

# Over Two-Hundred Annotated References on Systems Thinking\*†

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ABSTRACT: This 1.7 MB compilation of over 200 annotated references and over 300 hot-linked URL's provides a window into the vast literature on "Systems Thinking." Systems Thinking is characterized by the consideration of natural, scientific, engineered, human, or conceptual entities as systems in which the component parts interact with one another and with other systems so as to produce emergent properties which cannot be understood through analysis of the single parts of the system. Examples are provided by twelve quotes of systems thinkers. References are given in alphabetical order with superscripts that indicate their origin in the following categories: Ecology, Economics, Education, Engineering, Evaluation, General, and Physics.

## I. Introduction

Wikipedia's (2009a) entry on Systems Thinking (ST)

<[http://en.wikipedia.org/wiki/Systems\\_thinking](http://en.wikipedia.org/wiki/Systems_thinking)> defines ST as follows (My *italics*):

"Systems Thinking is any process of estimating or inferring how local policies, actions, or changes influence the state of the neighboring universe. It also can be defined, as an approach to problem solving, as viewing 'problems' as parts of an overall system, rather than reacting to present outcomes or events and potentially contributing to further development of the undesired issue or problem. *Systems thinking is a framework that is based on the belief that the component parts of a system can best be understood in the context of relationships with each other and with other systems, rather than in isolation.* The only way to fully understand why a problem or element occurs and persists is to understand the part in relation to the whole. Standing in contrast to Descartes's scientific reductionism and philosophical analysis, it proposes to view systems in a holistic manner. Consistent with systems philosophy, systems thinking concerns an understanding of a system by examining the linkages and interactions between the elements that compose the entirety of the system. Systems thinking attempts to illustrate that events are separated by distance and time and that small catalytic events can cause large changes in complex systems. Acknowledging that an improvement in one area of a system can adversely affect another area of the system, it promotes organizational communication at all levels in order to avoid the silo effect. *Systems thinking techniques may be used to study any kind of system — natural, scientific, engineered, human, or conceptual.*"

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\*The reference is:

Hake, R.R. 2009. "Over Two-Hundred Annotated References on Systems Thinking," online as ref. 58 at <<http://www.physics.indiana.edu/~hake>>.

I welcome suggestions and comments at <rrhake@earthlink.net>.

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## References - Notes:

1. Superscripts preceding references indicate their *origin* in the following categories: #ecol Ecology; #econ Economics; #edu Education; #eng Engineering; #eval Evaluation; #gen General; and #physics Physics. Thus readers primarily interested references originating in the field of e.g., “education” can search for “#edu” (without the quotes) to access the entries originating in that area.
2. The literature on “Systems Thinking” is generally *transdisciplinary*. Thus, with the exception of the category “General,” the categories indicate the *origin* of the reference and not the area of application or relevance. For example the category “Education” indicates that the origin of the reference is in the field of education, but the reference may be generally relevant to “Systems Thinking,” and not just to education.
3. The reference formatting takes advantage of the *best* features of the style manuals of the: (a) American Institute of Physics (AIP), (b) American Psychological Association (APA), and (c) Council of Science Editors (CSE). This *optimum* formatting is not often employed, but should be.
4. Tiny URL's courtesy <<http://tinyurl.com/create.php>>; all URL's accessed on 15-17 December 2009.

#physics Anderson, P.W. 1972. “More is Different: Broken symmetry and the nature of the hierarchical structure of science,” *Science* **177**(4047): 393-396; online to subscribers at <<http://www.sciencemag.org/cgi/content/citation/177/4047/393>>. See also “More is Different: Fifty Years of Condensed Matter Physics” [Ong & Bhatt (2001)] and “More Really is Different” [Gu et al. (2009)].

#gen Anderson, V. & L. Johnson. 1997. “Systems Thinking Basics: From Concepts to Causal Loops.” Pegasus Communications. Amazon.com information at <<http://tinyurl.com/yazes2p>>; note the “Look Inside” feature.

#gen Aronson, D. 2005. “Overview of Systems Thinking” online at <[http://www.thinking.net/Systems\\_Thinking/OverviewSTarticle.pdf](http://www.thinking.net/Systems_Thinking/OverviewSTarticle.pdf)> (32 kB).

#edu Aubrecht, G.J. 2006. *Energy: Physical, Environmental, and Social Impact*. Third Edition. Addison-Wesley; publisher's information at <<http://tinyurl.com/nbfb6r>>. Amazon.com information at <<http://tinyurl.com/ljsbx>>. A good companion text for an interdisciplinary physics/economics course might be Daly & Farley (2003). Good auxiliary texts might be *Consider a Spherical (Cylindrical) Cow* [Harte, 1988 (2001)].

#edu Banathy, B.H. 1992. *A Systems View of Education: Concepts and Principles for Effective Practice*. Educational Technology Publications. Amazon.com information at <<http://tinyurl.com/yestkg8>>.

#gen Banathy, B.H. 2000. *Guided Evolution of Society: A Systems View*. Springer. Amazon.com information at <<http://tinyurl.com/ybs6zwz>>.

#ecol Bardi, U. 2008. "Cassandra's curse: how 'The Limits to Growth' was demonized," *The Oil Drum: Europe*, 9 March; online at <[http://www.theoil Drum.com/pdf/theoil Drum\\_3551.pdf](http://www.theoil Drum.com/pdf/theoil Drum_3551.pdf)> (180 kB). Ugo Bardi <<http://www1.unifi.it/surfchem/solid/bardi>> is a Professor of Chemistry at the University of Firenze (Italy). See the above signature quote. In addition Bardi wrote:

The LTG study had everything that was needed to become a major advance in science. It came from a prestigious institution, MIT; it was sponsored by a group of brilliant and influential intellectuals, the Club of Rome; it used the most modern and advanced computation techniques and, finally, the events that were taking place a few years after publication, the great oil crisis of the 1970's seemed to confirm the vision of the authors. Yet the study failed in generating a robust current of academic research and, a couple of decades after the publication, the general opinion about it had completely changed. Far from being considered the scientific revolution of the century, in the 1990's LTG had become everyone's laughing stock. Little more than the rumination of a group of eccentric (and probably slightly feebleminded) professors who had really thought that end of the world was near. In short, Chicken Little with a computer.

#gen Barnes, B.& G. R. Fulford. 2008. *Mathematical Modelling with Case Studies: A Differential Equations Approach using Maple and MATLAB*, 2nd edition. Chapman & Hall/CRC. Publisher's information at <<http://tinyurl.com/yzmzg7q>>. Amazon.com information at <<http://tinyurl.com/ye88spo>>. Note the searchable "Look Inside" feature. A Google book preview is online at <<http://tinyurl.com/yeclx7l>>.

#ecol Bartlett, A.A. 1986. "Sustained Availability: A management program for nonrenewable resources," *Am. J. Phys.* **54**(5): 398-402; online to subscribers at <<http://scitation.aip.org/dbt/dbt.jsp?KEY=AJPIAS&Volume=54&Issue=5>>.

#ecol Bartlett, A.A. 2004. "Thoughts on Long-Term Energy Supplies: Scientists and the Silent Lie: The world's population continues to grow - shouldn't physicists care?" *Physics Today* **57**(7): 53-55; online at <[http://fire.pppl.gov/energy\\_population\\_pt\\_0704.pdf](http://fire.pppl.gov/energy_population_pt_0704.pdf)> (336 kB). In response to Goldstein (2004) and his claim that "failure to account for energy efficiency in a meaningful way renders the rest of [the articles by Bartlett (2004) and Weisz (2004)] virtually irrelevant," Bartlett, in *Physics Today Letters* (2004) wrote:

As David Goodstein observes, the technological potential for improved efficiency of energy use is enormous. But technology brings new way to consume energy as well as to conserve it . . . .[shades of Jevons' Paradox]. . . . If we are going to stretch the lifetimes of fossil fuels 'consistent with geophysical constraints' we must recognize the constraints and then combine the effects of technology and population growth so that there is a decline in total annual energy use [Bartlett (1986)]; that achievement will almost certainly require stabilizing population at the earliest possible date.

#ecol Bartlett, A.A. 2008. "Why have Scientists Succumbed to Political Correctness?" *Teachers' Clearinghouse for Science and Society Education*, Vol. 27, Spring 2008, page 21; online at <<http://www.albartlett.org/articles/art2008spring.html>>.

"This article was awarded a prize by The Population Institute as the best magazine article of the year dealing with population. The prize was presented at the 29th Annual Global Media Awards for Excellence in Population Reporting in Mid-November 2008 in Los Angeles."

#gen Brynteson, R. 2006. *Once Upon A Complex Time: Using Stories to Understand Systems*. Sparrow Media Group. Amazon.com information at <<http://tinyurl.com/yd6klne>>; note the “Look Inside” feature.

#gen Bertalanffy, L. 1976. *General System Theory: Foundations, Development, Applications*. George Braziller Publishing. Amazon.com information at <<http://tinyurl.com/yldj66z>>; note the “Look Inside” feature.

#physics Bohm, D. 1980. *Wholeness and the Implicat Order*. Routledge. Amazon.com information at <<http://tinyurl.com/ycapvzh>>, note the “Look Inside” feature.

#physics Bohm, D. 1994. *Thought as a System*. Routledge. Amazon.com information at <<http://tinyurl.com/ycfjcnx>>, note the “Look Inside” feature.

#physics Bohm, D. & B.J. Hiley. 1995. *The Undivided Universe*. Routledge. Amazon.com information at <<http://tinyurl.com/yebw8tj>>, note the “Look Inside” feature.

#econ #ecol Boulding, K.E. 1966. “The Economics of the Coming Spaceship Earth” in H. Jarrett (1966); online at <<http://tinyurl.com/yzrwhfa>>. This essay is also included in Daly & Townsend (1992).

#edu Brady, M. undated. “An Any-Century Curriculum,” online at <<http://www.marionbrady.com/documents/AnAny-CenturyCurriculum.pdf>> (208 kB).

#edu Brady, M. & H. Brady. 2008. *Investigating Systems - A Course of Study*, online at <<http://www.marionbrady.com/2008/10/investigating-systems-course-of-study.html>>.

#edu Brady, M. 2008. “Curriculum Reform: “Education, Democracy, and Systems Theory” EvalSys post of 30 Nov 2008 10:10:45 -0500; online at <<http://tinyurl.com/ykcwtv7>>.

To access the archives of EvalSys one needs to subscribe, but that takes only a few minutes by clicking on <<http://lists.evaluation.wmich.edu/archives/eval-sys.html>> and then clicking on "Join or leave the list (or change settings)." If you're busy, then subscribe using the "NOMAIL" option under "Miscellaneous." Then, as a subscriber, you may access the archives and/or post messages at any time, while receiving NO MAIL from the list!

#edu Brady, M. 2009. “Re: The core of systems ideas,” EvalSys post of 26 Jan 2009 17:43:18-0500; online at <<http://tinyurl.com/yzzxhb3>>.

#edu Brady, M. 2009. “Again,” EvalSys post of 2 Feb 2009 16:07:28-0500; online at <<http://tinyurl.com/ycbjk5w>>.

#edu Brady, M. 2009. “Re: Give Students a Compass: Can General Education Rise to the Challenge?” EvalSys post of 10 Feb 2009 16:29:38 -0500; online at <<http://tinyurl.com/y9oj4ya>>.

#edu Brady, M. & H. Brady. 2009. "Race to the Top: Information Overload," on YouTube at <<http://www.youtube.com/watch?v=luHm8QPZIMg>>.

#edu Brady, M. 2009. Website <<http://www.marionbrady.com/>>. Brady states:  
With the exception of the button labeled "Personal," all the links below are to my essays, books, journal articles, and newspaper columns relating to education-specifically to the general education curriculum. All reflect my contention that knowledge is seamless, systemic, and mutually supportive, that the human brain is 'wired' to select, organize, integrate, and create knowledge, that the young can be helped to elevate these processes into consciousness and make deliberate use of them, and that doing so allows intellectual performance not possible when knowledge is compartmentalized and fragmented.

#ecol Brown, L.R. 2000. *Vital Signs 2000: The Environment Trends That are Shaping our Future*. W.W. Norton. Amazon.com information at <<http://tinyurl.com/yhtk8x9>>; note the searchable "Look Inside" feature.

#ecol Brown, L.R. 2008. *Plan B 3.0: Mobilizing to Save Civilization*. International Publishers. The entire book may be download free of charge at <[http://www.earth-policy.org/images/uploads/book\\_files/pb3book.pdf](http://www.earth-policy.org/images/uploads/book_files/pb3book.pdf)> (2.9 MB). See also Brown (2008, 2009) and Brown's "Earth Policy Institute" [EPI (2009)].

#ecol Brown, L.R. 2009. *Plan B 4.0: Mobilizing to Save Civilization*. International Publishers. The entire book may be download free of charge at <[http://www.earth-policy.org/images/uploads/book\\_files/pb4book.pdf](http://www.earth-policy.org/images/uploads/book_files/pb4book.pdf)> (1.1 MB). See Wikipedia's (2009r) entry "Lester Brown," and Brown's "Earth Policy Institute"[EPI (2009)].

#ecol Bosch, O.J.H., C.A. King, J.L. Herbohn, I.W. Russell, and C.S. Smith. 2007. "Getting the big picture in natural resource management-systems thinking as 'method' for scientists, policy makers and other stakeholders," *Systems Research and Behavioural Science* **24**: 217-232; online at <[http://findarticles.com/p/articles/mi\\_7349/is\\_2\\_24/ai\\_n32048654/](http://findarticles.com/p/articles/mi_7349/is_2_24/ai_n32048654/)>.

#ecol #edu Bynum, N. 2009. "Successes and failures in teaching from a systems-based perspective?" POD post of 19 Oct 2009 20:56:43-0400; online on the OPEN! POD archives at <<http://tinyurl.com/y1g5kn2>>.

#gen Byrne, J.A. & L. Gerdes, 2005. "The Man Who Invented Management: Why Peter Drucker's ideas still matter," *Business Week*, 28 November, cover story, online at <<http://tinyurl.com/ydttk9>>. See also Drucker (1992, 1994), Drucker Institute (2009), and Wikipedia (2009ii).

#ecol Cairns, J. 2004. "Will the real sustainability concept please stand up?" *Ethics In Science and Environmental Politics*, June 22, pp. 49-52, online at <<http://www.int-res.com/articles/esep/2004/E53.pdf>> (56 kB).

#ecol Caldwell, J.C. 1976. "Toward a restatement of demographic transition theory." *Population and Development Review* 2: 321-366. The first page and an abstract are online at <<http://www.jstor.org/pss/1971615>>.

#ecol Caldwell, J.C., B.K. Caldwell, P. Caldwell, P.F McDonald, & T. Schindlmayr. 2006. *Demographic Transition Theory*. Springer. A searchable Google book preview is online at <<http://tinyurl.com/yefja4l>>. Amazon.com information at <<http://tinyurl.com/yz5f6cr>>; note the searchable "Look Inside" feature.

#physics Capra, F. 1984. *The Turning Point: Science, Society, and the Rising Culture*. Bantam. Amazon.com information at <<http://tinyurl.com/ycvt2cr>>; note the "Look Inside" feature.

#ecol Catton, W.R. 1982. *Overshoot: The Ecological Basis of Revolutionary Change*. University of Illinois Press; publisher's information at <<http://tinyurl.com/yjlo7jp>>. Amazon.com information at <<http://tinyurl.com/yhq67h5>>; note the searchable "Look Inside" feature.

#edu CLE. 2009. "Creative Learning Exchange," online at <<http://www.clexchange.org/>>. It is stated that the Mission is "To develop Systems Citizens in K-12 education who use systems thinking and system dynamics to meet the interconnected challenges that face them at personal, community, and global levels. "

Cleveland, C., L. De Angel. 2009. "Collections," in Encyclopedia of Earth [EOE (2009)], last revised September 8, 2009; online at <<http://www.eoearth.org/article/Collections>>.

A valuable resource with collections on Africa; Aldo Leopold; Biodiversity; Climate Change; Coral Reefs; *Ecological Economics*; Ecology; Ecoregions; Environmental Chemistry; *Environmental and Social Issues in Economics*; Howard T. Odum; Large Marine Ecosystems; Latin America and the Caribbean; Natural World Heritage Sites; and Net Energy: Concepts, Issues, and Case Studies.

The *Ecological Economics* Collection carries this introduction:

"Ecological Economics is the science of sustainability. Ecological economics exists because a hundred years of disciplinary specialization in scientific inquiry has left us unable to understand or to manage the interactions between the human and environmental components of our world. While none would dispute the insights that disciplinary specialization has brought, many now recognize that it has also turned out to be our Achilles heel. In an interconnected evolving world, reductionist science has pushed out the envelope of knowledge in many different directions, but it has left us bereft of ideas as to how to formulate and solve problems that stem from the interactions between humans and the natural world."

#ecol Cohen, J.E. 1996. *How Many People Can the Earth Support?* W.W. Norton. Amazon.com information at <<http://tinyurl.com/y1q5ss7>>; note the searchable "Look Inside" feature.

#ecol #econ Costanza, R., J.H. Cumberland, H. Daly, R. Goodland, R.B. Norgaard. 1997. *An Introduction to Ecological Economics (e-book)*, online at <<http://tinyurl.com/6qnu9x>>.



#econ#ecol Daly, H.E. 1997. *Beyond Growth: The Economics of Sustainable Development*. Beacon Press; publisher's information at <<http://www.beacon.org/productdetails.cfm?SKU=4709>>, which carries this assessment from Donella Meadows:

A new book by that most far-seeing and heretical of economists, Herman Daly. For 25 years now, Daly has been thinking through a new economics that accounts for the wealth of nature, the value of community and the necessity for morality.

Amazon.com information at <<http://www.amazon.com/gp/product/0807047090>>. A searchable Google book preview is online at <<http://tinyurl.com/yjc4nc9>>. For a good review see Hobson (1999). Pages 1-10.3 of the 23 page "Introduction" with links to Daly (1994) and Hansen (1995)] are online at <<http://acratcliffe.free.fr/sustainability/beyond%20growth.htm>>, thanks to Pierre Ratcliffe (2009). See also Daly (2009).

#econ#ecol Daly, H.E. & J. Farley. 2003. *Ecological Economics: Principles And Applications*. Island Press, publisher's information at <[http://www.islandpress.com/bookstore/details.php?prod\\_id=389](http://www.islandpress.com/bookstore/details.php?prod_id=389)>. Amazon.com information at <<http://tinyurl.com/yzwf3ul>>; note the searchable "Look Inside" feature. Good companion texts for an interdisciplinary economics/physics might be Aubrecht (2006) or Hobson (2009a).

#econ#ecol Daly, H.E. 2008. "A Steady-State Economy: A failed growth economy and a steady-state economy are not the same thing; they are the very different alternatives we face," Sustainable Development Commission, UK, April 24; online at <[http://www.sd-commission.org.uk/publications/downloads/Herman\\_Daly\\_thinkpiece.pdf](http://www.sd-commission.org.uk/publications/downloads/Herman_Daly_thinkpiece.pdf)> (136 kB).

#econ#ecol Daly, H.E. 2009. "Incorporating Values in a Bottom-Line Ecological Economy," *Bulletin of Science, Technology, & Society* 29(5): 349-357; an abstract is online at <<http://bst.sagepub.com/content/vol29/issue5/>>. Daly wrote:

The search for a social goodness function in economic systems is reviewed, especially in light of the fact that the economy is a subsystem of a biosphere that has its own rules for determining success, or at least for limiting feasibility. The frequent perversity of reductionist quantitative success indicators in economics (profit, quotas, GDP) is mainly attributed to the preanalytic vision of the economy as an isolated circular flow, and of \*homo economicus\* as an atomistic individual isolated from community, both social and biological. Specific examples of such perversity are considered. . . . .  
. . . . . Nowadays, error in economics must be maintained by complicated mathematics rather than easy logic. Personally, I do not see a brave army of heretics yet emerging from the economics departments across our nation. The curriculum is designed to spot potential heretics early and flunk them out. *Renewal is more likely to come from outside challenges to the discipline. . . .* [[My italics]]. . . . Is it reasonable to hope for help from the physical sciences and the humanities? Is it part of the role of each discipline to challenge other disciplines? In the name of truth, beauty, and righteousness, can scientists, humanists, and citizens ask economists if maybe the system is sufficiently imperfect that people really do need to be good? It would be folly to pretend that people are so good that any system will work but is it not also folly to believe that the system can be so perfect that it will really transform private evil into public good? *Maybe economics should return to its origins as a part of moral philosophy.*" [[My italics]]

See also in the same volume Costanza (2009b).

#gen Davidson, M. 1983. *Uncommon Sense: The Life and Thought of Ludwig von Bertalanffy (1901-1972), Father of General Systems Theory*. J.P. Tarcher, Inc., Amazon.com information at <<http://tinyurl.com/y8zuctg>>. Forwards by R. Buckminster Fuller and Kenneth E. Boulding.

Davis, J. 2009. "A systems approach to e-learning." Association for Learning Technology Newsletter, Issue 17, July 2009; online at [http://newsletter.alt.ac.uk/e\\_article001484468.cfm?x=b11,0,w](http://newsletter.alt.ac.uk/e_article001484468.cfm?x=b11,0,w).

#gen Deming, W.E. 2000. *Out of the Crisis*. MIT press (originally published in 1982). Publisher's information at <http://mitpress.mit.edu/catalog/item/default.asp?type=2&tid=3261>. Amazon.com information at <http://tinyurl.com/y87rkyk>; note the "Look Inside" feature.

#gen DEN. 2009. *Deming Electronic Network*, online at <http://deming-network.org>. See the site map at [http://deming-network.org/deming\\_map.htm](http://deming-network.org/deming_map.htm).

#gen #ecol Diamond, J. 1999. *Guns, Germs, and Steel: The Fates of Human Societies*. W. W. Norton. Amazon.com information at <http://tinyurl.com/yew2tg4>; note the "Look Inside" feature.

#gen #ecol Diamond, J. 2005. *Collapse: How Societies Choose to Fail or Succeed*. Penguin. Amazon.com information at <http://tinyurl.com/yeqra3h>; note the "Look Inside" feature.

#gen Drucker, P. 1994. *Post-Capitalist Society*. Harper Paperbacks. Amazon.com information at <http://tinyurl.com/yjon5rv>; note the "Look Inside" feature. See also Byrne & Gerdes (2005).

#gen Drucker, P. 1992. *The Age of Discontinuity: Guidelines to Our Changing Society*. Transaction Publishers. Amazon.com information at <http://tinyurl.com/yesfnop>; note the "Look Inside" feature. See also Byrne & Gerdes (2005).

#gen *Drucker Institute*. 2009. Claremont Graduate University, online at <http://www.druckerinstitute.com/>. See also Byrne & Gerdes (2005).

#ecol Dormgrandpop. 2009. "Remembering Dana Meadows on the 8th Anniversary of Her Death," blog entry of 20 February; online at <http://dormgrandpop.blogspot.com/2009/02/remembering-dana-meadows-on-8th.html>.

#edu Duderstadt, J.J. 2000. *A University for the 21st Century*. Univ. of Michigan Press; for a description see <http://tinyurl.com/9lhpl>. A Google book preview is online at <http://tinyurl.com/yhna54k>. James J. Duderstadt is President Emeritus and University Professor of Science and Engineering, University of Michigan.

#ecol *Ecology and Society*. 2009. Originally *Conservation Ecology*. A free online journal of integrative science for resilience and sustainability, online at <http://www.ecologyandsociety.org/>.

A good source of articles on systems thinking - see, e.g., Holling (1997) & Johnson (2009) on ecology & Hake (2002) on education.

#ecol EarthTrends. 2009. *World Resources Institute* <http://earthtrends.wri.org/> : "EarthTrends is a comprehensive online database, maintained by the World Resources Institute, that focuses on the environmental, social, and economic trends that shape our world."

#econ #ecol *Economist Magazine*. 2009. "Go forth and multiply a lot less," 29 October; online at <[http://www.economist.com/displaystory.cfm?story\\_id=14743589](http://www.economist.com/displaystory.cfm?story_id=14743589)>. I thank PHYSOC's resident economist Kevin Laws for this reference.

#ecol Ehrlich, P.R. 1968. *The Population Bomb*. Ballantine Books. Amazon.com information at <<http://tinyurl.com/ycwtkd9>>. See also Ehrlich & Ehrlich (1991).

#ecol Ehrlich, P.R. & A.H. Ehrlich. 1991. *The Population Explosion*, Touchstone Press. Amazon.com information at <<http://tinyurl.com/y86su56>>.

#ecol Ehrlich, P. & A.H. Ehrlich. 2005. *One With Nineveh: Politics, Consumption, and the Human Future*. Island Press; publisher's information at <[http://www.islandpress.com/bookstore/details.php?prod\\_id=1111](http://www.islandpress.com/bookstore/details.php?prod_id=1111)>. Amazon.com information at <<http://tinyurl.com/ya7sa7l>>; note the searchable "Look Inside" feature.

#ecol Ehrlich, P.R. & A.H. Ehrlich. 2009a. *The Dominant Animal: Human Evolution and the Environment*. Island Press; publisher's information at <[http://www.islandpress.com/bookstore/details.php?prod\\_id=1744](http://www.islandpress.com/bookstore/details.php?prod_id=1744)>. Amazon.com information at <<http://tinyurl.com/yf5t7ha>>; note the searchable "Look Inside" feature.

#ecol Ehrlich, P. & A.H. Ehrlich. 2009b. "The Population Bomb Revisited," *Electronic Journal of Sustainability* 1(3); online at <<http://www.docstoc.com/docs/12166078/Population-Bomb-Revisited>>. By clicking on the orange "Download" icon, and then filling out a form, one can download this article as a 180 kB pdf. The abstract reads:

The *Population Bomb* has been both praised and vilified, but there has been no controversy over its significance in calling attention to the demographic element in the human predicament. Here we describe the book's origins and impacts, analyze its conclusions, and *suggest that its basic message is even more important today than it was forty years ago*. . . . [[My italics.]]

The section "Reaction to the Population Bomb" reads as follows [see that article for the references; my insert at ". . . .[[insert]]. . . ."]:

The book has been seen, at the very least to some on the lunatic fringe. . . .[[e.g., R.R. Hake]]. . . . as of some enduring importance. It was listed by the Intercollegiate Review as one of the fifty worst books of the 20th century, along with John Kenneth Galbraith's "The Affluent Society," John Maynard Keynes' "General Theory of Employment, Interest, and Money," and John Rawls' "A Theory of Justice." In Human Events' list of the "Ten Most Harmful Books of the Nineteenth and Twentieth Centuries," it came in 11th place ("honorable mention"); even so, it bested Charles Darwin's "The Origin of Species" and "Silent Spring" by Rachel Carson, though it was outranked by Keynes (again), Marx's "Das Kapital," and "The Kinsey Report," among others. Much of the negative response to "The Population Bomb," from both the far right and the far left, was clearly a reaction to its main message - that it can be a very bad thing to have more than a certain number of people alive at the same time, that Earth has a finite carrying capacity, and that the future of civilization was in grave doubt.

#ecol<sup>1</sup> EOE. 2009a. *Encyclopedia of the Earth: Content, Credibility, Community*; “everything earth, articles by experts, ever expanding”; online at <<http://www.eoearth.org/>>. At <<http://www.eoearth.org/eoe/about>> it is stated:

Welcome to the *Encyclopedia of Earth*, a new electronic reference about the Earth, its natural environments, and their interaction with society. The Encyclopedia is a free, fully searchable collection of articles written by scholars, professionals, educators, and experts who collaborate and review each other's work. The articles are written in non-technical language and will be useful to students, educators, scholars, professionals, as well as to the general public.

See also the valuable collections in this encyclopedia by Cleveland et al. (2009).

#ecol #econ EOE. 2009b. *Herman Daly Festschrift (e-book)*, online at <[http://www.eoearth.org/article/Herman\\_Daly\\_Festschrift\\_%28e-book%29](http://www.eoearth.org/article/Herman_Daly_Festschrift_%28e-book%29)>.

#ecol EPI. 2009. Earth Policy Institute, online at <<http://www.earth-policy.org/>> :  
. . . dedicated to planning a sustainable future as well as providing a roadmap of how to get from here to there. Lester R. Brown is the President. At <<http://www.earth-policy.org/#>> it is stated that “Plan B is a plan to replace the fossil-fuel-based, automobile-centered, throwaway economy with a new economic model. Instead of being based on fossil fuels, a Plan B economy will be powered by abundant sources of renewable energy: wind, solar, geothermal, hydropower, and biofuels.

#eval EVAL-SYS. 2009. Discussion list on “Systems in Evaluation” with archives at <<http://lists.evaluation.wmich.edu/archives/eval-sys.html>>, managed by Bob Williams of Williams & Imam (2007).

#gen Fisher, L.M. 2005. “The Prophet of Unintended Consequences: Jay Forrester's computer models show the nonlinear roots of calamity and reveal the leverage that can help us avoid it,” *strategy+business* 40, Fall, 26 August; online at <<http://www.strategy-business.com/article/05308?pg=all>> (you may need to fill out a form to gain access). Fisher wrote:

Although Professor Forrester believed the book. . . .[[‘World Dynamics’]]. . . . had ‘everything necessary to guarantee no public notice,’ including 40 PAGES OF EQUATIONS . . . .[[My CAPS.]]. . . . , its message immediately garnered worldwide attention. Reviews and press mentions ranged from the London ‘Observer’ to the ‘Singapore Times,’ and even a full-length article in ‘Playboy.’ But this time Professor Forrester shied away from the public stage. And although he had scribbled out the initial model that attracted the Club of Rome, he left the actual assembly and fine-tuning to a team of students led by Dennis and Donella Meadows, who were in their mid-20s and just returning from a break. . . . . The team produced a popular adaptation called ‘The Limits to Growth’. . . .[[Meadows et al. (1972)]]. . . . , which sold several million copies and was translated into 30 languages. It painted a stark picture of the catastrophic outcomes that the model had predicted, but it also described an alternative future, in which humanity accepted less economic growth in return for a comfortable, and endlessly sustainable, future. The book became the rallying point of a global environmental movement that has continued to gain adherents. It also gained an increasingly outspoken group of critics who argued that the model gave short shrift to the most significant economic forces, such as the self-regulating effects of markets and prices. . . . . [[For discussion of the scathing (but mostly vacuous) criticism see e.g.: (a) the Wikipedia (2009t) entry “Limits to Growth,” and (b) Ugo Bardi's (2008) perceptive essay “Cassandra's curse: how ‘The Limits to Growth’ was demonized.”]]. . . . It did not help Professor Forrester's standing with economists that he cited the ‘Encyclopedia Britannica’ and the ‘World Almanac’ as sources instead of econometric data, and that most of his references were to his own previously published papers. Moreover, Professor Forrester, in his usual blunt way, had spent 15 years dismissing most orthodox economic theory as trivial. . . . [[shades of Herman Daly (1997)]]. . . .”

#gen Forrester, J.W. 1961. *Industrial Dynamics*. Pegasus Communications. Amazon.com information at <<http://tinyurl.com/yj8tlsa>>.

#gen Forrester, J.W. 1968. *Principles of Systems*. Pegasus Communications. Amazon.com information at <<http://tinyurl.com/yglcam2>>.

#gen Forrester, J.W. 1969. *Urban Dynamics* Pegasus, 2nd edition. Amazon.com information at <<http://tinyurl.com/yg755oq>>.

#gen Forrester, J.W. 1971a. *World Dynamics* Pegasus, 2nd edition. Amazon.com information at <<http://www.amazon.com/World-Dynamics-Jay-W-Forrester/dp/1563270595>>.

#gen Forrester, J.W. 1971b. “Counterintuitive Behavior of Social Systems.” *Technology Review* (MIT), January; online at <<http://www.constitution.org/ps/cbss.pdf>> (924 kB). I thank Michael Martin for alerted me to this article. Forrester wrote:

In July, 1970, we held at MIT a two-week international conference on world dynamics. A meeting was organized for the Club of Rome, a private group of about 100 individuals drawn from many countries who had joined together to attempt a better understanding of world problems. Their concern lay in the interactions of population, resources, industrialization, pollution, and world-wide disparities of standard of living. The July agenda included the theory and behavior of complex systems and talks on specific social systems ranging through corporations, commodity markets, biological systems, drug addiction, and growth and decline of cities. A dynamics model, especially prepared for the conference, showed interactions among world population, industrialization depletion of natural resources, agriculture, and pollution. A detailed discussion of the world model appears in “World Dynamics” (Forrester, 1971). That model was refined in the “Project on the Predicament of Mankind” sponsored by the Club of Rome at MIT. . . . [[Meadows et al. (1972), Meadows et al. (1973, 1974)]] . . . *The model of world interactions showed different alternative futures depending on whether social policies are adopted to limit population growth while a high standard of living is still possible or whether the future is ignored until population is suppressed by pollution, crowding, disease, water and resource shortage, social strife, hunger. . . .* [[My italics.]] . . . Malthus dealt only with the latter, but it is possible for civilization to encounter other controlling pressures before a food shortage occurs. It is certain that resource shortage, pollution, crowding, disease, food failure, war, or some other equally powerful force will limit population and industrialization if persuasion and psychological factors do not. Exponential growth cannot continue forever. At present population growth rates, there would remain only one square yard per person in less than 400 years. Our greatest challenge is to guide the transition from growth to equilibrium. There are many possible mechanisms for limiting growth. That current growth rates of population and industrialization will stop is inevitable. Unless we choose favorable processes to limit growth, the social and environmental systems by their internal processes will choose for us. The natural mechanisms for terminating exponential growth appear the least desirable. Unless the world understands and begins to act soon, civilization will be overwhelmed by forces we have created but can no longer control.

#edu #gen Forrester, J.W. 2007. "Empirical research about how to teach/learn systems thinking skills," K-12SD discussion list post of 24 February, online at <[http://www.clexchange.org/bb/cle\\_viewpost.asp?Post=609](http://www.clexchange.org/bb/cle_viewpost.asp?Post=609)> Forrester wrote:

"I believe that the hope of treating systems thinking (as distinguished from system dynamics modeling) as well defined, operationalized, and measured is not consistent with the nature of systems thinking. Systems thinking is an amorphous area and means different things to different people. It does not have an underlying theory or structure. Worse, it is based on intuitive understanding of systems, which is usually shown to be incorrect when the systems thinking discussion is converted to actual simulation models for verification and analysis. *I believe that the drift toward systems thinking and away from explicit simulation is apt to be harmful to the understanding of systems.* . . . [[My italics.]]. . . . The above email quite properly asks for a well defined description of systems thinking. I am skeptical that such can be generated. But any attempt should be evaluated in terms of what is being taught, if such can be defined, and how correctly it prepares students to understand the important aspects of real world systems. The only way that I see to determine how much students have advanced in understanding real-world systems is to test their ability to work with and understand the behavior of actual simulation models that allow bringing real-world dynamics into the laboratory for manipulation and evaluation."

But see <[http://en.wikipedia.org/wiki/Systems\\_thinking](http://en.wikipedia.org/wiki/Systems_thinking)>, quoted at the beginning of this post.

#gen Fulford, G., P. Forrester, A. Jones. 1997. *Modelling with Differential and Difference Equations*, Cambridge University Press; publisher's information at <<http://www.cambridge.org/catalogue/catalogue.asp?isbn=052144618X>>. Amazon.com information at <<http://www.amazon.com/gp/product/052144618X>>; note the "Look Inside" feature. A Google "book preview is online at <<http://tinyurl.com/ya552nu>>. See esp. Chapter 9 on "Non-linear difference equations and population growth."

#edu Fullan, M., C. Cuttress, & A. Kilcher. 2005. "8 Forces for Leaders of Change, JSD 26(4): 54-64; online at <[http://www.michaelfullan.ca/Articles\\_06/8ForcesforLeaders.pdf](http://www.michaelfullan.ca/Articles_06/8ForcesforLeaders.pdf)> (404 kB). JSD is the "Journal of Staff Development – see NSDC (2009).

#edu Fullan, M. 2006. "The Future of Educational Change: Systems Thinkers in Action," *Journal of Educational Change* 7(3): 1573-1812; an abstract is online at <<http://www.springerlink.com/content/a7w5p802501x7374> > :

In addressing the future agenda of educational change, this paper advances the notion of sustainability as a key factor in developing a new kind of leadership. This new leadership, if enduring, [and] large scale change is desired, needs to go beyond the successes of increasing student achievement and move toward leading organizations to sustainability. Currently, there is a lack of development of leaders toward system thinking. An argument is made for linking systems thinking with sustainability in order to transform an organization or a system. In order to accomplish this goal, it is necessary to change not only individuals but also systems. The way to change systems is to foster the development of practitioners who are "system thinkers in action." *Such leaders widen their sphere of engagement by interacting with other schools in a process we call lateral capacity building.* . . . [[My italics.]]. . . . When several leaders act this way they actually change the context in which they work. Eight elements of sustainability, which will enable leaders to become more effective at leading organizations toward sustainability, are presented. . . . [[see also Fullan et al. (2005)]. . . . Within the explication of the eight elements, prior research is considered, difficulties are surfaced, and challenges are issued to change contextual conditions in order to effect large scale, sustainable educational change."

Some of Fullan's articles from 1989 to 2009 - but not this one - are listed at <<http://www.michaelfullan.ca/articles.htm>>. Many are downloadable.

#edu Fullan, M. 2007. *The New Meaning of Educational Change* (4th ed.) Teachers College Press; publisher's information at <<http://store.tcpress.com/0807747653.shtml>>. Amazon.com information at <<http://tinyurl.com/yaerm7j>>. Note the searchable “Look Inside” feature.

#edu Fullan, M. 2008. *The Six Secrets of Change: What the Best Leaders Do to Help Their Organizations Survive and Thrive*. Jossey-Bass. Amazon.com information at <<http://tinyurl.com/yatpws5>>. Note the searchable “Look Inside” feature.

#physics Gell-Mann, M. 1994. *The Quark and the Jaguar: Adventures in the Simple and the Complex*. W.H. Freeman; especially Chapter 22: “Transitions to a More Sustainable World,” pp. 345 - 366. Amazon.com information at <<http://tinyurl.com/y8vuep5>>; note the “Look Inside” feature.

#ecol Goldstein, D.B. 2004. Letters in response to Bartlett (2004), *Physics Today* **57**(11);, November, p. 14-15, online to subscribers at <<http://tinyurl.com/19uwjs>>.

#econ #ecol Goodland, R. 2009. “Herman Daly Festschrift: The world is in over-shoot and what to do about it.” Encyclopedia of the Earth; online at <<http://tinyurl.com/ye7g3cv>>.

#gen Goodman, M.R. 1989. *Study Notes in System Dynamics*. Pegasus. Amazon.com information at Amazon.com information at <<http://tinyurl.com/yksexun>>.

#ecol Grist Magazine. 2004. “Paul Ehrlich, famed ecologist, answers questions,” 9 August; online at <<http://www.grist.org/article/ehrllich/PAL>>. See also Ehrlich & Ehrlich (2009). Wikipedia quotes this part of the interview:

Q: Were your predictions in The Population Bomb right?"

A: Anne and I have always followed U.N. population projections as modified by the Population Reference Bureau -- so we never made "predictions," even though idiots think we have. When I wrote “The Population Bomb” in 1968, there were 3.5 billion people. Since then we've added another 2.8 billion -- many more than the total population (2 billion) when I was born in 1932. If that's not a population explosion, what is? My basic claims (and those of the many scientific colleagues who reviewed my work) were that population growth was a major problem. Fifty-eight academies of science. . . .[[see Hansen (2001)]]. . . . said that same thing in 1994, as did the world scientists' warning to humanity. . . .[[UCS (1992)]]. . . . in the same year. My view has become depressingly mainline!

#physics Gu, M., C, Weedbrook, A. Perales, & M.A. Nielsen. 2009. “More Really is Different,” *Physica D* **238**: 835-839 online at <<http://arxiv.org/pdf/0809.0151v1>>.

#edu Gulyaev, S.A. & H.R. Stonyer. 2002. “Making a map of science: general systems theory as a conceptual framework for tertiary science education,” *International Journal of Science Education* **24**(7): 753 - 769; an abstract is online at <<http://www.informaworld.com/smpp/content~db=all~content=a713864852>>.

#ecol Gunderson, L.H. & C. S. Holling, eds. 2001. *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press. Amazon.com information at <<http://tinyurl.com/yevrwcfc>>. Note the “Look Inside” feature. An editorial review states: Creating institutions to meet the challenge of sustainability is arguably the most important task confronting society; it is also dauntingly complex. Ecological, economic, and social elements all play a role, but despite ongoing efforts, researchers have yet to succeed in integrating the various disciplines in a way that gives adequate representation to the insights of each. Panarchy, a term devised to describe evolving hierarchical systems with multiple interrelated elements, offers an important new framework for understanding and resolving this dilemma. Panarchy is the structure in which systems, including those of nature (e.g., forests) and of humans (e.g., capitalism), as well as combined human-natural systems (e.g., institutions that govern natural resource use such as the Forest Service), are interlinked in continual adaptive cycles of growth, accumulation, restructuring, and renewal. These transformational cycles take place at scales ranging from a drop of water to the biosphere, over periods from days to geologic epochs. By understanding these cycles and their scales, researchers can identify the points at which a system is capable of accepting positive change, and can use those leverage points to foster resilience and sustainability within the system.

#ecol Gunderson, L.H. & L. Pritchard, eds. 2002. *Resilience and the Behavior of Large-Scale Systems*, Scientific Committee on Problems of the Environment (SCOPE) Series. Island Press. Amazon.com information at <<http://tinyurl.com/yaqaht>>; note the “Look Inside” feature. An editorial review states:

Scientists and researchers concerned with the behavior of large ecosystems have focused in recent years on the concept of ‘resilience.’ Traditional perspectives held that ecological systems exist close to a steady state and resilience is the ability of the system to return rapidly to that state following perturbation. However beginning with the work of C. S. Holling in the early 1970s. . . . [[Holling was the first editor of “Ecology and Society” (2009)]. . . . , researchers began to look at conditions far from the steady state where instabilities can cause a system to shift into an entirely different regime of behavior, and where resilience is measured by the magnitude of disturbance that can be absorbed before the system is restructured. *Resilience and the Behavior of Large-Scale Systems* examines theories of resilience and change, offering readers a thorough understanding of how the properties of ecological resilience and human adaptability interact in complex, regional-scale systems. The book addresses the theoretical concepts of resilience and stability in large-scale ecosystems as well as the empirical application of those concepts in a diverse set of cases. In addition, it discusses the practical implications of the new theoretical approaches and their role in the sustainability of human-modified ecosystems.

#edu Hake, R.R. 2002. “Lessons from the physics education reform effort,” *Ecology and Society* 5(2): 28; online at <<http://www.ecologyandsociety.org/vol5/iss2/art28/>>.

#edu Hake, R.R. 2004. “Energy Policy, Population, & Education,” online on the OPEN! Phys-L archives at <[https://carnot.physics.buffalo.edu/archives/2004/12\\_2004/msg00141.html](https://carnot.physics.buffalo.edu/archives/2004/12_2004/msg00141.html)>. Post of 12 Dec 2004 16:31:59-0800 to AP-Physics, Physhare, Phys-L, & PhyLrnR.

#edu #ecol Hake, R.R. 2009a. “Energy Efficiency, the Jevons Paradox, and the Elephant in the Room: Overpopulation #4,” online on the OPEN! AERA-L archives at <<http://tinyurl.com/yj2pmqp>>. Post of 20 Oct 2009 14:25:15 -0700 to AERA-L, Net-Gold, PhysLrnR, & Physoc. The abstract only was transmitted to various discussion lists under the more descriptive title “Herman Daly's Ecological Economist View Contrasted with the Traditional Economist View of Lawrence Summers and the World Bank.”

#edu #ecol Hake, R.R. 2009b. "Re: Successes and failures in teaching from a systems-based perspective?" online on the OPEN! POD archives at <<http://tinyurl.com/yfw2du7>>. Post of 27 Oct 2009 12:43:05-0700 to AERA-L, Net-Gold, PHYSOC, & EvalSys. A slightly augmented version of this post was transmitted to EvalTalk on 31 Oct 2009.

#edu #ecol Hake, R.R. 2009c. "Misconceptions in the Population/Energy Debate #2," online on the OPEN! AERA-L archives at <<http://tinyurl.com/yf7zybn>>. Post of 16 Nov 2009 09:49:41-0800 to AERA-L & Net-Gold. The abstract only was sent to several discussion lists.

#edu Hake, R.R. 2009d. "National Education Standards for the United States?" online on the OPEN! AERA-L archives at <<http://tinyurl.com/mjrvla>>. Post of 9 Jun 2009 14:44:42-0700 to AERA-L and Net-Gold. The abstract was distributed to various discussion lists and is online at <<http://hakesedstuff.blogspot.com/2009/06/national-education-standards-for-united.html>> with a provision for comments. See also Hake (2009e).

#edu Hake, R.R. 2009e. "Marion Brady's Criticism of National Standards," online on the OPEN! AERA-L archives at <<http://tinyurl.com/yanlzyq>>. Post of 12 Jun 2009 10:58:21-0700 to AERA-L, ARN-L, EDDRA, EvalSys, Math-Teach, & PhysLrnR.

#edu #gen Hake, R.R. 2009f. "In Defense of Wikipedia," online on the OPEN! AERA-L archives at <<http://tinyurl.com/m5xpu9>>. Post of 31 Aug 2009 16:41:53 -0700 to AERA-L, Net-Gold, and MathTeach. The abstract was distributed to various discussion lists.

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#econ #ecol Hansen, K. 1995. "The Irrationality of Homo Economicus," Interview with Herman Daly, online at <<http://acratcliffe.free.fr/sustainability/Herman%20Daly.htm>>. Three excerpts [My CAPS.]:

KH#1: Is the intellectual higher ground in economics increasingly up for grabs?

HD#1 (My *italics*): My hope is the answer's 'yes'. And in the long run I think the answer *\*is\** yes. But currently academic economics is quite dismal. *University departments of economics are just wasting everyone's time.* That's harsh but I think there are some interesting problems, that might otherwise have been dealt with by economics, that don't go away just because economists say, 'Well, that's not economics ... that's ... economic policy or environment or something else.' So they keep themselves exceedingly pure just working out the logical implications of what they have taken to calling the 'canonical assumptions', which is a revealing phrase. There are certain canonical assumptions which define what it all is, and then you play games and [make] logical derivations on those assumptions. And the world and its real problems are just sort of left to one side. And if you try to apply any of that to the real world it's a real problem because you've abstracted from what are the most important things. . . . . And I think it [the intellectual higher ground] is up for grabs in the sense that it's beginning to be challenged and I think that some of the popes of the profession are getting rather defensive. But it's still the ant versus the elephant. They're still pretty much totally in control of all the major journals and the major university positions, et cetera, et cetera. So it's maybe a little wishful thinking on my part to say it's up for grabs, but I think it will be."

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KH#2: "Who are the 'popes of the profession?"

HD#2 (My *italics*): ". . . People like Lawrence Summers and all the Nobel laureates. Robert Solow, Milton Friedman, folks like that. All the faculty of the major universities"

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KH#6: "Regarding World Bank leadership ... should economists continue to dominate affairs at the Bank ...?"

HD#6 (My *italics*): I think economists exercise too large an influence at the World Bank. ... You might think of the Bank as kind of the functioning church in the world out there trying to do good in the world. And the economists at the World Bank all went to seminary and learned their theology and they're trying to apply that theology in the world to do good. Well I think they learned bad theology. I think the seminaries were teaching bad theology and that takes us back to the first point about the intellectual high ground in economics. *All economists who work at the world bank, whether they're from Africa or California, I mean they got their degrees from Harvard, MIT, Oxford, McGill, you know all these top-rate universities across the world, which all teach pretty much the same thing.* And so that's their view of the world. And, give 'em credit, they're very often wonderful people trying to do good in the world on the basis of what they know and what they've been taught. *So I think the real problem goes back to the academic departments of economics* which are supplying the World Bank economists and which are still directly supplying advice to the World Bank. And of course since the World Bank is populated by the products of these places, they're eager to receive the advice from them, and I think that's a fundamental problem.

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#ecol Hanson, J. 2001. "Dieoff" online at <<http://dieoff.org/page1.htm>>. Scroll down about half way to the heading "SCIENTIFIC CONSENSUS" under which is the report "Science Summit" on World Population: A Joint Statement by 58 of the World's Scientific Academies" at <<http://dieoff.org/page75.htm>>. Hansen reprints the text of the academies' statement from *Population and Development Review* **20**(1):233-238 (1994).

#edu #gen Harris, B. 2009. *Making Sense With Facilitated Systems* (blog), online at <<http://www.facilitatedsystems.com/weblog/>> :  
[Harris] founded *Facilitated Systems* in 1999 to help people by helping the organization in which they spend to much of their time. He uses a number of approaches to help them make sense of the puzzles and problems organizations face."

#edu #ecol Harte, J. 1988. *Consider a Spherical Cow: A Course in Environmental Problem Solving*. University Science Books. Amazon.com information at <<http://tinyurl.com/yfmlol4>>; note the "Look Inside" feature.

#edu #ecol Harte, J. 2001. *Consider a Cylindrical Cow: More Adventures in Environmental Problem Solving*. University Science Books. Amazon.com information at <<http://tinyurl.com/yzgcqle>>; note the "Look Inside" feature.

#edu Heinbokel, J. & J. Potash. 2009. "Using New Technologies to Help Build Community," *Creative Learning Exchange Newsletter* **18**(2), Fall, online at <<http://www.clexchange.org/ftp/newsletter/CLEx18.2.pdf>> (1.4 MB). See especially "Sec II. New Technologies A. On-Line Access to Models: NetSim® and other options."

#econ #edu #ecol Hobson, A. 1999. Review of Daly (1997), *APS Forum on Physics and Society Newsletter* **28**(2), 2 April; online at <<http://www.aps.org/units/fps/newsletters/1999/april/rapr99.html#a1>>. See also Hobson (2009a,b).

#edu #ecol Hobson, A. 2009a. *Physics: Concepts and Connections*, 5th edition, available about 18 Dec. 2009. Addison Wesley; publisher's information including the Table of Contents at <<http://tinyurl.com/y9ej9n9>>. Author's information (for the 4th edition) at <<http://physics.uark.edu/hobson/pcc.html>>. Amazon.com information at <<http://tinyurl.com/ycr67vx>>. A good companion text for an interdisciplinary physics/economics course might be Daly & Farley (2003). See also Hobson (1999, 2009b). Good auxiliary texts might be *Consider a Spherical (Cylindrical) Cow* [Harte, 1988 (2001)].

#ecol Hobson, A. 2009b. "Opinion piece: Overpopulation and excessive immigration spell trouble" *Northwest Arkansas Times*, 24 Oct; online at <<http://physics.uark.edu/hobson/NWAT/NWAT.date.html>>. Hobson comments on "Reproduction and the carbon legacies of individuals" [Murtaugh & Schlax (2009)].

#ecol Holling, C.S. 1997. "The Inaugural Issue of *Conservation Ecology*," vol.1, #1, online at <<http://www.ecologyandsociety.org/vol1/iss1/art1/>>.

#ecol Huggett, R.J. 1993. *Modelling the human impact on nature: systems analysis of environmental problems*. Oxford University Press. Amazon.com information at <<http://tinyurl.com/yhobpes>>.

#gen IIASA. 2009. International Institute for Applied Systems Analysis, "What is System Dynamics?" online at <<http://www.iiasa.ac.at/Research/POP/pde/htmldocs/system.html>>. The first five paragraphs are:

System dynamics originated in the 1960s with the work of Jay Forrester and his colleagues at the Sloan School of Management at the Massachusetts Institute of Technology. They developed the initial ideas by applying the concepts from feedback control theory to the study of industrial systems (Forrester 1961).

One of the best-known applications of the 1960s was Forrester's (1969) "Urban Dynamics." It explained the patterns of rapid population growth and subsequent decline that have been observed in American cities like Manhattan, Detroit, St. Louis, Chicago, Boston and Newark (Schroder and Strongman 1974). Forrester's simulation model portrayed the city as a system of interacting industries, housing and people (Forrester 1969).

One of the most widely known applications of system dynamics appeared a few years later in a best-selling book entitled "The Limits to Growth" (Meadows et al. 1972). This study looked at the prospects for human population growth and industrial production in the global system over the next

century. A computer model was used to simulate resource production and food supply to keep up with the growing system. The authors concluded that the world could not support the present rates of economic and population growth much beyond the year 2100. The study was not about a pre-ordained future - it was about making choices to influence the future.

This very brief and incomplete overview of the beginning of system dynamics shows that system dynamics is a method to study the world around us. The central concept is to understand how all the objects in a system interact with one another. System dynamics looks at a system as a whole. A system can be a bank account, a game herd, a population, and a company.

System dynamics attempts to understand the basic structure of a system, and therefore to understand the behavior it can produce. Many of these systems and problems can be built as a computer model. The advantage is that the model on the computer is flexible and can carry out many simulations. Hence, many future development paths can be evaluated.

#edu ISEE Systems. 2009. "STELLA: Systems Thinking for Education and Research," online at <<http://www.iseesystems.com/software/Education/StellaSoftware.aspx>>." At this site there's a testimonial by Dennis Meadows of "Limits To Growth: The 30 Year Update" [Meadows et al. (2004)]

STELLA gives us an enormously powerful and flexible tool for creating environments that allow people to learn by doing.

#gen ISSS. 2000. International Society for the Systems Sciences, "ONE – WHOLE: An activity of the Primer Group – The First International Electronic Seminar on Wholeness" online at <[http://www.newciv.org/ISSS\\_Primer/seminar.html](http://www.newciv.org/ISSS_Primer/seminar.html)>. Links to over 70 essays on "What Wholeness means to me" and the obvious subsequent question "How can this best be imparted to others?"

#gen ISSS. 2009. International Society for the Systems Sciences," online at <<http://iss.org/world/>> :

"The International Society for the Systems Sciences (ISSS) is among the first and oldest organizations devoted to interdisciplinary inquiry into the nature of complex systems, and remains perhaps the most broadly inclusive. The Society was initially conceived in 1954 at the Stanford Center for Advanced Study in the Behavioral Sciences by Ludwig von Bertalanffy, Kenneth Boulding, Ralph Gerard, and Anatol Rapoport. In collaboration with James Grier Miller, it was formally established as an affiliate of the American Association for the Advancement of Science in 1956. Originally founded as the Society for General Systems Research, the society adopted its current name in 1988 to reflect its broadening scope.

The initial purpose of the society was 'to encourage the development of theoretical systems which are applicable to more than one of the traditional departments of knowledge,' with the following principal aims:

- a. to investigate the isomorphy of concepts, laws, and models in various fields, and to help in useful transfers from one field to another;
- b. to encourage the development of adequate theoretical models in areas which lack them;
- c. to eliminate the duplication of theoretical efforts in different fields; and
- d. to promote the unity of science through improving the communication among specialists.

In the intervening years, the ISSS has expanded its scope beyond purely theoretical and technical considerations to include the practical application of systems methodologies to problem solving. Even more importantly, it has provided a forum where scholars and practitioners from across the disciplinary spectrum, representing academic, business, government, and non-profit communities, can come together to share ideas and learn from one another."

#econ #ecol Jackson, T. 2009. *Prosperity without Growth: Economics for a Finite Planet*. Earthscan Publications Ltd; publisher's information at <<http://tinyurl.com/yzck432>>. A FREE pre-publication copy may be downloaded as a 3 MB pdf at <<http://tinyurl.com/yeasa3q>>.

#ecol Jarrett, H. ed. 1966. “*Environmental Quality in a Growing Economy: Essays from the Sixth RFF Forum*.” Johns Hopkins Press. [RFF = Resources For the Future.]

#ecol Johnson, A. 2009. "Re: Energy Efficiency, the Jevons Paradox, and the Elephant in the Room: can we agree?" PhysLnR post of 16 Oct 2009 15:50:12-0600; online at <<http://tinyurl.com/yg5xd9s>>.

To access the archives of PhysLnR one needs to subscribe, but that takes only a few minutes by clicking on <<http://listserv.boisestate.edu/archives/physlnr.html>> and then clicking on "Join or leave the list (or change settings)." If you're busy, then subscribe using the "NOMAIL" option under "Miscellaneous." Then, as a subscriber, you may access the archives and/or post messages at any time, while receiving NO MAIL from the list!

#ecol Johnson, C.R. 2009. “Natural Length Scales of Ecological Systems: Applications at Community and Ecosystem Levels,” *Ecology and Society* **14**(1): 7; online at <<http://www.ecologyandsociety.org/vol14/iss1/art7/>>.

#edu K-12SD. 2009. *System Dynamics*, K-12 Discussion List. For information see <<http://www.lsoft.com/scripts/wl.exe?SL1=K-12SD&H=SYSDYN.CLEXCHANGE.ORG>>. Operates on a “Lite” version of LISTSERV software with (evidently) no easily accessible current archives. A "K-12SD Discussion Group Archive" at <<http://tinyurl.com/ycc839l>> exists as part of the "Creative Learning Exchange" <<http://www.clexchange.org/>>, but the most recent post at <<http://tinyurl.com/yeh8jkl>> is dated 6 March 2007! That archive contains an interesting post from Jay Forrester (2007) titled “Empirical research about how to teach/learn systems thinking skills.”

#edu Kearsley, G. 2004. *Online Learning: Personal Reflections on the Transformation of Education*. Educational Technology Publications. Amazon.com information at <<http://tinyurl.com/y1goqvt>>. See also Moore & Kearsley (2004).

#edu Kearsley, G. 2009. “Explorations in Learning & Instruction: The Theory Into Practice Database,” online at <<http://tip.psychology.org/>>. See also Moore & Kearsley (2004).

#gen Kim, D.H. 1999. *Introduction to Systems Thinking*. Pegasus Communications. Amazon.com information at <<http://tinyurl.com/yangymp>>; note the “Look Inside” feature.

#ecol Kunsch, P.L., M. Theys, & J.P. Brans. 2007. “The importance of systems thinking in ethical and sustainable decision-making,” *Central European Journal of Operations Research* **15**:253-269; the abstract and a one-page “preview” are online at <<http://www.springerlink.com/content/w4832357n211q6m6/>>.

#econ #ecol Laws, K. 2009. "Population growth dropping fast - worldwide," PHYSOC post of 6 Nov 2009 23:16:06+0100; online at <<http://tinyurl.com/yc74nbq>>.

To access the archives of PHYSOC one needs to subscribe, but that takes only a few minutes by clicking on <<http://listserv.uark.edu/archives/physoc.html>> and then clicking on "Join or leave the list (or change settings)." If you're busy, then subscribe using the "NOMAIL" option under "Miscellaneous." Then, as a subscriber, you may access the archives and/or post messages at any time, while receiving NO MAIL from the list!

#gen Lyneis, D. 1995. "Systems Thinking 'in 25 Words or Less'," online as a 12 kB pdf at <<http://tinyurl.com/ye5m6b7>>.

#ecol Mahon, R., P. McConney, & R. Roy. 2008. "Governing fisheries as complex adaptive systems," *Marine Policy* 32:104-112; abstract online at <<http://tinyurl.com/yz2duaqa>>.

#gen Mandel, T. ed. 2000. "The General System," in ISSS (2000); online at <[http://www.newciv.org/ISSS\\_Primer/ase10tm.html](http://www.newciv.org/ISSS_Primer/ase10tm.html)>.

#edu #ecol Mathews, L.G., & A. Jones. 2008. "Using Systems Thinking To Improve Interdisciplinary Learning Outcomes: Reflections on a Pilot Study in Land Economics," *Issues in Integrative Studies* 26: 73-104; soon to be online to subscribers and those willing to pay for it at <<http://www.units.muohio.edu/aisorg/pubs/issues/toclist.shtml>>. I thank Nora Bynum for alerting me to this valuable article.

#ecol McKibben, B. 2008. "Civilization's last chance: The planet is at a tipping point on climate change, and it gets much worse, fast," *Los Angeles Times*, 11 May; online at <<http://tinyurl.com/6a3frb>>.

#ecol Meadows, D.H., D.L. Meadows, J. Randers, W.W. Behrens. 1972. *The Limits to Growth: A Report for the Club of Rome's Project on the Predicament of Mankind*. Potomac Associates. Amazon.com information at <<http://tinyurl.com/yh7mrew>>. See also the updated Meadows et al. 1973, 1974, 1992, 2004) and Wikipedia's (2009t) entry "Limits to Growth."

#ecol Meadows, D.H., D.L. Meadows, & J. Randers, 1992. *Beyond the Limits: Confronting Global Collapse, Envisioning a Sustainable Future*. Chelsea Green. Amazon.com information at <<http://tinyurl.com/yzthom9>>. See also the precursor Meadows et al. (1972).

#ecol Meadows, D.H. 1988. "My Candidate for the Next President of the United States," online at <[http://www.sustainer.org/dhm\\_archive/index.php?display\\_article=vn146sillyed](http://www.sustainer.org/dhm_archive/index.php?display_article=vn146sillyed)>. This is from the "Donella Meadows Archive" <[http://www.sustainer.org/dhm\\_archive/index.php](http://www.sustainer.org/dhm_archive/index.php)> containing 15 years worth of essays published as the award winning weekly *Global Citizen* column.

#ecol Meadows, D.H., J. Randers, & D.L. Meadows. 2004. *Limits to Growth: The 30-Year Update*." Chelsea Green; publisher's information at <<http://tinyurl.com/yzlmhru>>, featuring:  
(a) additional information (Overview, Praise, Associated Articles, Excerpt (highly recommended), Reviews, Table Of Contents);

(b) a CD that "permits users to reproduce and examine the details of the ten scenarios published in the book";

(c) Herman Daly's endorsement: "Not everything bears repetition, but truth does--especially when both denied by entrenched interests and verified by new information";

(d) Lester Brown's appraisal: Reading the 30th-year update reminds me of why the systems approach to thinking about our future is not only valuable, but indispensable. Thirty years ago, it was easy for the critics to dismiss the limits to growth. But in today's world, with its collapsing fisheries, shrinking forests, falling water tables, dying coral reefs, expanding deserts, eroding soils, rising temperatures, and disappearing species, it is not so easy to do so. We are all indebted to the "Limits" team for reminding us again that time is running out."

Amazon.com information at <<http://tinyurl.com/yzg93tc>>; note the searchable "Look Inside" feature.

Since there has been some debate on the PhysLrnR list – see [Hake (2009a,b,c); Johnson (2009); Podolefsky (2009a,b,c)] regarding the significance of Meadows et al. (1972, 1992, 2004), it may be useful to quote an excerpt from the "Excerpt" of Meadows, Randers, & Meadows (2004) indicated in "(a)" above [my insert at ". . . [[insert]]. . ."]:

This book – "Limits to Growth: The 30-Year Update - is the third edition in a series. The first text. . . [[Limits to Growth (LTG) (Meadows et al., 1972)]]. . . appeared in 1972. In 1992 we published the revised edition, . . . [[“Beyond the Limits to Growth” (BTL) (Meadows et al., 1992)]]. . . , where we discussed global developments over the first 20 years in the scenarios of “The Limits to Growth” (LTG). This 30-year update presents the essential parts of our original analysis and summarizes some of the relevant data and the insights we have acquired over the past three decades.

The project that produced LTG took place in the System Dynamics Group of the Sloan School of Management within the Massachusetts Institute of Technology (MIT) from 1970 to 1972. Our project team used system dynamics theory and computer modeling to analyze the long-term causes and consequences of growth in the world's population and material economy. We addressed questions such as: Are current policies leading to a sustainable future or to collapse? What can be done to create a human economy that provides sufficiently for all? . . . . .

A major foundation of our project was the "World3" computer model, which we constructed to help us integrate data and theories related to growth.<sup>3</sup> With the model we can produce scenarios of world development that are internally consistent. In the first edition of LTG we published and analyzed 12 scenarios from World3 that showed different possible patterns of world development over the two centuries from 1900 to 2100. BTL presented 14 scenarios from a slightly updated version of World3. . . . .

#### 1970 - 2000: GROWTH IN THE HUMAN FOOTPRINT

The past 30 years have produced many positive developments. In response to an ever growing human footprint, the world has implemented new technologies, consumers have altered their buying habits, new institutions have been created, and multinational agreements have been crafted. In some regions food, energy, and industrial production have grown at rates far exceeding population growth. In those regions most people have become wealthier. Population growth rates have declined in response to increased income levels. Awareness of environmental issues is much higher today than in 1970. There are ministries of environmental affairs in most countries, and environmental education is commonplace. Most pollution has been eliminated from the smoke stacks and outflow pipes of factories in the rich world, and leading firms are pushing successfully for ever higher eco-efficiency.

These apparent successes made it difficult to talk about problems of overshoot around 1990. The difficulty was increased by the lack of basic data and even elementary vocabulary related to overshoot. It took more than two decades before the conceptual framework - for example, distinguishing growth in the Gross Domestic Product (GDP) from growth in the ecological footprint - matured sufficiently to enable an intelligent conversation about the limits to growth issue. And world society is still trying to comprehend the concept of "sustainability" a term that remains ambiguous and widely abused even sixteen years after the Brundtland Commission coined it. . . . [[see, e.g., "Will the real sustainability concept please stand up?" ( Cairns, 2004)]. . . . .

WAS LIMITS TO GROWTH CORRECT? We are often asked, "Were the 'Limits to Growth' predictions correct?" Note that this is the media's language, not ours! We still see our research as an effort to identify different possible futures. We are not trying to predict the future. We are sketching alternative scenarios for humanity as we move toward 2100. Nonetheless it is useful to reflect on the lessons of the past 30 years. So, what has happened since *LTG* appeared as a slim paperback from an unknown publisher in Washington, DC, in March 1972? *At first the voices of most economists, along with many industrialists, politicians, and third world advocates were raised in outrage at the idea of growth limits. . . .* [[My italics.]]. . . . But eventually events demonstrated that the concept of global ecological constraints is not absurd. There truly are limits to physical growth, and they have an enormous influence on the success of policies we choose to pursue our goals. And history does suggest that society has limited capacity for responding to those limits with wise, farsighted, and altruistic measures that disadvantage important players in the short term.

<sup>#ecol</sup> Meadows, D. H. 2008. "*Thinking in Systems: A Primer.*" Edited by Diana Wright. Chelsea Green; publisher's information at [http://www.chelseagreen.com/bookstore/item/thinking\\_in\\_systems:paperback](http://www.chelseagreen.com/bookstore/item/thinking_in_systems:paperback)>, featuring: (a) additional information (Overview; Praise; Associated Articles; For Bloggers, Press, Media; Reviews; & Upcoming Webinar Excerpt (highly recommended), Reviews, Table Of Contents), (b) Related News ("Remembering Dana Meadows on the 8th Anniversary of Her Death" [Dormgrandpop (2009)], and "A Presidential Candidate with the Dignity We Deserve" [Meadows (1988)]).

#gen Midgley, G, ed. 2003. *Systems Thinking, Volumes I-IV*. Sage, London. Publisher's information at <<http://tinyurl.com/yguydda>>. Amazon.com information at <<http://tinyurl.com/yjhwezf>>. The four volumes are: I. "Systems Science, Cybernetics and Complexity"; II. "Systems Theories and Modelling"; III. "Second Order Cybernetics, Systemic Therapy and Soft Systems Thinking"; IV. "Critical Systems Thinking and Systemic Perspectives on Ethics, Power and Pluralism." I thank Bill Harris for this reference. In a cogent review, John E.S. Lawrence <<http://home.att.net/~jeslawrence/jeslawrencehomepage.htm>>, an Amazon.com customer reviewer at <<http://tinyurl.com/yjhwezf>> wrote:

This is an extraordinary compilation of half a century or more of focused work. It provides a set of crucial organizing principles for human understanding of the way individuals and social organizations interact and work. The concept of 'system', and probabilistic (rather than mechanistic) predictions as to how to effectively influence system behavior is a revolution in philosophy, spreading throughout the natural and social sciences. . . . Midgley. . . .[[spans the work of]]. . . . early gurus in this field (Von Bertalanffy, Churchman, Wiener) with his own recent work on community engagement in policy formulation. Lack of systems thinking is at the heart of many, if not most of our societal problems today. Thoughtless littering or waste dumping, excessive garden watering, selfish and aggressive driver use of traffic feed-in lanes, neglect - or low prioritization- of infrastructure in poorer communities by governments, all are examples of disregard of the nature of interactive consequences, feedback, and 'ripple' effects throughout human systems. Even at the highest levels of government, simple, linear assumptions about immediate cause and effect usually trump any realistic acceptance of empirical ambiguity, uncertainty and probabilities related to outcomes of any intervention. Midgley has made a big contribution to the field of public policy analysis. It is now up to aficionados to spread the word."

#gen MITOpenCourseware. 2009. Sloan School of Management. System Dynamics Self Study, Fall 1998 & Spring 1999, online at <<http://tinyurl.com/yl423ve>> :

"The following documents include tutorials with step-by-step instructions for using a previous version of the STELLA software. Although the documents have not been updated to reflect the functionality in newer versions of STELLA, the basic ideas presented are still relevant. If you are interested in the current version of STELLA and other related resources, visit [isee systems](http://www.iseesystems.com/) <<http://www.iseesystems.com/>>. The Vensim PLE software is available for free at the Ventana Systems website <<http://www.vensim.com/venple.htm>>." Texts used in the course are:

- a. "Industrial Dynamics" [Forrester (1961)];
- b. "Principles of Systems" [Forrester (1968)];
- c. "Urban Dynamics" [Forrester (1969)];
- d. "World Dynamics" [Forrester (1971)];
- e. "Introduction to Computer Simulation: A System Dynamics Modeling Approach" [Roberts (1982)] [a more recent edition is Roberts et al. (1994)];
- f. "Study Notes in System Dynamics" [Goodman (1989)].

Judging from the information at <<http://ocw.mit.edu/OcwWeb/Sloan-School-of-Management/>> this is the most recent self-study course in System Dynamics. It's listed as both an undergraduate and graduate course.

#ecol Montgomery, K. 2000. "The Demographic Transition," online at <<http://www.marathon.uwc.edu/geography/demotrans/demtran.htm>>. A goldmine of information. Warren Thompson's (1929) model of the transition from high to low fertility rates is discussed.

#edu Moore, M.G. & G. Kearsley. 2004. *Distance Education: A Systems View*. Wadsworth Publishing, 2 edition; Publisher's information at <<http://tinyurl.com/yfrmsrs>>; Amazon.com information at <<http://tinyurl.com/mbaw2>>. Note the searchable "Look Inside" feature – see especially pages 4-7 "A Systems Approach" for a good discussion of systems thinking as applied to distance education. See also Kearsley (2009) and on Kearsley's homepage <<http://home.sprynet.com/~gkearsley/>> :

(a) his essay "Learning and Teaching in Cyberspace"

<<http://home.sprynet.com/~gkearsley/cyber.htm>> [this is dated May 2000 and is no longer maintained]; and (b) a study guide for Moore & Kearsley (1st edition) at

<<http://home.sprynet.com/~gkearsley/deguide.htm>>, wherein it is stated:

The critical aspect of the systems approach is that all components of a system are inter-related and interdependent. This means that if you change one component of the system, it will likely affect others too. For example, if you change or add a different communications medium, this will affect the instructional design, nature of interaction, and possibly the learning environment. So, if you try to design or implement distance education without taking into account these interdependencies, it will likely fail or be ineffective. There is much more to a systems approach to distance education than we have outlined in this chapter. We encourage you to read some of the major works about the systems approach such as Banathy (1993) or Reigeluth & Garfinkle (1994). . . [[the complete references are not given by Kearsley but are shown in this REFERENCE list as obtained from Google Scholar <[http://scholar.google.com/advanced\\_scholar\\_search](http://scholar.google.com/advanced_scholar_search)>]]. . . .

#gen Morcol, G. 2002. *A New Mind for Policy Analysis: Toward a Post-Newtonian and Postpositivist Epistemology and Methodology*. Praeger. Amazon. com information at <<http://tinyurl.com/yaxoj6o>>. John E. S. Lawrence <<http://home.att.net/~jeslawrence/jeslawrencehomepage.htm>>, a reviewer of Midgley (2003) at <<http://tinyurl.com/yguydda>> wrote:

An interesting annex should be "A New Mind for Policy Analysis" by Goktug Morcol which ties together systems thinking in three crucial areas (cognition, quantum physics, and complexity theory), in trying to bridge gaps between policy analysts and their clients.

#ecol Murtaugh, P.A. & M.G. Schlx. 2009. "Reproduction and the carbon legacies of individuals," *Global Environmental Change* **19**: 14-20; online at <<http://latimesblogs.latimes.com/files/study.pdf>> (416 kB), and also <[http://blog.oregonlive.com/environment\\_impact/2009/07/carbon%20legacy.pdf](http://blog.oregonlive.com/environment_impact/2009/07/carbon%20legacy.pdf)> (416 kB).

#edu NSDC. 2009. National Staff Development Council, online at <<http://www.nsd.org/>> : NSDC is deeply committed to ensuring success for all students by applying high standards for professional development for everyone who affects student learning. The Council views high-quality staff development programs as essential to creating schools in which all students and staff members are learners who continually improve their performance.

#edu Newell, W.H. 1990. "Interdisciplinary curriculum development." *Issues in Integrative Studies* **8**: 69-86; soon to be free online at <<http://www.units.muohio.edu/aisorg/pubs/issues/toclist.shtml>>.

#edu Newell, W.H. 2001. "A Theory of Interdisciplinary Studies," *Issues In Integrative Studies* **19**: 1-25; online at <[http://www.units.muohio.edu/aisorg/PUBS/ISSUES/19\\_Newell.pdf](http://www.units.muohio.edu/aisorg/PUBS/ISSUES/19_Newell.pdf)> (104 kB). For abstracts of responses to this article see <<http://www.highsouth.com/ais/number19.php3>>.

#edu Nolet, V. 2009. "Preparing Sustainability-Literate Teachers," *Teachers College Record* **111**(2): 409-442; the abstract is online at <<http://www.tcrecord.org/Content.asp?ContentId=15177>>.

#ecol OECD. 2009. "Factbook 2009: Economic, Environmental and Social Statistics," online at <<http://puck.sourceoecd.org/vl=2557548/cl=23/nw=1/rpsv/factbook/index.htm>>. Evolution of the population is online at <<http://puck.sourceoecd.org/vl=2557548/cl=23/nw=1/rpsv/factbook/01/01/01/index.htm>>.

The OECD (Organization for Economic Cooperation and Development) 29 full members: Australia, Austria, Belgium, Canada, the Czech Republic, Denmark, Finland, France, Germany, Great Britain, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, the Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, Turkey, and the United States. Of the 29 OECD countries, growth rates for 27 are listed in Wikipedia (2009u), the U.S. at 0.97 %/year ranks 7th in population growth behind (in %/year) Ireland (1.77), Netherlands (1.33), Turkey (1.26), Luxembourg (1.13), Mexico (1.12), and Australia (1.01).

#physics Ong, N. & R. Bhatt, eds. 2001. *More is Different: Fifty Years of Condensed Matter Physics*. Princeton University Press. Publisher's information at <<http://press.princeton.edu/titles/7103.html>>. Amazon.com information at <<http://tinyurl.com/yfzv37>>. Note the "Look Inside" feature.

#gen Parkany, R. 2009. "Systems Thinkers book now available," post of 31 Oct 2009 11:29:01+0700 to EvalTalk and EvalSys; online on the EvalTalk archives at <<http://tinyurl.com/yzkawzy>>.

To access the archives of EvalTalk one needs to subscribe, but that takes only a few minutes by clicking on <<http://bama.ua.edu/archives/evaltalk.html>> and then clicking on "Join or leave the list (or change settings)." If you're busy, then subscribe using the "NOMAIL" option under "Miscellaneous." Then, as a subscriber, you may access the archives and/or post messages at any time, while receiving NO MAIL from the list!

#econ #ecol Passell, P., M. Roberts, & L. Ross. 1972. Review of "Limits to Growth" [Meadows et al. (1972)], *New York Times Book Review*, 2 April.

According to Fisher (2005), these economists said "Limits to Growth" was "empty and misleading," based on an "intellectual Rube Goldberg device," full of "arbitrary conclusions that [had] the ring of science," but were really "less than pseudoscience."

#gem Pegasus Communications, Inc. , online at <<http://www.pegasuscom.com/community.html>> : "Pegasus offers an array of resources and opportunities for advancing your knowledge and skill in systems thinking and other innovative approaches to management." See especially: Links to the Field - A list of resources related to systems thinking and management innovation at <<http://www.pegasuscom.com/welcome.asp>>.

#ecol *Physics Today Letters*. 2004. November, pp. 12-18. "Long-Term Energy Solutions: The Truth Behind the Silent Lie," online to subscribers at <<http://tinyurl.com/19uwjs>>.

#edu Pintó, R. & D. Couso. 2007. "Contributions from Science Education Research," edited papers from the most outstanding contribution in the ESERA Conference held in Barcelona in 2005; information is at <<http://www.naturfagsenteret.no/esera/eserabook.html>>.

#ecol Podolefsky, N. 2009a. "Re: Energy Efficiency, the Jevons Paradox, and the Elephant in the Room: Overpopulation," PhysLrnR post of 10 Oct 2009 18:12:19-0600; online at <<http://tinyurl.com/yfjsdq2>>.

#ecol Podolefsky, N. 2009b. Re: Energy Efficiency, the Jevons Paradox, and the Elephant in the Room: Overpopulation #2," PhysLrnR post of 16 Oct 2009 13:39:33-0600; online at <<http://tinyurl.com/yf3o56z>>.

#ecol Podolefsky, N. 2009c. Re: Energy Efficiency, the Jevons Paradox, and the Elephant in the Room: Overpopulation #4," PhysLrnR post of 25 Oct 2009 11:07:56-0600; online at <<http://tinyurl.com/yeq6g9c>>. Podolefsky wrote:

. . . .we need to make sure models actually match the data. In an earlier post I provided a link <<http://energy.sigmaxi.org/?p=551=1>> to data on world population growth, energy consumption, all compiled in one convenient place by our friends at Sigma Xi (with references to original sources at bottom of the page). World population growth (since 1965) is clearly LINEAR. Growth rate in developed (OECD) countries is past an inflection point and decreasing. Even in developing the rate is now decreasing.

Note that these data start about 1965. Before 1965, population growth was roughly exponential (the rate peaked mid-1960's) - so not surprising that books like "The Population Bomb" (Erich, 1968) or "Limits to Growth" (Meadows, 1972) were so alarming, in their time. There is a more recent book "Limits to Growth: The 30-year Update" (Meadows, Randers, Meadows, 2004) which might be of interest. (I haven't read it - but descriptions suggest it carries a similar theme, albeit more nuanced given 30 years of additional data and time to reflect on the problem.)

For a response see "Misconceptions in the Population/Energy Debate #2" [Hake (2009c)].

#gen #econ #ecol #edu Radzicki, M.J. 1997. *Introduction to System Dynamics V 1.0*, adapted from *Foundations of System Dynamics Modeling* by Dr. Michael J. Radzicki,” online at <<http://www.systemdynamics.org/DL-IntroSysDyn/>>. The introduction states:

This *online book* was written to introduce **system dynamics**, a powerful methodology for framing, understanding, and discussing complex policy issues and problems. Energy policy is well suited for a “systems approach” because those who study, design, and implement national energy policy must not only understand the complexities of our nation's energy sector, but how energy issues influence and "connect" with national policy concerns such as economic growth, technology development, national security, international trade, and environmental conservation, just to name a few. System dynamics helps the decision maker untangle the complexity of these *connections* by providing a new *language* and set of *tools* to describe - and even model - the cause-and-effect relationships among various policy variables. The goal of this *online book* is to teach decision makers how to identify the underlying structure of their system or issue - a critical first step in effective policy design and implementation.”

Chapter 1. Origin of System Dynamics

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch1\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch1_f.htm)>;

Chapter 2. Why Model?

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch2\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch2_f.htm)>;

Chapter 3. The Building Blocks <[http://www.systemdynamics.org/DL-IntroSysDyn/ch3\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch3_f.htm)>

Chapter 4. Simple Structures

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch4\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch4_f.htm)>;

Chapter 5. The Modeling Process

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch5\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch5_f.htm)>;

Chapter 6. Natural Gas Discovery Model

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch6\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch6_f.htm)>;

Chapter 7. Next Steps

<[http://www.systemdynamics.org/DL-IntroSysDyn/ch7\\_f.htm](http://www.systemdynamics.org/DL-IntroSysDyn/ch7_f.htm)>.

For a list of some of Radzicki's other works see

<<http://www.michaeljosephradzicki.com/research.htm>>.

#econ Radzicki, M.J. & J.D. Sterman. 1994. “Evolutionary Economics and System Dynamics,” pp. 61-89 in Richard W. England, ed. “Evolutionary Concepts in Contemporary Economics.” University of Michigan Press; online at <<http://tinyurl.com/ycqvab7>>. At <<http://www.michaeljosephradzicki.com/research.htm>> it is stated that:

“This paper extends the notion that system dynamics should be combined with institutional economics and argues that system dynamics can be used by all “evolutionary economists” (institutional economics is a subset of the broader field of “evolutionary economics”). This paper includes an original system dynamics model that illustrates evolutionary economic behavior.”

#econ Radzicki, M.J. & L. Tauheed. 2009. “In Defense of System Dynamics: A Reply to Professor Hayden.” *Journal of Economic Issues* 43(4): Forthcoming, online at <<http://tinyurl.com/y8rxmy7>>. At <<http://www.michaeljosephradzicki.com/research.htm>> it is stated that:

“This paper is under review at the *Journal of Economic Issues*. It answers the egregiously inaccurate claims of Professor Greg Hayden that system dynamics modeling is inappropriate for institutional economic analysis.”

#econ Radzicki, M.J. 2003. "Mr. Hamilton, Mr. Forrester and a Foundation for Evolutionary Economics," *Journal of Economic Issues* 37(1): 133-173; online at <<http://tinyurl.com/y8mhvf4>>. At <<http://www.michaeljosephradzicki.com/research.htm>> it is stated that:

This is an invited paper for a special issue of the "Journal of Economic Issues" that was published to celebrate the fiftieth anniversary of the publication of David Hamilton's book "Evolutionary Economics". Hamilton's primary insight was that neoclassical economic models are based on Newtonian concepts of change while institutional economic models are based on Darwinian concepts of change. The paper extends Hamilton's insight to seven additional schools of economic thought and shows that many of them could profit from the use of system dynamics modeling and/or agent-based modeling. It also outlines how system dynamics modeling embodies the concept of Darwinian change and presented an extended version of the model originally presented in "Evolutionary Economics and System Dynamics.

#gen Ramage, M. & K. Shipp. 2009. *Systems Thinkers*. Springer. I thank Rick Parkany (2009) for his post regarding this book. Publisher's information at <<http://www.springer.com/life+sci/behavioural/book/978-1-84882-524-6>>, including the Table of Contents at <<http://tinyurl.com/y9ajgkp>> :

Introduction.- Gregory Bateson.- Norbert Wiener.- Warren McCulloch.- Margaret Mead.- W. Ross Ashby.- Ludwig von Bertalanffy.- Kenneth Boulding.- Geoffrey Vickers.- Howard Odum.- Jay Forrester.- Donella Meadows.- Peter Senge.- C. West Churchman.- Russell Ackoff.- Peter Checkland.- Werner Ulrich.- Michael Jackson.- Heinz von Foerster.- Stafford Beer.- Humberto Maturana.- Niklas Luhmann.- Paul Watzlawick.- Ilya Prigogine.- Stuart Kauffman.- James Lovelock.- Kurt Lewin.- Eric Trist.- Chris Argyris.- Donald Schön.- Mary Catherine Bateson.- Afterword"

Amazon.com information at <<http://tinyurl.com/yz7q87y>>. According to a message from Karen Ship that was included in Parkany's (2009) post:

"this book is associated with two new. . . [Open University]. . . postgraduate distance-learning courses, first available next May and next November respectively: (1) 'Thinking strategically: systems tools for managing change' <<http://www3.open.ac.uk/study/postgraduate/course/tu811.htm>> and (2) 'Managing systemic change: inquiry, action and interaction' <<http://www3.open.ac.uk/study/postgraduate/course/tu812.htm>>."

For information on Magnus Ramage and Karen Shipp see, respectively, <<http://systems.open.ac.uk/page.cfm?pageid=magnusrhome>> and <<http://systems.open.ac.uk/page.cfm?pageid=KarenShome>>. For a comment on this book see Williams (2009c).

#ecol Ratcliff, P. 2009. "Sustainable Development," blog at <<http://acratcliffe.free.fr/sustainability/frame.htm>>. The left hand column contains links to many resources in English. including #25. "Introductory chapter to "Beyond Growth" by Herman Daly."

#ecol Rees, W.E., M. Wackernagel, & P. Testemale. 1998. *Our Ecological Footprint: Reducing Human Impact on the Earth*. New Society Publishers; publisher's information at <<http://www.newsociety.com/bookid/3663>>. Amazon.com information at <<http://tinyurl.com/yfrjwz4>>; note the searchable "Look Inside" feature.

#edu Reigeluth, C.M. & R.J. Garfinkle, eds. 1994. *Systemic change in education*. Educational Technology Education Publications. Amazon.com information at <<http://tinyurl.com/yhkzfzfu>>. A Google book preview is online at <<http://tinyurl.com/ykownzu>>.

#gen Richardson, G. 1999. *Feedback Thought in Social Science and Systems Theory*. Pegasus Communications. Amazon.com information at <<http://tinyurl.com/yau6uhm>>. According to Bill Harris, who kindly alerted me to this book, it “covers the history of feedback thought, which you might think of as culminating today in two distinct threads: system dynamics and cybernetics.”

#gen Richardson, K., W.J. Gregory, & G. Midgley, eds. 2005. “*Systems Thinking and Complexity Science: insights for action* - Proceedings of the 11th Anzsys / Managing The Complex V Conference.” ISCE Publishing. Publisher's information at <[http://iscepublishing.com/catalog\\_detail.aspx?Value=3](http://iscepublishing.com/catalog_detail.aspx?Value=3)>, contents at <[http://iscepublishing.com/documents/9780976681496\\_contents.pdf](http://iscepublishing.com/documents/9780976681496_contents.pdf)> (332 kB). Amazon.com information at <<http://tinyurl.com/yl52uj6>>.

#gen Richmond, B. 1993. “Systems thinking: critical thinking skills for the 1990s and beyond,” *System Dynamics Review* 9:1-21; online at <[http://www.clexchange.org/ftp/documents/whyk12sd/Y\\_1993-05STCriticalThinking.pdf](http://www.clexchange.org/ftp/documents/whyk12sd/Y_1993-05STCriticalThinking.pdf)> (324 KB).

#gen Richmond, B. 2001. *An Introduction to Systems Thinking*. High Performance Systems, Inc., Hanover, NH. Amazon.com information at <<http://www.amazon.com/Introduction-Systems-Thinking-Ithink/dp/0970492103>>.

#gen Roberts, N., M. Garet, D. Andersen, and W. Shaffer. 1994. *Introduction to Computer Simulation: A System Dynamics Modeling Approach*. Productivity Press. Amazon.com information at <<http://tinyurl.com/yz44lgc>>.

#edu Romer, R.H. 1976. *Energy: An Introduction to Physics*. Freeman. Amazon.com information at <<http://tinyurl.com/yjhcg92>>. Unfortunately, now out of print, but used copies are available. See also Romer (1985).

#edu Romer, R.H. 1985. *Energy Facts and Figures*. Spring Street Press. Amazon.com information at <<http://tinyurl.com/yfsqjjq>>. Unfortunately, now out of print, but used copies are available.

#gen Ruben, B.D. & J. Y. Kim, eds. 1975. *General Systems Theory and Human Communication*, Transaction Publishers. Amazon.com information at <<http://tinyurl.com/yznc2az>>.

#physics #gen Santa Fe Institute. 2009. Online at <<http://www.santafe.edu/>> :

“The Santa Fe Institute is a transdisciplinary research community that is expanding the boundaries of scientific understanding. Its aim is to discover, comprehend, and communicate the common fundamental principles in complex physical, computational, biological, and social systems that underlie many of the most profound problems facing science and society today.”

See especially “Physics of Complex Systems”

<<http://www.santafe.edu/research/topics-physics-complex-systems.php>>.

- #ecol Sigma Xi. 2009. "Year of Energy 2009," online at <<http://energy.sigmaxi.org/?p=551=1>>. Podolefsky's (2009a) claim that population growth is most rapid in the developing world is evidently based on a graph captioned "Population is growing fastest in developing countries," showing linear plots of population vs time for OECD countries ("developed") and non-OECD countries ("developing") for the time span 1970 to 2007 (historical) and projected from 2007 to 2030. This graph is evidently based on data from OECD (2009). The slope of population vs time is about 10 times higher for the non-OECD countries than for the OECD countries. The data are evidently based on OECD (2009).
- #gen Senge, P.M., A. Kleiner C. Roberts, G. Roth, R. Ross, B. Smith. 1999. *The Dance of Change: The Challenges to Sustaining Momentum in Learning Organizations*. Broadway Business. Amazon.com information at <<http://tinyurl.com/yekysku>>; note the "Look Inside" feature.
- #gen Senge, P.M. 2006. *The Fifth Discipline: The Art and Practice of the Fifth Discipline*. Doubleday, the entire book is online at <<http://www.scribd.com/doc/21249023/The-Fifth-Discipline-Peter-Senge>>.
- #gen Senge, P.M., B. Smith, S. Schley, J. Laur, & N. Kruschwitz. 2008. *The Necessary Revolution: How individuals and organizations are working together to create a sustainable world*. Doubleday. Amazon.com information at <<http://tinyurl.com/ye4h2pj>>; note the "Look Inside" feature.
- #gen Skyttner. L. *General Systems Theory: Perspectives, Problems, Practice*. World Scientific. Amazon.com information at <<http://www.amazon.com/gp/product/981256389X>>; note the "Look Inside" feature. A Google book preview is online at <<http://tinyurl.com/yzqrub3>>.
- #gen Sterman, J. D. 2000. *"Business Dynamics: Systems Thinking and Modeling for a Complex World."* Irwin/McGraw-Hill. Extensive information by the author at <[http://web.mit.edu/jsterman/www/BusDyn2.html#From\\_The\\_Preface](http://web.mit.edu/jsterman/www/BusDyn2.html#From_The_Preface)>. Amazon.com information at <<http://tinyurl.com/ykpgy23>>.
- #gen Sterman, D., ed. 2007. Special Issue: "Exploring the Next Great Frontier: System Dynamics at 50," *System Dynamics Review* **23**(2-3): 89-370; the Table of Contents is online at <<http://www3.interscience.wiley.com/journal/116836756/issue>>.
- #gen Szostak, R. 2000. "Toward a unified human science," *Issues in Integrative Studies* **18**: 115-57; online at <[http://www.units.muohio.edu/aisorg/pubs/issues/18\\_Szostak.pdf](http://www.units.muohio.edu/aisorg/pubs/issues/18_Szostak.pdf)> (292 kB).
- #gen #ecol Tainter, J. 1990. *The Collapse of Complex Societies (New Studies in Archaeology)*. Cambridge University Press, publisher's information at <<http://tinyurl.com/y8wytha>>. Amazon.com information at <<http://tinyurl.com/yakpucw>>; note the "Look Inside" feature.
- #eng Thomé, B. ed. 1993. *Systems Engineering: Principles and Practice of Computer-based Systems Engineering*. John Wiley. Amazon.com information at <<http://tinyurl.com/ycx738l>>.

#ecol Thompson, W.S. 1929. "Population". *American Journal of Sociology* **34**(6): 959-975. Warren Thompson's (1929) model of the transition from high to low fertility rates is discussed in Wikipedia's (2009v) entry "Demographic transition," and in Montgomery's (2000) web page "Demographic transition."

#eng Tribus, M. 1961. *Thermostatistics and Thermodynamics: An Introduction to Energy, Information and States of Matter, with Engineering Applications*. Van Nostrand. Amazon.com information at <<http://tinyurl.com/yhmyt2c>>.

#gen #eng #edu Tribus, M. 1980-2001. Online on the Deming Electronic Network at <[http://deming-network.org/deming\\_tribus.htm](http://deming-network.org/deming_tribus.htm)>. Myron Tribus <[http://en.wikipedia.org/wiki/Myron\\_Tribus](http://en.wikipedia.org/wiki/Myron_Tribus)> is the former Director of the Center for Advanced Engineering Study at MIT. This resource includes the following essays by Tribus:

- "Deming's Way" (1981) <[http://deming-network.org/demings\\_way.pdf](http://deming-network.org/demings_way.pdf)> (40 kB)
- "Reducing Deming's 14 Points to Practice" (1984)  
<<http://deming-network.org/red14points.pdf>> (40 kB)
- "Deming Memorial for National Academy of Engineering: (1992)  
<[http://deming-network.org/nae\\_memorial.pdf](http://deming-network.org/nae_memorial.pdf)> (16 kB)
- "Observations on Systems, Probability, Entropy, and Management" (undated)  
<[http://deming-network.org/sys\\_entropy.pdf](http://deming-network.org/sys_entropy.pdf)> (36 kB)
- "The Feuerstein Letters" (1998) <[http://deming-network.org/ltrs\\_jerus2.pdf](http://deming-network.org/ltrs_jerus2.pdf)> (836 kB)
- "Quality in Education According to the Teachings of Deming and Feuerstein" (undated)  
<[http://deming-network.org/deming\\_feuerstein.pdf](http://deming-network.org/deming_feuerstein.pdf)> (76 kB)
- "The Application of Quality Management Principles in Education, at Mt. Edgecumbe High School, Sitka, Alaska" (1990) <[http://deming-network.org/mtedge\\_hs.pdf](http://deming-network.org/mtedge_hs.pdf)> (444 kB)
- "Quality Management in Education" (undated)  
<[http://deming-network.org/qmgt\\_inedu.pdf](http://deming-network.org/qmgt_inedu.pdf)> (64 kB)
- "The Contributions of W. Edwards Deming to the Improvement of Education (undated)  
<[http://deming-network.org/wed\\_contrib\\_edu.pdf](http://deming-network.org/wed_contrib_edu.pdf)> (40 kB)

#gen #eng Tribus. Undated. "Observations on Systems, Probability, Entropy, and Management" <[http://deming-network.org/sys\\_entropy.pdf](http://deming-network.org/sys_entropy.pdf)> (36 kB). Tribus wrote [my insert at ". . . .[[insert]]. . . ."]:

. . . .in 1961, when I wrote my book . . . .[[."Thermostatistics and Thermodynamics: An Introduction to Energy, Information and States of Matter, with Engineering Applications" Tribus (1961)]. . . . on thermodynamics I went to great lengths to define three classes of systems, each of which is a region of space bounded by an imaginary or real surface:

- a. Closed Systems, which do not exchange matter with their surrounds, but may still exchange energy and information.
- b. Flow Systems, which exchange matter, energy and information with their surrounds, but the matter enters and leaves only in well defined streams, through well defined ports and under some degree of control, in a purposeful way. (I likened such systems as similar to a prison in which the prisoners are transferred, under control, in packets. It is unlikely that those being thus transported are very different from those left behind.)
- c. Open Systems, which exchange matter, energy and information in a diffuse manner, through various places on the surface, in the absence of well defined streams and not necessarily under precise control. (I likened these systems as similar to a prison from which prisoners could escape. The prisoners escaping are likely to be more energetic than those that remain behind.)

#ecol Turner, G. 2008. "A Comparison of the Limits to Growth with Thirty Years of Reality," CSIRO Working Paper Series 2008-2009; online at <<http://www.csiro.au/files/files/plje.pdf>> (708 kB) [CSIRO = Commonwealth Scientific & Industrial Research Organization (Australia)]. Turner wrote:

From the time of its publication to contemporary times, the LTG has provoked many criticisms which falsely claim that the LTG predicted resources would be depleted and the world system would collapse by the end of the 20th century. Such claims occur across a range of publication and media types, including scientific peer reviewed journals, books, educational material, national newspaper and magazine articles, and web sites (Turner, unpublished). This paper briefly addresses these claims, showing them to be false. The main purpose of this paper however, is to compare LTG scenario outputs of the World3 model produced in 1974 (the second edition of LTG . . . [[evidently referring to Meadows et al. (1974)]]. . . . with 30 years of observed data covering 1970 to 2000. The comparison is made to distinguish between scenarios in terms of approximate magnitudes and trends of key variables, and is therefore commensurate with the purpose of the LTG modeling, i.e., to understand different global economic behavior modes rather than being strictly predictive. . . . Unless the LTG is invalidated by other scientific research, the data comparison presented here lends support to the conclusion from the LTG that the global system is on an unsustainable trajectory unless there is a substantial and rapid reduction in consumptive behavior. . . .[[see e.g., "Nevara (Ehrlich & Ehrlich (2005))]. . . , in combination with technological progress.

#ecol UCS. 1992. Union of Concerned Scientists, "World Scientists' Warning to Humanity" of November 1992, online at <<http://www.ucsusa.org/about/1992-world-scientists.html>> :  
"Some 1,700 of the world's leading scientists, including the majority of Nobel laureates in the sciences, issued this appeal in November 1992 The World Scientists' Warning to Humanity was written and spearheaded by the late Henry Kendall, former chair of UCS's board of directors."

#ecol UCS. 2000. Global Resources - "Population"; online at <<http://tinyurl.com/yg7sprw>>, especially "Frequently Asked questions about Population Growth" at <<http://web.archive.org/web/20000307001851/www.ucsusa.org/resources/pop.faq.html>>.

#ecol UN. 1999. "The World at Six Billion," online at <<http://www.un.org/esa/population/publications/sixbillion/sixbilcover.pdf>> (24 kB), and <<http://www.un.org/esa/population/publications/sixbillion/sixbilpart1.pdf>> (72 kB). See especially Fig.1 "Long-term world population growth," 1750 to 2050 on page 7.

#ecol UN. 2007. "World Population Prospects: The 2006 Revision, Highlights," United Nations Dept. of Economic and Social Affairs (DESA); online at <<http://tinyurl.com/6y7j7c>>. For a graph of world population vs time see Figure 1 on page ix, "Population of the world, 1950-2050, according to different projection variants" (Medium-, Low-, High-, & Constant-fertility). The paragraph above the figure reads:

"Future population growth is highly dependent on the path that future fertility takes (figure 1). In the medium variant, fertility of the world declines from 2.55 children per woman today to slightly over 2 children per woman in 2050. If fertility were to remain about half a child above the levels projected in the medium variant, world population would reach 10.8 billion by 2050. . . .[[the "high fertility rate curve]]. . . . A fertility path half a child below the medium variant would lead to a population of 7.8 billion by mid-century . . . .[[the "low fertility rate curve]]. . . . That is, at the world level, continued population growth until 2050 is inevitable even if the decline in fertility accelerates."

Warren Thompson's (1929) model of the transition from high to low fertility rates is discussed in Wikipedia's (2009v) entry "Demographic transition," and in Montgomery's (2000) web page "Demographic transition." Fertility rates are discussed by e.g.: Brown (2009), the *Economist Magazine* (2009); Caldwell (1976), Caldwell et al. (2007), Cohen (1996), & Meadows et al. (2004). See also Table A8, pp. 53-59 "Average Annual Rate Of Population Change By Country For Selected Periods, Medium Variant," in alphabetical order. The data for 2005-2010 are repeated in Wikipedia (2009u) except the order is by growth rate and some countries are omitted including two OECD countries Portugal (0.37 %/year) and Spain (0.77 %/year). For the World the rate for 2005-2015 is given as 1.10 %/year

#ecol UN. 2009. World Population Prospects: The 2008 Revision, online at <<http://esa.un.org/unpd/wpp2008/index.htm>>.

The data analysis is much less complete than that of UN (2007). However, there is a PRESS RELEASE with useful information at <<http://www.un.org/esa/population/publications/wpp2008/pressrelease.pdf>> (40 kB). Tables of the U.S. population and population density from 1950 (157 813 000 people, 16 people/km<sup>2</sup>) and projected to 2050 (403 932 000 people, 42 people/ km<sup>2</sup>, under a "medium variant" assumption can be obtained at <<http://esa.un.org/unpp/index.asp>> by selecting "population" and "population density" in the left-hand menu and "United States of America" in the right-hand menu. For the assumptions see <<http://esa.un.org/unpp/index.asp?panel=4>>. For comparison, the Bangladesh population and population density are given as 1950 (43 595 000 people, 303 people/km<sup>2</sup>) and projected to 2050 (222 495 000 people, 1545 people/ km<sup>2</sup> under a "medium variant" assumption.

#ecol Wackernagel, M, N.B. Schulz, D. Deumling, A.C. Linares, M. Jenkins, V. Kapos, C. Monfreda, J. Loh, N.Myers, R.Norgaard, & J. Randers. 2002. "Tracking the ecological overshoot of the human economy, 296 Endnotes" *Proceedings of the Academy of Science* **99**(14:9266-9271), Washington, DC. Also online at <<http://www.pnas.org/cgi/doi/10.1073/pnas.142033699>>.

#ecol Waltner-Toews, D., J. J. Kay, and N. E. Lister. 2008. *The Ecosystem Approach: Complexity, Uncertainty, and Managing for Sustainability*. Columbia University Press; publisher's information at <<http://cup.columbia.edu/book/978-0-231-13250-3/the-ecosystem-approach>>, including "Contents" and "Reviews." Amazon.com information at <<http://tinyurl.com/yj9yp49>>.

#edu Waters Foundation. 2009. "Systems Thinking in Schools," online at <http://watersfoundation.org/>>. I thank Michael Martin for alerting me to this resource. Their "What? Why? How" page <http://www.watersfoundation.org/index.cfm?fuseaction=stdm.whatwhyhow>> provides answers to these frequent concerns:

- What is systems thinking?
- What is a systems thinker?
- What are the habits of a systems thinker?
- What are the systems thinking tools?
- What are key systems thinking concepts?
- What is dynamic modeling?
- What we know - Action Research
- Why should I learn about systems thinking?
- Why do K-12 educators believe systems thinking is important?
- Benefits of a Systems Learning Environment
- How do K-12 educators use systems thinking?
- How is systems thinking assessed in the classroom?
- Examples of systems thinking in action.

For example, clicking on "What is systems thinking" yields a quote from Barry Richmond of "High Performance Systems" that may be in his book "An Introduction to Systems Thinking" [Richmond (2001): "What do we mean when we say 'systems thinking'? We can use the phrase to refer to a set of tools - such as causal loop diagrams, stock and flow diagrams and simulation models - that help us map and explore dynamic complexity. We can also use it to mean a unique perspective on reality - a perspective that sharpens our awareness of whole and of how the parts within those wholes interrelate. Finally, systems thinking can refer to a special vocabulary with which we express our understanding of dynamic complexity. For example, systems thinkers often describe the world in terms of reinforcing and balancing processes, limits, delays, patterns of behavior over time, and so forth."

#ecol WCED. 1987. World Commission on Environment and Development, *Our Common Future*. Oxford University Press. Publisher's information at <http://tinyurl.com/yh77dpe>>. Meadows, Randers, & Meadows (2004) state:

"The commission is widely known as the Brundtland Commission, after its leader, Gro Harlem Brundtland, former Prime Minister of Norway. In LTG. . . . [['Limits to Growth' (Meadows et al. ,1972)]] . . . we used the word 'equilibrium' instead of 'sustainability'."

#ecol Weisz, P.B. 2004. "Basic Choices and Constraints on Long-Term Energy Supplies: Population growth and energy demand are exhausting the world's fossil energy supplies, some on the timescale of a single human lifespan. Increasingly, sharing natural resources will require close international cooperation, peace, and security," *Physics Today*, July, pp. 47-52; online at [http://fire.pppl.gov/energy\\_choices\\_pt\\_0704.pdf](http://fire.pppl.gov/energy_choices_pt_0704.pdf)> (896 kB). Weisz wrote:

"Human society, like any system composed of dynamic processes, depends on an external energy source. Historically, that source was the Sun, which provides heat, light, and photosynthesis for food to support work energy by man and animal, and affects wind and water motion. Since the early 19th century, though, the discovery of and access to a vast supply of fossil fuels within Earth has enabled the industrial revolution, near-exponential growth of population, technologies, and wealth. That period could well be renamed the energy revolution (see figure 1)" . . . . [[World Population vs Time from 1250 to 2000]]. . . .

#edu Wells, H.G. 1920. *The Outline of History*. For an interesting history of this treatise see <[http://en.wikipedia.org/wiki/The\\_Outline\\_of\\_History](http://en.wikipedia.org/wiki/The_Outline_of_History)>. For Amazon.com information on a two volume set published in 1974 by Scholarly Press see <<http://tinyurl.com/yjs83d>>.

#edu #ecol Westra, R.K., K. Boersma, A.J. Waarlo, & E. Savelsbergh. 2007. *Learning and Teaching about Ecosystems Based on Systems Thinking and Modelling in an Authentic Practice*. Springer, an abstract and one-page preview is online at <<http://www.springerlink.com/content/u80k563703345133/>>. This is chapter 28 of Pintó & Couso (2007).

#gen WikiEductor. 2009. GST, online at <<http://wikieducator.org/GST>>. This entry begins:  
“Contemporary GST begins with Jay Forrester and The Club of Rome . . . [[both subjects are linked to the tutorial “Introduction to System Dynamics V 1.0” (Radzicki, 1997)] but the “deep linking” <[http://www.ercim.org/publication/Ercim\\_News/enw50/eurolegal.html](http://www.ercim.org/publication/Ercim_News/enw50/eurolegal.html)> does not give proper attribution to Radzicki (1997)]. . . although it grew out of operations research, used in maritime engineering especially. Using computers to simulate real world systems, incorporating as many relevant factors as the system architects might manage, remains a knowledge worker skill to this day.  
I thank Kirby Urner of the Math-Teach discussion list for this reference.

## WIKIPEDIA: SYSTEMS

- #gen Wikipedia. 2009a. "Systems thinking" <[http://en.wikipedia.org/wiki/Systems\\_thinking](http://en.wikipedia.org/wiki/Systems_thinking)>. *Can this and the wikipedia entries above and below be trusted?* See, e.g. "In Defense of Wikipedia" [Hake (2009f)].
- #gen Wikipedia. 2009b. "Systems philosophy" <[http://en.wikipedia.org/wiki/Systems\\_philosophy](http://en.wikipedia.org/wiki/Systems_philosophy)>.
- #gen Wikipedia. 2009c. "Systems Theory" <[http://en.wikipedia.org/wiki/Systems\\_theory](http://en.wikipedia.org/wiki/Systems_theory)>.
- #gen Wikipedia. 2009d. "General Systems Theory" <[http://en.wikipedia.org/wiki/General\\_System\\_Theory](http://en.wikipedia.org/wiki/General_System_Theory)>. According to Wikipedia, GST was founded by Ludwig Von Bertalanffy <<http://en.wikipedia.org/wiki/Bertalanffy>> and William Ross Ashby <[http://en.wikipedia.org/wiki/William\\_Ross\\_Ashby](http://en.wikipedia.org/wiki/William_Ross_Ashby)>.
- #gen Wikipedia. 2009e. "System Dynamics" <[http://en.wikipedia.org/wiki/System\\_dynamics](http://en.wikipedia.org/wiki/System_dynamics)>.
- #gen Wikipedia. 2009f. "Interdisciplinary" <<http://en.wikipedia.org/wiki/Interdisciplinarity>>.
- #gen Wikipedia. 2009g. "Multidisciplinary" <<http://en.wikipedia.org/wiki/Multidisciplinary>>.
- #gen Wikipedia. 2009gg. "Transdisciplinary" <<http://en.wikipedia.org/wiki/Transdisciplinary>>.
- #gen Wikipedia. 2009ggg. "Consilience" <<http://en.wikipedia.org/wiki/Consilience>>.
- #gen Wikipedia. 2009h. "Complex system" <[http://en.wikipedia.org/wiki/Complex\\_system](http://en.wikipedia.org/wiki/Complex_system)>.
- #gen Wikipedia. 2009i. "Complex systems" <[http://en.wikipedia.org/wiki/Complex\\_systems](http://en.wikipedia.org/wiki/Complex_systems)>.
- #gen Wikipedia. 2009j. "Dynamical System" <[http://en.wikipedia.org/wiki/Dynamical\\_system](http://en.wikipedia.org/wiki/Dynamical_system)>.
- #gen Wikipedia. 2009k. "Dynamical System Theory" <[http://en.wikipedia.org/wiki/Dynamical\\_systems\\_theory](http://en.wikipedia.org/wiki/Dynamical_systems_theory)>.
- #gen Wikipedia. 2009l. "Cybernetics" <<http://en.wikipedia.org/wiki/Cybernetics>>.

## WIKIPEDIA: ECOLOGY

- <sup>#ecol</sup> Wikipedia. 2009m. "The Population Bomb" <[http://en.wikipedia.org/wiki/The\\_Population\\_Bomb](http://en.wikipedia.org/wiki/The_Population_Bomb)>.
- <sup>#ecol</sup> Wikipedia. 2009n. "Ecological Footprint" <[http://en.wikipedia.org/wiki/Ecological\\_footprint](http://en.wikipedia.org/wiki/Ecological_footprint)>.
- <sup>#ecol #econ</sup> Wikipedia. 2009o. "Ecological Economics" <[http://en.wikipedia.org/wiki/Ecological\\_economics](http://en.wikipedia.org/wiki/Ecological_economics)>.
- <sup>#ecol #econ</sup> Wikipedia. 2009p. "Evolutionary Economics" <[http://en.wikipedia.org/wiki/Evolutionary\\_economics](http://en.wikipedia.org/wiki/Evolutionary_economics)>.
- <sup>#ecol</sup> Wikipedia, 2009q. "Club of Rome" <[http://en.wikipedia.org/wiki/Club\\_of\\_Rome](http://en.wikipedia.org/wiki/Club_of_Rome)>.
- <sup>#ecol</sup> Wikipedia. 2009r. "Lester Brown" <[http://en.wikipedia.org/wiki/Lester\\_Brown](http://en.wikipedia.org/wiki/Lester_Brown)>.
- <sup>#ecol</sup> Wikipedia. 2009s. "E.O. Wilson" <[http://en.wikipedia.org/wiki/E.\\_O.\\_Wilson](http://en.wikipedia.org/wiki/E._O._Wilson)>.
- <sup>#ecol</sup> Wikipedia. 2009t. "Limits to Growth" <[http://en.wikipedia.org/wiki/The\\_Limits\\_to\\_Growth](http://en.wikipedia.org/wiki/The_Limits_to_Growth)>.
- <sup>#ecol</sup> Wikipedia. 2009u. "List of countries by population growth rate," <[http://en.wikipedia.org/wiki/List\\_of\\_countries\\_by\\_population\\_growth\\_rate](http://en.wikipedia.org/wiki/List_of_countries_by_population_growth_rate)>. See the table captioned "2005-2010 List by the United Nations," which is "based on the estimates taken from the 2006 edition of the United Nations World Population Prospects report [UN (2007)], Table A8. Numbers are population growth rate estimates for the period 2005-2010 using the "medium variant."
- <sup>#ecol</sup> Wikipedia. 2009v. "Demographic Transition" <[http://en.wikipedia.org/wiki/Demographic\\_transition](http://en.wikipedia.org/wiki/Demographic_transition)>.

## WIKIPEDIA: SOME PIONEERS IN SYSTEMS THINKING

- <sup>#gen</sup> Wikipedia. 2009aa. "Russel Ackoff" <[http://en.wikipedia.org/wiki/Russell\\_Ackoff](http://en.wikipedia.org/wiki/Russell_Ackoff)>. For a tribute to Ackoff who died on 29 October 2009 due to complications arising from hip surgery see "Russ Ackoff" (Williams, 2009d)."
- <sup>#gen</sup> Wikipedia. 2009bb. William Ross Ashby <[http://en.wikipedia.org/wiki/William\\_Ross\\_Ashby](http://en.wikipedia.org/wiki/William_Ross_Ashby)>.
- <sup>#gen</sup> Wikipedia. 2009cc. Ludwig Von Bertalanffy <<http://en.wikipedia.org/wiki/Bertalanffy>>.
- <sup>#gen</sup> Wikipedia. 2009dd. "W. Edwards Deming" <[http://en.wikipedia.org/wiki/W.\\_Edwards\\_Deming](http://en.wikipedia.org/wiki/W._Edwards_Deming)>, revered by some as the "Father of Quality Control."
- <sup>#gen</sup> Wikipedia. 2009ee. "Jay Wright Forrester" <[http://en.wikipedia.org/wiki/Jay\\_Wright\\_Forrester](http://en.wikipedia.org/wiki/Jay_Wright_Forrester)>.
- <sup>#gen</sup> Wikipedia. 2009ff. "Norbert Wiener" <[http://en.wikipedia.org/wiki/Norbert\\_Wiener](http://en.wikipedia.org/wiki/Norbert_Wiener)>.

## WIKIPEDIA: SOME LEADERS IN SYSTEMS THINKING

#gen Wikipedia. 2009gg. Bela Banathy, <[http://en.wikipedia.org/wiki/Béla\\_H.\\_Bánáthy](http://en.wikipedia.org/wiki/Béla_H._Bánáthy)>.

#gen Wikipedia. 2009hh. C. West Churchman <[http://en.wikipedia.org/wiki/C.\\_West\\_Churchman](http://en.wikipedia.org/wiki/C._West_Churchman)>.

#gen Wikipedia. 2009ii. Peter Drucker  
<[http://en.wikipedia.org/wiki/Peter\\_Drucker](http://en.wikipedia.org/wiki/Peter_Drucker) Peter Drucker>.

#gen Wikipedia. 2009jj. Donella Meadows <[http://en.wikipedia.org/wiki/Donella\\_Meadows](http://en.wikipedia.org/wiki/Donella_Meadows)>

#gen Wikipedia. 2009kk. Dennis Meadows <[http://en.wikipedia.org/wiki/Dennis\\_Meadows](http://en.wikipedia.org/wiki/Dennis_Meadows)>

#gen Wikipedia. 2009ll. Barry Richmond <[http://en.wikipedia.org/wiki/Barry\\_Richmond](http://en.wikipedia.org/wiki/Barry_Richmond)>

#gen #eng #edu Wikipedia. 2009mm. Myron Tribus <[http://en.wikipedia.org/wiki/Myron\\_Tribus](http://en.wikipedia.org/wiki/Myron_Tribus)>, a disciple of Deming and friend of Marion Brady. Wikipedia states:  
"In recent years [Tribus] has focused on the theory of structural cognitive modifiability of Dr. Reuven Feuerstein <[http://en.wikipedia.org/wiki/Reuven\\_Feuerstein](http://en.wikipedia.org/wiki/Reuven_Feuerstein)>, an Israeli psychologist."

#eval Williams, B. & I. Imam, eds. 2007. "Systems Concepts In Evaluation: An Expert Anthology." EdgePress/American Evaluation Association. For information see <<http://tinyurl.com/ocrp2a>>, where it is stated that:

"... This book addresses the questions: What is a systems approach? What makes it different from other approaches? Why is it relevant to evaluation? The approaches and methods covered include: System Dynamics (both quantitative and qualitative), Cybernetics and the Viable System Model, Soft Systems Methodology, Critical Systems Thinking, Complex Adaptive Systems. . . . Although focused on evaluation, the book is a valuable source for anyone interested in systems concepts, action research and reflective inquiry. It is useful for both teaching and practice." The contributors are Kate Attenborough, Richard Bawden, Daniel D Burke, Danny Burns, Glenda H Eoyang, Dale Fitch, Jay Forrest, Richard Hummelbrunner, Amy LaGoy, Kee Pong Lim, Kenneth A Meter, Gerald Midgle, Martin Reynolds, Boon Hou Tay, & Bob Williams."

#eval Williams, B. 2009a. "Re: Systems dynamics, systems thinking and all that" EvalTalk post of 26 Jul 2006 19:59:34+1200; online at <<http://tinyurl.com/yavu4m2>>.

#eval Williams, B. 2009b. "Re: Systems dynamics, systems thinking and all that," EvalTalk post of 27 Jul 2006 11:55:27 +1200; online at <<http://tinyurl.com/yfpyfml>>.

#eval Williams, B. 2009c. "Part 1 - Re: Successes and failures in teaching from a systems-based perspective?" Post of 1 Nov 2009 13:45:16+1300; online at <<http://tinyurl.com/yjvtqqw>>.

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<sup>#eval</sup>Williams, B. 2009d. "Russ Ackoff" post of 4 Nov 2009 09:34:11+1300 to EvalSys, online to subscribers of EvalSys at <<http://tinyurl.com/yzr96f8>>; and of 4 Nov 2009 11:36:51+1300 to EvalTalk, online to subscribers of EvalTalk at <<http://tinyurl.com/yljj9rk>>. See also the Ackoff Center Weblog at <<http://ackoffcenter.blogs.com/>>.

<sup>#ecol</sup>Wilson, E.O. 1998. *Consilience: The Unity of Knowledge*. Knopf. Amazon.com information at <<http://www.amazon.com/Consilience-Knowledge-Edward-O-Wilson/dp/067976867X>>. Note the searchable "Look Inside" feature. See the signature quote above and Wikipedia's (2009l) entry "E.O. Wilson."

<sup>#econ</sup>World Bank. 2003. "World Bank Atlas-2003," pp. 64-65. World Bank information at <[http://publications.worldbank.org/ecommerce/catalog/product?item\\_id=2039926](http://publications.worldbank.org/ecommerce/catalog/product?item_id=2039926)>, which also contains links to subsequent volumes.