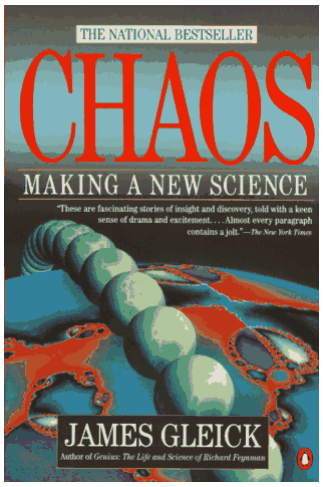
Jedi Technologies

Chaos: *Making a New Science*

by James Gleick
ISBN 0140092501



In his book, **'Chaos: Making a New Science'**, **James Gleick** chronicles the emergence of chaos theory from the first romantic insights to the dire ordeals endured by a few courageous thinkers.

Few writers distinguish themselves by their ability to write about complicated, even obscure topics clearly and engagingly.

James Gleick, a former science writer for the **New York Times**, resides in this exclusive category.

In **Chaos**, he takes on the job of depicting the first years of the study of chaos -- the seemingly random patterns that characterize many natural phenomena.

This is not a purely technical book. Instead, it focuses as much on the scientists studying chaos as on the chaos itself. In the pages of Gleick's book, the reader meets dozens of extraordinary and eccentric people. For instance, Mitchell Feigenbaum, who constructed and regulated his life by a 26-hour clock and watched his waking hours come in and out of phase with those of his coworkers at Los Alamos National Laboratory.

As for chaos itself, Gleick does an outstanding job of explaining the thought processes and investigative techniques that researchers bring to bear on chaos problems. Rather than attempt to explain Julia sets, Lorenz attractors, and the Mandelbrot Set with gigantically complicated equations, Chaos relies on sketches, photographs, and Gleick's wonderful descriptive prose.

--- *Review at Amazon.com*

Chaos-theory, touted as the third revolution in 20th-century science after relativity and quantum mechanics, uses traditional mathematics to understand complex natural systems with too many variables to study.

Philosophically, it counters the Second Law of Thermodynamics by demonstrating the "spontaneous emergence of self-organization." In this new science apparent disorder is meaningful; the structure of chaos can be mapped by plotting graphically the calculations of nonlinear mathematics using "fractal" geometry, a brainchild of Benoit Mandelbrot in which symmetrical patterns repeat across different scales.

With jocular descriptions of eccentric characters such as the "Dynamical Systems collective," (a.k.a. Chaos Cabal) of the University of CaliforniaSanta Cruz, Chaos offers an absorbing look at trailblazers on a new scientific frontier. Laurie Tynan, Montgomery Cty.

--- *From Library Journal*

We humans,by nature, desire order and predictability in our world. Perhaps this partly explains the apparent negligence of non-linear systems and aperiodic phenomena and the stubborn resistance to attempts to explain or model them. In his book, Chaos, James Gleick chronicles the emergence of chaos theory from the first romantic insights to the dire ordeals endured by a few courageous thinkers.

The scientists Gleick presents weren't quite as comfortable following the well-trodden paths. They realized the shortcomings of science in explaining nature's most elusive behaviors and were driven by the desire to understand them. These brave and curious few listened to the voice of these neglected behaviors and heard a strangely magical song that entranced them, and they could not turn away.

Gleick explains how Edward Lorenz's first computer weather model demonstrated the unpredictability of aperiodic systems like the weather. Previously, modern science held that very small influences had little effect, a belief perhaps arising form the successes like the accurate forecasting of missile and spacecraft trajectories. But Lorenz discovered simple systems that were not predictable. His waterwheel is one. The other he produced by putting a simple three-equation system into motion. It never repeated itself, defying predictability, but it produced an image of order.

Inspired by Lorenz's paper "Deterministic Nonperiodic flow," James Yorke and Robert May cried out for recognition of nonlinear systems and a re-thinking of the linear mathematics education that misleads students and scientists about the true nature of our world.

Gleick explains how Benoit Mandlebrot's study of a perplexing noise in a telephone line transmission led him to the development of a new geometry that mirrors nature's complexity. His work culminated in the book Fractals: Form, Chance, and Dimension. The book provides a way of thinking about the irregular shapes of things and appreciating the wildness of nature.

Along the way, Gleick leads the reader through a journey into theories of turbulence that includes a discussion of phase space and strange attractors. This section is a bit obscure and hard to understand, but perhaps that just reflects the nature of the scientists' findings.

The discussion of Feigenbaum's universality theory is long on history but short on explanation. It does, however, give the reader a clear impression of the stubborn dogmatism and resistance to change exhibited by the scientific community.

D'arcy Thompson makes an appearance as a neglected biologist who wrote eloquently on the constrained unity of all things, shaped partly, he believed, by physical forces. His views were largely rejected by his contemporaries who clung to Darwinian notions and teleology, asserting that shape arose solely from function or purpose. But it seems the more we learn, the more valid Thompson's speculations appear.

Gleick devotes a significant portion of the book to the tale of the rebellious graduate students at Santa Cruz. This section alone is so interesting and entertaining that it could be made into a movie.

A clear voice, radiating from these pages of struggle and discovery, advocates reform of a dogmatic and compartmentalized scientific community that resists change and ignores that which appears difficult, unexplainable, or seemingly unimportant.

Gleick's book also calls on scientific education to provide instruction that reflects the full complexity of things. For by continuing to resist wrestling with challenging ideas and implementing educational reform, we only act to thwart new discoveries that, like the ones of chaos theory, may help us understand and control such things as the human malady of epidemic disease.

Possibilities that, by our actions, we can make infinite or reduce to zero.

--- *Shaun Calhoun, edited by Robert jon Religa*