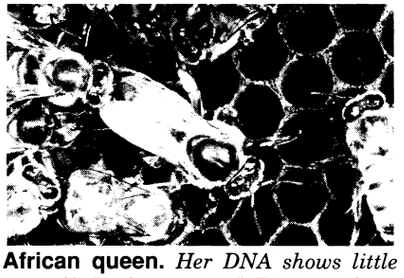
# How African Are "Killer" Bees?

The long-awaited "Africanized killer bees" finally arrived in the United States last month, 33 years after their African ancestors were accidentally released in Rio Claro, Brazil. But even as the first swarm crossed the U.S. border near Weslaco, Texas, researchers argued about how African the invaders really are. The question isn't merely theoretical: the more African traits—such as irritability, increased swarming, and low honey production—they carry, the greater the threat they pose to the $150-million U.S. honey industry and to the vital role that domestic bees play in pollinating agricultural crops.

Researchers at the U.S. Department of Agriculture (USDA) contend that as the migrants made their long journey north, they interbred with domesticated European bees, diluting many of their original traits. The evidence: physically the bees look like a blend of African and European types, say the USDA researchers.

Not so, argues a band of academic scientists that has been looking at the bees' genetic makeup. "These are *African* bees," says University of Florida entomologist H. Glenn Hall. "They have arrived at the border largely undiluted. Therefore we are going to have to cope with their traits."

Last year, Hall, along with Deborah Roan Smith of the University of Michigan and



**African queen.** *Her DNA shows little sign of hybridization with European bees.*

Orley Taylor of the University of Kansas, inflicted a painful sting on the genetic-dilution argument. Hall and Smith had independently analyzed the mitochondrial DNA from wild bee swarms collected in Brazil, Mexico, and Venezuela. They both found that more than 97% of the bees carried African-type mitochondrial DNA. Since an animal's mitochondria—and the small DNA genome they contain—are inherited entirely from its mother, "the only way that could happen is with a continuous [African] maternal lineage," says Hall.

Their finding suggested that, although African drones were clearly breeding with European queens and "Africanizing" the colonies of Latin American beekeepers, the northward migration was being carried on solely by wild swarms led by African queens.

Even though their maternal lineage was nearly pure African, the possibility remained that the bees had picked up non-African genes from the countless generations of local European drones that would have bred with the African queens since 1957. Such genes would be contained in the bees' nuclear DNA, which is inherited equally from both parents. When Hall analyzed the nuclear DNA from wild swarms, he found no European genes in bees taken from Venezuela, and in swarms taken from Mexico, near the leading edge of the northward migration, roughly 15% of the bees carried European markers. "These feral African maternal lineages have hybridized only slightly with the European bees," he concludes. That suggests that, although African queens might indeed mate with European drones, the hybrid offspring are less likely to survive. The hybrids could be placed at a disadvantage by maladaptive genes from the European bees, which are not suited to the tropics and survive only with a beekeeper's care.

Thomas Rinderer, director of the USDA Honeybee Laboratory in Baton Rouge, Louisiana, disputes Hall's conclusions but not his data. "The data demonstrate that the bees are hybrids," he says, but he goes on to fault Hall for looking at only three genetic markers when he tested for genetic mixing. Rinderer says that's not enough information to accurately determine the degree of hybridization, a value he places at 50% for bees collected in Mexico.



# Saturn Mission Backed, Europeans Relieved

Last August, Caltech astronomer Andrew Ingersoll sent an urgent letter to his fellow planetary scientists: The next planned mission to the outer solar system is in serious budgetary trouble. In order to preserve big-ticket items like the space station, Ingersoll wrote, Congress may cancel the CRAF/Cassini mission—a pair of spacecraft one of which should be launched in 1995 to investigate an asteroid and the other a year later to study Saturn. Write your member of Congress, Ingersoll urged.

Congress apparently got the message. Last week, it approved $145 million for the mission—just $3 million short of NASA's request. And that was a huge relief to the European Space Agency (ESA). The Europeans are responsible for a key part of the Saturn investigation, a $260-million probe that will descend to the surface of Saturn's largest moon, Titan. ESA is already heavily committed to the project, and just a week before Congress approved NASA's budget the agency chose six instruments that will fly on the probe.

Called the Huygens probe after the Dutch astronomer Christian Huygens who was the first to interpret Saturn's rings correctly, it will parachute slowly through Titan's atmosphere. The instruments chosen last month to fly on Huygens will measure the temperature and pressure of the atmosphere, its turbulence, winds, and electricity; analyze the chemical composition of Titan's atmosphere during the descent; sample and analyze aerosols in the atmosphere; make spectral measurements in several wavelengths and take pictures of the clouds and the ground; measure the characteristics of the winds on Titan with very high accuracy; and report back on the state of Titan's surface—liquid, semi-liquid, or solid—at the point of touchdown.

Though the probe is not designed to survive a hard impact, if it lands on an ocean of liquid methane and ethane it should survive for a few minutes before sinking, says Daniel Gautier, director of research at the French national center for scientific research (CNRS) and one of three scientists who will be coordinating the probe's work. "In 3 minutes we can measure many things and send the data back," he says.

The probe will be sent to Titan from an orbiter that is being developed by NASA. The orbiter will carry a battery of instruments to study Saturn and its system of moons and rings. If the spacecraft is launched on time, it will reach the giant planet in 2002.

Though astronomers are relieved that Congress has come through with the funds for next year, they are still nervous about future years. One worry: Last year, Congress capped total spending on CRAF/Cassini at $1.6 billion, so if there are cost overruns on the hardware, the science could get squeezed.

■ JEREMY CHERFAS