# Disorder to nudge order out of chaos

Introducing random variability into certain types of systems can help tame their otherwise chaotic behavior. It's a little like adding noise to an audio recording to turn grossly distorted sound into a discernible melody.

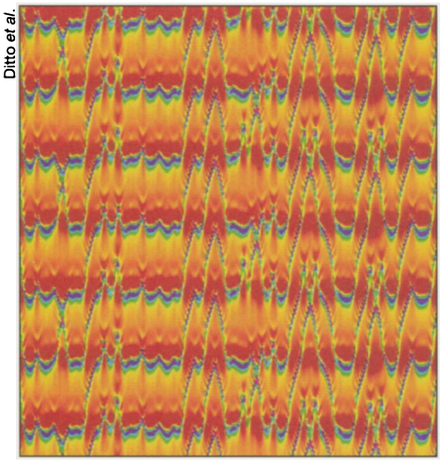
This surprising result comes out of computer simulations performed by physicists William L. Ditto of the Georgia Institute of Technology in Atlanta, Yuri Braiman, now at Emory University in Atlanta, and John F. Lindner of the College of Wooster in Ohio. They report their findings in the Nov. 30 NATURE.

The researchers studied the behavior of a chain of coupled oscillators, which can be imagined as a row of pendulums, each loosely connected to its neighbors. A motor operating at a given frequency drives all of the pendulums to oscillate, even as friction damps their motion.

Under such conditions, depending on its length, a single pendulum can swing back and forth, settle into an over-the-top whirling motion in which it completes one revolution for each cycle of the driving frequency, or display an irregular pattern of back-and-forth swings interrupted sporadically by over-the-top rotations.

Starting with a chain of identical pendulums, the researchers selected a pendulum length that resulted in chaotic motion, with no coordination among the linked pendulums. They then tried a chain in which the pendulum lengths varied by as much as 20 percent from that in the initial, chaotic array.

Ditto *et al.*



*Computer simulations demonstrate the effect of imposed disorder on the initially chaotic motion of a chain of linked pendulums. Randomly varying the lengths of these pendulums nudges them into coordinating their motions to create complex, repeating patterns of behavior. The colors show how the velocity of each pendulum in a long chain (from top to bottom) changes as time passes (from left to right).*

"We expected that we would get even more disorder and even more turbulent behavior, but what we got was organized behavior patterns coming out of the system," Ditto says. "The diversity, or disorder, provided a mechanism by which the system could organize itself."

Ultimately, this finding could lead to methods for improving the performance of electronic circuits and devices by exploiting variations among their components. — *I. Peterson*

# First portrait of a brown dwarf

***When it comes to heavenly featherweights, astronomers have detected low-mass stars and they have detected planets, but they have found nothing that has a mass in between. Now, researchers say they have discovered the missing link—an object considerably heavier than Jupiter but far less massive than a bona fide star. Researchers last week unveiled images of this unusual body.***

*In October, SCIENCE NEWS reported that Shrinivas Kulkarni of the California Institute of Technology in Pasadena and his colleagues had obtained, but hadn't yet released, the first images and spectra of a faint body near the cool, red star GL229 (SN: 10/21/95, p.260). Many astronomers regard this body as the best candidate yet for a failed star, or brown dwarf. They report their work in the Nov. 30 NATURE and the Dec. 1 SCIENCE.*

Kulkarni, David Golimowski/NASA

*On Nov. 17, Kulkarni's team used the Hubble Space Telescope to further view the object (SN: 11/25/95, p.358). In this Hubble image, the bright spot outside the glare from GL229 is the brown dwarf candidate, now called GL229B.*

*The GL229B spectra indicate methane, which cannot survive at the surface temperatures of even the coolest stars. GL229B must therefore have a mass far less than 8 percent of the mass of the sun, the minimum needed to constitute a true star.*

*"[T]here seems little question that it . . . bridges the gap between low-mass stars and Jupiter [the largest known planet]," comments theorist Frances Allard of Wichita State University in Kansas.*

— R. Cowen

# U.N. treaty to aid 'international' fish

The United Nations began accepting signatures this week for a treaty to protect some 20 percent of the world's fishes. It covers not only those pelagic giants—such as sharks, tuna, and marlins—that can migrate throughout the ocean, but also the stocks of smaller, less migratory fish whose range merely straddles the 200-mile exclusive economic zone (EEZ) of at least one country.

Each coastal nation can manage fishing within its EEZ—usually through licenses and quotas on catches. But beyond that, "on the high seas, it has basically been lawless," observes David Wilmot, director of the Ocean Wildlife Campaign in Washington, D.C.

Though several international commissions have sprung up over the years to regionally manage fish in international waters, such groups have not provided the level of protection that would be called for under the new treaty, notes Wilmot. For instance, Carl Safina of the National Audubon Society in Islip, N.Y., points to the heavily exploited bluefin tuna—each of which can stretch 15 feet in length, weigh more than 1,500 pounds, and command up to $50,000. Though western Atlantic stocks have declined by 80 percent since 1975—"due in part to the international demand for gourmet sushi"—he says that the International Commission for the Conservation of Atlantic Tunas has no management plan for them.

The new treaty would be the first to "put the precautionary principle into fisheries management," explains attorney Suzanne Iudicello of the Center for Marine Conservation in Washington, D.C. Uncertainty plaguing data on current fishing impacts cannot be used to justify putting off limits on catch size or regulating equipment, she says: "You must err on the side of the fish."

A report this year by the U.N. Food and Agriculture Organization in Rome noted that already "69 percent of the world's marine stocks, for which data are available, [are] either fully to heavily exploited (44 percent), overexploited (16 percent), or very slowly recovering from overfishing (3 percent) and therefore in need of urgent corrective conservation and management."

To enforce the treaty, notes Lisa Speer of the Natural Resources Defense Council in New York City, the nations that ratify it could "deter"—and sometimes impound—any ship that appears to be violating the management policies.

The fish protection treaty will become legally binding as soon as the governments of at least 30 nations ratify it, a process that is expected to take a year or more. — *J. Raloff*



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