A common dog virus diminishes lion pride

In 1994, a mysterious disease hit lions in Tanzania's Serengeti National Park, killing up to one-third of them. Indeed, the number of lions in the park plunged from about 3,000 to 2,000 that year.

After examining blood and tissue samples taken from lions during and before the outbreak, scientists found that a canine distemper virus (CDV) had killed the royal beasts, Melody E. Roelke-Parker of the Serengeti Wildlife Research Institute in Arusha, Tanzania, and her coworkers report.

Moreover, the virus had infected lions in the 1980s but killed few, if any, of the animals, the team notes in the Feb. 1 NATURE. Of 77 blood samples taken from healthy lions between 1984 and 1989, 22 had antibodies to the virus.

"The main message to emerge from this shift in susceptibility [to CDV] is that prospects for endangered populations may quickly take a turn for the worse," David W. Macdonald, a zoologist at the University of Oxford in England, asserts in an accompanying comment.

The researchers are now analyzing the DNA of the virus that infected the Serengeti lions to see whether it is simply a novel variant of CDV or a completely new member of the morbillivirus group, which includes the measles virus as well as CDV. Preliminary DNA tests suggested that the Serengeti virus is closely related to the CDV isolated from the blood of a domestic dog in South Africa, they report.

Evidence of a CDV epidemic came from the team's discovery that most of the animals tested in 1994, whether they showed symptoms or not, had antibodies to CDV in their blood. Signs of CDV infection showed up in the tissue of 19 of 23 dead animals.

Munson

A skinny Serengeti lion infected with canine distemper virus.

In the early 1990s, CDV killed lions at three U.S. zoos but did not develop into an epidemic. The outbreak in Africa surprised scientists because it occurred in the wild, far from the United States, and infected so many animals, says coauthor Linda Munson of the University of Tennessee's College of Veterinary Medicine in Knoxville. Before 1990, scientists did not know that CDV infected lions.

The virus can infect a variety of species, however, notes Macdonald. One variant almost caused the extinction of the black-footed ferret in the 1980s, and another killed large groups of seals and dolphins a few years later.

Scientists began to see a drop in the Serengeti lion population in early 1994, and then a tourist at the park reported seeing a lion in convulsions, explains Munson. Soon, many animals showed signs of canine distemper; they became very skinny, uncoordinated, and unresponsive, and some had seizures and twitching.

The researchers found 11 lion carcasses in Serengeti between January and March, "indicating that a serious epidemic was emerging," they report. Normally, they do not find more than two a year. The epidemic spread to the Maasai Mara National Reserve in Kenya. By the end of the year, about 30 percent of the lions in the two reserves had died. Researchers are still investigating whether the CDV killed other, less common cats, such as cheetahs, Munson says.

The virus probably originated in some of the 30,000 or so domestic dogs that live near the park, the team seculates. Because dogs produce so many puppies, which have no resistance to the disease, CDV survives well in dog populations. Spotted hyenas most likely picked up the virus from the dogs and passed it along to the lions. Researchers have recently begun a distemper vaccination program for the dogs.

The CDV epidemic did not last long in the lion populations. The infected animals either died or developed antibodies that provide lifetime immunity, and lions give birth to few cubs. — *T. Adler*

Strange attractions in quantum dots

Because all electrons have a negative electric charge, they repel each other. Even in an atom, where they are attracted to a positively charged nucleus, the orbiting electrons tend to stay as far apart as possible.

Paradoxically, under certain circumstances, this strong, intrinsic repulsion can make it seem that electrons attract one another.

"When you put together [electron] repulsion and quantum mechanics, you get a short-range attraction," says physicist Raymond C. Ashoori of the Massachusetts Institute of Technology.

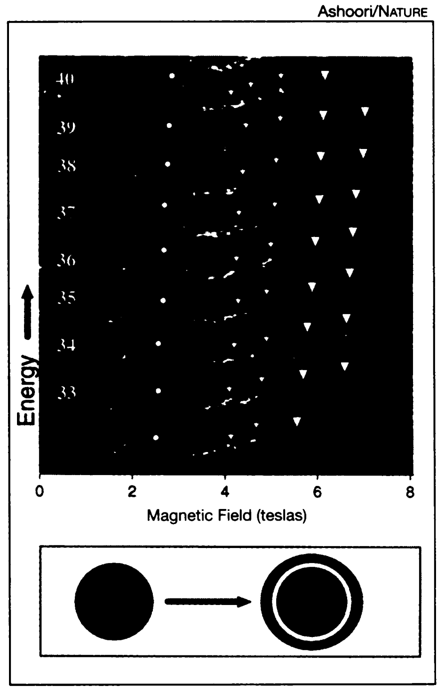
This effect, described in the Feb. 1 NATURE, can't be observed in a real atom. It occurs inside a microscopic box—a quantum dot—fabricated out of semiconductors to hold a specified number of mobile electrons (SN: 2/20/93, p. 118).

As in an ordinary atom, the confined electrons can have only certain well-defined energies. They also steer clear of each other, partly because they exert a repulsive force and partly because the rules of quantum mechanics specify that individual electrons must occupy different energy levels.

Because a typical quantum dot is much roomier than an atom, researchers can study subtle quantum effects not evident on atomic scales. In such a setting, a magnetic field can induce quantum effects that push the electrons into bunches, as if they were attracting each other, leaving gaps elsewhere.

— *I. Peterson*

Ashoori/NATURE



Each trace shows how much energy is needed to add the numbered electron to a quantum dot containing one electron fewer. As the magnetic field increases, this energy changes to reflect various types of quantum interactions (dots and arrows). The white triangles indicate the magnetic field values at which electrons get bunched, creating gaps in the distribution of electrons in the quantum dot (bottom diagram).