

PORTLAND STATE UNIVERSITY
Systems Science Ph.D. Program
Professor Martin Zwick
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Spring 2002
MW 4:00-5:50
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ARTIFICIAL LIFE

“Artificial Life” (ALife) is a name given to theoretical, mathematical, and computationally “empirical” studies of phenomena commonly associated with “life,” such as replication, metabolism, morphogenesis, learning, adaptation, and evolution. It focuses on the materiality-independent, i.e., abstract, bases of such phenomena. As such, it overlaps extensively with “theoretical biology” and, less extensively, with certain areas of physics and chemistry and the social sciences. It also raises important philosophical questions. It is part of a larger research program into “complex adaptive systems,” one stream of contemporary systems theory.

In its intersection with computer science, ALife is the newest example of “the sciences of the artificial” (Herbert Simon). ALife is to life what AI is to intelligence. Christopher Langton writes that “Artificial Life ... complements the traditional biological sciences ... by attempting to synthesize life-like behaviors within computers and other artificial media.” The purpose is twofold: to understand these phenomena better and to develop new computational technologies.

The course will sample the research literature in this field, and will be organized in a seminar format. Topics to be emphasized are: (1) discrete dynamics: cellular automata and random networks, (2) ecological & evolutionary dynamics, (3) genetic algorithm optimization and adaptation, (4) agent-based simulation. Other topics will include: artificial and real chemistry (metabolism, reproduction, & origin of life), “complex adaptive systems,” autonomous agents, and philosophical issues. For ALife research at PSU, see http://www.sysc.pdx.edu/res_alife.html

TEXTS

1. Christopher Langton, ed., *Artificial Life: An Overview*. MIT Press, Cambridge, 1997. (ISBN 0-262-62112-6 Paperback)
2. George Cowan, David Pines, David Meltzer, ed., *Complexity: Metaphors, Models, and Reality*, Santa Fe Institute Studies in the Sciences of Complexity. Addison-Wesley, New York, 1994. (ISBN 0-201-62606-3 Paperback)
3. Xeroxed articles (obtain packet at Smart Copy, 1915th SW 6th Ave, 227-6137)

PREREQUISITES: Graduate status or consent of instructor

COURSE WORK: term paper or project; class participation.