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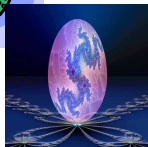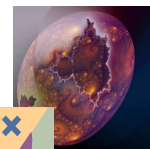
Special Colloquium Series, Spring & Fall 2005:
Between Nature and Science:
Advanced Modeling Concepts for Environmental Sciences

Melanie Mitchell
Portland State University

The Prospects and Perils of Complex Systems Modeling

November 10th
4:00-5:00pm
PES 3001
Light refreshments provided

Scientists have studied complex systems for centuries, but only the relatively recent invention of electronic computers and subsequent dramatic increases in computing power have allowed the detailed simulation of such systems as food webs, financial markets, the immune system, and human societies. Such computational models have the potential to address questions whose study has not been accessible via more traditional mathematical and experimental techniques. However, this new approach to scientific inquiry comes with its own problems and potential pitfalls, including hidden assumptions, non-replicability of behavior, and misinterpretation of and over-reliance on results.

In this talk I will review several prominent complex-systems models as examples of the prospects and perils of such modeling techniques. These examples will range from explorations of the simplest cellular automata to detailed "agent-based" simulations of food webs, economic systems, and human behavior. My hope is that an analysis of this kind will interest, assist, and possibly surprise people who are currently involved in modeling or who would like to be.

Melanie Mitchell received a Ph.D. in Computer Science from the University of Michigan in 1990. Her dissertation work with Douglas Hofstadter was on cognitive modeling of analogy-making. She has held faculty or research positions at the University of Michigan, the Santa Fe Institute (as Director of the Institute's Adaptive Computation Program), the Los Alamos National Laboratory, and the OGI School of Science and Engineering at the Oregon Health & Science University. She is currently Professor of Computer Science at Portland State University.

Dr. Mitchell has been the recipient of a University of Michigan Regents' Fellowship, a Fellowship in the Michigan Society of Fellows, and a 21st Century Research Award Grant from the J. S. McDonnell Foundation. She has also served on the external faculty of the Santa Fe Institute. In 1997 she was selected to give SFI's Ulam Memorial Lectures in Complex Systems.

Dr. Mitchell is the author of Analogy-Making as Perception (MIT Press, 1993) and An Introduction to Genetic Algorithms (MIT Press, 1996). She is a co-editor of Adaptive Individuals in Evolving Populations: Models and Algorithms (Addison Wesley, 1996) and Perspectives on Adaptation in Natural and Artificial Systems (Oxford University Press, 2005). She is also the author of over 60 research papers in the fields of machine intelligence, cognitive science, and complex systems.

Upcoming Speakers:

11/17	**Michelle Girvan**	TBA
12/1	**Elizabeth Bradley**	Nonlinear dynamics, modeling, and the environmental sciences: ideas and tools