

What Your Pet is Thinking

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From the day they brought her home, the D'Avellas' black-and-white mutt loathed ringing phones. At the first trill, Jay Dee would bolt from the room and howl until someone picked up. But within a few weeks, the D'Avellas began missing calls: When the phone rang, their friends later told them, someone would pick up and then the line would go dead.

One evening, Aida D'Avella solved the mystery. Sitting in the family room of her Newark, N.J., home, Ms. D'Avella got up as the phone rang, but the dog beat her to it. Jay Dee ran straight to the ringing phone, lifted the receiver off the hook in her jaws, replaced it and returned contentedly to her spot on the rug.

VIDEO



- [In this cognitive memory test](#), a monkey demonstrates that he knows when he remembers.

- [Sasha, the Husky](#), and Woody, the black dog, stop to assess what is going on when the play gets too rough.

Just about every pet lover has a story about the astonishing intelligence of his cat, dog, bird, ferret or chinchilla. Ethologists, the scientists who study animal behavior, have amassed thousands of studies showing that animals can count, understand cause and effect, form abstractions, solve problems, use tools and even deceive. But lately scientists have gone a step further: Researchers around the world are providing tantalizing evidence that animals not only learn and remember but that they may also have consciousness -- in other words, they may be capable of thinking about their thoughts and knowing that they know.

In the past few years, top journals have been publishing reports on self-awareness in dolphins and wild chimps whose different nut-cracking "technologies" constitute unique cultures. Others argue that rats have a sense of fun, mice show empathy for cage-mates and scrub jays are capable of "mental time travel" that enables them to remember where they stashed worms

and seeds.



Rhesus macaque monkeys have been the subject of memory studies in Atlanta

While researchers have yet to attain the field's holy grail -- proving that animals are self-aware -- the findings already have broad implications. For the 69 million U.S. households that own a pet, such knowledge might lead owners to question their animal companions' awareness of what they're fed, how they're housed and how often the kitty litter is changed. All of that would be a boon for the pet industry, which generates \$38 billion in annual revenue, according to the American Pet Products Manufacturers Association, selling everything from food and grooming services to pet exercise gear, hotels and psychics.

Drug companies are already addressing animals' feelings. Some 15 million dogs have taken Pfizer Inc.'s animal pain-reliever Remadyl. The company's Anipryl targets "cognitive dysfunction syndrome" in dogs. (In a dog, symptoms include failing to recognize people or respond to its name and getting lost in the house.) Experts expect a steady stream of drugs aimed at pets' minds instead of bodies.

The research is also coloring thinking about everything from science labs to farms and food-production facilities. Having demolished concrete cages in favor of naturalistic enclosures, many zoos are also offering animals "environmental enrichment" designed to exercise their minds, and housing them in social groups where they can express their emotions. The nonprofit Great Ape Project, Seattle, is campaigning on behalf of the primates for "life, liberty and protection against torture." And this year a member of the Spanish parliament introduced a resolution to protect great apes from "maltreatment, slavery, torture, death and extinction." Federal animal-welfare acts have long

required researchers who use primates to take into account their "psychological well-being," but researchers say more institutions that use lab dogs, rabbits and other small animals are voluntarily adopting the rules. "Without question, these discoveries [on animal awareness] are having an effect," says Wayne Pacelle, president and chief executive officer of the Humane Society of the U.S.



I bark, therefore I am: above, a groomed standard poodle

And if chimps and monkeys have hints of consciousness, do less-brainy animals have it, too? Does that mean people shouldn't hunt them, imprison them or eat them? Opponents of experimenting on animals say creatures as low on the evolutionary ladder as rats and mice are capable of suffering, even if they can't engage in self-reflection.

Some researchers say humans may be a bit too eager to attribute high-level mental functioning to animals, and end up inferring mental states that don't exist. Bonnie Beaver, professor of veterinary medicine at Texas A&M University and former president of the American Veterinary Medicine Association, says that when dogs act distressed in a boarding kennel, they're showing unfamiliarity with the surroundings, not resentment that their owner is vacationing in Bali. And if a dog looks guilty over leaving a mess on the rug, it is being submissive, she says, not showing a more complex emotion. "Most times," she says, "owners are reading things that are not there."

Not too long ago, scientists scoffed at the idea that animals could have consciousness. Philosophers haggle endlessly about the meaning of the word, of course. But they generally agree that it isn't enough to solve problems, learn or remember -- a semiconductor can do that -- but to be aware of the contents of one's own mind. When it comes to animals, the question "was

thought of as impossible to answer with objective observations," says Clive Wynne, an associate professor of psychology at the University of Florida, Gainesville. Now he sees an increase in such studies aimed at discovering what's going on inside animals' heads.

At the Yerkes National Primate Research Center in Atlanta, Robert Hampton, who has made some of the field's most significant findings, studies whether rhesus monkeys know if they know something. In one series of experiments, he gave the monkeys memory tests over a period of weeks. After seeing four images on a monitor, the monkeys would be asked to choose which one they had seen before. But before taking the test, the monkeys had a choice of pressing one of two icons whose meaning they already knew. One meant, "Yup, I'm ready to take the test." The other meant, "No test for me, thanks." They had an incentive to take it only if they remembered the target image: Failing the test brought them no reward, passing it got them a handful of peanuts, and declining to take the test got them monkey-chow pellets, which they don't like as much as peanuts but are better than nothing.



African elephants play-fighting

When the monkeys chose to take the test, they passed more than 80% of the time, apparently declining to take the test when their memory was poor. When they weren't given a choice and Prof. Hampton gave them the test anyway, they chose the correct image much less often. That suggests they knew the contents of their memory and assessed it before deciding whether to take the test -- a sign of self-reflective consciousness. "The monkeys know whether they remember something," says Prof. Hampton, who reported his latest monkey findings in May in the journal *Behavioural Processes*.

A key ingredient of consciousness is having a sense of self, a feeling that there's a "you" inside your brain. One sign of that is being able to imagine yourself in a different time and place. Some scientists have said that's why chimps in a forest pick up a stone so that they can crack a nut that they left far away, and why New Caledonian crows make hook-shaped devices to fish for bugs.

But maybe, skeptics say, chimps and crows learned that a rock, or hook, equals lunch and just act reflexively. To try to rule this out, scientists at the Max Planck Institute for Evolutionary Anthropology in Leipzig, Germany, taught orangutans and bonobos, considered the great apes closest to humans, how to use tools to snare grapes that were otherwise out of reach. Then they gave the animals a chance to take the right tools into a "waiting room," where they were kept for times ranging from five minutes to overnight, before being led back to the room with the grapes. The clever move, of course, was to grab a tool before going to the waiting room.

All 10 animals managed this at least sometimes, the researchers reported in May in the journal *Science*. Because the animals had to plan so far ahead, the scientists argue, the experiment showed an ability to anticipate needs. "It's hard to argue that these animals do not have consciousness," says primatologist Frans de Waal at Yerkes.

Dissenters argue that any behavior that meets a basic need such as hunger shouldn't be ascribed to anything as lofty as consciousness. More and more, however, scientists are observing what they call altruistic behavior that has no evident purpose. Prof. de Waal once watched as a bonobo picked up a starling. The bonobo carried it outside its enclosure and set the bird on its feet. When it didn't fly away, the ape took it to higher ground, carefully unfolded its wings and tossed it into the air. Still having no luck, she stood guard over it and protected it from a young bonobo that was nearby.

Since such behavior doesn't help the bonobo to survive, it's unlikely to be genetically programmed, says Marc Bekoff, emeritus professor of ecology and evolutionary biology at the University of Colorado, Boulder. If a person acted this way, "we would say this reflects planning, thought and caring," he adds. "When you see behaviors that are too flexible and variable to be preprogrammed, you have to consider whether they are the result of true consciousness."

In June, scientists reported new insights about compassion in African

elephants. These animals often seem curious about the bodies of dead elephants, but no one knew whether they felt compassion for the dying or dead. A matriarch in the Samburu Reserve in northern Kenya, which researchers had named Eleanor, collapsed in October 2003. Grace, matriarch of a different family, walked over and used her tusks to lift Eleanor onto her feet, according to Iain Douglas-Hamilton of Save the Animals, Nairobi, and colleagues at the University of Oxford and the University of California, Berkeley, reporting in the journal *Applied Animal Behaviour Science*. But Eleanor was too shaky to stand. Grace tried again, this time pushing Eleanor to walk, but Eleanor again fell. Grace appeared "very stressed," called loudly and often, and kept nudging and pushing Eleanor. Although she failed, Grace stayed with the dying elephant as night fell. Eleanor died the next day.

Grace's interest in an unrelated animal can't be explained by her genetic disposition to help a close relative, a behavior that's been well established. The scientists instead argue that the elephant was showing compassion. Mr. Douglas-Hamilton has also seen elephants guard and help unrelated elephants who have been hit by tranquilizer darts to let researchers tag the animals. Since standing by an animal that has been shot puts the other animals in harm's way, it's hard to argue self-interest.

Critics say that consciousness is in the eye of besotted observers, and animals are no more than stimulus-response machines. Florida's Prof. Wynne, for one, is skeptical that chimps know what they know. "To know one's own mental states does not necessarily imply conscious awareness," he says. "You can be unconsciously aware of what you know." Game-show contestants, for instance, sometimes press a buzzer to answer before they consciously know the answer -- knowing unconsciously that they know.

Anyone whose dog has ever run to the front door, leash in its mouth, assumes that animals form intentions. But that might also reflect dumb learning: the dog figured out that leash equals walk. A computer could be rigged to learn the same cause-and-effect relationship. Some scientists also see intentionality when beavers plug holes in their dam, bowerbirds build baroque nests, ants cultivate fungus farms and plovers feign injury to lure predators away from their hatchlings. But many researchers give genes, not conscious intentions, the credit for these clever behaviors.

As for emotions, the conventional view has long been that while animals might

seem to be sad, happy, curious or angry, these weren't true emotions: The creature didn't know that it felt any of these things. Daniel Povinelli of the University of Louisiana, who has done pioneering studies of whether chimps understand that people and other chimps have mental states, wonders whether chimps are aware of their emotions: "I don't think there is persuasive evidence of that."

The trouble is that all sorts of animals -- from those in the African bush to those in your living room -- keep acting as if they truly do have emotions remarkably like humans'. Last month, Ya Ya, a panda in a Chinese zoo, accidentally crushed her newborn to death. She seemed inconsolable -- wailing and frantically searching for the tiny body. The keeper said that when he called her name, she just looked up at him with tear-filled eyes before lowering her head again. The conventional view is that these were instinctive, reflexive reactions, and that Ya Ya didn't know she was sad. As the evidence for animal consciousness piles up, that view becomes harder to support.

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