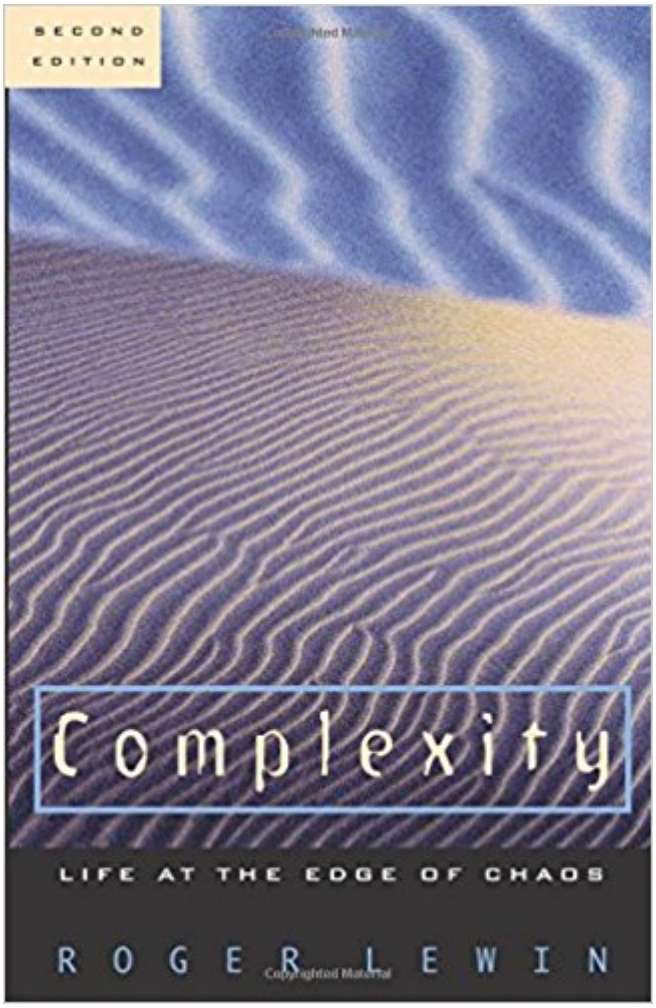
Complexity: Life At The Edge Of Chaos



Synopsis

"Put together one of the world’s best science writers with one of the universe’s most fascinating subjects and you are bound to produce a wonderful book. . . . The subject of complexity is vital and controversial. This book is important and beautifully done."Ã¢â ¬â •Stephen Jay Gould"[Complexity] is that curious mix of complication and organization that we find throughout the natural and human worlds: the workings of a cell, the structure of the brain, the behavior of the stock market, the shifts of political power. . . . It is time science . . . thinks about meaning as well as counting information. . . . This is the core of the complexity manifesto. Read it, think about it . . . but don’t ignore it."Ã¢â ¬â •Ian Stewart, NatureThis second edition has been brought up to date with an essay entitled "On the Edge in the Business World" and an interview with John Holland, author of Emergence: From Chaos to Order.

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Customer Reviews

Complexity, the nexus of theories forming at the edge of chaos theory and the boundaries of artificial life, may spark in life science a revolution equivalent to that wrought in physics by quantum mechanics. Anthropologist Lewin (Bones of Contention) provides an authoritative introduction to such pioneers on this mathematically demanding frontier as Stuart Kauffman, Jim Lovelock and Heinz Pagels; naming them is easier at this early juncture of complexity’s development, when there are fewer than a dozen active researchers, than it will become as complexity attracts further peer reviews. In its embrace of "underlying simplicity in complex natural systems," complexity challenges aspects of Darwinian evolution and, as Lewin points out, comes close to the Gaia Hypothesis. This

anecdotal introduction offers the general reader a generous sampling of this emergent theory. Copyright 1992 Reed Business Information, Inc. --This text refers to the Audible Audio Edition edition.

Complexity has its roots in the work of many scientists from several disciplines and has only very recently, with the establishment of an institute in Santa Fe dedicated to its study, begun to come into focus as an analytical theory. Lewin's book is written as a kind of scientific travelog; he goes from the San Juan Basin of New Mexico to rural southwest England to the rain forests of Costa Rica in order to interview some of the key figures of complexity, whose independent works have contributed to the development of what could become a unified theory of the life sciences. Whether studying cellular automata or the evolution of life on earth, these scientists have found that order naturally seems to emerge within dynamic systems, often from the very brink of chaos. Lewin's far-ranging treatment of the subject is quite different from that of Michael Waldrop's Complexity: The Emerging Science at the Edge of Order and Chaos (LJ 11/1/92), which remains pretty much centered at the Sante Fe Institute. Of the two, Lewin offers the most vivid and engaging discussion of complexity for general readers.- Gregg Sapp, Montana State Univ. Libs., BozemanCopyright 1992 Reed Business Information, Inc. --This text refers to the Audible Audio Edition edition.

This was a very intriguing book. The author's method of discussing the topic is by interviewing the various individuals involved in complexity research. It is sometimes a little difficult to follow because it's difficult to decide who is doing the questioning and who the answering, but once past that, the reader will find that the author follows a very coherent outline of the topic.In general Lewin starts with the inception of the concept by its various originators and the way that they have developed methods (largely computerized programs) to test their hypotheses. He also discusses the difficulty which these individuals met in trying to promote their ideas of complexity, chaos, and self-organizing criticality to the various academic departments to which they were attached. The author interviews a number of the best known scientists for their impressions of the output of the research into complexity. Some meet it with great skepticism while others, though cautious, seem to think that complexity theory has a great deal to say about dynamic complex systems.Those of you unfamiliar with complexity but have read something on chaos theory or self-organizing criticality (particularly Per Bok'sÃ Â how nature works: The Science of Self-Organized Criticality (Copernicus)) will realize that this is simply another component of the dynamic system, another way of putting mathematics and computer generated programs to use in understanding things like evolution of species and

ecosystems, of financial, business, and economic systems, and natural physical phenomena, even historic events (such as the abandonment of the Chaco Canyon Pueblo system.I found especially interesting the appendices, particularly that dealing with global economics and business. It was interesting to see what the predictions were and what the author and his sources thought businesses should do to make their particular market share more stable in a world economy that is forever changing not only within a specific region or a specific business type but within an entire suite of interacting businesses world wide.Very worthwhile reading.

I liked the writing, and the ideas but it did tend ti jump around and didn’t always hang together properly

A captivating writer. He could make a tour of a cannery become an interesting subject. Good depth of coverage, too.

Very good. Important work in the area of complexity.I’m glad I got this book and surely will get a lot from it.

The science of complexity, a discipline unique to the computer age, was born of chaos and a growing sense that there is something amenable to scientific inquiry about complex systems that we are missing. Before we had the number crunching power of computers, complexity could not be explored because the many variables resulted in astronomical calculations.In this revision of his book originally published in 1992, Roger Lewin explains what the science of complexity is all about through interviews with some of its most important practitioners (and critics) organized around some of the central ideas. As such this is both a fine introduction to the subject and an interesting read. Lewin includes 16 pages of photos of the scientists he interviewed captioned with a significant quote from each. He has added an afterword on the application of complexity science to business, and an appendix about John Holland, whom he dubs, "Mr. Emergence.""Everything works toward an ecology" is an old dictum of mine. I have the sense that I came up with that myself, but I probably read it somewhere years ago. At any rate, what is being said here is that complex systems work toward a state of equilibrium near a transition phase, near "the edge of chaos." This equilibrium can be an ecology (Darwin’s "tangled web"); indeed it can be the entire planet, as in the concept of Gaia in which "the Earth’s biological and physical systems are tightly coupled in a giant homeostatic system" (quoting Stuart Kauffman on page 109).A central idea is that "...large, interactive

systems-dynamical systems-naturally evolve toward a critical state" (physicist Per Bak, quoted on page 61). These systems include weather, financial markets, piles of sand, and most significantly, ecologies, so that evolution itself is seen as shaped by the dynamics of complexity. Complexity is the "interesting" middle ground between order and the purely random, between the crystalized structure of ice and the Brownian motion of molecules. I had a curious sense of understanding when I compared these three states with positions at chess. First there is the even, static position, perhaps with bishops of opposite color in which no progress can be made, a drawn the inevitable result. Second there is the wildly chaotic position so complex that no one can completely calculate it, say the board after black takes white's queen knight pawn in the "poisoned pawn" variation of the Najdorf Sicilian. In between are the "interesting" positions in which one side might have a small advantage or there might be a dynamic balance of advantages, space versus material, for example, in which a startling combination might be hidden.These states-"at the edge of chaos"-are seen here as analogous to the phrase transition states of matter, from liquid to gas, for example. The idea is that there is a naturally occurring property of the physical world that forces complex systems into stable, readiness states near the edge of transition. What is exciting is that these states, because they are so "ripe" for change can be influenced or manipulated into change with small resources. Out of complexity comes something that could not be predicted by an analysis of its individual components, an emergent property of the system. I would note that such a natural phenomenon would be attractive to those who believe in punctuated evolution (e.g., Steven Jay Gould) and to those who believe that social and political change typically comes suddenly and with great force.Central to what complexity science is saying is that reductionism-which is the technique that has driven science to its present position of power and influence-is limited. "...[Y]ou have to look at the interactions as well as the parts," John Holland is quoted as saying on page 220. In other words, you have to take a holistic approach. However, the use of the word "holistic," a New Age shibboleth, is the just sort of thing that makes traditional scientists wince.Consequently, complexity science is not without its critics who argue that the fundamental mechanism of complexity exists only in a mystical sense and is therefore anathema to mainstream science. Even its practitioners, such as University of Michigan "complexologist" John Holland, admit they are still searching for the fundamental mechanism of this new science. He is quoted on page 214 as saying, "Our present understanding is not much better than the child saying that Jack Frost explains the wondrous colors of autumn."However most complexity scientists would say that the mechanism isn't mystical at all. It's just not understood yet. I would add that much of what we think we know about the world is based on relationships and phenomenon that we assume we understand, but really we don't. For

example physicists say that gravity curves spacetime, but they don't say how it curves spacetime. Presumably gravitons do the trick, but they haven't been discovered yet! So it could be said that gravity is mystical. I like to compare this lack of understanding to the task of watching grass grow. (This also works for evolution.) Every day I look but at no time do I ever see the grass growing, yet after a while I know it has grown. It seems that it always grows when I'm not looking! By the same token we see the results of complexity, but we do not yet see the inner workings of the process. We may never see the process, but through complexity science we may yet understand it.--Dennis Littrell, author of "Hard Science and the Unknowable"