

PORTLAND STATE UNIVERSITY  
Systems Science Ph.D. Program  
Professor Martin Zwick  
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Spring 2010  
TuTh 4:40 - 6:30  
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## **S y S c 5 1 0: S Y S T E M S I D E A S & S U S T A I N A B I L I T Y**

This course examines systems-theoretic ideas about sustainability. Graph theory, non-linear dynamics, game and decision theory, thermodynamics, and theories of complexity and complex adaptive systems (CAS) offer insights into the challenge of sustainability and suggest principles that can help us meet this challenge. These insights and principles will be explored in this course primarily via four texts. Though not explicitly a 'systems' book, *The Ecology of Commerce* gives an overview of the sustainability challenge, invoking a variety of systems ideas. *Complexity Theory for a Sustainable Future* is a recent anthology of articles about sustainability drawing directly upon the complexity and CAS literature, especially dynamic systems, networks, and ideas about uncertainty and information. *Limits to Growth: The 30 Year Update* revisits and updates one of the first books to raise public awareness of sustainability challenge in the 1970s. *Panarchy* describes the work of C.S. Holling and colleagues on the dynamics of transformations in ecological and social systems. The course begins with a talk<sup>1</sup> introducing some systems ideas relevant to sustainability and locates the sustainability challenge within a larger macro-historical systems-theoretic perspective.<sup>2</sup>

<sup>1</sup> <http://www.sysc.pdx.edu/download/papers/sustain07.pdf>

<sup>2</sup> [http://www.pdx.edu/sites/www.pdx.edu/sysc/files/media\\_assets/hhh\\_sp.pdf](http://www.pdx.edu/sites/www.pdx.edu/sysc/files/media_assets/hhh_sp.pdf)

### Texts (at the PSU bookstore):

1. Paul Hawken, *The Ecology of Commerce: A Declaration of Sustainability*. HarperBusiness, New York, 1993 (paper ISBN 0-88730-704-3).
2. Jon Norberg and Graeme S. Cumming, *Complexity Theory for a Sustainable Future*. Columbia University Press, New York, 2008 (paper ISBN 978-0-231-13461-3).
3. Donella Meadows, Jorgen Randers, & Dennis Meadows, *Limits to Growth: The 30-Year Update*. Chelsea Green Publishing Company, White River Junction, Vermont, 2004 (paper ISBN 1-931498-58-X).
4. Lance H. Gunderson & C.S. Holling, eds., *Panarchy: Understanding Transformations in Human and Natural Systems*. Island Press, Washington, DC, 2002 (paper ISBN 1-55963-857-5).

### Distributed in class:

Xeroxed selections from Thomas Berry, *The Dream of the Earth*, Sierra Club Books, San Francisco, 1988; Thomas Berry, *The Great Work*, Bell Tower, New York, 1999.

Grades: Based on a term paper ( $\geq 25$  double-spaced pages + bibliography); class participation and presentations; supplementary short writing assignments

Prerequisites: None, though some background in either systems ideas or sustainability is helpful. Although this is a graduate course in Systems Science, undergraduates are definitely welcome.

Course Outline:

Mar 30	Professor Jeff Fletcher, guest lecture
Apr 1	Course introduction. Presentation: “Systems Ideas and Sustainability” (an overview of some systems ideas relevant to sustainability)
Apr 6	Presentation: “Holism and Human History” (speculative proposal on macro-historical context of the sustainability challenge)
Apr 8	<i>Ecology of Commerce</i> , chapters 1-6
Apr 13	<i>Ecology of Commerce</i> , chapters 7-12
Apr 15	<i>Complexity Theory for a Sustainable Future</i> Foreword, Preface, Introduction, Chapters 1-3
Apr 20	<i>Complexity Theory for a Sustainable Future</i> , Chapters 4-6
Apr 22	<i>Complexity Theory for a Sustainable Future</i> , Chapters 7-9, Conclusion
Apr 27,29	<i>Limits To Growth: The 30-Year Update</i> Preface, Chapters 1-3; Chapter 4, Appendix 1
<b>Apr 29</b>	<b>Paper declarations</b>
May 4,6	<i>Limits To Growth: The 30-Year Update (continued)</i> Chapters 5-6; Chapters 7-8
May 11	<i>Panarchy</i> , Chapters 1-3
May 13	Guest talk by Joshua Hughes on adaptive cycle & catastrophe theory
May 18,20	<i>Panarchy</i> , Chapters 4,5,8,15,16
May 25	<i>The Dream of the Earth</i> , Chapters 1-2,5-7
May 27	<i>The Great Work</i> , Chapters 1,3,5,8,13,15
June 1	<b>Papers due</b>
June 1,3	<b>Class presentations</b>
June 8	General discussion