Oostendorp, "The Questionable Impact of an Assisting Interface on Performance in Transfer Situations," *International Journal of Industrial Ergonomics*, 39, no. 3 (May 2009): 501–8.

- 28. Ibid.
- 29. Ibid.
- "Features: Query Suggestions," Google Web Search Help, undated, http://labs.google.com/suggestfaq.html.
- James A. Evans, "Electronic Publication and the Narrowing of Science and Scholarship," Science, 321 (July 18, 2008): 395–99.
- 32. Ibid.
- 33. Thomas Lord, "Tom Lord on Ritual, Knowledge and the Web," Rough Type blog. November 9, 2008, www.roughtype.com/archives/2008/11/tom_lord_on_rit.php.
- 34. Marc G. Berman, John Jonides, and Stephen Kaplan, "The Cognitive Benefits of Interacting with Nature," *Psychological Science*, 19, no. 12 (December 2008): 1207–12.
- 35. Carl Marziali, "Nobler Instincts Take Time," USC Web site, April 14, 2009. http://college.usc.edu/news/stories/547/nobler-instincts-take-time.
- 36. Mary Helen Immordino-Yang, Andrea McColl, Hanna Damasio, and Antonio Damasio, "Neural Correlates of Admiration and Compassion," Proceedings of the National Academy of Sciences, 106, no. 19 (May 12, 2009): 8021–26.
- 37. Marziali, "Nobler Instincts."
- 38. L. Gordon Crovitz, "Information Overload? Relax," Wall Street Journal. July 6, 2009.
- 39. Sam Anderson, "In Defense of Distraction," New York, May 25, 2009.
- 40. Tyler Cowen, Create Your Own Economy (New York: Dutton, 2009), 10.
- 41. Jamais Cascio, "Get Smarter," Atlantic, July/August 2009.
- Martin Heidegger, Discourse on Thinking (New York: Harper & Row, 1966),
 The italics are Heidegger's.
- Martin Heidegger, The Question Concerning Technology and Other Essays (New York: Harper & Row, 1977), 35.

Epilogue HUMAN ELEMENTS

 William Stewart, "Essays to Be Marked by 'Robots," Times Education Supplement, September 25, 2009.

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- Cowan, Nelson. Working Memory Capacity. Psychology Press, 2005.
- Doidge, Norman. The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Brain Science. Penguin, 2007.
- Dupuy, Jean-Pierre. On the Origins of Cognitive Science: The Mechanization of the Mind. MIT Press, 2009.
- Flynn, James R. What Is Intelligence? Beyond the Flynn Effect. Cambridge University Press, 2007.

 Golumbia, David. The Cultural Logic of Computation. Harvard University Press,
- James, William. The Principles of Psychology. Holt, 1890.
- Kandel, Eric R. In Search of Memory: The Emergence of a New Science of Mind. Norton, 2006.

Klingberg, Torkel. The Overflowing Brain: Information Overload and the Limits of Working Memory. Oxford University Press, 2008.

LeDoux, Joseph. Synaptic Self: How Our Brains Become Who We Are. Penguin, 2002.

Martensen, Robert L. The Brain Takes Shape: An Early History. Oxford University Press, 2004.

Schwartz, Jeffrey M., and Sharon Begley. The Mind and the Brain: Neuroplasticity and the Power of Mental Force. Harper Perennial, 2002.

Sweller, John., Instructional Design in Technical Areas. Australian Council for Educational Research, 1999.

Wexler, Bruce E. Brain and Culture: Neurobiology, Ideology, and Social Change. MIT Press, 2006.

Young, J. Z. Doubt and Certainty in Science: A Biologist's Reflections on the Brain. Oxford University Press, 1951.

THE HISTORY OF THE BOOK

Chappell, Warren. A Short History of the Printed Word. Knopf, 1970.

Diringer, David. The Hand-Produced Book. Philosophical Library, 1953.

Eisenstein, Elizabeth L. The Printing Press as an Agent of Change. Cambridge University Press, 1980. An abridged edition, with a useful afterword, has been published as The Printing Revolution in Early Modern Europe (Cambridge University Press, 2005).

Kilgour, Frederick G. The Evolution of the Book. Oxford University Press, 1998. Manguel, Alberto. A History of Reading. Viking, 1996.

Nunberg, Geoffrey, ed. *The Future of the Book*. University of California Press, 1996.

Saenger, Paul. Space between Words: The Origins of Silent Reading. Stanford University Press, 1997.

THE MIND OF THE READER

- Birkerts, Sven. The Gutenberg Elegies: The Fate of Reading in an Electronic Age. Faber and Faber, 1994.
- Dehaene, Stanislas. Reading in the Brain: The Science and Evolution of a Human Invention. Viking, 2009.
- Goody, Jack. The Interface between the Written and the Oral. Cambridge University Press, 1987.

Havelock, Eric. Preface to Plato. Harvard University Press, 1963.

Moss, Ann. Printed Commonplace-Books and the Structuring of Renaissance Thought. Oxford University Press, 1996.

Olson, David R. The World on Paper: The Conceptual and Cognitive Implications of Writing and Pagaina Carry

of Writing and Reading. Cambridge University Press, 1994.
Ong, Walter J. Orality and Literacy: The Technologizing of the Word. Routledge,

Wolf, Maryanne. Proust and the Squid: The Story and Science of the Reading Brain. Harper, 2007.

MAPS, CLOCKS, AND SUCH

Aitken, Hugh G. J. The Continuous Wave: Technology and American Radio, 1900–1932. Princeton University Press, 1985.

Harley, J. B., and David Woodward, eds. *The History of Cartography*, vol. 1. University of Chicago Press, 1987.

Headrick, Daniel R. When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700–1850. Oxford University Press, 2000.

Landes, David S. Revolution in Time: Clocks and the Making of the Modern World, rev. ed. Harvard University Press, 2000.

Robinson, Arthur H. Early Thematic Mapping in the History of Cartography. University of Chicago Press, 1982.

Thrower, Norman J. W. Maps and Civilization: Cartography in Culture and Society. University of Chicago Press, 2008.

Virga, Vincent, and the Library of Congress. Cartographia: Mapping Civilizations. Little, Brown, 2007.

TECHNOLOGY IN INTELLECTUAL HISTORY

Heidegger, Martin. The Question concerning Technology and Other Essays. Harper & Row, 1977. Heidegger's essay on technology was originally published in the collection Vorträge und Aufsätze in 1954.

Innis, Harold. The Bias of Communication. University of Toronto Press, 1951.

Kittler, Friedrich A. Gramophone, Film, Typewriter. Stanford University Press, 1999.

Marx, Leo. The Machine in the Garden: Technology and the Pastoral Ideal in America. Oxford University Press, 2000.

Oostendorp, "The Questionable Impact of an Assisting Interface on Performance in Transfer Situations," *International Journal of Industrial Ergonomics*, 39, no. 3 (May 2009): 501–8.

- 28. Ibid.
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- 32. Ibid.
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- Marc G. Berman, John Jonides, and Stephen Kaplan, "The Cognitive Benefits of Interacting with Nature," Psychological Science, 19, no. 12 (December 2008): 1207–12.
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- 36. Mary Helen Immordino-Yang, Andrea McColl, Hanna Damasio, and Antonio Damasio, "Neural Correlates of Admiration and Compassion," Proceedings of the National Academy of Sciences, 106, no. 19 (May 12, 2009). 8021–26.
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- µ1. Jamais Cascio, "Get Smarter," Atlantic, July/August 2009.
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Golumbia, David. *The Cultural Logic of Computation*. Harvard University Press, 2009.

James, William. The Principles of Psychology. Holt, 1890.

Kandel, Eric R. In Search of Memory: The Emergence of a New Science of Mind. Norton, 2006.

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Educational Research, 1999.

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Harley, J. B., and David Woodward, eds. The History of Cartography, vol. 1. University of Chicago Press, 1987.

Headrick, Daniel R. When Information Came of Age: Technologies of Knowledge in the Age of Reason and Revolution, 1700-1850. Oxford University Press,

Landes, David S. Revolution in Time: Clocks and the Making of the Modern World, rev. ed. Harvard University Press, 2000.

Robinson, Arthur H. Early Thematic Mapping in the History of Cartography. University of Chicago Press, 1982.

Thrower, Norman J. W. Maps and Civilization: Cartography in Culture and Society. University of Chicago Press, 2008.

Virga, Vincent, and the Library of Congress. Cartographia: Mapping Civilizations. Little, Brown, 2007.

TECHNOLOGY IN INTELLECTUAL HISTORY

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Innis, Harold. The Bias of Communication. University of Toronto Press, 1951.

Kittler, Friedrich A. Gramophone, Film, Typewriter. Stanford University Press,

Marx, Leo. The Machine in the Garden: Technology and the Pastoral Ideal in America. Oxford University Press, 2000.

- McLuhan, Marshall. The Gutenberg Galaxy: The Making of Typographic Man. University of Toronto Press, 1962.
- McLuhan, Marshall. Understanding Media: The Extensions of Man, critical ed Gingko, 2003.
- Mumford, Lewis. Technics and Civilization. Harcourt Brace, 1934.
- Postman, Neil. Technopoly: The Surrender of Culture to Technology. Vintage, 1993.

COMPUTERS, THE INTERNET, AND ARTIFICIAL INTELLIGENCE

- Baron, Naomi S. Always On: Language in an Online and Mobile World. Oxford University Press, 2008.
- Crystal, David. Language and the Internet, 2nd ed. Cambridge University Press, 2006.
- Dyson, George B. Darwin among the Machines: The Evolution of Global Intelligence. Addison-Wesley, 1997.
- Jackson, Maggie. Distracted: The Erosion of Attention and the Coming Dark Age. Prometheus, 2008.
- Kemeny, John G. Man and the Computer. Scribner, 1972.
- Levy, David M. Scrolling Forward: Making Sense of Documents in the Digital Age.
 Arcade, 2001.
- Von Neumann, John. *The Computer and the Brain*, 2nd ed. Yale University Press, 2000.
- Wiener, Norbert. The Human Use of Human Beings. Houghton Mifflin, 1950.
- Weizenbaum, Joseph. Computer Power and Human Reason: From Judgment to Calculation. Freeman, 1976.

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