surface and a mirrorlike flat bottom surface. The combination helped newly created photons bounce around inside the device until they could find an escape route, raising the efficiency to more than 1%.

The next step for the team is to convert the silicon LED's steady stream of light into a series of pulses that can encode information, by connecting the LED to a device called a modulator. Then both devices will be placed directly onto a silicon computer chip. –ROBERT F. SERVICE

ECOLOGY

## African Elephant Species Splits in Two

As the largest land mammal, elephants should be hard to miss. But scientists have apparently overlooked an entire species. On page 1473, a team of geneticists and elephant experts describe new molecular evidence showing that forest- and savanna-dwelling elephants, currently lumped together in a single species called *Loxodonta africana*, each merits its own species name.

For more than 100 years, scientists have argued about the distinctiveness of forest elephants. The shy creatures are difficult to spot in their thick forest habitat, and only one is in captivity in the Paris Zoo. But those fortunate enough to have seen both them and their better known savanna-dwelling cousins note that the difference is striking. Forest elephants are not only smaller, but they also have straighter, longer tusks and round, as opposed to pointed, ears. "If you see a forest elephant for the first time, you think, 'Wow, what is that?,' " says team member Nicholas Georgiadis, a biologist at the Mpala Research Center in Nanyuki, Kenya.

Despite the differences between savanna and forest elephants, most biologists had assumed that the two populations readily mix on the edges of forests. At best, forest elephants were designated as a subspecies, *Loxodonta africana cyclotis*. But when Georgiadis and his collaborators analyzed the DNA of the elephants, the results indicated that the two populations are as genetically distinct as lions are from tigers. Indeed, the researchers propose two separate species names: *Loxodonta africana* for the savanna elephants and *Loxodonta cyclotis* for the forest dwellers. "The morphological evidence has been very, very strong," says conservation biologist Samuel Wasser of the University of Washington, Seattle. "When you see the genetic data, it seems almost a no-brainer."

The team bases its claim on data from an extensive collection of tissue samples from 195 animals in 21 different elephant populations. Georgiadis spent 8 years collecting the samples, shooting needlelike darts into free-ranging elephants. The darts collected a plug of skin and then fell to the ground, enabling Georgiadis to retrieve them after the startled elephant ran away. The project was originally designed to collect genetic signatures so that ivory samples could be traced to their elephant populations—a goal other geneticists are pursuing. A preliminary analysis of the mitochondrial genes suggested significant differences between forest and savanna dwellers (*Science*, 7 March 1997, p. 1418), a finding that piqued Georgiadis's interest, but a more robust test with nuclear genes was needed to cinch the case, he says.

To pursue the question, Georgiadis teamed up with researchers at the National Cancer Institute (NCI) in Frederick, Maryland, to measure the genetic variation between the populations. Alfred Roca, a postdoc at NCI, with geneticists Stephen O'Brien and Jill Pecon-Slattery, sequenced portions of four nuclear genes, a total of 1732 nucleotides, from each of the samples. The researchers focused on the noncoding intron regions of the genes, which are not subject to natural selection; this makes them more reliable indicators of the random genetic changes that occur over time.

The team pegged the genetic distance between forest and savanna samples as more than half as large as the distance between Asian and African elephants—long recognized as distinct genera. Only one of the populations showed the type of genetic mixing that could come from interbreeding, and that apparently happened several generations ago. To O'Brien, that means that crossbreeding between the two populations "does occur once in a while, but not very often."

The new genetic evidence has implications for conservation, says Georgiadis. Instead of assuming that 500,000 elephants exist in Africa, "there are many fewer than that of each kind, and they're both much more endangered than we presumed," he says. Researchers estimate that up to one-third of African elephants are forest dwellers.

Ivory from forest elephants is especially prized for its hardness and sometimes pinkish hue. Wasser cautions that conservation organizations must be alert: The current international regulations list only *Loxodonta africana* as protected. If the law is not changed quickly to reflect a new species name, an inadvertent loophole might leave the vulnerable forest elephant even more at risk. –GRETCHEN VOGEL

Image not available for online use.

Image not available for online use.

Images of both species are available on the next page.

VIROLOGY

## Finally, a Handle on The Hantaviruses

A group of U.S. Army virologists has found by accident what researchers had been seeking for decades: an animal model to study hantaviruses, a fearsome group of rodent-borne pathogens that cause disease and death across the globe. In a paper accepted by the journal *Virology*, they report that Syrian hamsters get sick and die when injected with a hantavirus from South America—and that the animals' disease looks strikingly like hantavirus pulmonary syndrome (HPS), one lethal manifestation of the infection in humans.

The report, from a group at the U.S. Army Medical Research Institute of Infectious Diseases (USAMRIID) in Fort Detrick, Maryland, means that researchers at last have a way to study how one member of the family sickens and kills—and how the disease can be stopped. "I'm impressed," says Heinz Feldmann, a virologist at the Canadian Science Centre for Human and Animal Health in Winnipeg. "This will definitely speed up vaccine and drug development." Virologist Stuart Nichol of the U.S. Centers for Disease Control and Prevention in Atlanta hails the study as "a major breakthrough for the field."

The hantavirus family grabbed world headlines in 1993 when an outbreak occurred in the Four Corners area of the southwestern United States. The culprit, now called Sin Nombre virus, is one of several hantaviruses that cause HPS throughout North and South America. No specific

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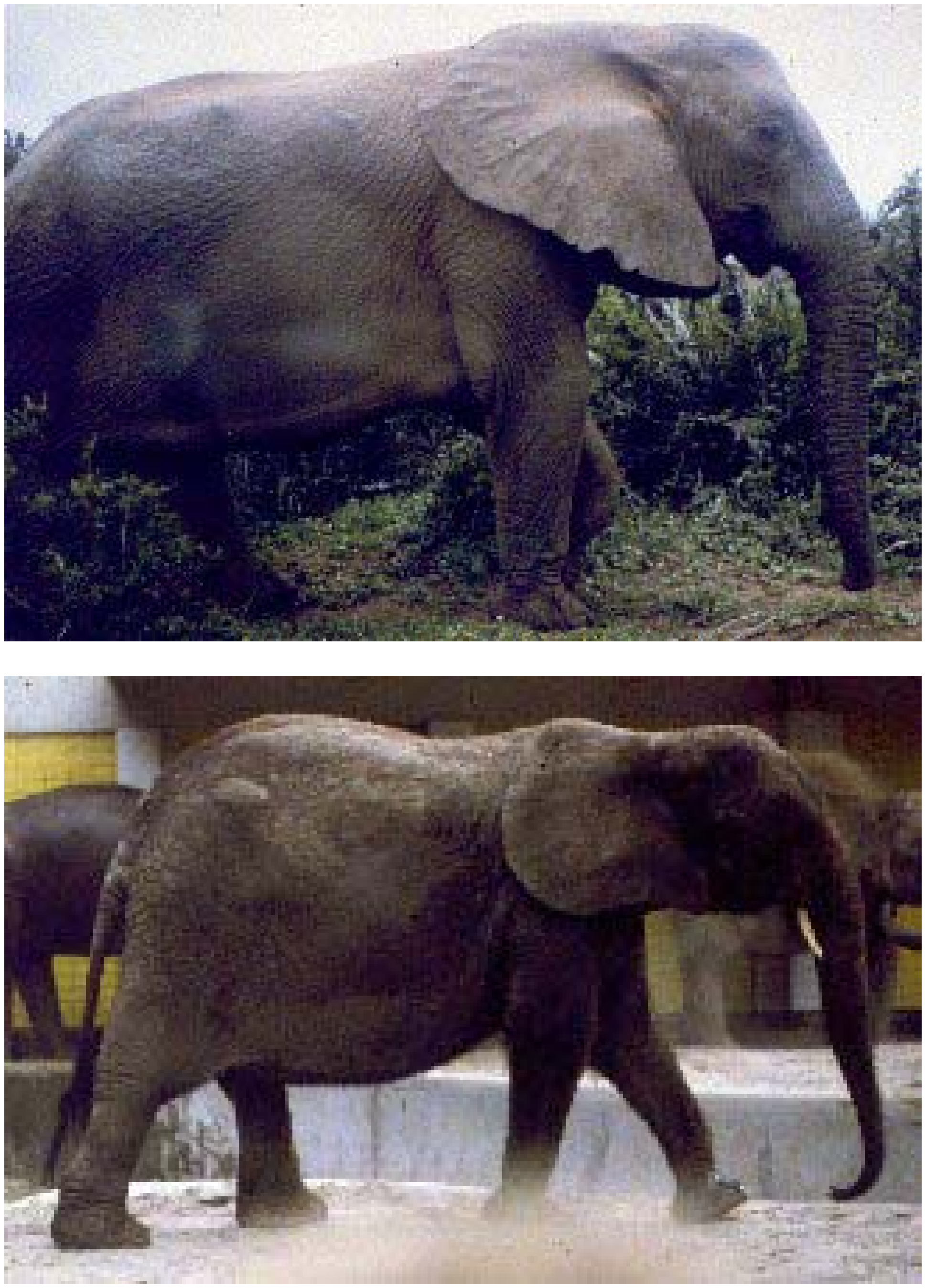

African forest elephants (top) have rounder ears and straighter tusks than savanna-dwelling elephants (bottom).