

Complexity Reading List

I. GENERAL

I.1. Introduction to Complexity Theory

Arthur, W. Brian. "On the Evolution of Complexity." Santa Fe Institute Working Paper No. 93-11-070, Santa Fe Institute, Santa Fe, New Mexico, 1993.
<http://www.santafe.edu/media/workingpapers/93-11-070.pdf>

Bar-Yam, Yaneeer. *Dynamics of Complex Systems*. Reading: Addison-Wesley, 1997.

Bertalanffy, Ludwig Von. "The History and Status of General Systems Theory." *The Academy of Management Journal* 15, no. 4 (December 1972): 407–426.

Gell-Mann, Murray. "What is Complexity?" *Complexity* 1, no. 1 (1995): 1–9.

Holling, C.S. "Understanding the Complexity of Economic, Ecological, and Social Systems." *Ecosystems* 4 (2001): 390–405.

Homer-Dixon, Thomas. *The Ingenuity Gap: Can We Solve the Problems of the Future?* Toronto: Vintage Canada, 2001.

—. *The Upside of Down: Catastrophe, Creativity, and the Renewal of Civilization*. Washington, DC: Island Press, 2006.

Michell, Melanie. *Complexity: A Guided Tour*. New York: Oxford University Press, 2009.

I.2. Emergence

Cunningham, Bryon. "The Reemergence of 'Emergence'." *Philosophy of Science* 68, no. 3, Supplement: Proceedings of the 2000 Biennial Meeting of the Philosophy of Science Association. Part 1: Contributed Papers (2001): S62–S75.

Jukka-Pekka, Onnella, and Felix Reed-Tsochas. "Spontaneous Emergence of Social Influence in Online Systems." *Proceedings of the National Academy of Sciences of the United States of America* 107, no. 43 (2010): 18375–18380.

Mitchell, Sandra D. "Emergence: Logical, Functional and Dynamical." *Synthese* 185, no. 2 (2012): 171–186.

Sawyer, Keith Robert. *Social Emergence: Societies as Complex Systems*. New York: Cambridge University Press, 2005.

I.3. Thermodynamics, Energy and Complexity

Hall, Charles, Pradeep Tharakan, John Hallock, Cutler Cleveland, and Michael Jefferson. "Hydrocarbons and the Evolution of Human Culture." *Nature* 426, no. 6964 (2003): 318–322.

Schneider, Eric D., and Kay, James J. "Complexity and Thermodynamics: Towards a New Ecology." *Futures* 26, no. 6 1994: 626–647.

Complexity Reading List

—. “Life as a Manifestation of the Second Law of Thermodynamics.” *Mathematical and Computer Modelling* 19, no. 6–8 1994: 25–48.

I.4. Non-linear/Threshold Behaviour

Bertuglia, Christoforo S., and Franco Vaio. *Nonlinearity, Chaos and Complexity. The Dynamics of Natural and Social Systems*. Oxford: Oxford University Press, 2005.

Buldyrev, Sergey V., Roni Parshani, Gerald Paul, H. Eugene Stanley, and Shlomo Havlin. “Catastrophic Cascade of Failures in Interdependent Networks.” *Nature* 464, no. 7291: 1025–1028.

Gladwell, Malcolm. *The Tipping Point: How Little Things Can Make a Big Difference*. Boston: Little, Brown and Company, 2000.

Scheffer, Marten. *Critical Transitions in Nature and Society*. Princeton: Princeton University Press, 2009.

Scheffer, Marten, Stephen R. Carpenter, Timothy M. Lenton, Jordi Bascompte, William Brock, Vasilis Dakos, Johan van de Kopel *et al.* “Anticipating Critical Transitions.” *Science* 338, no. 6105 (2012): 344–348.

Strogatz, Steven H. *Nonlinear Dynamics and Chaos: with Applications in Physics, Biology, Chemistry, and Engineering*. Reading, MA: Addison-Wesley Publishing, 1994.

I.5. Self-organized criticality

Bak, Per. *How Nature Works: The Science of Self-Organized Criticality*. New York: Copernicus, 1996.

Bak, Per. “Self-organized Criticality.” *Physica A* 163 (1990): 403–409.

Preussner, Gunnar. *Self-organized Criticality: Theory, Models and Characterisation*. Cambridge: Cambridge University Press, 2012.

I.6. Power Laws

Brown, James H., Vijay K. Gupta, Bai-Lian Li, Bruce T. Milne, Carla Restrepo, and Geoffrey B. West. “The Fractal Nature of Nature: Power Laws, Ecological Complexity and Biodiversity.” *Philosophical Transactions: Biological Sciences* 357, no. 1421, 2002: 619–626.

Cederman, Lars-Erik. “Modeling the Size of Wars: From Billiard Balls to Sandpiles.” *American Political Science Review* 97, no. 1 (2003): 135–150.

I.7. Networks

Barabasi, Albert-Laszlo. *Linked: The new Science of Networks*. Cambridge, MA: Perseus, 2002.

Complexity Reading List

Barabasi, Albert-Laszlo, and Reka Albert. "Emergence of Scaling in Random Networks." *Science* 286, no. 5439 (October 1999): 509–512.

Oltvai, Zoltan, and Albert-Laszlo Barabasi. "Life's Complexity Pyramid." *Science* 298, no. 5594 (2002): 763–764.

Watts, Duncan J., and Steven H. Strogatz. "Collective Dynamics of 'Small-World' Networks". *Nature* 393, no. 4 (June 1998): 440–442.

I.8. Complex Adaptive Systems

Gell-Mann, Murray. "Complexity and Complex Adaptive Systems." In *The Evolution of Human Languages*, SFI Studies in the Sciences of Complexity, Proc. Vol. X, edited by J.A. Hawkins and M. Gell-Mann. Boston: Addison Wesley, 1992.

Holland, John H. "Complex Adaptive Systems." *Daedalus* 121 (1992): 17–30.

—. "Genetic Algorithms." *Scientific American* 267, no. 1 (July 1992): 66–72.

—. *Hidden Order: How Adaptation Builds Complexity*. New York: Basic Books, 1995.

Schelling, Thomas. "Simple Models of Segregation." *Micromotives and Macrobehaviour*. New York: Norton, 1978: 147–165.

I.9. Evolution and Co-evolution

Beinhocker, Eric D. "Evolution as Computation: Integrating Self-organization with Generalized Darwinism." *Journal of Institutional Economics* 7, no. 3 (September 2011): 393–423.

Kauffman, Stuart A. *The Origins of Order: Self-Organization and Selection in Evolution*. New York: Oxford University Press, 1993.

II. SPECIFIC TOPICS

II.1. Complexity Economics

Beinhocker, Eric D. *The Origin of Wealth: Evolution, Complexity, and the Radical Remaking of Economics*. Boston: Harvard Business School Press, 2006.

Farmer, Doyne J. "Market force, ecology and evolution." *Industrial and Corporate Change* 11, no. 5 2002: 895–953.

Farmer, Doyne J., and Andrew W. Lo. "Frontiers of Finance: Evolution and Efficient Markets." *Proceedings of the National Academy of Sciences of the United States of America* 96, no. 18 1999: 9991–9992.

Farmer, Doyne J., and Duncan Foley. "The Economy needs Agent-based Modelling." *Nature* 460, no. 7256 (2009): 685.

Complexity Reading List

- Haldane, Andrew G., and Robert M. May. "Systemic Risk in Banking Ecosystems." *Nature* 469, no. 7330 (2011): 351–355.
- Mandelbrot, Benoit B. *The (Mis)behavior of Markets: a Fractal View of Risk, Ruin, and Reward*. New York: Basic Books, 2004.
- Nordhaus, William D. "Economic Policy in the Face of Severe Tail Events." *Journal of Public Economic Theory* 14, no. 2 (2012): 197–219.
- Parker, Dawn Cassandra, and Thomas Homer-Dixon. "Green Complexity Economics: Modeling Global-Scale Environmental, Resource, and Ecological Changes." WICI Occasional Paper No. 2, Waterloo Institute for Complexity and Innovation, University of Waterloo, Waterloo, Ontario, 2012.
http://issuu.com/waterloo_institute_complexity/docs/wici_op2_dawn_tad?mode=window&backgroundColor=%23222222
- Weitzman, Martin L. "A Precautionary Tale of Uncertain Tail Fattening." NBER Working Paper 18144, National Bureau of Economic Research, Cambridge, MA, 2012.
<http://www.nber.org/papers/w18144>
- Weitzman, Martin L. "GHG Targets As Insurance Against Catastrophic Climate Damages." *Journal of Public Economic Theory* 14, no. 2 (2012): 221–244.

II.2. Complexity in Social and Political Systems

- Arrow, Holly, Joseph McGrath, and Jennifer Berdahl. *Small Groups as Complex Systems: Formation, Coordination, Development, and Adaptation*. Sage, 2000.
- Bennett, Andrew, and Colin Elman. "Complex Causal Relations and Case Study Methods: The Example of Path Dependence." *Political Analysis* 14, no. 3 (2006): 250–267.
- Braumoeller, Bear F. "Causal Complexity and the Study of Politics." *Political Analysis* 11 (2003): 209–233.
- Cederman, Lars-Erik. *Emergent Actors in World Politics: How States and Nations Develop and Dissolve*. Princeton: Princeton University Press, 1997.
- Chew, Sing C. "Dark Ages: Ecological Crisis Phases and System Transition." In *Globalization and Global History*, edited by Barry K. Gills and William R. Thompson, 149–183. New York: Routledge, 2006.
- Gerring, John. "The Mechanismic Worldview: Thinking Inside the Box." *British Journal of Political Science* 38, no. 1 (2003): 161–179.
- Homer-Dixon, Thomas. "Complexity, Crisis and Change: Implications for the Federal Public Service." 2010 Manion Lecture at The Canada School of Public Service, Ottawa, May 2010.
- Jervis, Robert. "Complexity and the Analysis of Political and Social Life." *Political Science Quarterly*

Complexity Reading List

112, no. 4 (Winter 1997/1998): 569–593.

Mathews, K. Michael, Michael C. White, and Rebecca G. Long. “Why Study the Complexity Sciences in the Social Sciences?” *Human Relations* 52, no. 4 (1999): 439–462.

Miller, John, and Scott Page. *Complex Adaptive Systems: An Introduction to Computational Models of Social Life*. Princeton, 2007.

Norber, Jon, and Graeme Cumming. *Complexity Theory for a Sustainable Future*. Columbia, 2008.

Pierson, Paul. *Politics in Time: History, Institutions, and Social Analysis*. Princeton: Princeton University Press, 2002.

Roe, Mark J. “Chaos and Evolution in Law and Economics.” *Havard Law Review* 109, no. 3 (1996): 641–668.

Tainter, Joseph A. *The Collapse of Complex Societies*. Cambridge: Cambridge University Press, 1988.

Urry, John. *Global Complexity*. Cambridge: Polity Press, 2003.

Westley, Frances, Per Olsson, Carl Folke, Thomas Homer-Dixon, Harrie Vredenburg, Derk Loorbach, John Thompson *et al.* “Tipping Toward Sustainability: Emerging Pathways of Transformation.” *AMBIO: A Journal of the Human Environment* 40, no. 7 (2011): 762–780.

II.3. Ideology and Complexity

Feygina, Irina, John T. Jost, and Rachel E. Goldsmith. “System Justification, the Denial of Global Warming, and the Possibility of ‘System-Sanctioned Change’.” *Personality and Social Psychology Bulletin* 36, no. 3 (2010): 326–338.

Gifford, Robert. “The Dragons of Inaction: Psychological Barriers That Limit Climate Change Mitigation and Adaptation.” *American Psychologist* 66, no. 4 (May–June 2011): 290–302.

Heath, Yoko and Robert Gifford. “Free-market Ideology and Environmental Degradation: The Case of Belief in Global Climate Change.” *Environment and Behaviour* 38, no. 1 (January 2006): 48–71.

James, William. “What is an Emotion?” *Mind* 9, no. 34 (April 1884): 188–205.

Jervis, Robert. “Understanding Beliefs.” *Political Psychology* 27, no. 5 (2006): 641–663.

Jost, John T. “The End of the End of Ideology.” *American Psychologist* 61, no. 7 (2006): 651–670.

McDermott, Rose. “The feeling of rationality: The meaning of neuroscientific advances for political science.” *Perspectives on Politics* 2, no. 4 (December 2004): 691–706.

Mercer, Jonathan. “Emotional Beliefs”. *International Organization* 64 (Winter 2010): 1–31.

Complexity Reading List

—. “Rationality and Psychology in International Politics.” *International Organization* 59, no. 1 (2005): 77–106.

Renshon, Jonathan. “Stability and Change in Belief Systems – The Operational Code of George W. Bush.” *Journal of Conflict Resolution* 62, no. 6 (2008): 820–849.

Swim, Janet K., Paul C. Stern, Thomas J. Doherty, Susan Clayton, Joseph P. Reser, Elke U. Weber, Robert Gifford, and George S. Howard. “Psychology’s Contributions to Understanding and Addressing Global Climate Change.” *American Psychologist* 66, no. 4 (May–June 2011): 241–250.

Thagard, Paul. *Conceptual Revolutions*. Princeton: Princeton University Press, 1992.

II.4. Alternative Concepts of Economic Growth

Balakrishnan, Uma, Tim Duvall, and Patrick Primeaux. “Rewriting the Bases of Capitalism: Reflexive Modernity and Ecological Sustainability as the Foundations of a New Normative Framework.” *Journal of Business Ethics* 47, no. 4 (November 2003): 299–314.

Daly, Herman E., and Joshua C. Farley. *Ecological Economics: Principles and Applications*. Washington DC: Island Press, 2004.

Douthwaite, R. J. *The Growth Illusion: How Economic Growth has Enriched the Few, Impoverished the Many and Endangered the Planet*. Dublin: Lilliput Press, 1992.

Fourier, Valerie. “Escaping from the Economy: the Politics of Degrowth.” *International Journal of Sociology and Social Policy* 28, no. 11/12 (2008): 528–545.

Harvey, David. *A Brief History of Neoliberalism*. Oxford: Oxford University Press, 2005.

Homer-Dixon, Thomas. “Growth Won’t Last Forever.” *Foreign Policy* 184 (January/February 2011): 56.

Pellizzoni, Luigi. “Governing through Disorder: Neoliberal Environmental Governance and Social Theory.” *Global Environmental Change* 21 (2011): 795–803.

Quilley, Steven. “De-Growth Is Not a Liberal Agenda. Relocalization and the Limits to Low Energy Cosmopolitanism.” Prepublication, Keele University, 2012.
<http://www.whpress.co.uk/EV/papers/Quilley.pdf>

Schneider, Francois, Giorgos Kallis, Joan Martinez-Allier. “Crisis or Opportunity? Economic degrowth for social equity and Ecological Sustainability. Introduction to this Special Issue.” *Journal of Cleaner Production* 18, no. 6 (April 2010).

II.5. Climate Complexity and Nonlinearity

Barnosky, Anthony D., Elizabeth A. Hadly, Jordi Bascompte, Eric L. Berlow, James H. Brown, Mikael Fortelius, Wayne M. Getz, et al. “Approaching a State Shift in Earth’s Biosphere.” *Nature* 486

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(June 2012): 52–58.

Kriegler, Elmar, Jim W. Hall, Herrmann Held, Richard Dawson, and Hans Joachim Schellnhuber. “Imprecise Probability Assessment of Tipping Points in the Climate System.” *Proceedings of the National Academy of Sciences of the United States of America* 106, no. 13 (March 2009): 5041–5046.

Lenton, Timothy M., Hermann Held, Elmar Kriegler, Jim W. Hall, Wolfgang Lucht, Stefan Rahmstorf, and Hans Joachim Schellnhuber. “Tipping elements in the Earth’s climate system.” *Proceedings of the National Academy of Sciences of the United States of America* 105, no. 6 (February 2008): 1786–1793.

Rial, Jose A., Roger A. Pielke Sr., Martin Beniston, Martin Claussen, Josep Candell, Peter Cox, Hermann Held, Nathalie de Noblet-Ducoudre, Ronald Prinn, James F. Reynolds, and Jose D. Salas. “Nonlinearities, feedbacks and critical thresholds within the earth’s climate system.” *Climatic Change* 65 (2004): 11–38.

Wassman, Paul, and Timothy Lenton, eds. “The Arctic in the Earth System Perspective – The Role of Tipping Points.” Special Issue, *AMBIO: A Journal of the Human Environment* 41, no. 1 (February 2012).

III. METHODS

III.1. Agent-based Modeling

Axelrod, Robert. *The Complexity of Cooperation: Agent-Based Models of Competition and Collaboration*. Princeton: Princeton University Press, 1997.

Axelrod, Robert, and Michael D. Cohen. *Harnessing Complexity: Organizational Implications of a Scientific Frontier*. New York: Basic Books, 2000.

<http://mass.leeds.ac.uk/2013/02/13/an-excellent-abm-paper/> (link for online resources, textbooks and papers related to agent-based modeling).

III.2. System Dynamics

Palm, William J. *System Dynamics*. Boston: Mc-Graw Hill Higher Education, 2005.

III.3. Cognitive Models

Axelrod, Robert. *Structure of Decision: The Cognitive Maps of Political Elites*. Princeton: Princeton University Press, 1976.

Clark, Andy. *Being There: Putting Brain, Body and World Together Again*. Cambridge, MA: MIT

Complexity Reading List

Press, 1997.

- Milkoreit, Manjana. "Why the Mind Matters: A Cognitive Research Agenda for World Politics." WICI Occasional Paper No. 3, Waterloo Institute for Complexity and Innovation, University of Waterloo, Waterloo, Ontario, 2012.
http://issuu.com/waterloo_institute_complexity/docs/final_version_manjana_milkoreit?mode=window&backgroundColor=%23222222
- Mock, Steven J. "Cognitive-Affective Mapping (CAM) in the Study of National Identity." Working Paper, Balsillie School of International Affairs, 2012.
http://issuu.com/waterloo_institute_complexity/docs/cognitive-affective_mapping_nationalidentity?mode=window&backgroundColor=%23222222
- Novak, Joseph D. *Learning, Creating and Using Knowledge: Concept Maps as Facilitative Tools in Schools and Corporations*. Mahwah: Lawrence Erlbaum Associates, 1998.
- Sowa, John F. *Knowledge Representation: Logical, Philosophical, and Computational Foundations*. Pacific Grove: Brooks Cole (1999).
- Thagard, Paul. "EMPATHICA: A Computer Support System with Visual Representations for Cognitive-affective Mapping." In *Proceedings of the Workshop on Visual Reasoning and Representation*, 79–81. Menlo Park, CA: AAAI Press, 2010.
- . "Mapping Minds Across Cultures." In *Grounding Social Sciences in Cognitive Sciences*, edited by Ron Sun, 35–62. Cambridge, MA: MIT Press, 2011.