

CHAOS ALL THE WAY DOWN —PRE-SHOW TO COLLAPSE (SUDDENLY FALLING DOWN)

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Abstract

We designed a collective of autonomous acoustic and visual chaotic objects to explore self-organization and its sins.

Keywords: Acoustic ecology, chaos, instability

A butterfly's wing flap in Beijing leads to a downpour in Manhattan days later [1]. Failure of a Russian currency market cascades into a US Federal Reserve Board billion-dollar emergency intervention—a fortunately successful attempt to save the domestic economy from collapse due to a single hedge-fund's highly-leveraged investment portfolio [2]. Slight increases in the global climate temperature lead to shorter and less severe winters and to unprecedented forest-destroying insect infestations in the western US and Canada. A possibly irreversible shift in the planet's carbon pool looms a decade hence [3,4].

Nature and now humans assemble interconnected systems on vast scales—networks of energy and information flow whose unpredictable behaviors are exquisitely sensitive and have global effects. When is the next earthquake, hurricane landfall, pandemic, or market failure?

Fig. 2. A Lorenz swarm implodes in *Chaos All the Way Down*. (© James P. Crutchfield.)

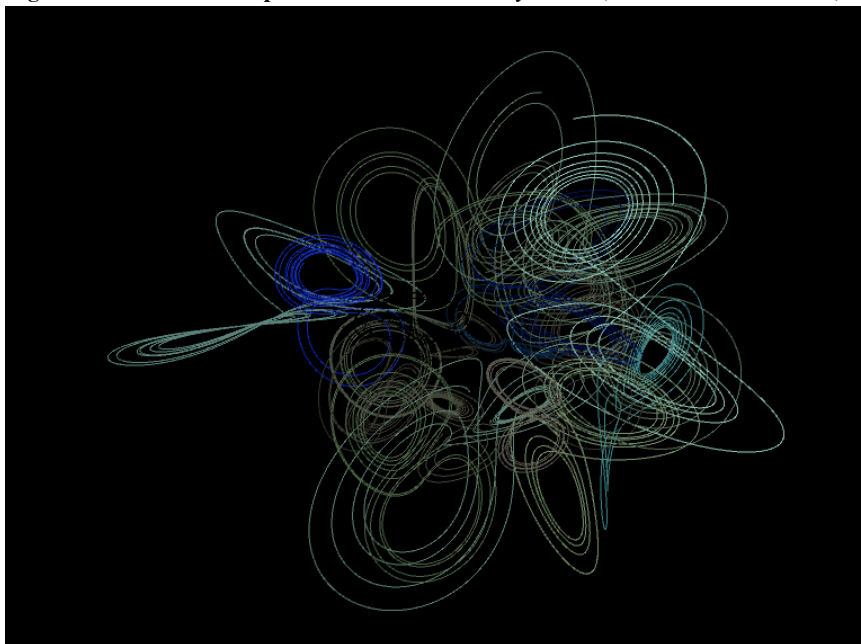


Fig. 1. A swarm of Lorenz chaotic attractors from *The Theater of Pattern Formation*. (© James P. Crutchfield.)

Chaos All the Way Down is the most recent component of *The Theater of Pattern Formation*, an acoustic and visual ecology of sound- and form-generating processes that explores large networks of interacting dynamical systems [5]. Coupled chaotic processes produce sound elements, melodic structure, and even spatialization of the sometimes cooperative, sometimes highly antagonistic voices. The visual elements, strange attractors, respond and feed back their own behaviors to the sound ecology. It lives as an autonomous network that evolves, interacts, flourishes, and collapses; a dynamic metaphor for our times.

Its visual and acoustic architecture is an homage to John Cage's pioneering

work on indeterminacy, often oversimplified as purely chance or random organization. Cage meant something quite different by his notion of indeterminacy, something that is easier to understand in the light of nonlinear dynamics. Beneath the surface of our assumptions, prejudices, and preferences lurks a more profound mesh of interconnection, one that is normally invisible or inaudible but emergent through strategies for indeterminate reorganization. It is the opportunity to transcend the mere expression of our aesthetic norms—our likes and dislikes—to encourage creative renewal. To go someplace that one cannot otherwise get to and has never visited before. This was always the motivation for a Cage and Cunningham collaboration. How much more delightful and surprising to create separate strategies for making sound and movement and then allow them to simply coexist rather than to force each to conform to prior expectations.

Interactive performance versions of the *Theater of Pattern Formation*, for Burning Man 2005 and CalArts CREAT Festival 2006, were implemented as a network of software and hardware systems. The component controlling the multi-channel projected visualization uses an X-windows graphics and ordinary differential equation simulation tool written in C by Crutchfield. The sonic-ecology component was developed in Reaktor by Dunn. These components share signals, and so change each other's behavior, over a network-transparent shared-memory Open Sound Control [6] interface written by Puckett.

For the Fall 2007 performance of *Collapse (suddenly falling down)*, *Chaos All the Way Down* was ported by Puckett and Crutchfield to run entirely on a single Macintosh G5 desktop machine, using its native Cocoa graphics. This non-interactive, chaotic version with surround sound and images was projected into the theater for about 15 minutes as the audience entered [7].

References and Notes

1. James P. Crutchfield, James D. Farmer, Norman H. Packard, and Robert S. Shaw, "Chaos", *Scientific American* **255** (1986) 46-57.
2. Padma Desai, "Why Did the Ruble Collapse in August 1998?" *The American Economic Review* **90**:2 (2000) 48-52.
3. David D. Dunn and James P. Crutchfield, "Entomogenic Climate Change: Insect Bioacoustics and Future Forest Ecology", *Leonardo* **42**:3 (June 2009).
4. "Pop Chirp Bite Crunch Chew", *Science News* **174**:5 (30 August 2008).
5. See the *Theater of Pattern Formation*: artscilab.com/Theater_of_Patterns.html.
6. Open Sound Control: opensoundcontrol.org/.
7. See <http://youtube.com/yodrchaos> for examples of *Chaos All The Way Down*.