

A. Complex Systems and Spatio-Temporal Dynamics

Allen P M, 1982 "Evolution, modelling, and design in a complex world" **Environment and Planning B 9**, 95-111

A very nicely written introduction to the work of the Prigogine group on "dissipative structures" and bifurcation theory, with examples from urban and regional modeling.

von Bertalanffy L, 1968 **General System Theory** (Penguin, Harmondsworth)

An extremely ambitious (and in its days influential) exposition of the "approach" that would unify all science, physical and social. B

Boudon R, 1971 **The Uses of Structuralism** (Heinemann, London)

Describes the applications of structuralism in anthropology, linguistics, sociology and other social sciences. B

Casti J, 1981 "Systemism, system theory and social system modeling" **Regional Science and Urban Economics 11**, 405-424

On the special challenges of building good models in areas such as social science (but also biology, computer science...) where no laws exist.

Cowan G A, Pines D, and Meltzer D (eds), 1994 **Complexity: Metaphors, Models, and Reality. Proceedings Volume XIX, Santa Fe Institute Studies in the Sciences of Complexity.** (Addison-Wesley, Reading, MA)

Possibly the most comprehensive reference on complexity on this list. Includes some terrific papers! B

Eigen M, Winkler R, 1981 **Laws of the Game: How the Principles of Nature Govern Chance** (Harper Colophon, New York)

The world of physics (and society?) viewed "as a vast game in which nothing is determined in advance but the rules, and only the rules are open to objective understanding". An imaginative and FUN book! B

Gleick J, 1987 **Chaos: Making a New Science** (Viking Penguin, New York)

An unexpected non-fiction bestseller of the late 1980's - obviously chaos has great popular appeal! B

Langton, C G, Taylor C, Doyne Farmer J, Rasmussen S, 1992 **Artificial Life II: Proceedings Volume X, Santa Fe Institute Studies in the Sciences of Complexity.**

Yes, that virus inside your computer is really alive! B
An intriguing theme and some solid complex systems work.. I also have Vol. I

May R M, 1976 "Simple mathematical models with very complicated dynamics" **Nature** **261**, 459-467

A landmark paper in dynamic system theory, proving once and for all that you don't need a complex model to model complexity.

Pagels H, 1988 **The Dreams of Reason: the Computer and the Rise of the Sciences of Complexity** The perfect 'textbook' for this week's theme - accessible and intelligently written.

Phillips, Jonathan D, 1999 "Divergence, convergence, and self-organization in landscapes" **Annals of the Association of American Geographers** **89 (3), 466-488**

A very useful paper applying principles of complex systems theory to landscape analysis in geography.

Schaffer W M, 1985 "Order and chaos in ecological systems" **Ecology** **66(1)**, 93-106

An elegant technical argument, with some very nice pictures of 'strange attractors'.

Urry J, 1985 "Social relations, space and time" in D Gregory and J Urry (Eds) **Social Relations and Spatial Structures** (St Martin's, New York)

Some of the fundamental theoretical questions in human geography discussed from a structuralist/realist perspective. B

Waldrop, M M, 1992 **Complexity: the Emerging Science at the Edge of Order and Chaos** (Simon & Shuster, New York)

The history of the Santa Fe Institute and the people, ideas and events that came together to foster the systematic study of the 'sciences of the 21st century'. Another popular best-seller, very interesting also as a piece in the sociology of modern science.

White R W, 1985 "Transitions to chaos with increasing system complexity: the case of regional industrial systems" **Environment and Planning A** **17**, 387-396.

An intelligent application of dynamic system theory to regional systems - if you ever suspected their evolution is chaotic, here's the proof!

Wilson, A G, 1981 **Geography and the Environment: Systems Analytical Methods** (Wiley, New York)

A text on system-based methods in environmental modeling, with a good introduction to systems concepts.

B Computation: Machines, Languages, and Automata

Couclelis H, 1986 "Artificial intelligence in geography: conjectures on the shape of things to come" **The Professional Geographer** **38**(1), 1-11

Despite the title, this is more about the significance of the "computational revolution" for geography than about AI. One of the first such discussions in the geographic literature. Motivated by Terry Smith's earlier paper (see below).

Dewdney, A K, 1989 **The Turing Omnibus** (Computer Science Press, Rockville, MD)

A very readable, fun collection of 61 vignettes on computer science issues and problems, by the former "Mathematical Recreations" columnist of **Scientific American**. There's now a 'son-of-the-Turing Omnibus' volume that I haven't yet seen. Highly recommended!

Goldstine, Herman H, 1972 *The computer from Pascal to Newmann* (Princeton University Press, Princeton).

A thorough history of the genesis of the modern computer

Hillis W D, 1982 "New computer architectures and their relationship to physics, or why computer science is no good" **Int. Journal of Theoretical Physics** **21** (3- 4), 255-263

By the designer of the "Connection Machine", the first truly parallel computer, an unusual and easy to follow argument about the relationship between physics and computation.

Hodges A, 1983 "Alan Turing: mathematician and computer builder" **New Scientist** **15**, 789-791

By the author of a best-selling book on the "father of modern computers", a nicely written sketch of that fascinating man and his ideas.

Hopcroft J E, 1984 "Turing Machines" **Scientific American** **250**(5), 86-98

A very readable introduction to the basic logical principles underlying the operation of every modern digital computer. (You **never** thought it was so simple!)

Lewis H R, Papadimitriou C, 1981 **Elements of the Theory of Computation** (Prentice Hall, Englewood Cliffs)

An excellent basic text covering the theory of automata, formal languages, and recursive functions.

Minsky M, 1967 **Computation: Finite and Infinite Machines** (Prentice Hall, Englewood Cliffs)

A classic, by a master.

Smith T R, 1984 "Artificial intelligence and its applicability to geographical problem solving"
The Professional Geographer 36, 147-147-158

On the various uses of the "engineering" and "cognitive" streams of AI in geographic research and teaching. **Must** read.

Weizenbaum J, 1976 **Computer Science and Human Reason** (Freeman, San Francisco)

The author has made some very important early contributions in AI but has since become a critic. A very thoughtful but also controversial book.

Zeigler B, 1976 **Theory of Modeling and Simulation** (Wiley, New York) Chapters 2 and 11 A formal theory of system modeling from the perspective of computer science.

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There's a whole bunch of semi-popular books (i.e., with low to moderate technical content) dealing with related themes: Douglas Hofstadter's Godel, Escher, Bach; A K Dewdney's The Turing Omnibus; David Harel's Algorithmics; Rudy Rucker's Mind Tools.