Mass.: MIT Press, 2003.
Moving into the twentieth century, argues that information technology is shaped by the existing needs of systematic activities, using the case of the British Civil Service.

Background reading on Babbage and Lovelace

- Babbage, Charles, *Passages from the Life of a Philosopher*. London: Pickering, 1994 reprint (first published 1864.)
Babbage's autobiography. Very readable, and the best possible way of getting an insight into this eccentric and sometimes tragic character.
- Williams, Michael R, *A History of Computing Technology*, 2nd edition. London: Wiley 1997. Chapter 4.
Accessible account of how the Babbage and Scheutz machines worked.
- Hyman, Anthony, *Charles Babbage: pioneer of the computer*. Princeton University Press 1982.
Best book-length biography of Babbage.
- Swade, Doron, "The Shocking Truth about Babbage and his Calculating Engines." *Resurrection*, New Year 2004, 18-27; online at [www.cs.man.ac.uk/CCS/res/res32.htm#d]
More recent research on the role of the nineteenth-century science writer and populariser, Dionysius Lardner.
- Swade, Doron, *The Cogwheel Brain: Charles Babbage and the quest to build the first computer*. London: Abacus 2000.
Mostly a light general survey of Babbage and his machines, with some original research. More important is the final third of the book: a first-hand account of efforts to construct a working Difference Engine Number 2 for the Science Museum, to original plans, in time for the 1991 bicentenary of Babbage's birth.
- Menabrea, Luigi, translated with additional notes by Ada Lovelace, "Sketch of the Analytical Engine invented by Charles Babbage." Originally published in the *Bibliothèque Universelle de Genève*, 1842; online transcript at [www.fourmilab.ch/babbage/sketch.html].
The single most influential account of the unbuilt Engine's nature and possibilities. Read the "Notes by the Translator" and assess Lovelace's contribution for yourself.
- Schaffer, Simon, "Babbage's Intelligence: calculating engines and the factory system." *Critical Inquiry* 21 (1994) 203-227.
The importance of social and geographical place, setting Babbage in the wider context of Victorian industrialism.
- Swade, Doron, "'It will not slice a pineapple': Babbage, miracles and machines", in Francis Spufford and Jenny Uglow, eds, *Cultural Babbage: technology, time and invention*. London: Faber and Faber 1996.
Babbage's historical reputation, and the role of miracles in his demonstrations with the model Difference Engine.
- Bromley, Allan G, "Difference Engines and Analytical Engines" in William Aspray, ed, *Computing Before Computers*. Ames: Iowa State University Press 1990.
More technical account of how Babbage's engines (would have) worked. Also includes information on the Scheutz Difference Engine and other, later machines.

- Stein, Dorothy, *Ada: a life and a legacy*. Cambridge, Mass: MIT Press 1985.
Biography aiming to de-mythologise Ada Lovelace. Generally good on the peculiar position of a mathematically inclined, socially privileged woman in nineteenth-century society, but beware the occasional attempt to apply psychology more appropriate to the twentieth century.
- Toole, Betty A, *Ada: the enchantress of numbers*. Mill Valley, Calif: Strawberry Press 1992.
Toole is an opponent of those (including Stein) who downplay Lovelace's abilities. This volume consists mostly of excerpts from Lovelace's letters to Babbage and others.

Recommended video

- The Dream Machine, part 1: "Giant Brains" (1991)
The Dream Machine (BBC/WGBH Boston co-production) was a five-part documentary on the history and projected future of the computer, including useful interviews with significant people (many of them no longer alive). This first instalment covers the work of Charles Babbage and the development of electronic computing in the 1940s and 50s.

Recommended museum exhibit

- Babbage's Difference Engine Number 2 (1991; 2000), The Science Museum, London.
Details at [www.sciencemuseum.org.uk/objects/computing_and_data_processing/1992-556.aspx]
The vast mechanism specified in Babbage's second (and in some ways *simplified*) plan for the Difference Engine was eventually completed to the original designs, in full working order, for his 1991 bicentenary. The printing apparatus was completed nine years later. The Science Museum also has on public display a small trial component of the unbuilt Analytical Engine.

03A. Source analysis exercise: the changing computer

In this session you will investigate primary sources — direct evidence from throughout the historical period we are studying — to consider how ideas about computing machines, and how they fit into the lives of everyday people, have changed over the years. Instructions will be given out in advance (see Blackboard).

03B. Getting bigger, getting smaller: hardware comes of age

In this lecture we'll be looking at the remarkable history of electronic information-processing hardware — a topic which, until about 25 years ago, dominated all attempts to write "the history of IT" in general.

This story is partly the story of International Business Machines (IBM), a corporation which dominated information processing in the USA (and many other places) in the years before the coming of the computer, and swiftly learned to do the same in the digital computing age. It is also the story of a young industry whose most noticeable defining feature — speeding-up of processes and shrinking-down of components at an astonishing rate — had unpredictable consequences for the balance of power between a large, entrenched

operation and its smaller but (sometimes) more adaptable competitors. Finally, it is the story of how making digital equipment caught up not only people and companies, but whole geographical areas in its operation.

Required reading

- **Campbell-Kelly et al**, chapters 5 and 6: “The Computer Becomes a Business Machine” and “The Maturing of the Mainframe: the Rise and Fall of IBM”

Background reading

- **Campbell-Kelly et al**, chapters 3 and 4: “Babbage’s Dream Comes True” and “Inventing the Computer”.
- Ceruzzi, Paul E, *A History of Modern Computing*, 2nd edition. Cambridge, Mass: MIT Press 2003. Chapters 1 and 4.
- Williams, Michael R, *A History of Computing Technology*, 2nd edition. London: Wiley 1997. Chapter 9.
- Watson, Thomas J, and Peter Petre, *Father, Son & Co.: my life at IBM and beyond*. London: Bantam 1990.
Autobiography of the younger Watson, looking back at his father’s life, the growth of IBM, and the move into digital computing.
- DeLamarter, Richard, *Big Blue: IBM’s use and abuse of power*. London: Macmillan 1986.
Readable anti-IBM account by an economist involved in the antitrust initiative. Contrasts interestingly with official histories.
- Lécuyer, Christophe, *Making Silicon Valley: innovation and the growth of high tech, 1930-1970*. Cambridge, Mass: MIT Press 2006.
How a small collection of firms making radio and radar parts in the far American West grew into a defining feature of the information-technology world.
- Christine Finn, *Artifacts: an archaeologist’s year in Silicon Valley*. Cambridge, Mass: MIT Press 2001.
See in particular the “Photo Essay” (pp xviii-xlix). Finn’s aim is to investigate, not so much the Valley’s built environment, as its overall culture.

Recommended video

- *The Dream Machine*, part 2: “Inventing the Future” (1991)
Covers a lot of important themes which will be picked up throughout the course: the growth of the US and British hardware industries, the first programming languages, popular representations of the computer, miniaturisation and the early stirrings of a desire for personal computers.

04A. Essay skills

This session is included because many students on this course do not have experience of writing humanities-style essays at undergraduate level – but please attend, even if you’re much more experienced, as some of the lessons of this class will probably still be new to you.

Some sample essay writing will be distributed in advance. Your task, during the week before the class, is to ‘mark’ this work. You will suggest a mark, and give comments on a sheet

similar to the one you will receive for your own essay later in the course. You should make notes on what seems to work well in the sample essays, what problems you find, and how you would correct them.

Books and websites on research and essay-writing

- William Cronon et al, “Learning to do historical research”, online at [www.williamcronon.net/researching/].
There are many “how to do research” guides out there, but this one is the best in my experience: loads of specific examples based on real students’ and academics’ work. Focuses more on research (reading, taking and organising notes etc) than the technical side of essay-writing. Written for environmental historians, but good for anyone writing history.
- UNC Chapel Hill Writing Center handouts, online at [writingcenter.unc.edu/handouts/].
A large, easy-to-use collection of advice sheets on different topics (“Argument”, “Paragraph development”, “Commas” etc) from the University of North Carolina, Chapel Hill’s essay advisory service.
- Dixon, Thomas, *How To Get A First*. London: Routledge 2004.
- Walliman, Nicholas, *Your Undergraduate Dissertation: the Essential Guide for Success*. London: Sage 2004.
- Barnet, Sylvan, et al, *A Short Guide to College Writing*. London: Longman 2004.
- Booth, Wayne, et al, *The Craft of Research*, 2nd edn. Chicago: University of Chicago Press 2003.
- Storey, William Kelleher, *Writing History: a guide for students*, 2nd edn. Oxford: Oxford University Press 2004.

04B. Software in crisis?

The biggest recent change, in attempts to account for the history of information technology, has been the shift away from a focus on hardware (usually, particular individual big machines) to devote a lot more attention to software and programming. This represents an underlying change in status in the field, because software is the chief defining feature of any modern computer-based system’s identity: hardware decisions have long been determined by software needs, and whole managerial cultures have been built around software systems. The business of making and maintaining software, however, has always been famously difficult to manage.

In the 1950s, as computer use took off in science and business, the common complaint was that there were not enough software developers to keep up with the hardware installations. As this problem was solved, others became clear: managers found that the habits and expectations of “good programmers” didn’t necessarily fit in with the industrial workplace, and struggled to get projects completed however many developers were assigned. Ongoing talk of a “software crisis” in the 1960s led to new ideas about professional identity which, it was hoped, would solve the problem. And yet, decades later, claims of crisis are still very much alive...

Required reading

- Campbell-Kelly et al, chapters 8 and 9: “Software” and “New modes of computing”.

Background reading

- Nathan Ensmenger, *The Computer Boys Take Over*. Cambridge, Mass: MIT Press 2010.
Best historical survey of the themes raised in this lecture, showing how desperation to find good programmers gave way to bafflement as to what to do with them. See in particular Chapter 9, the conclusion, which connects closely with themes raised later in the course.
- Thomas Haigh, “‘Crisis, What Crisis?’ Reconsidering the Software Crisis of the 1960s and the origins of software engineering”. Unpublished draft, 2010; online at [tomandmaria.com/Tom/Writing/SoftwareCrisis_SofiaDRAFT.pdf].
A challenge to the established view: Haigh argues that the idea of a particular “crisis” in the late 1960s, though important to some in the field, has little to do with the actual development of programming culture.
- Randell, Brian, “The NATO software engineering conferences”, 1968/1969/2001. Online at [homepages.cs.ncl.ac.uk/brian.randell/NATO/]
One of the central contributors to the original “software engineering” proposals maintains this archive, including full text of the reports from the 1968 Garmisch meeting and the follow-up conference in Rome, plus recollections.
- Brooks, Frederick P, *The Mythical Man-Month: essays on software engineering*. London: Addison-Wesley 1975.
The most influential primary source on the particular problems of managing software. Brooks’s Law – “Adding manpower to a late software project makes it later” – summed up the central problem and inspired numerous very different attempts to change coding culture.
- Brooks, Frederick P, “No silver bullet: essence and accidents of software engineering”, first published in *Proceedings of the IFIP Tenth World Computing Conference (1986)*; many reprints.
Important follow-up: Brooks here assesses responses so far, and argues that *no* solution will make software costs drop as fast as hardware costs.
- Ceruzzi, Paul E, *A History of Modern Computing*, 2nd edition. Cambridge, Mass: MIT Press 2003. Chapter 3.
- Campbell-Kelly, Martin, *From Airline Reservations to Sonic the Hedgehog: a history of the software industry*. Cambridge, Mass: MIT Press 2003.
Full-length history of software, mainly from a US perspective and focusing on business history. An earlier version of Chapter 8 — which usefully points out a recent tendency to exaggerate the role of Microsoft in recent software history — is available electronically:
- Campbell-Kelly, Martin, “Not Only Microsoft: the maturing of the personal computer software industry, 1982-1985,” *Business History Review* 75 (2001) 103-145.

05. Alan Turing: man and myth

The media circus around the 2014 feature film *The Imitation Game*, starring Benedict Cumberbatch, completed the rise to global public prominence of the name and achievements of Alan Turing (1912-1954) – a rise which had already been heavily boosted by the 2012 celebrations of Turing’s centenary, but which had been building gradually for several decades. The career of Turing’s reputation in the decades since his early death, from

near obscurity to an increasingly central role in studies of twentieth-century science and sexuality, is as extraordinary as was his life.

Alan Turing's story is also partly a local story. Turing came to the University of Manchester at the end of 1948, following a series of achievements in computability theory, wartime cryptanalysis and computer design at Cambridge, Bletchley Park and the National Physical Laboratory. Ahead of him lay equally significant work on the nature of machine intelligence, investigations into the theory of biological form, and disgrace – which many hold responsible for his untimely death – at the hands of a society fundamentally out of line with his identity and beliefs.

Required reading

- Turing, Alan, "Computing Machinery and Intelligence," *Mind* 59 (1950) 433-460. Reprinted in various publications (see bibliography on Andrew Hodges' Turing site – link below – for details) and online in several places including [cogprints.org/499/1/turing.html].

Required video

- *Horizon: "The Strange Life and Death of Dr Turing"* (BBC2, 1992)
Still the best documentary on Turing, giving a brief history of Turing's ideas, and outlining the controversy surrounding his death. Closing comment about lack of any permanent memorial to Turing is now out of date.

Exercise for this week

Turing's 1950 paper is a classic attempt to lay down rules as to when a machine should be accepted as demonstrating true intelligence, of the kind we recognise instantly in humans but find very difficult to define precisely. Make careful notes on the paper, and come to the class prepared to discuss the following questions:

- Look at Turing's description of the Turing Test. Do you agree with Turing that a machine that passes the test *must* be accepted as thinking, to the same degree that a human thinks?
- If not, what do you make of Turing's responses to possible objections?
- The Turing Test is an *operational* definition of intelligence: not a list of properties to look for, but a sequence of steps to take. Why did Turing think it was important to create an operational definition?
- What impression do you get of Turing as a communicator of scientific ideas?

Background reading

- Hodges, Andrew, *Alan Turing: the Enigma*. Originally published 1983; paperback editions 1992 (London: Vintage) and 2012 (Princeton: Princeton University Press)
Definitive Turing biography. Too long and detailed for casual reading, but essential background for a Turing-based essay or project. Available cheaply in paperback. Useful sections to read, covering sex, intelligence, morphogenesis and Manchester, are pp372-455. The "Author's note" at the end is the inspiration for some of the discussion of Turing's reputation in this class. All editions have the same main content, but the 2012 (Centenary) edition has a new preface addressing more recent developments.
- Hodges, Andrew, Alan Turing Website at [www.turing.org.uk].
Online companion-piece to the biography, with useful additional material.

- Agar, Jon, *Turing and the Universal Machine: the making of the modern computer*. Cambridge: Icon 2001.
Effective, fairly simple brief survey of major issues surrounding Turing, computability and universality, aimed at a general audience. Best introduction to computability theory for non-mathematicians.
- Copeland, B Jack, ed, *The Essential Turing*. Oxford: Clarendon 2004.
An extensive collection of Turing's own writings, together with some material from various of his colleagues. Spans 1936-54, and so covers computability, the Bletchley Park years, automatic computing, artificial intelligence, morphogenesis and more. The editor adds a useful introduction to each source text, together with several analytical overview pieces.
- Teuscher, Christof, ed, *Alan Turing: life and legacy of a great thinker*. London: Springer 2004.
Multi-author collection on, and inspired by, the full range of Turing's work in computer science, cryptanalysis, morphogenesis biology and the philosophy of mind.
- Hinsley, F H, and Alan Stripp, eds, *Codebreakers: the inside story of Bletchley Park*. Oxford: Oxford University Press 1994.
Multi-author volume consisting entirely of first-hand recollections by those who worked on Britain's wartime cryptanalysis programme. Gives a good sense of the sheer scale and variety of the operations surrounding the information-processing endeavour.
- Copeland, B Jack, ed., *Colossus: the secrets of Bletchley Park's codebreaking computers*. Oxford: Oxford University Press 2006.
A mixture of first-hand recollections and journalistic overview pieces. Draws on material still classified at the time of Hinsley and Stripp's book.
- Haigh, Thomas, "Actually, Turing did not invent the computer," *Communications of the ACM* 57:1 (2014), online at [www.tomandmaria.com/tom/Writing/CACMActuallyTuringDidNotInventTheComputer.pdf]
The idea that one person invented a fully-formed practical computer from nowhere is, of course, very silly, but many popular sources make this claim about Turing (among others). More plausible are the claims by Turing's admirers, including Jack Copeland (above) and Andrew Hodges (see in particular [www.turing.org.uk/turing/scrapbook/computer.html]), that Turing's 1936 specification of the stored-program concept is a crucial origin point for computing as we know it. Haigh's piece surveys the evidence and takes a different view.

Recommended video

- *Breaking The Code* (BBC, 1996). Online at [www.youtube.com/watch?v=S23yie-779k].
TV-movie adaptation of Hugh Whitmore's 1986 stage play of the same name, which draws on Andrew Hodges' biography. Widely acclaimed for drawing together elements of Turing's personal life and cryptographic work for a general audience, and for the central performance by Derek Jacobi.

06. Machines that think: hopes, dreams, failures and nightmares

Early computers were designed to replace human mental effort, and the term 'giant brain' or 'electronic brain' was often applied, especially in the popular press — although many experts insisted that their machines' operations were very different from, and more limited than, those of the human brain.

In the 1950s, debates over the nature of ‘brainlike’ behaviour spawned ‘Artificial Intelligence’ as a vibrant area of academic activity, sitting somewhere between computer science, cognitive psychology and philosophy. Many researchers were, and still are, confident that sufficiently complex computer systems will ultimately learn to take on roles currently filled by thinking humans. The past forty years, however, have seen a limited success record and a trenchant strain of criticism, leading some to believe that AI, as initially defined, will never achieve its goals.

There is also another line of attack: that if AI *were* ever really successful, it would alter human society in unpredictable and perhaps very dangerous ways. This position draws on a powerful set of ideas which appear again and again in speculative and fictional accounts, reaching back long before electronic computers were ever imagined.

Required reading

- Crevier, Daniel, *AI: the tumultuous history of the search for artificial intelligence*. New York: Basic Books 1993, chapter 5: “Clouds on the AI horizon”.
- Čapek, Karel, *RUR (Rossum’s Universal Robots)*, English-language translation by David Wyllie, “Introductory Scene” online at [etext.library.adelaide.edu.au/c/capek/karel/rur/act0.html].

Exercise for this week

RUR is the 1921 Czech play which introduced the term ‘robot’ – though not the concept of a mechanical worker – into the English language. In the class discussion, we’ll be using it to look at different concepts of the robot (some practical, some not-so-practical) and their relationship to automation and computerisation in general. Study the introductory scene carefully and come to the class prepared to discuss the following questions:

- How do Čapek’s robots differ from robots as we know them?
- And how are they similar?
- What point is Čapek making with the concept of the robot?
- It’s clear almost from the outset that the story of the RUR factory is not going to end happily. Why?

Background reading on artificial intelligence

- Further chapters in Crevier 1993 (above)
- Pratt, Vernon, *Thinking Machines: the evolution of artificial intelligence*. Oxford: Blackwell 1987.
Discusses the work of both Babbage and Turing, and the earlier ideas of the famed philosopher Gottfried Leibniz, in AI context.
- Minsky, Marvin, *The Society of Mind*. New York: Simon and Schuster 1986.
Philosophical account by one of the most high-profile researchers who see AI as a probable future prospect.
- Weizenbaum, Joseph, *Computer Power and Human Reason: from judgment to calculation*. San Francisco: Freeman 1976.
Influential statement of the position that while advanced artificial intelligence may be possible, it is likely to be so different from intelligence based on human values as to pose a major danger to society.

- Dreyfus, Hubert, *What Computers Can't Do: the limits of artificial intelligence*, revised edition. London: Harper Colophon 1979.
The most influential attack on the possibility that machines can ever be meaningfully “intelligent” at all.
- Martin, C Dianne, “The myth of the awesome thinking machine”, *Communications of the ACM* 36 (1993), 121-133.
Surveys popular ideas of early digital computers (discussed in earlier weeks) as ‘brains’ or ‘robots’.
- Bloomfield, Brian, ed, *The Question of Artificial Intelligence*. London: Croom Helm 1987.
Fairly advanced philosophical and sociological accounts by various authors. Includes Bloomfield’s own piece on the culture of the AI community, and Harry Collins on “expert systems” and the possibility of mechanising skill and expertise.
- Roland, Alex, with Philip Shiman, *Strategic Computing: DARPA and the quest for machine intelligence*. Cambridge, Mass: MIT Press 2002.
The US Department of Defense Advance Research Projects Agency spent a billion dollars trying to make AI happen in the 1980s. This book considers why they didn’t manage it, and what they got instead.

Background reading on robots

- The rest of *RUR*: see index page at [etext.library.adelaide.edu.au/c/capek/karel/rur/].
This is a recent translation. You can also see the somewhat different script used for the first English-language production, of 1923, collected in *RUR and The Insect Play*, Oxford University Press 1961 (paper copy in UML).
- Nocks, Lisa. *The Robot: the life story of a technology*. Westport, Conn: Greenwood 2007.
Broad overview covering early automata, mechanical automation, the link to AI, and recent scientific prototypes.
- Hankins, Thomas, and Robert Silverman, *Instruments and the Imagination*. Chichester: Princeton University Press 1996.
The long historical view of automated devices, including fascinating examples shrouded in mystery and magic.
- Schaffer, Simon, “Babbage’s dancer and the impresarios of mechanism”, in Francis Spufford and Jenny Uglow, eds, *Cultural Babbage: technology, time and invention*. London: Faber and Faber 1996.
Charles Babbage’s early interest in automata; and the mysterious Mechanical Turk.
- Evans, Christopher, *The Mighty Micro*. London: Gollancz 1979, 139-151.
This chapter on “Work and robots” should give you an indication of how automation and its relationship to the employment question were being presented to the public around 1980.

07. The Manchester dimension

Manchester was once known throughout the world as the ‘shock city’ of the Industrial Revolution, and gained a powerful reputation as a centre for technical and scientific innovation. In the twentieth century, however, its status suffered badly as manufacturing declined and regional identity lost much of its role in British national culture. Efforts to keep Manchester’s pioneering reputation afloat have concentrated on its scientific heritage – a story in which information technology plays a central role.

Some promoters have even called Manchester the “birthplace of computing”: the first-ever practical demonstration of the important principle of stored-program processing was achieved with a University of Manchester prototype, the Small Scale Experimental Machine (‘Baby’), in 1948. Less than three years later the Ferranti Mark 1, developed by the local engineering firm as an extension of the University project, became the first commercially

available computer in the world, fostering brief hopes of long-term British dominance of a new and world-changing industry. Later collaborations included the Atlas machine of 1962, which was for a short while the most powerful computer in the world.

This class looks at the foundations of Manchester's computer heritage, its unique development path, and how it has been used and shaped for different purposes. In particular, we will consider the longstanding tensions between the two sides of the University's heritage culture: the engineering and hardware-focused culture promoted by the core group of founders of the Department (later School) of Computer Science, and the mathematical, psychological and philosophical tradition of Alan Turing.

As part of this class, we will take a **historical tour** of sites of early and current computing activity on the University campus.

Required reading

- Bowker, Geof, and Richard Giordano, "Interview with Tom Kilburn," *IEEE Annals of the History of Computing* 15 (1993) 17-31.

And please skim the material at:

- Napper, Brian, et al, "Computer 50: the University of Manchester celebrates the birth of the modern computer." Online at [www.computer50.org].

Created for the 1998 anniversary of the SSEM's first successful run: includes information on personnel and equipment, plus details of the 1998 celebrations themselves.

Exercise for this week

Please come to the class with answers to the following questions:

- What are the biggest differences between Tom Kilburn's undergraduate/early career days and your own?
- Does Kilburn see himself as a mathematician, or an engineer? How do you know? How does this influence his picture of what computer science is all about?
- What does Kilburn focus on? What doesn't he discuss (compared to other accounts of early computing you have read)?

Background reading

- Briggs, Asa, *Victorian Cities*, London: Odhams 1963. Chapter 3: "Manchester, symbol of a new age".

Classic study of the nineteenth-century culture that defined Manchester in the eyes of the world.

- Agar, Jon, Sarah Green and Penny Harvey, "From cotton to computers: the social contexts of virtual Manchester" in Steve Woolgar, ed, *Virtual Society? Technology, cyperbole, reality*, Oxford: Oxford University Press 2002, 264-285.

Survey of Manchester's technological claims, produced at an interesting transition point when "virtuality" and online connection still had promotional power as novelties.

- Williams, Michael R, *A History of Computing Technology*, 2nd edition. London: Wiley 1997. pp 304-346.

Sets early Manchester developments in the broader context of British computing.

- *IEEE Annals of the History of Computing* 15:3 (1993), special issue on “Computing at the University of Manchester.”
For full details, see the UML print copy or the index available at the IEEE site (the full text is available for download.) Pieces include John Pickstone and Geof Bowker on Manchester computing’s place in the industrial history of the area; Mary Croarken on the early Electro-Technics Department and the pre-history of Mancunian computers; and Simon Lavington’s more technical account of computer architectures to 1975.
- “The Computer that Changed the World.” CD-ROM. Europress Software 1998.
Multimedia presentation including archive clips and interviews with participants. Copies are held by the course lecturer and many people associated with the Department/School of Computer Science.

Recommended museum exhibit

- The Manchester Baby rebuild (1998), Museum of Science and Industry, Castlefield, Manchester.
Not the 1948 machine itself (which was adapted into the more powerful Mark 1, and later broken up for parts or abandoned), but a structurally faithful replica, using as close to original parts as possible, built for the fiftieth anniversary. Now part of a showpiece introductory gallery: see [www.mosi.org.uk] for further information. There may be guided demonstrations by volunteers on some days.

08. Computers for the people! Home micros, hackers and hyperspace

In the era of big mainframes, computers existed in corporate space: a computer in the home would have seemed as out of place and impractical as a jumbo jet in the garage. The arrival of cheap microprocessors, however, coincided with a movement to ‘democratise’ computing power, and a new generation of mostly amateur enthusiasts began to seek computers of their very own. Part of this change was the growth of the ‘home micro’, or ‘personal computer’, as a new consumer product – but some users were not happy to be consumers. They saw computers as part of an alternative to the whole established social and political order.

An important theme was the identity of a new breed of computer user: the hacker. ‘Hacking’ has taken on various meanings: from college pranks, through obsessive or particularly ingenious interaction with machines, to unauthorised remote access, hacks and hackers have been presented as socially useful, criminally destructive or plain weird — but always as subversive. If ‘computer people’ are fascinated by rules, they are also fascinated by how to break them.

Another key part of this story is the idea of using a computer to play games. Gaming actually has a longstanding relationship with research at the forefront of computer science, sponsored by some exceedingly ‘serious’ clients — most notably the US military. Gamers and Cold Warriors alike were attracted to the latest in graphics, response processing, and AI simulation; but their hopes and dreams were often very different. Looking at the history of one of the first-ever videogames, we will see how long-haired countercultural hackers first got hooked on making war.

Required reading

Three readings this week – but the Levy is very short:

- Haddon, Leslie, “The Home Computer: the making of a consumer electronic.” *Science as Culture* 2 (1988) 7-51.
- Levy, Steven, *Hackers: heroes of the computer revolution*, updated edition. London: Penguin 2001, Chapter 2: “The Hacker Ethic”.

Hackers is a well-known and colourful account of hacker activity (first published 1984), among the first to put hacking on the popular cultural map. Levy defines three waves of hackers: early minicomputer users at specialist (mostly university) facilities; the builders of the first user-owned microcomputers; and games software developers in the early 1980s. This chapter is Levy’s take on the philosophy laid down by members of MIT’s Tech Model Railway Club after they were introduced to the TX-0 minicomputer.

- Brand, Stewart, “Spacewar: Fanatic Life and Symbolic Death among the Computer Bums” Originally published in *Rolling Stone*, December 1972; online at [www.wheels.org/spacewar/stone/rolling_stone.html].

Exercise for this week

Once you have read Brand’s 1972 article about Spacewar, try to play the game itself. There is a faithful re-creation, running on a Java emulation of the PDP-1 minicomputer, at [spacewar.oversigma.com].

Now answer the following questions and bring your answers to the class:

- Why *Spacewar*? Why were these early gamers attracted to life-or-death battle in a science-fiction environment?
- How have computer games changed?
- What were the aims of the “Counter-computer” movement? How much of their influence can you see in computer use today?
- “Spacewar serves Earthpeace.” Do you agree?

Background reading on hackers, the counterculture, and Free Software

- Further chapters in Levy 2001
- Turner, Fred, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Cambridge, Mass: MIT Press 2006, chapter 4.
Excellent survey of how US West Coast counter-culturalists and human-focused computer interface designers came together to “bring computers to the people”.
- Peterson, T F, *Nightwork: a history of hacks and pranks at MIT*. Cambridge, Mass: MIT Press 2003.
Why hacking is called hacking: the term’s origins in elegant (non-computing) campus trickery.
- Cringely, Robert X, *Accidental Empires: how the boys of Silicon Valley make their millions, battle foreign competition, and still can’t get a date*. London: Penguin 1996.
Informal, gossipy, very readable account of the US personal computer and software industry. Don’t rely on it as an authoritative historical account; concentrate on how it portrays the people described — and how they themselves like to be portrayed.
- Turkle, Sherry, *The Second Self: computers and the human spirit*. New York: Simon and Schuster 1984, chapter 6: “Hackers: loving the machine for itself.”
Influential attempt to characterise the psychology and social relations of the serious hacker, with case studies from MIT.
- Raymond, Eric, “The Jargon File”. Online at [www.catb.org/jargon].
Guide to hacker language, with appendices charting some hacker folklore and (supposedly) typical hacker traits.

- Cornwall, Hugo [pseudonym, = Peter Sommer], *The Hacker's Handbook*, London: Century Communications 1985. Full text online at [www.textfiles.com/etext/MODERN/hhbk].
Hugely controversial in its day, the how-to manual which in Britain popularised the idea of the 'hacker' as a dangerous whizkid obsessed with breaking into computer systems.
- Gates, Bill, "An open letter to hobbyists", 3 February 1976. Online at [commons.wikimedia.org/wiki/File:Bill_Gates_Letter_to_Hobbyists.jpg]
Later to become famous in the light of Gates's growing fame, this letter was typical of the traditional commercial approach to software as it confronted the newcomers.
- Himanen, Pekka, *The Hacker Ethic: a radical approach to the philosophy of business*. New York: Random House 2001.
Social theory of hacker values, contrasted with the traditional ('Protestant') work ethic. Prologue by Linus Torvalds.
- Stallman, Richard, *The GNU Manifesto*, 1985, online with notes at [<https://www.gnu.org/gnu/manifesto.html>]
Earliest and most important practical definition of the goals of Free Software.
- Kelty, Christopher, *Two Bits: the cultural significance of Free Software*. Durham, NC: Duke University Press 2008. Free online (as you might expect!) at [twobits.net/read/]
The Free Software movement in the context of wider political commitments to communal ownership of intellectual property.

Background reading on home computers

- **Campbell-Kelly et al**, chapter 10: "The Shaping of the Personal Computer"
- Ceruzzi, Paul E, *A History of Modern Computing*, 2nd edition. Cambridge, Mass: MIT Press 2003. Chapters 7 and 8.
- Campbell-Kelly, Martin, *From Airline Reservations to Sonic the Hedgehog: a history of the software industry*. Cambridge, Mass: MIT Press 2003. Chapters 8 and 9.
- Evans, Christopher, *The Mighty Micro*. London: Gollancz 1979.
The book which alerted British public and policy-makers to the 'challenge of the chip.'
- Spufford, Francis, "Chapter 3: The Universe in a Bottle" in *Backroom Boys*. London: Faber 2003.
Off-beat but fascinating story of the seminal space-trader game Elite, originated on the BBC Micro platform. Well worth reading to get an idea of the conditions in which early-80s programmers operated.
- Sumner, James, "Standards and Compatibility: the rise of the PC computing platform", in James Sumner and Graeme Gooday, eds., "By Whose Standards?: Standardization, stability and uniformity in the history of information and electrical technologies" (*History of Technology* vol. 28). London: Continuum, 2008, 101-128; online at [www.jbsumner.com/writing/2008-history-of-technology-pc.pdf].
Covers the fading of the 1980s "home" microcomputer formats as the PC became dominant.
- Lindsay, Christina, "From the Shadows: Users as Designers, Producers, Marketers, Distributors and Technical Support", in Nelly Oudshoorn and Trevor Pinch, eds, *How Users Matter*. Cambridge, Mass: MIT Press, 2003, 29-50.
The survival of an early personal-computing community (TRS-80), and the role of users in the development and representation of technologies
- Hiltzik, Michael, *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age*. London: Orion 2000.
The story of the institution whose staff created so many features of the modern graphical user interface.

Background reading on games

- Herz, J C, *Joystick Nation*. London: Abacus 1997.
Fast-paced, light but insightful survey of the cultural impact of videogames, from arcade to console.
- Cassell, Justine, and Henry Jenkins, eds, *From Barbie to Mortal Kombat: Gender and Computer Games*. Cambridge, Mass: MIT Press 1998.
Includes numerous interviews with designers, coders and gamers. Useful for links to the class on gender and skills.
- Kline, Stephen, Nick Dyer-Witheford and Greig de Peuter, *Digital Play: the interaction of technology, culture, and marketing*. Montreal: McGill-Queen's University Press 2003.
Some questionable cultural/economic theory, but worth a look for its survey of the growth of the videogame concept from 1960 to around 2001.
- Montfort, Nick, *Twisty Little Passages: an approach to interactive fiction*. Cambridge, Mass: MIT Press 2003.
Discusses interactive fiction and 'text adventure' games, a huge commercial phenomenon in the 1980s.

Recommended video

- *The Dream Machine*, part 3: "The Paperback Computer" (1991)
Covers the foundations of 'user-friendliness' and 'usability', the difference made by disposable integrated circuits, and several well-remembered individuals (Clive Sinclair, Steve Jobs) and machines (Altair 8800, Xerox Alto, the original Apple Mac...)
- *Horizon: "Now the Chips are Down"* (BBC2, 31 March 1978).
The documentary which introduced many viewers to the microprocessor for the first time. Was also viewed, privately, by many policymakers. The presentation is in many ways negative, focusing on possible unemployment and the destruction of traditional industries — in sharp contrast to what came later.
- *Commercial Breaks: "The Battle for Santa's Software"* (BBC2, 13 December 1984).
Business documentary. The film-makers set out to tell the story of the highly-successful Liverpool games company, Imagine, famous for tabloid headlines involving teenage "whiz-kid" programmers, fast cars and fortunes. The reality turned out to be very different...

09. Geek mythology: skills and identities, women and men

Computers have long been seen as 'boys' toys'; the stereotypical 'computer nerd' is a young man; the information technology professions are by anybody's standards male-dominated. Most people, seeing the ongoing efforts to attract more women to work with computers, vaguely suppose that the field must have started out as all-male, with the gender balance gradually improving ever since. In reality, there was a significant number of women among the first generation of computer professionals, especially on the software side, and the field has actually become *more* male-dominated since then.

The reasons for this complicated history have a lot to do with judgments and assumptions about the skills involved in working with computers. In particular, programming and documentation were routinely assigned to women during the Second World War: as unfamiliar new activities, they were sometimes assumed to be low-grade clerical tasks (and sometimes not really thought about at all). As it became clear that coding was a highly skilled and crucial task, it was increasingly reclassified as the kind of highly paid professional

work which tended to go to men – but not before a significant number of women had found footholds in the industry, and begun developing new ways forward.

This class will also look briefly at other themes in the relationship between computer use and skills. A popular view around the 1960s and 70s suggested that computers and information network systems would cause apocalyptic mass unemployment; in fact, while the overall automation process did destroy many jobs, it also opened up others. But what *kinds* of jobs – and what kinds of lives, for the people who work with automated technologies, and the people who use what they produce? Are we being “de-skilled” by reliance on highly organised, regimented information systems? If so, do the lost skills matter for our rights as individuals, or for the common good of society? And what, if anything, can we do about it?

Required reading

- Abbate, Janet, “Breaking codes and finding trajectories: women at the dawn of the digital age”, Chapter 1 in Janet Abbate, *Recoding Gender: women’s changing participation in computing*. Cambridge, Mass.: MIT Press 2012.
- “Chapter 4: Geek Mythology” in Margolis, Jane, and Allan Fisher, *Unlocking the Clubhouse: women in computing*. Cambridge, Mass: MIT Press 2003.

In 1995, the percentage of women undergraduates entering the School of Computer Science at Carnegie Mellon University (one of the three famed centres of computer science innovation, alongside Stanford and MIT) was just 7%. In 2000, it was 42%, an international record. The reforms which caused this change were largely based on a collaboration between Allan Fisher, a member of the Computer Science faculty, and Jane Margolis, a social scientist who conducted hundreds of hours of interviews on the positive and negative experience of female students.

Exercise for this week

Margolis and Fisher’s book, though now beginning to show its age, provides an unusually direct and practical introduction to the problems and responses involved. Does the lack of women in most CS departments result from ‘lack of interest’ or pre-existing ‘male dominance’? Or is there a more complicated explanation to be found in the obsessive behaviour of the ‘typical’ computer geek? Read the required chapter from the book – and skim the rest if possible: it’s available electronically – and answer these questions:

- A question for the Computer Science students: what’s familiar to you in the picture Margolis and Fisher paint of life in Computer Science at CMU? What’s different?
- What is the “geek mythology paradox” (pp 67-68)?
- If Margolis and Fisher’s explanation of the problem is correct, what changes need to be made to the way computer science is promoted and taught?
- Do you agree with their position?

Background reading on gender and IT

- Abbate, Janet, *Recoding Gender: women’s changing participation in computing*. Cambridge, Mass.: MIT Press 2012.

Best recent introduction to gender themes, running quite quickly and readably through the literature on quite a wide range of situations and problems. The oral history interviews listed as required reading above were conducted as part of the project which produced this book.

- Misa, Thomas, ed, *Gender Codes: why women are leaving computing*. Hoboken: Wiley, 2010.

The proportion of women in the computing professions has fallen since the 1980s. It is falling *now*. This book asks why, focusing on cases from the beginnings of the field to the present, and finding answers in the public image of computing and the history of professionalisation. See in particular Marie Hicks, on the status of computer operators/coders in the British civil service, also available at [mariehicks.net/writing/GenderCodesIllus.pdf]. See also Tom Misa's concluding chapter; and Caroline Clarke Hayes on the practicalities of solving the problem.
- Further chapters in Margolis and Fisher 2003, especially Chapter 2 (on school-age computer users).
- Cohoon, J McGrath, and William Aspray, eds, *Women and Information Technology: research on underrepresentation*. Cambridge, Mass.: MIT Press, 2006.

Social-science research on what deters women and girls from IT education and professions, mostly concentrating on American cases.
- Abbate, Janet, ed, special issue on "Women and Gender in the History of Computing." *IEEE Annals of the History of Computing* 25:4 (2003).

A range of approaches to diverse cases in the nineteenth and twentieth centuries, including some first-hand memoirs of women computer users.
- Light, Jennifer, "When computers were women," *Technology and Culture* 40 (1999) 455-483.

Why did women engineers and programmers disappear from the historical record of the ENIAC?
- Beyer, Kurt W, *Grace Hopper and the Invention of the Internet Age*. Cambridge, Mass.: MIT Press, 2009.

Biography of the most influential of early female coders. Hopper was able to command serious respect across a long career, but, unlike her male colleagues, had to sacrifice the opportunities of a typical family life to do so.

Background on skills and automation

Questions of skills overlap unavoidably with the questions raised in the gender section, as will become obvious from several of these texts...

- Ensmenger, Nathan, *The Computer Boys Take Over*. Cambridge, Mass: MIT Press 2010.

How industry hired and managed – or mismanaged – software specialists from the 1950s to the 1990s. Themes include professional identity, mistrust of subcultures, and reasons why the "computer boys" remain mostly "boys".
- Rochlin, Gene, *Trapped in the Net: the unanticipated consequences of computerization*. Princeton: Princeton University Press.

See in particular Chapter 4, "Taylorism redux". "Taylorism", or "Scientific Management", was a theory applied to traditional industry in the early twentieth century: based on precise measurement, hierarchy and standardisation, its results were invariably a deskilled workforce and a powerful management. How far can the same approach be applied with information technology, and what are the dangers?
- David Noble, *Forces of Production: a social history of industrial automation*, Oxford: Oxford University Press, 1986.

Classic critical account. Noble argues that managers use automation as a tool to remove the power that comes with shop-floor workers' skills and knowledge. (What, then, happens when it's time to automate management...?)
- Thomas Haigh, "The chromium-plated tabulator: institutionalizing an electronic revolution, 1954-1958", *IEEE Annals of the History of Computing* 23:4 (2001), 75-104.

Addresses the shift from punched-card information processing to electronics. Did computers simply automate existing processes? Or did they create something entirely new, in terms of labour roles and management structure?

- Taylor, Phil, and Peter Bain, “‘An assembly line in the head’: work and employee relations in the call centre”, *Industrial Relations Journal* 30:2 (1999), 101-117.
Written not long after the call centre emerged as a major social phenomenon, and focuses on questions of routinisation, de-skilling and power relations.
- David Noble, “Technology and the commodification of higher education”, *Monthly Review* 53:10 (2002). Online at [www.monthlyreview.org/0302noble.htm].
Noble’s expansion of his argument into a field in which you’re directly involved: university-level teaching. Published at the height of the “distance learning” boom in the US.

10. Internet connections

The communication systems which make up the internet, in particular the World Wide Web and the social applications that run on it, have been the hottest, most widely debated feature of computing culture in recent years — a fact few would have predicted even a couple of years before the Web was launched. This class ties together the military origins of distributed communication networks, the idealism of early hypertext enthusiasts, and big-business responses to the promise of worldwide, instantaneous and (partly) anonymous transactions, to explain how the public internet evolved.

Required reading

- Bush, Vannevar, “As we may think”, *The Atlantic*, July 1945; reproduced online at [www.theatlantic.com/magazine/archive/1945/07/as-we-may-think/303881/].
Please focus on Section 6 onwards, dealing with the ‘Memex’.
- de Lacy, Justine, “The sexy computer”, *The Atlantic*, July 1987, 18-26.
- Haigh, Thomas, “Protocols for profit: web and e-mail technologies as product and infrastructure” in William Aspray and Paul Ceruzzi, eds, *The Internet and American Business*. Cambridge, Mass: MIT Press 2008, 105-158.

Exercise for this week

Please come to the class ready to answer the following questions:

- Bush’s piece was written at a time when the whole principle of electronic computing was still in its infancy. Are there, however, recognisable features in his proposals for a data storage system? Do you think the ‘Memex’ was an influence on later developments?
- The 1980s world of the French Minitel, as described by de Lacy, obviously has much more in common with present-day online culture. Again, what are the likely influences – and what are the major differences?
- What does de Lacy’s account focus on, in particular? Are there similarities to the way journalists cover stories about online life today?
- How does the history of the internet’s evolution define its nature and constrain what can happen online today? In what ways is this a problem?

Background reading on the history of online technologies

- Further chapters in Aspray and Ceruzzi 2008.
This is the only good broad survey so far of the commercial use, rather than the initial production of Internet technology: it's part history, part policy study. See in particular Haigh's second chapter, on search engines and portals; Campbell-Kelly and Garcia-Swartz on computer utility/software-as-service; and Aspray on filesharing and the music industry.
- **Campbell-Kelly et al**, chapter 12 (third edition strongly recommended)
- Campbell-Kelly, Martin, and Daniel D Garcia-Swartz, "The History of the Internet: The Missing Narratives", *Journal of Information Technology* 28 (2013), 18-33.
Good survey of how various parallel developments (computer utility, bulletin boards, videotex etc) fit in alongside the traditional ARPANET-to-Internet narrative. Only provides a brief overview of each topic, but more detailed than the equivalent treatments in the Campbell-Kelly et al book.
- Ceruzzi, Paul E, *A History of Modern Computing*, 2nd edition. Cambridge, Mass: MIT Press 2003, chapter 10.
- Abbate, Janet, *Inventing the Internet*. Cambridge, Mass: MIT Press 1999.
Comprehensive history of ARPAnet (the internet's precursor), from the early Cold War context which created it to the emergence of the commercial internet and the birth of the Web.
- Russell, Andrew L, "'Rough Consensus and Running Code' and the Internet-OSI Standards War", *IEEE Annals of History of Computing* 28:3 (2006), 48-61.
The battle between 'bottom-up' and 'top-down' visions of network planning.
- Turner, Fred, *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the rise of digital utopianism*. Cambridge, Mass: MIT Press 2006, chapter 5.
"Virtuality and community on the WELL" looks at the Whole Earth 'Lectronic Link, an online (but pre-mass public internet) data resource inspired by the countercultural trends discussed in previous lectures.
- Nelson, Ted, "Xanalogical Structure, Needed Now More than Ever" (1999) Online at [www.xanadu.com.au/ted/XUsurvey/xuDation.html]
The pioneer of hypertext wrote this revised specification after the arrival of the Web, and his views set the WWW model in interesting context... See also the 2008 demo of Xanadu Space at [www.youtube.com/watch?v=En_2T7KH6RA]
- Katie Hafner, "The epic saga of the WELL", *Wired* 5:5 (1997), 98-142, online at [www.wired.com/wired/archive/5.05/ff_well_pr.html]
Journalistic account of the Whole Earth 'Lectronic Link (WELL), an influential 1980s/90s online system rooted in the countercultural ideas of Stewart Brand. Focuses on the nature of online community.
- Frana, Philip L, "Before the Web there was Gopher," *IEEE Annals of History of Computing* 26:1 (2004) 20-41.
Useful not only as a description of the vanished Gopher system (flourished 1991-4), but for its depiction of a time when the World Wide Web was neither the only, nor the most obvious, model of internet use.
- Brunton, Finn. *Spam: a Shadow History of the Internet*. Cambridge, Mass.: MIT Press, 2013.
First full-length academic study of the spam phenomenon. A bit theoretically ponderous, but worth a look.

Recommended video

- *The Net* (BBC2, 1994).
Since around 1990, 'educational' TV documentary programming on computers has been rare: to most audiences, computer technology is ordinary and familiar now. An exception was the mid-90s bubble of interest around the as-yet unfamiliar internet and World-Wide Web. The BBC's final (to date) computer magazine show covered IT issues more broadly, but — as the title suggests — took internet culture as a defining theme.

11. Living in the information age: identity, privacy and power

The rise of mass public internet use, discussed in last week’s lecture, was accompanied by a wave of optimistic claims predicting revolutionary social benefits: the end of censorship, the levelling out of inequalities in education and opportunity, the rise of a public-spirited global community. After a couple of decades, however, the picture is not so rosy. Indeed, many commentators – including not only traditional “technophobes”, but IT professionals, legal experts and informed activists – fear that we may be heading in the opposite direction: towards unprecedented government surveillance and control, growing erosion of personal privacy by corporate social media platforms, or new technological barriers that exclude certain kinds of people from positions of power. This class examines the fears, as well as the hopes, of the new information age.

Required reading

- boyd, danah, “Privacy: why do youth share so publicly?”, Chapter 2 in *It’s Complicated: the Social Lives of Networked Teens*, New Haven: Yale University Press 2014, 54-76, full text online at [www.danah.org/books/ItsComplicated.pdf]

Exercise for this week

boyd’s book uses a standard plaint of older generations – “What is wrong with kids these days? Why can’t they be more sensible?” – to frame a series of issues which don’t only apply to young people: the effects of global connection on privacy, the differing and fuzzy definitions of “public” and “private”, the differences between technological and social fixes to problems. Think about the cases and questions boyd presents: do you recognise them from your own life online?

In advance of this class, I will also ask you to look at a few recent online items: details will appear on Blackboard.

Background reading

- Further chapters in boyd 2014
- Goldsmith, Jack, and Tim Wu, *Who Controls the Internet? Illusions of a borderless world*. Oxford: Oxford University Press, 2006.

When the internet first became public, it was widely hyped as a kind of libertarian utopia where traditional boundaries, censorship and government could not function. This book, by two law professors, surveys the technical and political details of internet control in practice to reach a very different conclusion.

- Turkle, Sherry, *Life on the Screen: identity in the age of the internet*. London: Phoenix 1997.

The most influential study so far on how people project identity online. As is true for most of Turkle’s work, the details of the particular subcultures studied have very quickly fallen out of date, but the general points should be obviously relevant to today’s internet. See in particular Chapter 8, “TinySex and Gender Trouble”, on the familiar phenomenon of online gender-swapping.

- Turkle, Sherry, *Alone Together: why we expect more from technology and less from each other*. New York: Basic 2011.

Compare and contrast. Whereas *Life On The Screen* drew many positive conclusions about living online, fourteen years later *Alone Together* is far more guarded. Assessing the effects of more recent technologies from robot pets

and care assistants, to text messages and IM services, to Second Life, Myspace, Facebook and ChatRoulette, Turkle finds evidence of a new and unsettling form of loneliness, to which young “digital natives”, who have never known a world without these technologies, are as vulnerable as anyone.

- Wajcman, Judy, *TechnoFeminism*. Oxford: Polity 2004.
Chapter 3 is a relatively accessible introduction to the wider issues in gender theory which inform discussion of ‘online’ or ‘virtual’ identities.
- Nakamura, Lisa, *Cybertypes: race, ethnicity, and identity on the internet*. New York: Routledge 2002.
The groundswell of 1990s literature on online identity focused heavily on gender issues; Nakamura raises comparable questions of racial identity online.
- Nakamura, Lisa, and Peter Chow-White, eds, *Race After the Internet*, New York: Routledge, 2011.
Studies by a range of authors looking at how digital media technologies, including Facebook-era social media platforms, influence and are influenced by racial identities and assumptions.
- Michael Bittman, Judith E Brown and Judy Wajcman, “The mobile phone, perpetual contact and time pressure”. *Work, Employment and Society* 23 (2009), 673-691.
So, does the “constant touch” of mobile telephony destroy the work-life balance of its users? This study reaches some complex and perhaps surprising answers.
- Plus your own experience of blogs, social networking sites, user-generated videos, product reviews...

12A. Exam skills

This session will provide advice on how to tackle the exam.

There is no required reading for this class.

Recommended exam skills guidance

Beside the materials discussed in class, you might find the following useful:

- Chapel Hill “Essay Exams” handout, online at [writingcenter.unc.edu/handouts/essay-exams/].
- Dixon, Thomas, *How To Get A First*. London: Routledge 2004, chapter 11: “Revision and exams”
- Palmer, Stephen, and Angela Puri, *Coping with Stress at University: a survival guide*. London: Sage 2006, chapter 14: “Preparing for exams”

12B. Conclusion: memory expansion

This class looks back over the history of data from the nineteenth to the twenty-first century. We will chart the relationship between the ever-growing size, speed and affordability of digital data processing and the wider themes of commercialisation, popular culture, labour relations and personal identity.

There is no required reading for this class.

Background reading

- Mahoney, Michael S, "The history of computing in the history of technology", *Annals of the History of Technology* 10 (1988), 113-125.
Mahoney was the first serious commentator on what "the history of computing" as an academic branch of study ought to be. In this paper he aimed to give direction to the field by taking lessons from the broader field of history of technology.
- Winner, Langdon, "Mythinformation" in *The Whale and the Reactor: a search for limits in an age of high technology*, Chicago: University of Chicago Press, 1986, 98-117.
The definitive takedown of how we *shouldn't* write the history of computing: as a "revolution" which came from nowhere to radically change society and everything in its path. Objections like Winner's mean that the "revolutionary change" account is now largely unacceptable in academic history, but it still survives in popular accounts. Why?
- Edwards, Paul N, "Virtual machines, virtual infrastructures: the new historiography of information technology", *Isis* 89 (1998), 93-99.
- Edwards, Paul N, "Making history: new directions in computing historiography", *IEEE Annals of History of Computing* 23 (2001), 87-85.
Another manifesto for future directions, making connections which (more than a decade on) the field is still coming to terms with.
- Burrell, Jenna. *Invisible Users: Youth in the Internet Cafés of Urban Ghana*. Cambridge, Mass.: MIT Press, 2012.
What do current histories of computing typically miss? "Global user perspectives" is one obvious answer. Burrell's book is one of several recent volumes which are beginning to challenge the omission, and helps to reveal some of the unconscious assumptions on which standard histories – and predictions for the future – perhaps unduly rely.

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Option courses for 2014-2015

Semester One	Semester Two
Level 1	
Science and the modern world HSTM10221 · HSTM10721 Monday 15.00-17.00	Bodies in history: an introduction to the history of medicine, 1500-2000 HSTM10272 · HSTM10772 Thursday 14.00-16.00
A history of biology in 20 objects BIOL10381 Monday 11.00-12.00 and 13.00-14.00 Wednesday 11.00-12.00	
Level 2	
From cholera to Aids: the history of infectious diseases in Europe, 1800-2000 HSTM20031 · HSTM20081 Monday 14.00-16.00	The crisis of nature: issues in environmental history HSTM20092 · HSTM20592 Monday 11.00-13.00
Science, the media and the public HSTM20181 · HSTM20681 Thursday 13.00-15.00	From Frankenstein to The Matrix: science fiction and film HSTM20302 · HSTM20802 Friday 11.00-13.00
	The information age HSTM20282 · HSTM20782 Thursday 16.00-18.00
Level 3	
History of climate change HSTM33201 · HSTM33701 Monday 11.00-13.00	Madness and society HSTM30832 · HSTM40332 Tuesday 11.00-13.00
From Baker Street to CSI: a history of forensic medicine HSTM32011 · HSTM32511 Wednesday 11.00-13.00	The nuclear age: Hiroshima to nuclear terrorism HSTM31211 · HSTM31711 Wednesday 11.00-13.00
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