

The Early History of Personal Computing: A Bibliography

PART ONE:

GENERAL SOURCES ON THE HISTORY OF HCI

One useful historical overview is Chapter 1 of Baecker, R.M. and Buxton, W. (1987), *Readings in Human Computer Interaction: A Multidisciplinary Approach*, Morgan Kaufmann. (A slightly improved version appears in Baecker, R.M., Grudin, J., Buxton, W., and Greenberg, S. (1995), *Readings in Human Computer Interaction: Toward the Year 2000*, Morgan Kaufmann.) Three others are Shackel, B. (1997), "Human-Computer Interaction—Whence and Whither," *Journal of the American Society for Information Science* 48(11); Myers, B. (1998), "A Brief History of Human-Computer Interaction Technology," *interactions*, March-April; and Grudin, J. (2007), "A Moving Target: The Evolution of Human-Computer Interaction," in A. Sears and J. Jacko (Eds.), *Human-Computer Interaction Handbook: Fundamentals, Evolving Technologies and Emerging Applications*, Erlbaum.

Two excellent edited volumes on the early history of personal computers are Gupta, A. and Toong, Hoo-min D. (Eds.) (1985), *Insights into Personal Computers*, IEEE Press; and Goldberg, A. (Ed.) (1988), *A History of Personal Workstations*, ACM Press. A good journalistic account is Levy, S. (1984), *Hackers*, Anchor Press/Doubleday.

Licklider is discussed in depth in Waldrop, M.M. (2001), *The Dream Machine: J.C.R. Licklider and the Revolution that Made Computing Personal*, Penguin Books.

More than 40 recent interviews with important interaction designers are reported in Moggeridge, B. (2007), *Designing Interactions*, MIT Press. Erickson, T. and McDonald, D. (Eds.) (in press), *HCI Remixed*, MIT Press, presents personal accounts of the impacts of seminal papers. A useful website is maintained by the Georgia Tech Program in Human-Centred Computing, see <http://hcc.cc.gatech.edu/taxonomy/cat.php?cat=2>.

PART TWO: HYPERTEXT

The original article is Bush, V. (1945), "As We May Think," *Atlantic Monthly* 176(1). But see also Rayward W. B. (1994), "Visions of Xanadu: Paul Otlet (1868–1944) and Hypertext," *Journal of the American Society for Information Science* 25(4), May, describing an early Belgian "information scientist" who anticipated some key aspects of hypertext.

Much has been written about Engelbart and Nelson. Most useful for learning about Engelbart is Bardini, T. (2000), *Bootstrapping: Douglas Engelbart, Coevolution, and the Origins of Personal Computing*, Stanford University Press, and Oinas-Kukkonen, H. (2007), "From Bush to Engelbart: 'Slowly, some little bells were ringing,'" *IEEE Annals of the History of Computing* 29(2), April-June, 31-39, which relies on interviews, includes a comprehensive bibliography, and details Bush's influence. A monumental early book is Nelson, T. (1974), *Computer Lib: You Can and Must Understand Computers Now*, and, on the flip side, *Dream Machines: New Freedoms Through Computer Screens—a Minority Report*, self-published, out of print.

A useful set of resources, <http://www.cs.brown.edu/memex/>, includes Andy Van Dam's keynote address at the first Hypertext Conference in 1987.

PART THREE: INTERACTIVE COMPUTER GRAPHICS AND DIRECT MANIPULATION

For accounts of the early history of interactive graphics, see

Hurst, J., Mahoney, M.S., Taylor, N.H., Ross, D.T. & Fano, R.M. (1989), "Retrospectives: The Early Years in Computer Graphics at MIT, Lincoln Lab, and Harvard," *ACM SIGGRAPH '89 Panel Proceedings*, Part I and Part II; Machover, C. (1978), "A Brief, Personal History of Computer Graphics," *IEEE Computer* 11(11), November; Wayne Carlson's "Critical History of Computer Graphics and Animation," (<http://design.osu.edu/carlson/history/ID797.html>); and also chapters by Gordon Bell, Doug Ross, and Wesley Clark in *Goldberg* (1988).

An important historical panel is Buxton, W. (2005), "Interaction at Lincoln Laboratory in the 1960s: Looking Forward — Looking Back." Panel Introduction, *Proc. CHI 2005*, 1163-1167, also see <http://www.billbuxton.com/Lincoln.html>, and the ePresence video archive of the panel, <http://epresence.tv/Presentation/3>.

The Sketchpad thesis has been reprinted as Sutherland, I.E. (1963), "Sketchpad: A Man-Machine Graphical Communication System," MIT Ph.D. Dissertation (<http://www.cl.cam.ac.uk/techreports/UCAM-CL-TR-574.html>).

Direct manipulation was defined in Shneiderman, B. (1983), "Direct Manipulation: A Step Beyond Programming Languages," *IEEE Computer*, August.

The development of Spacewar is recounted in Levy, S. (1984), *Hackers: Heroes of the Computer Revolution*, Anchor Press, Chapter 3. A series of computer-aided design history timelines is at <http://mbinfo.mbdesign.net/CAD-History.htm>. An archive devoted to the history of using computer graphics to visualize biological macromolecules, starting with the work of Cyrus Levinthal and colleagues at MIT in 1964-67, is <http://www.umass.edu/molvis/francoeur/>.

PART FOUR: GUI AND WIMP INTERFACES

The best account of the development of the Xerox PARC Alto personal computer, the Superpaint color frame buffer, and the earliest implementations of the graphical user interface is Hiltzik, M. (1999), *Dealers of Lightning: Xerox PARC and the Dawn of the Computer Age*, Harper Business. An earlier journalistic account focusing more on the business context is Smith, D.K. and Alexander, R.C. (1988), *Fumbling the Future: How Xerox Invented, Then Ignored, the First Personal Computer*, William Morrow.

An excellent scholarly account of the desktop metaphor is in Blackwell, A. (2006), "The Reification of Metaphor as a Design Tool," *ACM Transactions on Computer-Human Interaction* 13(4). The earliest WYSIWYG word processors were Bravo and Gypsy developed at Xerox PARC; for information about Gypsy development see the interviews with its developers, Tim Mott and Larry Tesler, in Moggeridge (2007).

Overlapping windows, a key feature of most GUIs, emerged in the pioneering Smalltalk environment developed by Alan Kay's group at PARC (Kay, A., and Goldberg, A., 1976, Personal Dynamic Media, Xerox PARC Technical Report SSL-76-1). Early thoughts that led to the concept of personal dynamic media are found in Kay, Alan, "The Reactive Engine," Ph.D. dissertation, University of Utah, 1969. A comprehensive first-person account of the development of Smalltalk is Kay, A. (1993), "The Early History of Smalltalk," *ACM Sigplan Notices* 28(3). See also two recent publications: Barnes, S. (2007), "Alan Kay: Transforming the Computer into a Communications Medium," *IEEE Annals of the History of Computing* 29(2), April-June; and Maxwell, J. (2007), "Tracing the Dynabook: A

Study of Technocultural Transformations," Ph.D. dissertation, Simon Fraser University, and <http://thinkubator.ccsf.sfu.ca/Dynabook/>, which provides many links to relevant sources.

A good single source on the Xerox Star is Johnson, J., Roberts, T.L., Verplank, W., Smith, D.C., Irby, C.H., Beard, M., and Mackey, K. (1989), *IEEE Computer* 22(9). Case Study D in Baecker and Buxton (1987) lists almost 40 other sources.

A good journalistic account of the development of the Apple Macintosh is Levy, S. (1994), *Insanely Great: The Life and Times of Macintosh, the Computer that Changed Everything*, Penguin Books. 118 stories about the development of the Macintosh and the people who created it are at <http://www.folklore.org/index.py>.

PART FIVE: GRAPHIC DESIGN AND INDUSTRIAL DESIGN IN INTERACTION DESIGN

To my knowledge, Aaron Marcus is the first graphic designer to commit himself to a career in interaction design. A pioneering early article applying graphic design expertise to the design of a page layout system is Marcus, A. (1971), "A Prototype Computerized Page-Design System," *Visible Language* V(3), Summer 1971. Aaron began teaching tutorials on the subject in 1980 and established the design firm Aaron Marcus and Associates in 1982. Good interviews with Aaron are found at http://www.informationdesign.org/special/marcus_interview.php and http://www.amanda.com/resources/webword/webword_marcus.html.

An excellent history of Apple covering the development of the Apple II is Malone, M.S. (1999), *Infinite Loop: How Apple, the World's Most Insanely Great Computer Company, Went Insane*, Currency Doubleday. Pages 122-123 discuss the roles of industrial designer Jerry Manock in developing the case for the Apple II and art director Rob Janov in developing a new Apple logo. See also <http://apple2history.org/>.

Levy (1984), Chapter 6, discusses the roles of Manock and graphic designer Susan Hare in developing the Macintosh. Interesting debates involving Steve Jobs and key designers and developers about whether the Mac should be more like a Beetle, a Ferrari, a Porsche, or a Cuisinart are documented in http://www.folklore.org/StoryView.py?project=Macintosh&story=More_Like_A_Porsche.txt. Beginning with work on statistical graphics in the mid-'70s, Edward Tufte has emerged as the preeminent information designer, setting standards for elegant design tailored to cognitive tasks such as understanding causality, comparison, and the effects of multiple variables on complex phenomena. A thoughtful and comprehensive interview with Tufte is Zachary, M. and Thrall, C. (2004), "An Interview with Edward Tufte," *Technical Communication* 13(4). See <http://www.edwardtufte.com/tufte/> for information about his four beautiful books, including the particularly influential first book, *The Visual Display of Quantitative Information*, 1983, 2001, Graphics Press.

PART SIX: USABILITY TESTING

The extensive usability testing in Star development is described in Bewley, W., Roberts, T., Schroit, D., and Verplank, W. (1983), "Human Factors Testing in the Design of Xerox's 8010 'Star' Office Workstation," *Proc. CHI '83*, 72-77. User testing of the Lisa conducted by Larry Tesler is described in Levy (1994) Chapter 4, and also in <http://www.folklore.org/StoryView>.

http://www.folklore.org/StoryView.py?project=Macintosh&story=Do_It.txt&sortOrder=Sort%20by%20Date&detail=medium&search=user%20testing.

Arguably the most influential industrial research group to develop principles of user-centered, iterative design was IBM Yorktown Heights. Lessons learned were summarized in Gould, J. and Lewis, C. (1985), "Designing for Usability: Design Principles and What Designers Think," *Communications of the ACM* 28(3). See also Gould, J. (1988), "How to Design Usable Systems," Chapter 35 of Helander, M. (Ed.), *Handbook of Human-Computer Interaction*, North-Holland.

Another important group was at DEC, see for example Whiteside, J., Bennett, J., and Holtzblatt, K. (1988), "Usability Engineering: Our Experience and Evolution," Chapter 36 of *Helander*. An excellent overview of the history and practice of usability engineering is Butler, K.A. (1996), "Usability Engineering Turns 10," *interactions*, Jan. 1996.

A seminal vision of an applied information-processing psychology of human-computer interfaces that could reduce the need for usability testing is Card, S.K., Moran, T.P., and Newell, A. (1983), *The Psychology of Human-Computer Interaction*, Erlbaum.

PART SEVEN: UNDERSTANDING WORKPLACE CONTEXT

An excellent review of sociotechnical design, including its origins at the Tavistock Institute founded in London in 1946 and its interactions with developments in Scandinavia, is Mumford, E. (2006), "The Story of Socio-technical Design: Reflections on its Successes, Failures, and Potential," *Information Systems Journal* 16. The Scandinavian approach to the design of computer-based systems is treated in depth in Floyd, C., Mehl, W.-M., Reisin, F.-M., Schmidt, G., and Wolf, G. (1989), "Out of Scandinavia: Alternative Approaches to Software Design and System Development," *Human-Computer Interaction* 4(4). See also Ehn, P. (1988), *Work-oriented Design of Computer Artifacts*, Lawrence Erlbaum, esp. Chapter 11.

Hiltzig (1999), Chapter 14, describes how designers of the Gypsy word processor grounded their work in interviews with editors at the Ginn publishing subsidiary of Xerox. Chapter 21 discusses how the Xerox Systems Science Lab based new office system designs on an understanding of how people do their work. A landmark achievement was the Ph.D. dissertation Suchman, L. (1987), *Plans and Situated Actions: The Problem of Human-Machine Communication*, Cambridge University Press, which applied ethnomethodological methods to the analysis of an expert help system.

PART EIGHT: TOWARDS A RICHER UNDERSTANDING OF THE HISTORY OF HCI

For the Welcome Trust, see <http://www.ucl.ac.uk/histmed/>. The Computer History Museum's website may be found at <http://www.digibarn.com/>. Most interesting is the Digibarn Computer Museum, with a website at <http://www.digibarn.com/>, that describes its "nonmuseum approach" to creating "a kind of 'memory palace' for the nerd-inclined [to] help ... piece together the amazing story of the invention of personal computing and Cyberspace."