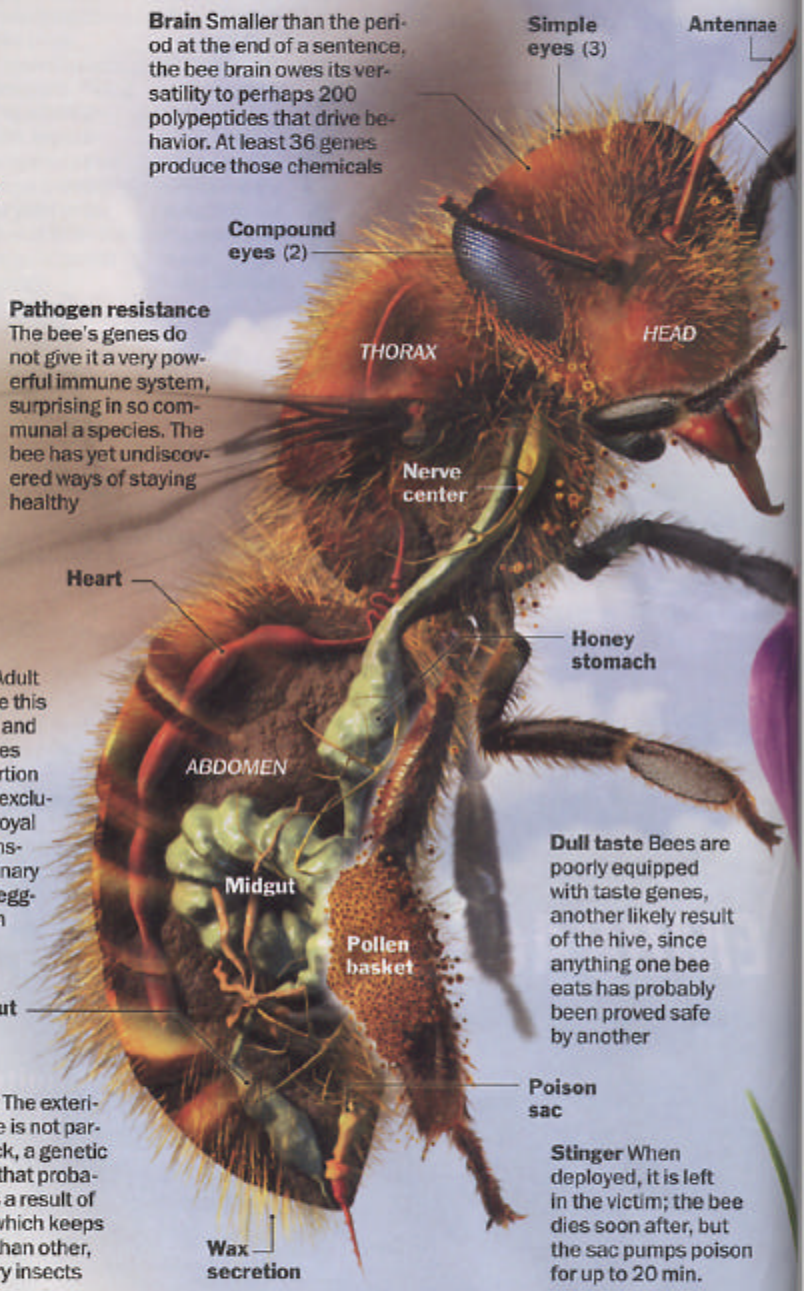
THE BUZZ ON BEES

We don't give bees much thought unless they're terrorizing us at a picnic, but they're exquisitely complex creatures. *Nature* and *Science* reported last week that the genome of the honeybee has been mapped, making it only the fourth bug to be so sequenced. Researchers have already begun studying that genetic blueprint, providing new insights into our most valuable insect—and new strategies to save it from extinction.

—Graphic by Lon Tweeten and Ed Gabel. Text by Jeffrey Kluger and Kristina Dell

Inside the honeybee

It's not easy to build a bee, as new insights into its genes and anatomy are revealing



Why bees are in danger

Over the past 50 years, the honeybee population in the U.S. has been cut in half. Here are some reasons:

1. **THE VARROA MITE** A tiny killer first detected in the U.S. in 1987, the mite attacks honeybee adults and larvae, wiping out a generation of young bees before they hatch

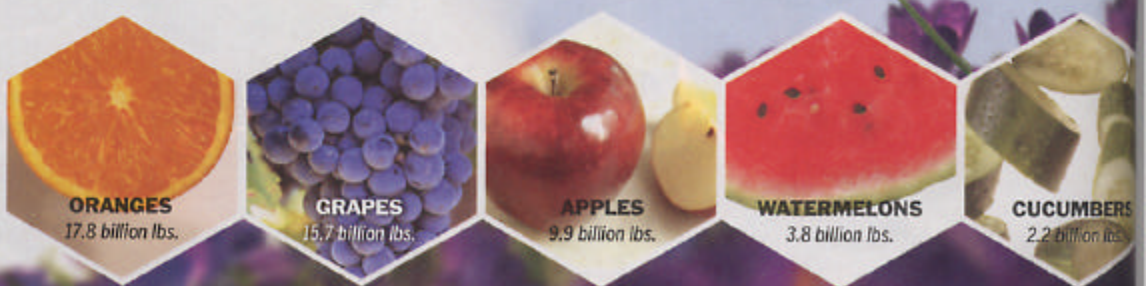
2. **TRACHEAL MITES** First spotted in the U.S. in 1984, tracheal mites attack the respiratory system of adult bees and can kill an entire hive in a matter of hours

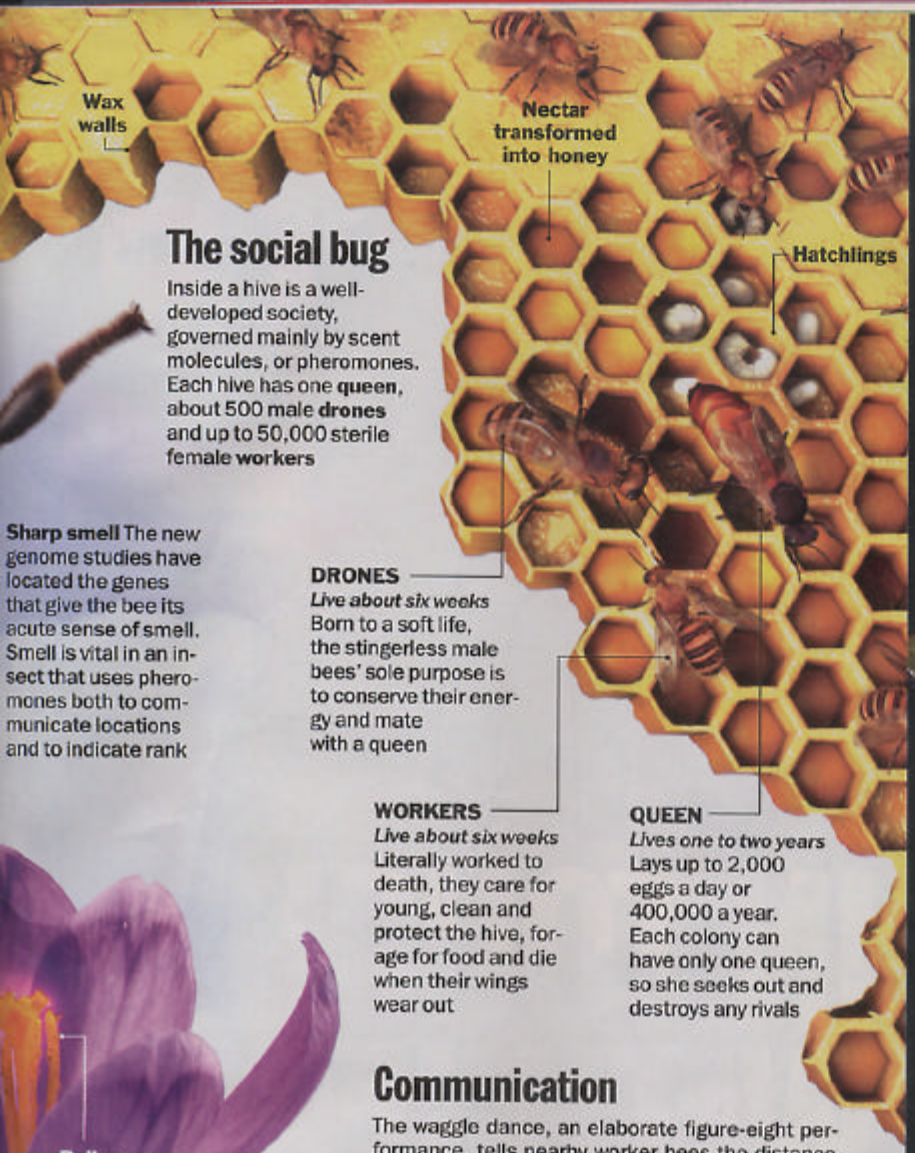
3. **PESTICIDES** The wax in beehives is a natural sink for airborne toxins, and the relatively weak bee immune system is no match for such concentrations of man-made poisons

What we stand to lose

Honeybees are responsible for up to 30%* of food in the U.S. diet that relies on pollination—and that includes alfalfa-fed beef

*2005 production





The social bug

Inside a hive is a well-developed society, governed mainly by scent molecules, or pheromones. Each hive has one **queen**, about 500 male **drones** and up to 50,000 sterile female **workers**

Sharp smell The new genome studies have located the genes that give the bee its acute sense of smell. Smell is vital in an insect that uses pheromones both to communicate locations and to indicate rank

DRONES
Live about six weeks
Born to a soft life, the stingerless male bees' sole purpose is to conserve their energy and mate with a queen

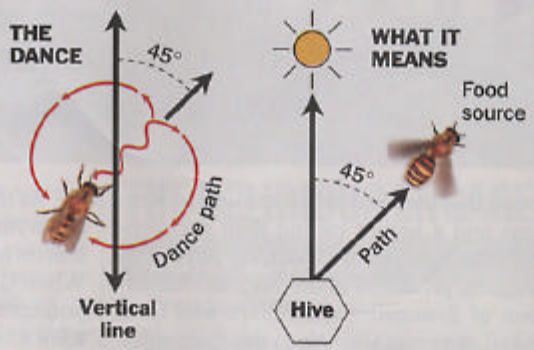
WORKERS
Live about six weeks
Literally worked to death, they care for young, clean and protect the hive, forage for food and die when their wings wear out

QUEEN
Lives one to two years
Lays up to 2,000 eggs a day or 400,000 a year. Each colony can have only one queen, so she seeks out and destroys any rivals

Pollen As bees collect pollen for food, they also act as sex workers, scattering stray grains among male and female flower parts, allowing the plants to reproduce

Communication

The waggle dance, an elaborate figure-eight performance, tells nearby worker bees the distance to food and its direction in relation to the sun

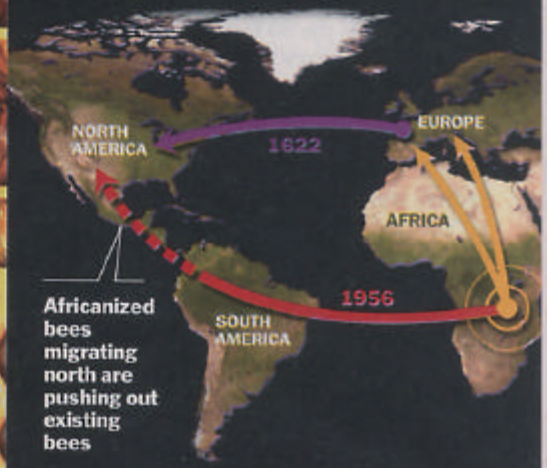


The number of waggles, or shakes, and the bee's pulsing sounds indicate to others how far to fly

WHAT THE GENES TELL US

OUT OF AFRICA
Honeybees have been with us for a long time. Gene markers reveal that bees migrated from Africa to southern Europe in two waves about a million years ago. At the end of the last ice age, 10,000 years ago, they spread to northern Europe. More recently, European and African bees were imported to the Americas to serve as agricultural pollinators

Found in Myanmar: a 100 million-year-old honeybee trapped in amber



Africanized bees migrating north are pushing out existing bees

A TALE OF THREE BUGS Compared with the mosquito and fruit fly, whose genomes have also been sequenced, the honeybee has the best sense of smell and the worst sense of taste

	HONEYBEE	MOSQUITO	FRUIT FLY
Smell genes	163	79	62
Taste genes	10	76	68

1 MILLION Approximate number of neurons in the honeybee brain—about one-millionth the total in the human brain. Yet the two species are among only a handful of creatures that form large, complex societies

Can the bees be saved?

China, where pesticides are overused and apple orchards are largely hand-fertilized by humans, gives us a peek at a beeless future. Cutting back on harsh agricultural poisons is a first step. Mites can be controlled with menthol vapor or mild pesticides that are safer for bees. Genetically engineering a sturdier bee is a real—if distant—possibility now that the genome has been cracked

Sources: Gene Robinson, University of Illinois at Urbana-Champaign; Neil Tsutsui, University of California at Irvine; USDA National Agricultural Statistics Service