Biology

Bats hang in after battling hurricanes

In 1989, the eye of Hurricane Hugo passed within 10 kilometers of Puerto Rico's Caribbean National Forest, where for 3 years researchers had tracked three species of bats. The storm provided the team with a unique opportunity to see how the bats respond to such natural disasters.

While two species suffered population declines and then made gradual recoveries, the third species' numbers grew slightly, Michael R. Gannon of Pennsylvania State University in Altoona and Michael R. Willig of Texas Tech University in Lubbock report in the June BIOTROPICA. To keep tabs on the bats, the two captured them using nets and marked each animal with a numbered necklace. The researchers also put radio transmitters on some to monitor their travel.

The red fig-eating bat appeared healthy soon after the storm, Gannon and Willig report. But its numbers dropped quickly, probably because the bat is unable to fly far to forage for food. The proportion of pregnant or lactating females declined from 93 percent to 29 percent of the population. Only in the past year has this bat begun to make a comeback.

Gannon

The red fig-eating bat.

The population of Jamaican fruit bats remained low for 2 years after the hurricane. Strong fliers, these animals may have moved to other, less damaged areas. The number of Greater Antillean long-tongued bats grew slightly, in part because of an increase in flowering plants, on whose nectar this bat dines.

Other species in the forest would have suffered from a permanent loss of any of these winged creatures. "Bats are keystone agents of pollination and seed dispersal in the tropics," Gannon and Willig point out.

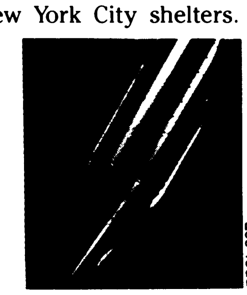
Social security numbers for animals?

Tired of trying to determine who's who among their prosimian primates, staff at the Duke University Primate Center in Durham, N.C., this month began injecting microchips into the animals. Now, to learn a primate's identity, researchers merely pass a scanner over the area where they placed the chip. The readout reveals the chip's – and the animal's – ID number.

The Duke prosimians, which include lemurs, lorises, and bush babies, are joining a growing number of microchip-carrying animals in zoos and elsewhere. The American Society for the Prevention of Cruelty to Animals, which donated the chips to Duke, began inserting similar IDs this month in all cats and dogs released from its seven New York City shelters. Breeders of ratites use microchips in these flightless avian livestock as well (SN: 7/30/94, p.72).

Duke veterinarian Patricia Feeder has placed chips in 20 of the center's 500 prosimians.

Researchers want to make sure that the microchips stay put in the captive primates before using them in animals released into the wild, says Feeser. The chips would replace collars, dyes, and tags, all of which have disadvantages, she adds.



Les Todd

A polyurethane-coated microchip for identifying animals.

Mathematics

Richard Lipkin reports from San Diego at a meeting of the Society for Industrial and Applied Mathematics

Intricate patterns from cellular automata

Imagine a flock of birds, a pod of migrating whales, or a huge traffic jam. Each of these images exhibits a pattern.

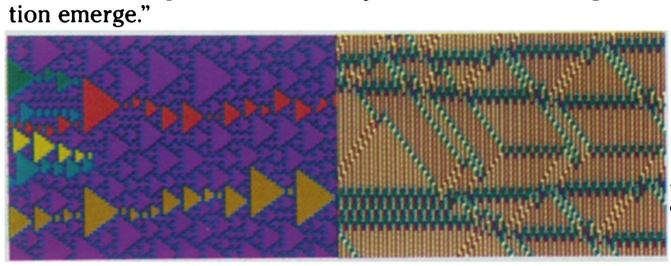
The patterns emerge from the simple behavior of thousands of individuals, each acting according to a set of simple rules. Collectively, these behaviors give rise to a complex system.

In a world where simple, repetitive actions often lead to unexpectedly complicated systems, mathematicians experiment with models to investigate how complexity arises out of simplicity. In some recent experiments, cellular automata have provided interesting examples, according to Erica Jen at the Los Alamos (N.M.) National Laboratory.

With cellular automata models, a computer manages a large number of small, distinct programs, each following specific instructions. "Cellular automata can tell us a lot about self-organization," says Jen. "Starting from a primordial soup of initial conditions, these rules show extremely simple ways to generate complex structures." This phenomenon pertains not only to birds and whales, but also to the way in which neurons branch, earthquakes propagate, or life originated, she says.

Jen argues that cellular automata can serve as prototypes of systems with a large number of simple, identical, and locally connected components. Particularly revealing, she adds, is the manner in which information travels through a system, beginning in a localized region and then spreading outward in the population.

"From a complete mess," she says, "one can watch organization emerge."



Jen/Signition

Cellular automata create self-organized patterns.

A model with heart

Each year, thousands of people with heart disease receive artificial heart valves. Likewise each year, biomechanical engineers seek to improve those valves.

But as in the design of automobiles and airplanes, each variation requires the time-consuming process of building a model to test its fluid-flow characteristics.

Timothy David and Cheung-Hwa Hsu, both applied mathematicians and mechanical engineers at the University of Leeds in England, have developed a computer program that speeds up the process of designing, improving, and ultimately testing artificial heart valves. Taking advantage of the latest tools for computer-aided design and fluid-flow modeling, they have created a "quick-design" algorithm. The program's visualization and editing tools permit a designer to adjust the valve's shape and perform virtual tests almost instantaneously, a process that otherwise takes many hours of computer time.

"In this interactive computer environment, changes in the valve's surface geometry show up immediately in the modeled fluid flow," says David.

"Here the designer may, in one session, investigate a broad range of valve designs," he adds, "each providing important information on the flow over the valve surface."

David, Hsu, *et al.*

Computer model of a heart valve.