Technische Universität Berlin

Institut für Philosophie, Literatur-, Wissenschafts- und Technikgeschichte

Course Syllabus, Winter Semester 2014/2015

Course type: **Hauptseminar**

Course title: **A Computer Perspective**

Course organiser: **Dr Giuditta Parolini**

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Course language: **English**

Course presentation

In 1971 the company IBM commissioned the designers Charles and Ray Eames to prepare an exhibition on the complex origins and influences of the computer. The outcome of the project was a *history wall* made up of floor-to-ceiling panels in which the history of computation was illustrated from the end of the 19th century to the mid of the 20th century using a mix of printed explanations, artefacts, documents, photographs and quoted texts placed in a three-dimensional grid. Moving from one decade to the next, the visitors walking along the wall could see some objects disappear, while others became visible.

The exhibition, named *A Computer Perspective*, wanted to remind with its arrangement that "the computer is the product of men's minds and hands, and that the manifest complexities of its influence upon our lives reflect the incredible variety and complexity of sources from which it has sprung".

In the age of smartphones and tablets, big data and cloud computing, the Eames' invitation to put the computer into perspective cannot be forgotten, as it offers an opportunity for a cultural

understanding of this technology, too often stereotypically portrayed as revolutionary or future-oriented.

The course will offer an overview of the history of computing from the pre-computer age of mathematical tables and human computers to present day social networking. The case studies examined will give the opportunity to reflect on the technological, social, scientific and gender issues that are intertwined with the development of the computer.

The aim of the course is to provide critical instruments for a deeper understanding of the computer as an artefact and to set its history in the broader scenario of the history of science and technology in the twentieth century.

There is no prerequisite for attending the course. A basic knowledge of the history of science and technology in the twentieth century is helpful, but not mandatory. Lectures and discussions will be in English and the evaluation tests (essay and presentation) must also be prepared in English, but the use of German sources and German case studies to complement the English ones suggested by the course organiser is welcome and can certainly offer opportunities for stimulating discussions.

Evaluation

Kleine Leistung

A 1,500 words critical summary of one group in the following list of readings on the history of computing. In writing a critical summary I ask you not only to summarise the argument(s) of the book/papers, but also to use the information learnt during the course to point out how these contributions can be framed in the current historiography of computing and whether their argument(s) is/are convincing or not. Proposals for further readings are welcome, but the feasibility must be discussed in advance with the course organiser.

Group 1: Working with the first computers.

    a) Williams, Michael R., A preview of things to come: some remarks on the first generation of computers; in: Raúl Rojas and Ulf Hashagen, *The First Computers – History and Architectures* (Cambridge, Massachusetts and London, England: The MIT Press, 2000); pp. 1-13.

    b) Campbell-Kelly, Martin Programming the EDSAC: early programming activity at the university of Cambridge. *IEEE Annals of the History of Computing*, Vol. 20, No. 4, 1998: 46-67.

c)   Campbell-Kelly, Martin, Past into present: the EDSAC simulator; in: Raúl Rojas and Ulf Hashagen, *The First Computers – History and Architectures* (Cambridge, Massachusetts and London, England: The MIT Press, 2000); pp. 397-416.

Group 2: Konrad Zuse and his autobiography

Read Konrad Zuse's autobiography (in the English or German version) *The Computer – My Life/ Der Computer Mein Lebenswerk* and provide a critical summary in English.

Group 3: The Computer, the Military, and the Government

a)   Cohen, I. Bernard, The computer: a case study of support by government, especially the military, of a new science and technology; in: E. Mendelsohn, M. R. Roe & P. Weingart (eds) *Science, Technology and the Military* (Dordrecht: Kluwer, 1988); pp. 119-154.

b)   Agar, Jon, *The Government Machine*, chapter 7 "The military machine?" (Cambridge, Massachusetts and London, England: The MIT Press, 2003); pp. 263-292.

Group 4: Women and Computing

Read Janet Abbate's *Recoding Gender: Women's Changing Participation in Computing* (Cambridge, Massachusetts and London, England: The MIT Press, 2012) and provide a critical summary in English.

Group 5: The computer business as a case study of industrial innovation

Read John Hendry's, *Innovating for Failure: Government Policy and the Early British Computer Industry* (Cambridge, Massachusetts and London, England: The MIT Press, 1989) and provide a critical summary in English.

Große Leistung

1) An essay in English (3,000 words excluding bibliography) to be prepared by the end of the winter semester.

Suggested essay questions:

a)   The historian Michael S. Mahoney (Michael S. Mahoney, *The histories of computing(s)*, http://www.thecorememory.com/THOC.pdf) has argued that the history of the computer is not a single one, but there are several histories, derived from the histories of the groups of practitioners who appropriated this technology to realise their agendas and

aspirations. Discuss Mahoney's claim using case studies and the general literature on computing.

b) What can the issues in the history of computing tell us about the history of technology in the twentieth century? Does technology drive history or rather is society that shapes technologies? Useful ideas for the essay can be found in Donald Mackenzie and Judy Wajcman (eds.) *The Social Shaping of Technologies*, Open University Press, 1985; Merritt Roe Smith and Leo Marx (eds.) *Does Technology Drive History? The Dilemma of Technological Determinism*, The MIT Press, 2001.

c) During the twentieth century scientific research has found an ally in the computer and this technology has even promoted the development of a new branch of science, computational science. Yet, the history of computing in the sciences is much longer and complex than revolutionary accounts of the role of the computer (for instance, Douglas S. Robertson, *Phase Change: The Computer Revolution in Science and Mathematics*, Oxford University Press, 2003) might suggest. Compare and contrast computing in the sciences before and after the development of digital computers.

d) From the 1970s onwards the computer has become a personal technology besides being a business and scientific tool. How can we assess the impact of the computer in the arts, humanities or entertainment?

Proposals for further essay questions are welcome, but the feasibility must be discussed in advance with the course organiser.

2) A short presentation in English (15 min.) to be given in the final lectures of the course. The topic of the presentation will be chosen by the students in agreement with the course organiser.

Course program and readings

Suggested pre-course reading

Paul E. Ceruzzi *Computing: A Concise History*. Cambridge, Massachusetts and London, England: The MIT Press, 2012, 175 pp.

This booklet is a brief introduction to the history of computing. It can be useful to get acquainted with some of the issues examined during the course. Available in the TU Zentralbibliothek.

Week 1

General Introduction

Readings: Extracts (Introduction, Babbage's Analytical Engine, L. J. Comrie and Scientific Calculation, The Universal Turing Machine, ENIAC at the Moore School, The First Twenty Years of the Computer; 15 pp.) from *A Computer Perspective* by Charles and Ray Eames (Cambridge, Massachusetts: Harvard University Press, 1973).

Week 2

Computing before computers/1: Mathematical tables

Readings: Mary Croarken, "Table making by committee: British table makers, 1871-1965", in: Campbell-Kelly, M. et al. (eds.) *The History of Mathematical Tables: From Sumer to Spreadsheets.* (Oxford: Oxford University Press, 2003); pp. 235-263.

Week 3

Computing before computers/2: Human computers

Readings: David A. Grier, *When Computers Were Human* (Princeton: Princeton University Press, 2007); pp. 102-118 and 126-133.

Week 4

Computer hardware: The stored-programme principle

Readings: Thomas Haigh, " 'Stored program concept' considered harmful: history and historiography", in: Bonizzoni, P. et al. (eds.) *The Nature of Computation: Logic, Algorithms, Applications*, Lecture Notes in Computer Science, Vol. 7921 (Berlin and Heidelberg: Springer-Verlag, 2013); pp. 241-251.

Week 5

IBM and the computer business

Readings: Martin Campbell-Kelly, William Aspray, Nathan Ensmenger, Jeffrey R. Yost, *Computer: A History of the Information Machine* (3rd edition) (Boulder, Colorado: Westview Press, 2013); pp. 119-139.

Week 6

Computer software: The *black art* of programming

Readings: Nathan Ensmenger, *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise* (Cambridge, Massachusetts and London, England: The MIT Press, 2010); pp. 51-82.

Week 7

Gender issues in computing

Readings: Janet Abbate, *Recoding Gender: Women's Changing Participation in Computing* (Cambridge, Massachusetts and London, England: The MIT Press, 2012); pp. 113-143.

Week 8

The personal computer

Readings: Paul E. Ceruzzi, From scientific instrument to everyday appliance: the emergence of personal computers, 1970-77, *History and Technology*, Vol. 13, No. 1: 1-31.

Week 9

The Internet and social media

Readings: Martin Campbell-Kelly, William Aspray, Nathan Ensmenger, Jeffrey R. Yost, *Computer: A History of the Information Machine* (3rd edition) (Boulder, Colorado: Westview Press, 2013); pp. 275-305.

Week 10

The historiography of computer pioneers: Konrad Zuse as a case study

Readings: Konrad Zuse, *The Computer – My Life* (Berlin Heidelberg: Springer-Verlag, 1993); pp. 33-73. You can also read the original German version of Zuse's autobiography. Konrad Zuse, *Der Computer Mein Lebenswerk* (Berlin Heidelberg: Springer-Verlag, 1993); pp. 30-65.

Week 11

Biomedical computing

Readings: Soraya de Chadarevian, *Designs for Life: Molecular Biology After WWII* (Cambridge: Cambridge University Press, 2002); pp. 98-135.

Week 12

Computing in agricultural science

Readings: David A. Grier, *When Computers Were Human* (Princeton: Princeton University Press, 2007); pp. 159-169.

David A. Grier, Agricultural computing and the context for John Atanasoff, *IEEE Annals of the History of Computing*, Vol. 22, No. 1, 2000: 48-61.

Week 13:

Computer (r)evolution?

Readings: Jon Agar, What difference did computers make?, *Social Studies of Science*, Vol. 36, No. 6, 2006: 869-907. Read only: 869-888 and 892-900.

Week 14:

The computer and the arts: Pietro Grossi

Readings: Francesco Giomi, "The work of the Italian artist Pietro Grossi: from early electronic music to computer art, *Leonardo*, Vol. 28 (1), 1995: 35-39.

Kenneth Gaburo, "The Deterioration of an Ideal, Ideally Deteriorized: Reflections on Pietro Grossi's 'Paganini Al Computer' ", *Computer Music Journal*, Vol. 9 (1), 1985: 39-44.

Pietro Grossi, *Selected Writings* (edited by Marco Ligabue) (Firenze: Firenze University Press and Fondazione Ezio Franceschini, 2007) http://www.fupress.net/index.php/mt/article/view/2442.

Week 15: Student presentations

Week 16: Student presentations

Readings on the history of computing useful for preparing the essay and the short presentation for the Große Leistung. [I will be happy to advise on the most suitable readings in the list once you have chosen the topic of your essay and presentation]

Abbate, Janet (1999) *Inventing the Internet.* Cambridge, Massachusetts, and London, England: The MIT Press.

Abbate, Janet (2012) *Recoding Gender: Women's Changing Participation in Computing.* Cambridge, Massachusetts, and London, England: The MIT Press.

Agar, Jon (2003) *The Government Machine: A Revolutionary History of the Computer.* Cambridge, Massachusetts, and London, England: The MIT Press.

Aspray, William (1990) *John von Neumann and the Origins of Modern Computing.* Cambridge, Massachusetts and London, England: The MIT Press.

Campbell-Kelly, Martin (1989) *ICL: A Business and Technical History.* Oxford: Clarendon Press.

Martin Campbell-Kelly, Aspray, William, Ensmenger, Nathan and Yost, Jeffrey R. (2013) *Computer: A History of the Information Machine* (3rd edition). Boulder, Colorado: Westview Press.

Campbell-Kelly, Martin, Croarken, Mary, Flood, Raymond and Robson, Eleanor (2003) *The History of Mathematical Tables: From Sumer to Spreadsheets.* Oxford: Oxford University Press.

Ceruzzi, Paul E. (2013) *A History of Modern Computing* (2nd edition). Cambridge, Massachusetts and London, England: The MIT Press.

Cohen, I. Bernard (1999) *Howard Aiken: Portrait of a Computer Pioneer.* Cambridge, Massachusetts and London, England: The MIT Press.

Croarken, Mary (1990) *Early Scientific Computing in Britain.* Oxford: Clarendon Press.

Eames, Charles and Ray (1973) *A Computer Perspective.* Cambridge, Massachusetts: Harvard University Press.

Edwards, Paul (1996) *The Closed World: Computers and the Politics of Discourse in Cold War America.* Cambridge, Massachusetts and London, England: The MIT Press.

Ensmenger, Nathan (2010) *The Computer Boys Take Over: Computers, Programmers, and the Politics of Technical Expertise.* Cambridge, Massachusetts and London, England: The MIT Press.

García-Sancho, Miguel (2012) *Biology, Computing, and the History of Molecular Sequencing: From Proteins to DNA, 1945-2000.* Basingstoke: Palgrave Macmillan.

Grier, David A. (2007) *When Computers Were Human.* Princeton: Princeton University Press.

Heide, Lars (2009) *Punched-Card Systems and the Early Information Explosion, 1880-1945.* Baltimore: the John Hopkins University Press.

Hendry, John (1990) *Innovating for Failure: Government Policy and the Early British Computer Industry*. Cambridge, Massachusetts, and London, England: The MIT Press.

Hicks, Mary (2010) "Only the clothes changed: women operators in British computing and advertising, 1950-1970", *IEEE Annals of the History of Computing*, Vol. 32, No. 4: 5-17.

Hughes, Agatha C. and Hughes, Thomas P. (eds.) (2000) *Systems, Experts, and Computers: The Systems Approach in Management and Engineering: WWII and After*. Cambridge, Massachusetts, and London, England: The MIT Press.

Krige, John and Pestre, Dominique (eds.) (2003) *Companion to Science in the Twentieth Century*. Routledge World Reference.

Lécuyer, Christophe (2005) *Making Silicon Valley: Innovation and the Growth of High Tech, 1930-1970*. Cambridge, Massachusetts, and London, England: The MIT Press.

Mackenzie, Donald and Wajcman, Judy (eds.) (1985) *The Social Shaping of Technologies*, Open University Press.

Mahoney, Michael S. (2011) [Thomas Haigh ed.] *Histories of Computing*. Cambridge, Massachusetts: Harvard University Press.

Medina, Eden (2011) *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*. Cambridge, Massachusetts and London, England: The MIT Press.

Metropolis, Nicholas, Howlett, J. and Rota, Gian Carlo (eds.) (1980) *A History of Computing in the Twentieth Century*. New York: Academic Press.

November, Joseph (2012) *Biomedical Computing: Digitizing Life in the United States*. Baltimore: The John Hopkins University Press.

Pugh, Emerson W. (1995) *Building IBM: Shaping an Industry and Its Technology*. Cambridge, Massachusetts, and London, England: The MIT Press.

Robertson, Douglas S. (2003) *Phase Change: The Computer Revolution in Science and Mathematics*. Oxford: Oxford University Press.

Roe Smith, Merritt and Marx, Leo (eds.) (1994) *Does Technology Drive History? The Dilemma of Technological Determinism*. Cambridge, Massachusetts, and London, England: The MIT Press.

Swade, Doron (2001) *The Cogwheel Brain: Charles Babbage and the Quest to Build the First Computer*. London: Abacus.

Wilkes, Maurice V. (1985) *Memoirs of a Computer Pioneer*. Cambridge, Massachusetts, and London, England: The MIT Press.

Yates, JoAnne (2008) *Structuring the Information Age: Life Insurance and Technology in the Twentieth Century*. Baltimore: The John Hopkins University Press.

Zuse, Konrad (1993) *The Computer – My Life*. Berlin Heidelberg: Springer-Verlag.

A good starting point for researching the literature on the history of computing is the archive of the journal *IEEE Annals of the History of Computing.* The MIT Press has published over the years major titles in the history of computing and browsing its online catalogue can be helpful. A further source on the history of computing is also represented by oral histories. Two main repositories are the *IEEE Oral History Project* http://www.ieeeghn.org/wiki/index.php/Oral-History:List_of_all_Oral_Histories and *An Oral History of British Science* by the British Library http://sounds.bl.uk/Oral-history/Science (searchable for subject, e.g. computer hardware or computer software or name of the interviewee).