

# SUGGESTIONS FOR FURTHER READING

## Chapter 1: Computation

Jack Copeland

- Barwise, J. and Etchemendy, J. 1993. *Turing's World: An Introduction to Computability Theory*. Stanford: CSLI. [The best introduction to Turing machines. Includes software for building and displaying your own Turing machines.]
- Boolos, G. S. and Jeffrey, R. C. 1980. *Computability and Logic*, 2nd ed. Cambridge: Cambridge University Press. [Offers a detailed mathematical treatment of the theory of computable functions, the *Entscheidungsproblem*, the halting problem, incompleteness, and much, much more.]
- Copeland, B. J. 1996. "The Church–Turing thesis." In E. Zalta, ed., *The Stanford Encyclopedia of Philosophy*, <<http://plato.stanford.edu>>.
2000. "Narrow versus wide mechanism, including a re-examination of Turing's views on the mind–machine issue." *Journal of Philosophy* 97: 5–32. Reprinted in M. Scheutz, ed., 2002. *Computationalism: New Directions*. Cambridge, MA: MIT Press. [Continues the discussion begun in the present chapter of the Church–Turing thesis and the limits of machines.]
2001. "Colossus and the dawning of the computer age." In M. Smith and R. Erskine, eds., 2001. *Action This Day*. London: Bantam. [The story of the birth of the electronic computer, from the top-secret code-breaking machines of the Second World War to the IBM 701.]
- Epstein, R. L. and Carnielli, W. A. 2000. *Computability: Computable Functions, Logic, and the Foundations of Mathematics*, 2nd ed. Belmont, CA: Wadsworth. [A very readable, if sometimes technical, tour of the theory of computable functions and its connections with logic, philosophy, and the foundations of mathematics.]
- Floridi, L. 1999. *Philosophy and Computing: An Introduction*. London and New York: Routledge. [Contains among other things a clear introduction to the Church–Turing thesis based on Copeland 1996.]
- Sieg, W. 1999. "Hilbert's programs: 1917–1922." *Bulletin of Symbolic Logic* 5: 1–44. [A rewarding, if demanding, examination of Hilbert's thought.]
- Sipser, M. 1997. *Introduction to the Theory of Computation*. Boston: PWS Publishing. [Good introduction to automata theory, computability theory, and complexity theory.]

## Chapter 2: Complexity

Alasdair Urquhart

- Garey, M. R. and Johnson, D. S. 1979. *Computers and Intractability: A Guide to the Theory of NP-completeness*. San Francisco: Freeman. [This well-known text contains a very readable introduction to the theory of NP-completeness, as well as an extensive list of NP-complete problems from many areas.]
- Li, M. and Vitányi, P. 1997. *An introduction to Kolmogorov Complexity and its Applications*. New York: Springer-Verlag. [The basic textbook on this fascinating theory; it contains detailed technical developments as well as more discursive material on the general notion of complexity.]
- Papadimitriou, C. 1994. *Computational Complexity*. Reading, MA: Addison-Wesley. [A clearly written

textbook giving the basic definitions and results of complexity theory; unusual for its strongly logical orientation.]

Parberry, I. 1994. "Circuit complexity and neural networks." Cambridge, MA: MIT Press. [The first chapter is an excellent nontechnical discussion of the Chinese-room thought experiment from a complexity-theoretic point of view. The remainder of the book is a more technical, but accessible, discussion of the problem of scaling in neural network theory.]

Stockmeyer, L. 1987. "Classifying the computational complexity of problems." *Journal of Symbolic Logic* 52: 1–43. [A very informative survey article.]

Van Leeuwen, J., ed. 1990. *Handbook of Theoretical Computer Science*, volume A: *Algorithms and Complexity*. Amsterdam: Elsevier. [A collection of detailed survey articles by leading researchers covering many topics, including parallel complexity and cryptology.]

### **Chapter 3: System: An Introduction to System Science**

Klaus Mainzer

Abarbanel, H. D. I. 1996. *Analysis of Observed Chaotic Data*. New York: Springer. [Basic textbook on time-series analysis: graduate level.]

Birkhoff, G. 1927. *Dynamical Systems*. Providence, RI: American Mathematical Science Publication [Basic textbook on mathematical dynamical systems: graduate level.]

Chaitin, G. J. 1988. *Algorithmic Information Theory*. Cambridge: Cambridge University Press. [Introduction to algorithmic systems theory: undergraduate level.]

Chen, C. T. 1984. *Linear System Theory and Design*. New York: Holt, Rinehart, & Winston. [Physics textbook on linear systems science: graduate level.]

Franklin, G. F, Powell, J. D, and Emami-Naeini, A. 1994. *Feedback Control of Dynamic Systems*. Reading, MA: Addison-Wesley. [Methods of feedback control: graduate level.]

Goodwin, R. M. 1992. *Chaotic Economic Dynamics*. New York: Oxford University Press. [Introduction to chaotic economic dynamics: undergraduate level.]

Haken, H. 1983. *Advanced Synergetics: Instability Hierarchies of Self-organizing Systems and Devices*. Berlin: Springer. [Textbook on advanced synergetics: graduate level.]  
and Mikhailov, A. eds. 1993. *Interdisciplinary Approaches to Nonlinear Complex Systems*. Berlin: Springer. [Interdisciplinary survey of nonlinear complex systems: undergraduate level.]

Kailath, T. 1980. *Linear Systems*. Englewood Cliffs, NJ: Prentice-Hall. [Physics textbook: graduate level.]

Kaplan, D. T. and Glass L. 1993. "Course-grained embeddings of time series: random Walkes, Gaussian random processes, and deterministic chaos." *Physica D* 64: 431–54. [Methods of time-series analysis: graduate level.]

Kauffman, S. A. 1993. *Origins of Order*. Oxford: Oxford University Press. [Popular introduction to the Santa Fe approach: undergraduate level.]

Klir, G. J. 1969. *The Approach to General Systems Theory*. New York: Van Nostrand Reinhold Co. [Survey of early systems science: undergraduate level.]

- Laszlo, E. ed. 1972. *The Relevance of General Systems Theory*. New York: George Braziller. [Historically important introduction to early systems science: undergraduate level.]
- Mainzer, K. 1999. *Computernetze und Virtuelle Realität*. Berlin: Springer. [Introduction to computational networks of the World Wide Web: undergraduate level.]
2001. "Computational intelligence." In UNESCO, ed., *Encyclopedia of Life Support Systems*. Oxford: Encyclopedia of Life Support Systems (EOLSS) Publishers. [Introduction to computational intelligence: undergraduate level.]
- ed. 1999. *Komplexe Systeme und Nichtlineare Dynamik in Natur und Gesellschaft*. Berlin: Springer. [Interdisciplinary survey of complex systems and nonlinear dynamics in nature and society: undergraduate level.]
- Müller, A., and Saltzer, W., eds. 1997. *From Simplicity to Complexity: Information, Interaction, and Emergence*. Braunschweig: Vieweg. [Interdisciplinary and philosophical survey on complex systems: undergraduate level.]
- Nakamura, E. R., ed. 1997. *Complexity and Diversity*. Tokyo: Springer. [Interdisciplinary survey of complex systems: undergraduate level.]
- Nicolis, G. and Prigogine, I. 1977. *Self-Organization in Non-Equilibrium Systems*. New York: Wiley. [Basic textbook on non-equilibrium systems: graduate level.]
- Petit, L. and Vulpiani, A., eds. 1988. *Measures of Complexity*. Berlin: Springer. [Survey of mathematical methods: graduate level.]
- Tufillaro, N. B., Abbott, T., and Reilly, J. 1992. *An Experimental Approach to Nonlinear Dynamics and Chaos*. Reading, MA: Addison-Wesley. [Experimental introduction to nonlinear dynamics and chaos: undergraduate level.]
- Weisbuch, G. 1989. *Dynamique des systèmes complexes*. Paris: Inter Editions. [Basic textbook on mathematical complex systems: graduate level.]
- Zurek, W. H. 1989. "Thermodynamic cost of computation: algorithmic complexity and the information metric." *Nature* 341: 119–24. [Investigation of the connection between thermodynamic and algorithmic complexity: graduate level.]

## Chapter 4: Information

Luciano Floridi

- Armstrong, D. M. 1968. *A Materialist Theory of the Mind*. London: Routledge & Kegan Paul. [Interesting analysis of mind that uses the concept of information.]
- Brillouin, L. 1962. *Science and Information Theory*. New York: Academic Press. [Discusses the relation between information theory and physics; requires a solid mathematical background. Graduate level.]
- Buckland, M. 1991. "Information as thing." *Journal of the American Society of Information Science* 42(5): 351–60. [Discusses the concept of information as hypostatized entity. Undergraduate level.]
- Campbell, J. 1983. *Grammatical Man: Information, Entropy, Language, and Life*. London: Allan Lane. [Introductory; undergraduate level.]

Checkland, P. B. and Scholes, J. 1990. *Soft Systems Methodology in Action*. New York: John Wiley & Sons. [Standard reference for the data + meaning analysis of information. Undergraduate level.]

Dennett, D. C. 1969. *Content and Consciousness*. New York: Humanities Press. [One of the first attempts to use the concept of information in the philosophy of mind.]

Newman, J. 2001. "Some observations on the semantics of 'information.'" *Information Systems Frontiers* 3(2): 155–67. [Very useful and accessible review of some approaches to information theory and the analysis of semantic information. Undergraduate level.]

Rényi, A. 1987. *A Diary on Information Theory*. New York: Chichester, Wiley. [Introduces information theory and discusses some of its conceptual implications. Graduate level.]

Sayre, K. M. 1976. *Cybernetics and the Philosophy of Mind*. London: Routledge & Kegan Paul. [Defends naturalism on the basis of information theory.]

1986. "Intentionality and information processing: an alternative model for cognitive science." *Behavioral and Brain Sciences* 9: 121–65. [Develops a theory of intentionality on the basis of information theory.]

Siegfried, T. 2000. *The Bit and the Pendulum: From Quantum Computing to M Theory – The New Physics of Information*. New York: Chichester, Wiley. [Very accessible account of some of the problems in the physics of information. Undergraduate level.]

Szaniawski K. 1998 [1984]. *On Science, Inference, Information and Decision Making: Selected Essays in the Philosophy of Science*, eds. A. Chmielewski and J. Wolenski. Dordrecht: Kluwer. [Contains several essays on the philosophy of information, often undergraduate level.]

UTI: the Unified Theory of Information website, contains documents and links about the development of UTI: <<http://kaneda.iguw.tuwien.ac.at/uti/uti4/index.html>>.

## Chapter 5: Computer Ethics

Deborah G. Johnson

Baird, R. M., Ramsower, R., and Rosenbaum, S. E., eds. 2000. *Cyberethics*. Amherst, NY: Prometheus Books. [An anthology of readings including many classic papers in computer ethics, as well as more current work by philosophers and scholars in other disciplines; covers the moral landscape in cyberspace, privacy, property rights, and issues of community and citizenship in democracies.]

Bennett, C. J. and Grant, R. 1999. *Visions of Privacy: Policy Choices for the Digital Age*. University of Toronto Press. [An anthology of readings that cover a wide range of policy approaches for protecting privacy. The volume is not intended to be philosophical but presents the most current policy discussion.]

Brey, P. 2000. "Method in computer ethics: towards a multi-level interdisciplinary approach." *Ethics and Information Technology* 2(2): 125–9. [Argues for a method in computer ethics called disclosive computer ethics. This method aims at uncovering the embedded normativity in computer systems, applications, and practices.]

DeCew, J. W. 1997. *The Pursuit of Privacy: Law, Ethics, and the Rise of Technology*. Ithaca, NY:

Cornell University Press. [Presents an intricate philosophical analysis of privacy. Covers privacy in a wide variety of contexts, not just computers. DeCew argues that privacy has fundamental value because it allows us to create ourselves as individuals, offering us freedom from judgment, scrutiny, and the pressure to conform.]

Floridi, L. and Sanders, J. W. 2001. "Artificial evil and the foundation of computer ethics." *Ethics and Information Technology* 3(1): 55–66. [The authors argue for a new class of evils – artificial evil – based on autonomous agents in cyberspace. Artificial evil complements our notions of moral evil and natural evil. A consequence of recognizing this form of evil is that it clarifies debate over the uniqueness of computer ethics.]

Goodman, K. 1998. *Ethics, Computing, and Medicine: Informatics and the Transformation of Health Care*. Cambridge: Cambridge University Press. [An anthology of readings that try to bring together three areas of inquiry – ethics, computing, and medicine. While the quality of chapters varies, this is a good first attempt to bring together these areas.]

Graham, G. 1999. *The Internet: A Philosophical Inquiry*. New York: Routledge. [An important philosopher assesses the potential significance of the internet. Graham asks and answers questions about how radically transformative the internet will be, how it will affect democracy and community, how significant virtual reality will be, and so on. He draws modest conclusions.]

Hester, D. M. and Ford, P. J., eds. 2001. *Computers and Ethics in the Cyberage*. Upper Saddle River, NJ: Prentice Hall. [An anthology of readings covering a wide range of topics oriented more towards values than ethics; includes works by philosophers as well as excerpts from the popular press. Divided into four sections: Technology, Computers, and Values; Computers and the Quality of Life; Uses, Abuses, and Social Consequences; and Evolving Computer Technologies.]

Johnson, D. G. 2001. *Computer Ethics*, 3rd ed. Upper Saddle River, NJ: Prentice Hall. [This popular textbook provides a good introduction to the field. It explains, in very easily understood prose, the core ethical issues surrounding computers and information technology. The most recent edition includes two chapters on the internet.]

and Nissenbaum, H., eds. 1995. *Computers, Ethics and Social Values*. Englewood Cliffs, NJ: Prentice Hall. [This anthology of readings on core issues in computer ethics includes many classic pieces; provides some hardcore philosophical works as background pieces; and includes works by scholars in many disciplines. Each chapter begins with a case study.]

Langford, D., ed. 2000. *Internet Ethics*. London/New York: Macmillan Press/St. Martin's Press, 2000. [This book includes 10 chapters written by different authors and focused on a wide range of issues around the internet, including the technology itself, law, privacy, moral wrongdoing, democratic values, and professional ethics. A unique feature of this volume is that at the end of each chapter there are commentaries by individuals from different countries.]

*Metaphilosophy* 16(4) (1985). [Special issue on computer ethics.]

Nissenbaum, H. 1995. "Should I copy my neighbor's software." In D. G. Johnson and H. Nissenbaum, eds., *Computers, Ethics, and Social Values*. Englewood Cliffs, NJ: Prentice Hall. [This is a classic piece on the ethics of software copying. Nissenbaum argues that it can sometimes be wrong not to copy software.]

Spinello, R. 2000. *Cyberethics: Morality and Law in Cyberspace*. Sudbury, MA: Jones & Bartlett Publishers. [This volume is focused on the use of communication and information networks (the internet). Its aim is to review social costs and moral problems of the technology. Chapters cover governing and regulating the internet; free speech and content control; intellectual property; privacy; and, security.]

and Tavani, Herman T., eds. 2001. *Readings in CyberEthics*. Sudbury, MA: Jones & Bartlett Publishers. [An anthology of readings focused on the standard issues in computer ethics but with heavy emphasis on the issues surrounding the internet; includes works by important philosophers working in the field. This is arguably the most current anthology.]

Tavani, H. 1999. "Information privacy, data mining, and the Internet." *Ethics and Information Technology* 1(2): 137–45. [One of several articles by Tavani on the ethical issues surrounding data mining. In this piece Tavani asks what data mining is, discusses how it raises privacy concerns, asks how data mining differs from traditional data retrieval techniques in the issues it raises, and how data mining from the internet differs from other kinds of data mining.]

Van den Hoven, J. 1998. *Proceedings of the Conference on Computer Ethics: Philosophical Enquiry (CEPE97)*. Rotterdam, the Netherlands: Erasmus University Press. [This volume is the proceedings of one of the first philosophically oriented European conferences on computer ethics. It includes pieces by important scholars in the field, pieces that have been widely cited and republished elsewhere.]

Vedder, A. 1999. "KDD: the challenge to individualism." *Ethics and Information Technology* 1(4): 275–81. [Vedder provides an analysis of the ethical implications of knowledge discovery in databases (KDD) tools. He argues that KDD is problematic because it facilitates and encourages the judging and treating of persons on the basis of group characteristics instead of on the basis of individual characteristics and merits.]

Wallace, K. A. 1999. "Anonymity." *Ethics and Information Technology* 1(1): 23–35. [Wallace provides a rigorous analysis of the notion of anonymity, arguing that it is noncoordinatability of traits in a given respect. She uses this account to explain different ways that anonymity can be achieved in different contexts.]

Weckert, J. and Adeney, D. 1997. *Computer and Information Ethics*. Westport, CT: Greenwood Press. [This volume is organized from the perspective of computers considered as information-processing machines. It includes chapters focused on processing and transfer of information (freedom, censorship, and intellectual property); chapters on the information generated by computers (responsibility and what computers should not do); chapters focused on the environment created by computers (quality of work and virtual reality); and a final chapter on the nature of computers.]

## **Chapter 7: Internet Culture**

Wesley Cooper

Levy, S. 1984. *Hackers: Heroes of the Computer Revolution*. New York: Dell. [For the educated public. He brings to life the early computer culture on the East Coast of the USA, especially MIT.]

Raymond, Eric. 2001. *The Cathedral and the Bazaar*. Sebastopol, CA: O'Reilly. [For the educated public. He takes up the story where Levy leaves off, with emphasis on the Open Source initiative.]

Dibbell, Julian. 1999. *My Tiny Life: Crime and Passion in a Virtual World*. New York: Holt, Rinehart & Winston. [For the educated public. This brings to life the multi-user dungeon (MUD) subculture, with specific reference to LambdaMOO; it includes his tiny classic essay for the *Village Voice* about a rape in cyberspace.]

Butler, Judith. 1997. *Excitable Speech: A Politics of the Performance*. New York and London:

Routledge. [For graduates. She takes over, in effect, where Dibbell leaves off, taking issues about “speech acts” deep into feminist theory.]

## **Chapter 8: Digital Art**

Dominic McIver Lopes

Cubitt, S. 1998. *Digital Aesthetics*. London: Sage. [A heady account of digital art and its cultural impact by an art and media theorist.]

Davis, D. S. 1988. *Computer Applications in Music: A Bibliography*. Madison, WI: A-R Editions.

1992. *Computer applications in music: a bibliography*. Supplement 1. Madison, WI: A-R Editions.

Douven, I. 1999. “Style and supervenience.” *British Journal of Aesthetics* 39: 255–62. [A rigorous critique of the claim that computers can imitate artistic styles.]

Druckrey, T. 1996. *Electronic Culture: Technology and Visual Representation*. New York: Aperture. [A collection of essays exploring the aesthetic and cultural consequences of photography's displacement by digital imaging.]

Fisher, S. 2000. “Architectural notation and computer-aided design.” *Journal of Aesthetics and Art Criticism* 58: 273–89. [Argues that CAD systems provide architecture with a notation that defines the essential features of an architectural work.]

Lunenfeld, P., ed. 1999. *The Digital Dialectic: New Essays on New Media*. Cambridge, MA: MIT Press. [A recent collection of essays on digital art from the perspectives of media theory and cultural studies. Contains an extensive bibliography.]

Mealing, S., ed. 1997. *Computers and Art*. Exeter: Intellect. [A widely-read collection of essays on digital imaging by art historians and art theorists.]

Rowe, R. 1993. *Interactive Music Systems: Machine Listening and Computing*. Cambridge, MA: MIT Press. [An excellent overview of systems designed to parse and compose music.]

## **Chapter 9: The Philosophy of AI and its Critique**

James H. Fetzer

Boden, M. A., ed. 1990. *The Philosophy of Artificial Intelligence*. Oxford and New York: Oxford University Press. [Papers on the principal philosophical-methodological disputes within AI, including a comprehensive bibliography. Intermediate.]

Churchland, P. M. 1990. *A Neurocomputational Perspective: The Nature of Mind and the Structure of Science*. Cambridge, MA: MIT Press. [A defense of an approach to connectionism applied to philosophical problems. Intermediate.]

Clark, A. 1989. *Microcognition: Philosophy, Cognitive Science, and Parallel Distributed Processing*. Cambridge, MA: MIT Press. [An introduction to connectionism with a discussion of its relations to classical AI and of the role of folk psychology within cognitive science. Introductory to intermediate.]

1993. *Associative Engines: Connectionism, Concepts, and Representational Change*. Cambridge, MA: MIT Press. [A more advanced discussion of connectionism in both philosophy and psychology. Intermediate to advanced.]
- Cliff, D., Harvey, I., and Husbands, P. 1993. "Explorations in evolutionary robotics." *Adapted Behavior* 2: 73–110. [A survey of work on robot design. Intermediate.]
- Copeland J. 1993. *Artificial Intelligence: A Philosophical Introduction*. Oxford: Blackwell. [An introduction to AI with a different take on the Turing test and its philosophical significance, among other issues. Introductory to intermediate.]
- Deacon, T. 1997. *The Symbolic Species: The Co-evolution of Language and the Human Brain*. London: Penguin. [A fascinating study employing Peirce's theory of signs to shed light on the evolution of species. Intermediate.]
- Feigenbaum, E. A. and Feldman, J., eds. 1963. *Computers and Thought*. New York: McGraw-Hill. [Classic papers in AI with an extensive bibliography. Intermediate.]
- Fetzer, J. H. 2001. *Computers and Cognition: Why Minds Are Not Machines*. Dordrecht, the Netherlands: Kluwer Academic Publishers. [Essays on the nature of computers, minds, consciousness, and cognition. Intermediate to advanced.]
- Floridi, L. 1999. *Philosophy and Computing*. London: Routledge. [An introduction to "light AI" as well as to the philosophy of information. Introductory.]
- Gillies, D. 1996. *Artificial Intelligence and Scientific Method*. Oxford: Oxford University Press. [Explores logical ramifications of AI research. Intermediate.]
- Millican, P. and Clark, A., eds. 1999. *Machines and Thought: The Legacy of Alan Turing*. New York: Oxford University Press. [A collection of essays that explore the importance of Turing's work for contemporary AI. Intermediate.]
- Rich, E. and Knight, K. 1991. *Artificial Intelligence*, 2nd ed. New York: McGraw-Hill. [A comprehensive textbook that details various methods in AI. Intermediate.]
- van Gelder, T. 1995. "What is cognition, if not computation?" *Journal of Philosophy* 91. [A defense of dynamical systems as opposed to computation as a more suitable foundation for understanding the nature of mental processes. Intermediate.]
- Varela, F. J., Thompson E., and Rosch, E. 1991. *The Embodied Mind: Cognitive Science and Human Experience*. Cambridge, MA: MIT Press. [A defense of embodiment and embeddedness in a non-Cartesian cognitive science framework. Intermediate.]
- von Eckhardt, B. 1992. *What is Cognitive Science?* Cambridge, MA: MIT Press. [A spirited defense of computational conceptions that takes for granted that cognition can be defined as computation across representations. Intermediate.]

## **Chapter 10: Computationalism, Connectionism, and the Philosophy of Mind**

Brian P. McLaughlin

- Bechtel, W. 1994. "Connectionism." In Guttenplan 1994. [An introduction to connectionism. Accessible to advanced undergraduates.]



- and Graham, G. 1998. *A Companion to Cognitive Science*. Oxford: Blackwell. [Contains a number of chapters addressing topics relative to this chapter. Accessible to undergraduates.]
- Block, N. and Rey, G. 1997. "Mind, computational theories of." In E. Craig, ed., *The Routledge Encyclopedia of Philosophy*. New York and London: Routledge. [A brief introduction to the computational theory of mind. Accessible to advanced undergraduates.]
- Clark, A. 1989. *Microcognition*. Cambridge, MA: MIT/Bradford. [A discussion of philosophical issues surrounding connectionism. Accessible to advanced undergraduates.]
1993. *Associative Engines: Connectionism, Concepts, and Representational Change*. Cambridge, MA: MIT/Bradford. [A sophisticated discussion of some results in connectionist modeling and some philosophical issues surround connectionism. Accessible to graduate students.]
2001. *Mindware: An Introduction to the Philosophy of Cognitive Science*. New York: Oxford University Press. [An introduction to the computational theory of mind, with an emphasis on the connectionist paradigm. Accessible to advanced undergraduates.]
- Crane, T. 1993. *The Mechanical Mind*. London: Penguin. [An introduction to the computational theory of mind. Accessible to undergraduates.]
- Dietrich, E. 1990. "Computationalism." *Social Epistemology* 4: 135–54.
- and Markman, A., eds. 2000. *Cognitive Dynamics: Conceptual Change in Humans and Machines*. Mahwah, NJ: Lawrence Erlbaum. [An excellent collection of essays about minds and machines. Accessible to advanced undergraduate students.]
- and Markman, A. 2000. "Cognitive dynamics: computation and representation regained." In Dietrich and Markmann 2000. [An essay defending the view that an account of cognition requires appeal to mental representations. Accessible to advanced undergraduates.]
- Guttenplan, S., ed. 1994. *A Companion to the Philosophy of Mind*. Oxford: Blackwell. [Contains a number of chapters relevant to topics covered in this article. Accessible to undergraduates.]
- Horgan, T. and Tienson, J. 1996. *Connectionism and the Philosophy of Psychology*. Cambridge, MA: MIT/Bradford. [An excellent defense of a dynamical systems approach to cognition. Accessible to graduate students.]
- Newell, A. 1980. "Physical symbol systems." *Cognitive Science* 4: 135–83. Repr. in J. Haugeland, ed., *Mind Design II*. Cambridge, MA: MIT/Bradford, 1997. [A classical paper in the symbolic paradigm. Accessible to undergraduates.]
- Ramsey, W., Stich, S., and Garon, J. 1990. "Connectionism, eliminativism, and the future of folk psychology." *Philosophical Perspectives* 4: 499–533. [Argues that connectionism cannot explain beliefs and other propositional attitudes and that this may be a reason for being an eliminativist about the propositional attitudes postulated by folk psychology. Accessible to advanced undergraduates.]
- Rey, G. 1997. *Contemporary Philosophy of Mind: A Contentiously Classical Approach*. Oxford: Blackwell. [A discussion of issues in the philosophy of mind from a symbolic perspective. Accessible to advanced undergraduates.]

## Chapter 11: Ontology

Barry Smith

<http://www.formalontology.it>

Hafner, Carole D. and Natalya, Fridman Noy. 1997. "The state of the art in ontology design: a survey and comparative review." *AI Magazine* (Fall): 53–74.

Mulligan, Kevin, ed. 1992. *Language, Truth and Ontology*. Philosophical Studies Series. Dordrecht/Boston/London: Kluwer.

Smith, Barry. 2002. "Ontology and information systems." *Stanford Encyclopedia of Philosophy*, <<http://plato.stanford.edu/>>.

ed. 1982. *Parts and Moments: Studies in Logic and Formal Ontology*. Munich: Philosophia.

Welty, Christopher and Smith, Barry, eds. 2001. *Formal Ontology in Information Systems: Proceedings of the Second International Conference (FOIS '01), October 17–19, Ogunquit, Maine*. New York: Association of Computing Machinery Press.

## Chapter 12: Virtual Reality

Derek Stanovsky

Ebo, B. 2001. *Cyberimperialism? Global Relations in the New Electronic Frontier*. Westport, CT: Praeger. [This anthology explores political, economic, and social issues arising from globalization and the internet.]

Hayles, N. K. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press. [Hayles' book examines the technological, cultural, and literary effects of virtual reality and information technology.]

Heim, M. 1998. *Virtual Realism*. Oxford: Oxford University Press. [In his book, Heim explores the tension between the utopian promises of virtual reality for freedom and democracy, and technophobic fears of the loss of reality and privacy.]

Holmes, D., ed. 1997. *Virtual Politics: Identity and Community in Cyberspace*. London: Sage. [This book provides an excellent collection of essays on the political, social, philosophical, and cultural implications of virtual reality. Articles of particular philosophical interest include Cathryn Vasseleu's "Virtual bodies/virtual worlds" and Chris Chesher's "The ontology of digital domains."]

Ihde, D. 2001. *Bodies in Technology*. Minneapolis: University of Minnesota Press. [This book provides a careful, philosophical exploration of the impact of technology, including the internet and virtual reality, on the meaning of the body.]

Jones, S. G., ed. 1997. *Virtual Culture: Identity and Communication in Cybersociety*. London: Sage. [This anthology collects essays exploring the cultural aspects of virtual communities, primarily from the standpoint of communications theory.]

Markley, R., ed. 1996. *Virtual Realities and their Discontents*. Baltimore: Johns Hopkins University Press. [A collection of essays focusing on the culture, theory, and literature surrounding virtual reality.]

McChesney, R. W., Wood, E. M., and Foster, J. B., eds. 1998. *Capitalism and the Information Age*:

*The Political Economy of the Global Communication Revolution*. New York: Monthly Review Press. [This book gathers critical essays on the intersection of capitalism with the internet and global information technology.]

Morse, M. 1998 *Virtualities: Television, Media Art, and Cyberculture*. Bloomington: University of Indiana Press. [This book discusses virtual reality from the perspective of mass media theory.]

Porter, D., ed. 1997. *Internet Culture*. New York: Routledge. [This collection includes sections on virtual communities and virtual bodies as well as other aspects of virtual culture and the internet.]

Shields, R., ed. 1996. *Cultures of Internet: Virtual Spaces, Real Histories, Living Bodies*. London: Sage. [This edited anthology brings together a selection of articles on critical social theory and the internet. Ken Hillis's "A geography of the eye: the technologies of virtual reality" and Mark Lajoie's "Psychoanalysis and cyberspace" are of particular philosophical interest and relevance.]

Zhai, P. 1998. *Get Real: A Philosophical Adventure in Virtual Reality*. Lanham, MD: Rowman & Littlefield. [A lively, and optimistic, book on the metaphysical and social possibilities of virtual reality.]

## **Chapter 13: The Physics of Information**

Eric Steinhart

Chopard, B. and Droz, M. 1998. *Cellular Automata Modeling of Physical Systems*. New York: Cambridge University Press. [An advanced text that discusses the use of CAs in many aspects of physical theory.]

Cleland, C. 1993. "Is the Church-Turing thesis true?" *Minds & Machines* 3: 283–312. [Examines the relation between Turing machines and their physical realizations.]

Landauer, R. and Bennett, C. H. 1985. "The fundamental physical limits of computation." *Scientific American* (July): 48–56. [Discusses computation as a physical process.]

Steinhart, E. 1998. "Digital metaphysics." In T. Bynum and J. Moor, eds., *The Digital Phoenix: How Computers are Changing Philosophy*. Oxford: Blackwell, pp. 117–34. [An analysis of the thesis that nature is finitely recursive, with an extensive bibliography on finitely recursive physics.]

Wolf-Gladrow, D. 2000. *Lattice-gas Cellular Automata and Lattice Boltzmann Models: An Introduction*. Lecture notes in mathematics vol. 1725. New York: Springer-Verlag.

Zurek, W. H., ed. 1990. *Complexity, Entropy, and the Physics of Information*. SFI Studies in the Sciences of Complexity, vol. VIII. Reading, MA: Addison-Wesley. [The classic work on the physics of information with many important essays.]

## Chapter 14: Cybernetics

Roberto Cordeschi

Boden, M. A. 1978. *Purposive Explanation in Psychology*. Brighton: Harvester, Hassocks. [An original investigation of the issues concerning teleological explanation, from McDougall to cybernetics and early AI.]

Cohen, J. 1966. *Human Robots in Myth and Science*. New York: Allen & Unwin. [A synthesis of the evolution of the machines that imitate organisms, from antiquity up to the advent of cybernetics.]

Cordeschi, R. 2001. *The Discovery of the Artificial*. Dordrecht, the Netherlands: Kluwer. [An investigation in the field of the models of mental life and their philosophical implications starting from research programs before cybernetics (Hull's robot approach, Thorndike's connectionism) up to the current developments in AI, neural networks, and new robotics.]

Feigl, Herbert. 1967. *The "Mental" and the "Physical": The Essay and a Postscript*. Minneapolis: University of Minnesota Press.

Heims, S.J. 1991. *The Cybernetics Group*. Cambridge, MA: MIT Press. [Cybernetics as it can be seen through the story of the famous Macy Conferences of Cybernetics.]

Hook, S., ed. 1960. *Dimensions of Mind*. New York: Collier Books. [A reading including classical articles by Feigl, Putnam, McCulloch, and others that demonstrate the influence of cybernetics and Turing-machine functionalism on the debate regarding the mind-body problem.]

Nolfi, S. and Floreano, D. 2000. *Evolutionary Robotics*. Cambridge, MA: MIT Press. [An excellent survey of original investigations in evolutionary robotics.]

Waldrop, M. M. 1992. *Complexity*. Englewood Cliffs, NJ: Simon and Shuster. [A well-written popular introduction to the new trends in the research on complexity and self-organization.]

### URLs:

*Principia Cybernetica Web*: <<http://pespmc1.vub.ac.be/DEFAULT.html>>.

This is the most comprehensive website on cybernetics. It includes links, bibliographies, biographies of the people working in the field, issues and topics from classical cybernetics up to constructivism, second cybernetics, systems theory, complexity, and self-organization.

*The Cybernetics Society*: <<http://www.cybsoc.org/index.htm>>.

The website of the UK national learned society and professional body promoting pure and applied cybernetics. It includes a section with articles and pages dealing with several cybernetic topics.

*Kybernetes: Journal Homepage*: <<http://www.mcb.co.uk/k.htm>>.

The website of an international journal of systems and cybernetics. It includes links to related sites, sample of published articles, tables of contents, and abstracts.

## Chapter 15: Artificial Life

Mark A. Bedau

### *Artificial Life.*

The primary journal for artificial-life research, published quarterly since 1994 by MIT Press.

Adami, C. 1998. *Introduction to Artificial Life*. New York: Springer. [An introduction to how a physicist might approach issues in artificial life. Includes a CD containing software for a derivative of Ray's Tierra (Ray 1992). Advanced undergraduate or graduate level.]

Bedau, M. A. 1998. "Philosophical content and method of artificial life." In T. W. Bynum and J. H. Moor, eds., *The Digital Phoenix: How Computers are Changing Philosophy*. Oxford: Blackwell, pp. 135–52. [An introductory explanation of the impact of artificial life on the content and method of philosophy. Discusses emergence, the supple dynamics of mental states, and evolutionary progress. For postsecondary school audiences.]

Bedau, M. A., McCaskill, J. S., Packard, N. H., and Rasmussen, S., eds. 2000. *Artificial Life VII*. Cambridge: MIT Press. [Proceedings of the seventh international artificial life conference, containing 65 papers spanning the whole field. For postgraduate audiences.]

Boden, M., ed. 1996. *The Philosophy of Artificial Life*. Oxford: Oxford University Press. [A collection of articles on philosophical issues involving artificial life. Level of discussion varies, but generally for postsecondary school audiences.]

Clark, Andy. 2001. *Mindware: An Introduction to the Philosophy of Cognitive Science*. New York: Oxford University Press. [Chapter 6, "Robots and artificial life," illustrates robotic work in artificial life and explores the implications of artificial life for representationalism, emergence, and the nature of life and mind. For a general audience.]

Emmeche, C. 1994. *The Garden in the Machine: The Emerging Science of Artificial Life*. Princeton: Princeton University Press. [An introduction to artificial life and some of its philosophical implications. Accessible to a general audience.]

Farmer, J. D., Lapedes, A., Packard, N. H., and Wendroff, B., eds. 1986. *Evolution, Games, and Learning: Models for Adaptation for Machines and Nature*. Amsterdam: North Holland. [Proceedings of what could be considered the first artificial life conference, but before the field was named. For postgraduate audiences.]

Floreano, D., Nicoud, J.-D., and Mondada, F., eds. 1999. *Advances in Artificial Life: 5th European Conference, ECAL '99*. Berlin: Springer. [Proceedings of the fifth European Conference on Artificial Life (ECAL), containing 90 technical papers. For postgraduate audiences.]

Holland, J. H. 1992. *Adaptation in Natural and Artificial Systems: An Introductory Analysis with Applications to Biology, Control, and Artificial Intelligence*, 2nd ed. Cambridge, MA: MIT Press. [An expanded edition of Holland's classic technical book on genetic algorithms. For postgraduate audiences.]

1995. *Hidden Order: How Adaptation Builds Complexity*. Reading: Helix Books. [A perspective on complex adaptive systems, by one of the founding fathers of artificial life. For a general audience.]

Langton, C. G., ed. 1995 *Artificial Life, An Overview*. Cambridge, MA: MIT Press. [Contains 17 scientific papers surveying many of the areas of artificial life, originally published as the three inaugural issues of the journal *Artificial Life*. For postsecondary school audiences.]

Taylor, C., Farmer, J. D., and Rasumssen, S., eds. 1992. *Artificial Life II*. Redwood City: Addison-Wesley. [Proceedings of the second international artificial life conference, containing

29 technical papers. Widely viewed as the best single collection of scientific work in artificial life to date. For postsecondary school audiences.]

Levy, S. 1992. *Artificial Life, the Quest for a New Creation*. New York: Pantheon. [A popular but scientifically respectable account of the origin of artificial life.]

Ray, T. S. 1992. "An approach to the synthesis of life." In Langton et al. 1992: 371–408. [The classic discussion of one of the best-known artificial-life models. For postsecondary school audiences.]

Varela, F. J. and Bourgine, P. 1992. *Towards a Practice of Autonomous Systems*. Cambridge, MA: MIT Press. [Proceedings of the first European conference on artificial life, containing 55 technical papers covering all aspects of the field. For postsecondary school audiences.]

## Chapter 16: Information and Content

Jonathan Cohen

Adams, F. 2000. "Fodor's asymmetrical causal dependency theory of meaning." In Nani, M. and Marraffa, M., editors, *A Field Guide to the Philosophy of Mind*, URL = <http://www.uniroma3.it/progetti/kant/field/>. [Adams gives a nice overview of the various versions of Fodor's proposal, and discusses the main objections to it as well as Fodor's replies.]

Aydede, M. 1997. "Has Fodor really changed his mind on narrow content?" *Mind and Language* 12(3/4): 422–58. [Aydede compares and contrasts several of Fodor's alternative formulations of the asymmetric dependence account.]

Dretske, F. 1983. Précis of *Knowledge and the Flow of Information*. *Behavioral and Brain Sciences* 6: 55–90. [This is Dretske's overview of his *Knowledge and the Flow of Information* (Cambridge, MA: MIT Press, 1981). It is followed by a number of brief critical comments by various authors and Dretske's replies.]

McLaughlin, B. 1987. "What is wrong with correlational psychosemantics." *Synthese* 70: 271–86. [McLaughlin raises objections against Stampe's, Fodor's, and Stalnaker's versions of optimal conditions theories.]

and Rey, G. 1998. "Semantics, informational." In E. Craig, ed., *The Routledge Encyclopedia of Philosophy*. Routledge, New York. [In addition to the theories discussed in my chapter, McLaughlin and Rey consider two-factor theories – those that construe the semantic value of expressions in terms of both a referential factor (given by an informational theory) and a sense factor (given by an inferential role theory).]

Stampe, D. 1990. "Content, context, and explanation." In E. Villanueva, ed., *Information, Semantics and Epistemology*. Oxford: Blackwell. [Stampe defends and elaborates his informational approach to content, setting it in the context of the explanatory questions he thinks it should answer. He argues that the theory does not suffer from the disjunction problem, contrary to what is claimed in Fodor's "Semantics, Wisconsin style," *Synthese* 59 (1984): 231–50.]

## Chapter 17: Knowledge

Fred Adams

- Adams, F. and Kline, D. 1987. "Nomic reliabilism: weak reliability is not enough." *Southern Journal of Philosophy* 25: 433–43. [Defends reliabilism as a theory of knowledge by arguing for a stronger form of reliabilism – a form where reliably formed beliefs are comparable to informationally sustained beliefs. For the mature student.]
- Audi, R. 1998. *Epistemology*. New York: Routledge. [Excellent and lucid treatment of most of the important issues of knowledge and justified belief. Relevant, up-to-date, and accessible to the beginner.]
- Benacerraf, P. 1973. "Mathematical truth." *Journal of Philosophy* 70: 661–80. [Landmark paper outlining the important challenges for explaining the possibility of mathematical knowledge, given no causal connection between our minds and mathematical objects. Not for beginners.]
- Bernecker, S. and Dretske, F., eds. 2000. *Knowledge: Readings in Contemporary Epistemology*. Oxford: Oxford University Press. [A collection of 41 articles suitable for philosophy undergraduates. Includes an extensive section (10 essays) on the externalism/internalism debate including Dretske's *Précis of Knowledge and the Flow of Information*.]
- Clay, M. and Lehrer, K., eds. 1989. *Knowledge and Skepticism*. Boulder, CO: Westview Press. [Collection of 9 essays on knowledge, skepticism, and justified belief. Accessible to the dedicated student.]
- DeRose, K. and Warfield, T., eds. 1999. *Skepticism: A Contemporary Reader*. Oxford: Oxford University Press. [Excellent collection of 15 papers on skepticism, knowledge and closure, and knowledge and relativism. Accessible.]
- Dretske, F. 1970. "Epistemic Operators." *Journal of Philosophy* 67: 1007–23. [Perhaps the first paper to deny that knowledge obeys deductive closure. Accessible.]
- Goldman, A. 1976. "Discrimination and perceptual knowledge." *The Journal of Philosophy* 73: 771–91. [Elegant and influential paper. Source of many famous examples in the literature, including the famous barn-façade examples. Accessible.]
- Harman, G. 1973. *Thought*. Princeton: Princeton University Press. [Philosophical classic giving many examples of problems that an adequate theory of knowledge must solve. Accessible.]
- Lycan, W. 1988. *Judgement and Justification*. Cambridge: Cambridge University Press. [Collection of essays by Lycan on issues in philosophy of mind and theory of knowledge. Five chapters are squarely on issues of knowledge, including problems for reliabilism and Lycan's own "epistemological explanationism" – where justification is a form of inference to the best explanation. Accessible.]
- Palmer, S. 1999. *Vision Science*. Cambridge, MA: MIT Press. [Excellent up-to-date survey of perceptual mechanisms and channel conditions necessary for visual, perceptual knowledge. Aimed at the science-oriented cognitive science student.]
- Plantinga, A. 1993. *Warrant and Proper Function*. Oxford: Oxford University Press. [Develops an account of warrant such that it is what, when added to justified true belief, converts into knowledge. For the advanced student.]
- Radford, C. 1966. "Knowledge – by examples." *Analysis* 27: 1–11. [Classic paper presenting examples designed to show that it is possible to know that *p* without belief that *p*. However, some would maintain (and I would agree) that a mental representation that *p* sufficient for knowledge is a belief that *p*. Accessible.]

- Sosa, E. and Kim, J., eds. 2000. *Epistemology: An Anthology*. Oxford: Blackwell. [Excellent collection of 43 contemporary essays on justification and knowledge. For the advanced student.]
- Stine, G. 1976. "Skepticism, relevant alternatives, and deductive closure." *Philosophical Studies* 29: 249–61. [This is an extremely influential and widely read paper on the topics of its title. Accessible.]
- Unger, P. 1975. *Ignorance: A Case for Scepticism*. Oxford: Oxford University Press. [An important, powerful, and sustained argument for skepticism. Accessible.]
1984. *Philosophical Relativity*. Minneapolis: University of Minnesota Press. [This book presents a change in view for Unger, away from skepticism and toward a kind of relativism. Accessible, but rigorous.]

## Chapter 18: The Philosophy of Computer Languages

Graham White

- Abelson, H., Sussman, G. J., and Sussman, J. 1996. *Structure and Interpretation of Computer Programs*, 2nd ed. Cambridge, MA: MIT Press. [An outstanding, and semantically aware, programming textbook, using the functional language scheme.]
- Dummett, Michael. 1991. *The Logical Basis of Metaphysics*. London: Duckworth. [A critical reconstruction of the Davidson–Dummett project.]
- Lambek, J. and Scott, P. J. 1986. *Introduction to Higher Order Categorical Logic*. Cambridge Studies in Advanced Mathematics no. 7. Cambridge: Cambridge University Press. [An introduction to category theory and higher-order intuitionist logic.]
- Longo, Giuseppe, ed. 1999. *Philosophy of Computer Science*. A special issue of *The Monist*, vol. 82, no. 1. [Philosophical articles on various aspects of modern computer science.]
- Stoy, Joseph E. 1977. *Denotational Semantics: The Scott–Strachey Approach to Programming Language Theory*. Cambridge, MA: MIT Press. [An "old-fashioned," but very solid, introduction to denotational semantics, together with an interesting historical introduction by Dana Scott.]
- Taylor, Paul. 1999. *Practical Foundations*. Cambridge Studies in Advanced Mathematics no. 59. Cambridge: Cambridge University Press. [A philosophically ambitious, category-theoretical account of the foundations of mathematics.]
- Tennent, R. D. 1994. "Denotational semantics." In S. Abramsky, D. M. Gabbay, and T. S. E. Maibaum, eds., *Handbook of Logic in Computer Science*, vol. 3. Oxford: Oxford University Press. [A good account of modern techniques in denotational semantics.]
- Wexelblat, Richard L., ed. 1981. *History of Programming Languages*. New York: Academic Press. From the ACM SIGPLAN History of Programming Languages Conference, June 1–3, 1978. [Proceedings of a conference on the history of programming languages, with contributions by those active in the field at the time. Fascinating, if occasionally lacking in perspective.]



## Chapter 19: Hypertext

Thierry Bardini

Aarseth, E. 1997. *Cybertext: Perspectives on Ergodic Literature*. Baltimore: Johns Hopkins Press. [In a provocative departure from the most basic assumptions of hypertext theory, Espen Aarseth proposes to include hypertext in the more generic notion of *cybertext*, that also includes computer games and other kinds of programs. The text that constitutes a cybertext is not "a chain of signifiers" in the linguistic sense, Aarseth explains, but "a whole range of phenomena, from short poems to complex computer programs and databases." In his subtitle, Aarseth introduces a second neologism, "ergodic," to qualify a work that requires labor from the reader to create a path in it. Taken together, these two conceptual innovations reopen the field of investigation and critique in a refreshing way. Undergraduates, graduates.]

Bolter, J. D. and Grusin, R. 1999. *Remediation: Understanding New Media*. Cambridge, MA: MIT Press. [This innovative book from two scholars in Georgia Tech's School of Literature, Communication, and Culture rejects the notion that the "new media" are fundamentally different from the media they seem to be replacing. Instead they claim that media borrow from and refashion (*remediate*) not only earlier media from which they are emerging but also the later media emerging from them. Undergraduates, graduates.]

Landow, G. P., ed. 1994. *Hyper/Text/Theory*. Baltimore: Johns Hopkins University Press. [An intelligible introduction to hypertext theory, this collection of 11 essays organized into three sections ("Nonlinearity," "The Politics of Hypertext," and "The New Writing") is the closest to a hypertext "reader." Especially interesting are George Landow's introductory essay ("What's a critic to do?: critical theory in the age of hypertext") and Espen Aarseth's contribution ("Nonlinearity and literary theory"), where Aarseth proposes to rethink textuality with the help of the notion of "cybertext." Undergraduates, graduates.]

Manovich, L. 2001. *The Language of New Media*. Cambridge, MA: MIT Press. [A far-reaching and stimulating contribution to the discourse surrounding new media, Lev Manovich's book focuses on both the logic of new media's aesthetic and the discourse that surrounds it. In his attempt to show how new media appropriate forms and conventions of previous art and communication media, his book especially stresses the influence of cinema's language, thus providing a crucial alternative to the literary model of most hypertext/hypermedia theory. Undergraduates, graduates.]

Schultz, E. 1990. *Dialogue at the Margin: Whorf, Bakhtin, and Linguistic Relativity*. Madison: University of Wisconsin Press. [A brilliant analysis of Whorf's work and legacy, and a convincing comparison with the work of Bakhtin that casts a new light on Whorf's ambiguities and "loopholes": it shows how the social context of Whorf's writings (including his readership) limited him to a weak formulation of his hypothesis that does not take into account the existence of *heteroglossia*. Advanced undergraduates, graduates.]

## Chapter 22: Game Theory: Nash Equilibrium

Cristina Bicchieri

(**Note:** references marked with one asterisk are readable by an undergraduate with some basic mathematical knowledge. Two asterisks mean the reader must have greater mathematical sophistication and/or some background knowledge in game theory.)

### An excellent game-theory textbook:

\*Osborne, M. J. and Rubinstein, A. 1994. *A Course in Game Theory*. Cambridge, MA: MIT Press.

### **On the epistemic problems encountered in eliminating weakly dominated strategies:**

- \*Harper, W. 1976. "Rational belief change, Popper functions, and counterfactuals." In W. Harper and C. Hooker, eds., *Foundations of Probability Theory, Statistical Inference, and Statistical Theories of Science*, vol. 1. D. Dordrecht: Reidel.
- \*McGee, V. 1994. "Learning the impossible." In E. Eells and B. Skyrms, eds., *Probability and Conditionals*. Cambridge: Cambridge University Press.

### **On reconciling elimination of weakly dominated strategies with Bayesian decision theory:**

- \*\*Blume, L., Brandenburger, A., and Dekel, E. 1991. "Lexicographic probabilities and choice under uncertainty." *Econometrica* 59: 61–79. [.]
- \*\*Stahl, D. 1995. "Lexicographic rationalizability and iterated admissibility." *Economic Letters* 47: 155–9.

### **On solving the problem of order of elimination of weakly dominated strategies:**

- \*\*Bicchieri, C. and Schulte, O. 1997. "Common reasoning about admissibility." *Erkenntnis* 45: 299–325.
- \*Harper, W. 1991. "Ratifiability and refinements." In M. Bacharach and S. Hurley, eds., *Foundations of Decision Theory*. Oxford: Blackwell.
- \*Moulin, H. 1986. *Game Theory for the Social Sciences*, 2nd ed. New York: New York University Press.
- \*Rochet, J.-C. 1980. "Selection of a unique equilibrium payoff for extensive games with perfect information." Mimeo, Université de Paris IX.

### **On formally representing players' reasoning in games:**

- \*\*Arlo-Costa, H. and Bicchieri, C. 1998. "Games and conditionals." In *Theoretical Aspects of Rationality and Knowledge*. Los Altos, CA: Morgan Kaufman.
- \*\*Aumann, R. 1995. "Backward induction and common knowledge of rationality." *Games and Economic Behavior* 8: 6–19.
- \*Bacharach, M. 1987. "A theory of rational decision in games." *Erkenntnis* 27: 17–55.
- \*\*Bicchieri, C. and Antonelli, A. 1995. "Game-theoretic axioms for local rationality and bounded knowledge." *Journal of Logic, Language and Information* 4: 145–67.
- \*\*Samet, D. 1996. "Hypothetical knowledge and games with perfect information." *Games and Economic Behavior* 17: 230–51.
- \*Skyrms, B. 1990. *The Dynamics of Rational Deliberation*. Cambridge, MA: Harvard University Press.
- \*\*Stalnaker, R. 1994. "On the evaluation of solution concepts." *Theory and Decision* 37: 49–73.

### **On the role of counterfactual reasoning in games:**

- \*Bicchieri, C. 1988. "Strategic behavior and counterfactuals." *Synthese* 76: 135–69.

- \*Harper, W. 1991. "Ratifiability and refinements." In M. Bacharach and S. Hurley, eds., *Foundations of Decision Theory*. Oxford: Blackwell.
- \*\*Samet, D. 1996. "Hypothetical knowledge and games with perfect information." *Games and Economic Behavior* 17: 230–51.
- \*Selten, R. and Leopold, U. 1982. "Subjunctive conditionals in decision and game theory." In W. Stegmüller, W. Balzer, and W. Spohn, eds., *Philosophy of Economics*. Berlin: Springer-Verlag.
- \*\*Skyrms, B. 1998. "Subjunctive conditionals and revealed preference." *Philosophy of Science* 65: 545–74.
- \*\*Stalnaker, R. 1994. "On the evaluation of solution concepts." *Theory and Decision* 37: 49–73.
- \*\*Stalnaker, R. 2000. "Knowledge, belief, and counterfactual reasoning in games." In C. Bicchieri et al., eds., *The Logic of Strategy*. New York: Oxford University Press.

## Chapter 23: Computing in the Philosophy of Science

Paul Thagard

- Artificial Intelligence*, 1997, vol. 91. Special issue on machine discovery. [Contains several state-of-the-art essays on AI models of discovery.]
- Darden, L. 1991. *Theory Change in Science: Strategies from Mendelian Genetics*. Oxford: Oxford University Press. [Philosophical discussion of scientific development inspired partly by AI.]
- Langley, P., Institute for the Study of Learning and Expertise website: <<http://newatlantis.isle.org/~langley/>>. [Contains many papers on machine learning and discovery.]
- Magnani, L., Nersessian, P., and Thagard, P., eds. 1999. *Model-based Reasoning in Scientific Discovery*. New York: Kluwer/Plenum. [A collection of articles on topics such as abduction and analogy.]
- Shrager, J. and Langley, P., eds. 1990. *Computational Models of Scientific Discovery and Theory Formation*. San Mateo: Morgan Kaufmann. [Contains descriptions of many computational approaches to discovery.]
- Thagard, P., Computational Epistemology Laboratory website: <<http://cogsci.uwaterloo.ca/>>. [Contains many articles on coherence models of scientific thinking, with software.]
- Valdés-Pérez, R., Scientific Discovery website: <<http://www.cs.cmu.edu/~sci-disc/>>. [Has many excellent articles on the engineering AI approach to machine discovery.]
- Zytkow, J. M., ed. 1997. *Machine Discovery*. Dordrecht: Kluwer. [Includes a survey article by Herbert Simon with critical discussion.]

## Chapter 24: Methodology of Computer Science

Timothy Colburn

Colburn, T. 2000. *Philosophy and Computer Science*. Armonk, NY: M. E. Sharpe. [Concerns the philosophical foundations of computer science and the contributions that philosophy and computer science can make to each other. Part III in particular concerns philosophical aspects of computer science methodology. For the introductory philosophy student.]

Fetzer, J., and Rankin, T., eds. 1993. *Program Verification: Fundamental Issues in Computer Science*. Studies in Cognitive Systems. Dordrecht, the Netherlands: Kluwer Academic Publishers. [An anthology of papers centering around the role of formal methods in computer science. Difficulty level varies.]

Cormen, T., Leiserson, C., Rivest, R., and Stein, C. 2001. *Introduction to Algorithms*, 2nd ed. Cambridge, MA: The MIT Press. [The definitive undergraduate text on algorithms and data structures. For the advanced computer science student.]

Gumb, R. 1989. *Programming Logics: An Introduction to Verification and Semantics*. New York: John Wiley and Sons. [An example of the focus on program verification from a formal mathematical point of view. For the advanced computer science student.]

Myers, G. 1979. *The Art of Software Testing*. New York: John Wiley and Sons. [An example of the focus on program verification from a program testing point of view. For the intermediate computer science student.]

Peeger, S. 2001. *Software Engineering: Theory and Practice*, 2nd ed. Upper Saddle River, NJ: Prentice-Hall. [An example of the current practice in software engineering methodology. For the advanced computer science student.]

## Chapter 25: Philosophy of Information Technology

Carl Mitcham

Cherry, C. 1957. *On Human Communication*. Cambridge, MA: MIT Press. [Good overview of attempts to apply information theory in disciplines as diverse as engineering and psychology.]

Floridi, L. 1999. *Philosophy and Computing: An Introduction*. New York: Routledge. [This is the most technically sophisticated and philosophically sensitive introduction that exists in the field.]

Hershock, P. D. 1999. *Reinventing the Wheel: A Buddhist Response to the Information Age*. Albany, NY: State University of New York Press. [Approaches the philosophy of information technology from a non-Western perspective.]

Ifrah, G. 2001. *The Universal History of Computing: From the Abacus to the Quantum Computer*, tr. E. F. Harding et al. New York: John Wiley. French original: *Histoire universelle des chiffres* (Paris: Editions Robert Laffont, 1994). [An insightful but mistitled book that provides a good philosophical history of writing systems, numerical notation, and the technological processing of information.]

Lubar, S. 1993. *Infoculture: The Smithsonian Book of Information Age Inventions*. Boston: Houghton Mifflin. [A narrative with pictures that grew out of the Smithsonian "Information Age" exhibit. Covers communication (words to telephones), entertainment (records through movies and radio to television), and computers.]

Mitcham, C. and Richardson, W. M., eds. 1999. *Science, Technology, and the Spiritual Quest*. Theme

issue of *Technology in Society* 21(4): 345–486. [See especially the contributions by Mark Weiser, Mitchell Marcus, Anne Foerst, Kevin Kelly, Jennifer Cobb, Henry Thompson, and Mark Pesce, all of whom explore the spiritual meaning of advanced information technologies.]

Winston, B. 1998. *Media Technology and Society: A History from the Telegraph to the Internet*. New York: Routledge. [Good supplement to Cherry 1957.]

## **Chapter 26: Computational Modeling as a Philosophical Methodology**

*Patrick Grim*

### **The following are good general introductions:**

Bynum, T. and Moor, J., eds. 1998. *The Digital Phoenix: How Computers are Changing Philosophy*. Oxford: Blackwell. [An important anthology of work in computer modeling, from which several other references are drawn. A good introduction for anyone.]

Grim, P., Mar, G., and St. Denis, P. 1998. *The Philosophical Computer: Exploratory Essays in Philosophical Computer Modeling*. Cambridge, MA: MIT Press. [A rich sampler of philosophical computer modeling by a single research group, including a CD-ROM with animations and all source code. Undergraduate and above.]

Burkholder, L. 1992. *Philosophy and the Computer*. Oxford: Westview Press. [A valuable anthology of computer-assisted philosophical work earlier than Bynum & Moor 1998. Different contributions at different levels of difficulty.]

### **Seminal works that are also good introductions to particular areas:**

Axelrod, R. 1984. *The Evolution of Cooperation*. New York: Basic Books. [A major source for game-theoretic modeling regarding competition and cooperation, and a good introduction for any interested reader.]

Skyrms, B. 1996. *Evolution of the Social Contract*. Cambridge: Cambridge University Press. [A seminal source of formal game-theoretic modeling relevant to questions in ethics and social and political philosophy. Undergraduate and above.]